Comprehensive Long-term Environmental Action Navy

N00164.AR.001003
NSWC CRANE
5090.3a

CONTRACT NUMBER N62467-94-D-0888

Rev. 0
01/23/06

Resource Conservation and Recovery Act Facility Investigation Report
for
Mine Fill A (SWMU 12)

VOLUME III OF III - APPENDICES D - J

Naval Surface Warfare Center Crane
Crane, Indiana

Contract Task Order 0357

January 2006

NAVFAC
Naval Facilities Engineering Command
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

SWMU 12 RFI
LIST OF APPENDICES

A Photographs and Photograph Direction Figures

B Boring logs, Monitoring Well Construction Diagrams and Related Materials

C Sample Log Sheets and Other Field Forms

D Miscellaneous Field Documentation

E Aquifer Characteristics, Calculations, and Records

F Health and Safety Documentation

G Analytical Data

H Data Quality Review

I Human Health Risk Assessment Calculations

J Supporting Materials for the Ecological Risk Assessment

APPENDIX D

SMWU 12

MISCELLANEOUS FIELD DOCUMENTATION ROUND 1 AND ROUND 2

APPENDIX D.1.1

SWMU 12

SITE LOGBOOK ROUND 1

NSWC CRANE

N6878

SWMU 12

1374

IF Lost Return book to

TETRA TECH NUS, INC.

Terry R. Rojahn
Biologist

661 Andersen Drive, Pittsburgh, PA 15220-2745
(412) 921-8857 ▪ FAX (412) 921-4040
rojahnt@ttnus.com ▪ www.tetratech.com

NSWC CRANE

PROJECT # 6878 SWMU 16

CTO 0357

PROJECT TOM - RALPH BASINSKI

FOL - TERRY ROJAHN

Start WORK - 7/8/04

END WORK -

OTHER Notebooks

2576 - S. Conti (Geo)

2581 - Chip LANEY

[illegible] - J. Goerdt

CHRIS FREEMAN = (812) 296-0545 (CELL)
TOM BRENT = (812) 295-6230 (CELL)

DAVE BAKER SUPER. FOR MINE FILL A

T. JOHNSTON - (412) 854-1052 (HOME)

DAVE BAKER - 854-1662 BLDG 155

BOB GILLIS - 854-6968

SA ANH HO - (206) 957-2433 FAX (206) 767-5063

MARK ROSS - MFA 3056

CHIP - (703) 963 6265

HERTZ - (317) 849 5124
National - (812) 372-3377

BEN SHERE - (812) 854-1613 RR Dispatcher

Lonie Warren X 3972
Skip Laurence X 1296
Max Hostettler X 3120
Dave Fisher X 1884

BOB GILLIS
854-6968
BLDG 13
CAAA SAFETY

Don Mills
Fire Inspector
Also 1235
Tel (812) 854-6019
Fax (812) 854-4269
DSN 482-6019
mills_d@crane.navy.mil

Naval Support Activity
Code 08501, Bldg 10
300 Highway 361
Crane, IN 47522-5001

CAAA SAFETY - BOB GILLAS? - 854-6968 (BLDG #13 BEHIND FIRE STA.)
(ARMY)

DIGGING PERMIT
NSWC CRANE 11000/3 (REV. 8/02)

4562

REQUESTED BY	DATE
T. [illegible] NUS Inv/Ralph Borowski 412-921-8205	6/28/04
WORK REQUEST ON E/S NO.	
151017	Mine Fill "A" AREA
WORK WILL BE PERFORMED BY	**DATE (Start - on or about)**
Tetra Tech NUS, INC.	

WORK DESCRIPTION
Soil samples at various locations at Mine Fill "A" AREA. Locations are inside fence, along fence, west side of Hwy 45, & 2 are under powerline right-of-way. Marked with wooden stakes with pink & orange flagging.

EQUIPMENT TYPE
☐ HAND TOOLS ☐ CORE DRILL ☐ TRENCHER ☐ BACKHOE ☐ HEAVY EQUIPMENT

Faxed 22 6/28/04

UNDERGROUND UTILITIES LOCATED IN WORK SITE

UTILITY	PRESENT	MARKED	NOT LOCATED	REMARKS
COMPRESSED AIR 22	N/A			J Berl [illegible] 7/8/04
HIGH VOLTAGE ELECTRICAL	N/A			S.A. 7/6/04
FIRE ALARM 22	N/A			[illegible] 6/30/04
GROUNDING 22	N/A			6-29-04 [illegible]
Sub 7/19 NATURAL GAS 040629 3083 3076 3088	YES	YES		7/1/04 [illegible]
SECURITY ALARM 22	N/A			[illegible] 6/30/04
SEWER	YES	YES		7-7-04 [illegible]
STEAM	N/A			6-29-04 RRT
TELEPHONE Faxed 6/28/03	N/A			7-6-04 YP
WATER	YES	YES		7-7-04 [illegible]
SECOND ELECTRICAL 22	YES	YES		6-29-04
Faxed 6/28/04 GENERAL DYNAMICS/NMCI	N/A	N/A		6-30-04 [illegible]

In addition to the general precautions for excavating where underground utilites are present, comply with the following:

PERMIT HOLDER SIGNATURE	DATE
[illegible] X	7/9/04
DIGGING PERMIT APPROVED BY	**DATE**
[illegible]	7/9/04

DISTRIBUTION:
ORIGINAL - Code 09Z5 File
YELLOW - Supv. At work site
PINK - Permit requestor

TITLE NSWC CRANE

PROJECT NO. 6873

BOOK NO. 1374

1

THURS 7-8-04

Work continued from Page

TRAVEL DAY → TO NSWC CRANE

0900 Hrs - Arrive BLDG #3245
Begin organizing office & storage; except FED.EX. delivery
Check out EQ from US Environmental
Prep for H&S Site Specific Training

1430 - 1600 - H&S Site Specific Training for the Following

B-M: Joshua Dean, Bruce Kirkpatrick, Don Nulk, Jim Walsh

T+ N4S: Stan Conti, Chip Laney, Jim Goerdt

1615 Hrs - Pick up Dig Permits @ Public Works for
- Ming Fill A except wells along RR tracks
- SWMU 13 wells

1700 Hrs - Return to BLDG #3245
Meet w/ Chris Freeman - Ming Fill A access & Additional Keys
Organize H&S files
Prep to leave

1815 Hrs - Left BLDG #3245 for Hotel

END

Chris 812-296-0545
Tom 812 295-6230
- SWMU 12 - Access & Letter
- Hot work permits

[redacted]

Fire Inspector
Hot Work permit
#1235

Doug Baker

Triple A
Army Safety
to approve
site specific
gen

Work continued to Page

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE

DATE 7-8-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©

VOID THIS PAGE

3M ENGINEERING PRODUCTS CHICAGO 60605 MADE IN USA

Work continued from Page

Weather - Hot & Humid High 80's / Low 90's

0700 Hrs - Arrive @ BLDG # 3245
- Inventory Bottles sent by Laucks
- Up Date Chemical List

0800 Hrs - Left BLDG for MFA
Talk / Meet D. Baker ok to drive through ARC (1000')
just don't stop - Need to get Army
Approval @ Decon PAD south of MFA
(Battery Area)

0915 Hrs - Return to BLDG # 3245
- Prep for SW/SD sampling @ MFA
- T. Brent stopped by checked with him regarding
Decon Hot Permit - said to check w/
Fire Inspector regarding procedure
- Call Instruments YSI & Turbidity Meter

1130 Hrs - Left BLDG # 3245 to talk to Fire Inspector about Permit
Don Mills informed me that No work or Permits are to
be issued @ this time in areas were contractors
can be exposed to Explosives - word came down
from Bob Gillis of CAAA Safety (Army).

1200 Hrs - Informed T. Johnston of above

1230 Hrs - Lunch / Meet Drillers (asked them to report to BLDG # 3245)

1310 Hrs - Arrive BLDG # 3245 - Listen to T. Johnston's message
that he talked to C. Freeman & B. Gates - will wait
for word to stay or demob.

1400 Hrs - Demob - THNCS & Drillers
- Pack all U.S. Environmental Eq. 15 items on
Fed. Ex Airbill 8947 8135 5351 - T. Brent &
C. Freeman w/ ship if we don't return
soon enough.
- Drillers packing up / demob & break down
Decon behind BLDG # 3245 after Eq Decon

1700 Hrs - Showed Drillers B. Kirkpatrick & D. Null where
to dump decon water - Wd. sewer

1720 Hrs - Left Site for Hotel

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 7-9-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

VOID THIS PAGE

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SAT. 7-10-04

Work continued from Page

1000 Hrs - Check out of Hotel & LEAVE Bloomington for Indy Airport to return to Pittsburgh

TRAVEL DAY → Pittsburgh

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 7-10-04

ISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

GGING PERMIT
WC CRANE 11000/3 (REV. 8/02)

4562

QUESTED BY NUS Inc/Ralph Brusski 412-921-8308	DATE 6/28/04
ORK REQUEST ON E/S NO. 151017	Mine Fill "A" Area
ORK WILL BE PERFORMED BY TETRA Tech NUS Inc.	DATE (Start - on or about)

ORK DESCRIPTION
Soil samples at various locations at Mine Fill "A" Area. Locations are inside fence, along fence, west side of Hwy 45, ± 2 mile under powerlines right-of-way - Marked with wooden stakes with pink & orange flagging.

QUIPMENT TYPE
☐ HAND TOOLS ☐ CORE DRILL ☐ TRENCHER ☐ BACKHOE ☐ HEAVY EQUIPMENT

Faxed ZZ 6/28/04

UNDERGROUND UTILITIES LOCATED IN WORK SITE

UTILITY	PRESENT	MARKED	NOT LOCATED	REMARKS
OMPRESSED AIR ZZ	N/A			J. Bauer Pa Phone 7/15/04
IGH VOLTAGE ELECTRICAL	NA			S.P. 7-6-04
IRE ALARM ZZ	NA			WMM 6/30/04
ROUNDING ZZ	N/A			6/29/04
Exp 7/19 ATURAL GAS 040629 3083 3076 3088	yes	yes		7/1/04
ECURITY ALARM ZZ	NA			WMM 6/30/04
EWER	yes	yes		7-7-04
TEAM	N/A			6-29-04 RRT
ELEPHONE Faxed 6/28/03	N/A			7-6-04
VATER	yes	yes		7-7-04
ECOND ELECTRICAL ZZ	yes	yes		6/29/04
Faxed 6/28/04 GENERAL DYNAMICS/NMCI	N/A	N/A		6-30-04

In addition to the general precautions for excavating where underground utilites are present, comply with the following:

* Exp 8/9 040720322 9, 3230, 3232

PERMIT HOLDER SIGNATURE X	DATE 7/9/04
DIGGING PERMIT APPROVED BY	DATE 7/9/04

DISTRIBUTION:
ORIGINAL - Code 09Z5 File
YELLOW - Supv. At work site

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

THURS 7-22-04

Work continued from Page

SEE Notebook # 1376 FOR Details of this date
i.e. Decon Recon & Dig Permit Info

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Troy Rogers

DATE 7-22-04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

E TOOL/HOT WORK PERMIT
CRANE 11320/19 (REV. 1-02)

ITEM	FROM	TO	ISSUED TO
VE DATES	[illegible]	[illegible]	☐ NSWC ☐ CAAA ☑ CONTRACTOR ☐ TENANT
	0800	1900	NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY: Powser + Mont

EQUIPMENT TO BE USED *(Cutting Torch, Arc Welder, etc.)*

Steam cleaning, Power Tools, Hand Tools

E OF USE

Clean Paint

USED *(Building/Structure/Other location)*

Lot on West side of M.P. ☐ INSIDE ☑ OUTSIDE

CTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT

☑ GENERAL FIRE PREVENTION INSTRUCTIONS ON REVERSE SIDE MUST BE COMPLIED WITH.

☑ IN ADDITION TO THE GENERAL FIRE PREVENTION INSTRUCTIONS ON REVERSE SIDE, YOU SHALL COMPLY WITH THE FOLLOWING:

☑ REMOVE ALL COMBUSTIBLES 35 FEET, ALL FLAMMABLE LIQUIDS 50 FEET, AND ALL EXPLOSIVES (UNLESS APPROVED TO STAY BY THE SAFETY DEPARTMENT (CAAA OR NAVY ESO) AND FIRE PREVENTION) 100 FEET FROM THE HOT WORK AREA.

1) 10# ABC

2) Fire watch

3) 30 min cool down

DESIGNATED AS FIRE WATCH *(NOT SAME PERSON AS PERMIT HOLDER)*

[illegible] Diamond

REQUIRED FIRE EXTINGUISHER AT WORK SITE		OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE	SIZE	
WATER ☐ CO_2 DRY CHEMICAL	10# ABC	

ad, understand and will comply with the above "Instructions of the Fire Suppression/Prevention Branch, Fire Department"

URE *(Permit Holder)*	DATE
[illegible]	07-23-02

HAZARDOUS AREAS ONLY

hat the "Instructions of the Fire Suppression/Prevention Branch, Fire Department" stated above are adequate and area is safe to work in.

URE *(Building Supervisor/Forman/Representative)*	DATE

ion is hereby granted the Trade/Contractor/Tenant Activity named above to use specified equipment in accordance with the "Instructions of the Suppression/Prevention Branch, artment as stated above.

URE *(Fire Department/Representative)*	DATE
[illegible]	07-23-02

BUTION: Original (Code 0631 File)

TLE N5WC CRANE

PROJECT NO. 6878

BOOK NO. 1374

FRI 7-23-04

Work continued from Page

SEE Note book # 1376 FOR DETAILS OF this date
i.E. Hot Work Permit. and meeting w/ Fire Inspector.

GENERAL FIRE PREVENTION INSTRUCTIONS

ll combustibles, flammable liquids, and explosives must be out of the hot work area. (Minimum of 35 feet for combustibles, feet for flammable liquids, 100 feet for explosives if in a building, railcar, or vehicle containing explosives or ammunition unless roved by the Safety Department (CAAA or Navy) and the Fire Prevention Branch.)

Building and/or Area Supervisor/Foreman/Representative will be contacted before work begins each day (hazardous locations ecially).

ll work shall be performed by competent, well trained, carefully supervised personnel.

ll work shall be performed in a manner equal or superior to normal trade practices.

During the performance of his/her duties a worker realizes he/she does not fully understand the work to be done; or the planned k has changed; hazards of the job have changed; the work must stop and advice from their supervisor and Fire Prevention must obtained.

Welding or other hot work is not permitted within 100 feet of a building, railcar, or vehicle containing explosives or ammunition ess approved by the Safety Department (CAAA or Navy) and the Fire Prevention Branch. Flame permits for this type of work st be issued by the Fire Prevention Branch before such work is started.

Drilling is not permitted in a room containing explosives, ammunition, or pyrotechnics, unless otherwise specified by the Safety partment (CAAA or Navy) and the Fire Prevention Branch. Drilling permits for this type of work must be issued by the Fire ntion Branch before such work is started.

el tools are not permitted in a room containing explosives or propellants. Steel tools shall be used as little as possible in other ms adjacent to rooms containing explosives or ammunition.

On completion of work, the work area shall be cleaned so that the work areas is returned to as good or better condition than en the work began.

Equipment that may have been contaminated with explosives shall be carefully cleaned by an explosive operator and certified an by the job supervisor before an employee may work on it.

Contractors not in compliance with the above instructions and other requirements of this permit resulting in injury to person(s) d/or damage to property, may be liable for injury and/or damages incurred.

. Government employees not in compliance with the above instructions and other conditions of this permit, resulting in injury to rson(s) and/or damage to property, may be subject to disciplinary action.

. Report all fires to the Fire Department (extension 911- Center Phones, and 854-1333/1100 - Cell Phones).

. If at any time during the progress of work explosive contamination is discovered, the building supervisor and Fire Prevention ist be notified, work shall be stopped and the contamination/hazard shall be removed by qualified personnel.

. The permit holder may be held responsible for condition(s) in and around the work area. The permit holder must take positive tion to inform his/her supervisor of any suspected hazardous condition(s) encountered or observed.

. All Flame Tool/Hot Work Permits issued for work in or on an explosive/pyrotechnics structure must be signed by the building pervisor or his designated representative.

. A minimum of one person will be designated as a fire watch with the specified fire extinguisher in hand, during all hot work. e fire watch will be required to stay in the immediate hot tool work area for a minimum of 30 minutes to insure no fire starts er the fact.

. This permit may be revoked at any time that the permit holder is found to be in on-complicance with the above instructions other conditions of this permit.

CIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

GNATURE

DATE 7-23-04

OSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

NOTES

Subject 6000 Hill RR Track

Meeting Attendees

J. Hunsicker	RP3	X-3233
Michael R. Rose	40620	X-1490
Gary Rayhill	DOO GS11	X-1592
Michael Ashford	RR ENG Tech	X-3336

Name	Code/Office	Phone
Stan Conti	Tt NUS	412-551-2629
Fred Winklepleck	CRPW7 B-2713	812-854-3383
Terry Rojahn	Tt NUS	412-921-8857 / CRANE OFFICE 0280
Ed Scott	RP1E3	812-854-1154
Nathan Skinner	RP1N3	812-854-3162
Jim Walsh	Bowser morner	419-304-3005
William Alexander	DOS B-2532	812-854-3015
Jim Hunsicker	RP3	812-854-3233
Michael R. Rose	B#7	812-854-1490

The meeting was held at 0800 hours CST in the Building 2 Safety Office Conference Room. Attendees:

Jim Hunsicker (Navy Environmental)
Tom Brent (Navy Environmental)
Fred Winklepleck (Navy Transportation)
Michael Rose (Navy Rail Road)
Ed Scott (Navy Safety)
Nathan Skinner (Navy Safety)
Michael Ashford (Navy Rail Road)
William Alexander (Army Production)
Gary Rayhill (Army Production)
Ralph Basinski (Tetra Tech NUS - by phone) Matt Soltis (Tetra Tech NUS - by phone) Terry Rojahn (Tetra Tech NUS) Stan Conti (Tetra Tech NUS) Jim Walsh (Bowser Morner)

SCIENTIFIC BINDERY PRODUCTS CHICAGO 50605 MADE IN USA

HURS 7/29/04

rk continued from Page (For additional details for this date see pp. 16 & 17 of Note Book #1376)

300 Hrs - 600 Hill RR Pre-Con meeting
210 Hrs - See Page 10 for list of those present
→ Return to BLDG #3245
M. Soltis - will wright procedure for RR travel
+ All parties will sign off on it
MEETING NOTES BELOW:

ey points: Communication, communication, and communication.

er key points:
tra Tech will drill up to six wells in the 600 Hill railroad corridor, beginning in
roximately 4 weeks.
e drill rig will need to travel on the track to get to the drill locations.
vy trains run both downhill uphill and carry explosives.
ains running downhill cannot stop.
enever we're on the track we need to let the Dispatcher know. When we're off the
ck, we need to let the dispatcher know.
fore a train is authorized to come down the track, the Dispatcher will check to make
e we're clear of the track. If he can't reach us, someone will come looking.
vy will provide 2-way radios with the RR frequency. Two will be provided for
lundancy.
dios will be tested at the drill sites prior to issuance.
ll phones will probably work since a tower is close by. Cell phones will be tested
or to work start (e.g., next shift).
phones must be turned off during munitions shipment on the RR (minimum 25'
cional distance from ordnance).
vy trains run on the track 2 to 3 times/day during dayshift and 1 or 2 times at night.
mmercial trains don't use this track.
tra Tech will draft a safety plan specific to the well installations on the track and
lude follow-on work (development and sampling).
tra Tech will provide copies of the Safety plan to Tom Brent for Safety & the RR office
review. Navy Safety must sign-off.
vy will supply a truck w/a driver that can run on the rail 1 time per day to move
ipment and supplies.
Dispatcher's number is 812-854-1613.
ternate number is Security (812-854-3300).
Dispatch radio call sign: Inchworm Alpha.
Crew typically does not work Sundays. However, Tetra Tech will still call the RR
patcher to see if they're working. If no answer, Tetra Tech will leave a message on
Dispatcher's v-mail. In the event the Dispatcher does not answer on a Sunday, Tetra
h will also call Security.

Meeting Attendees on Page 10.

Work continued to Page

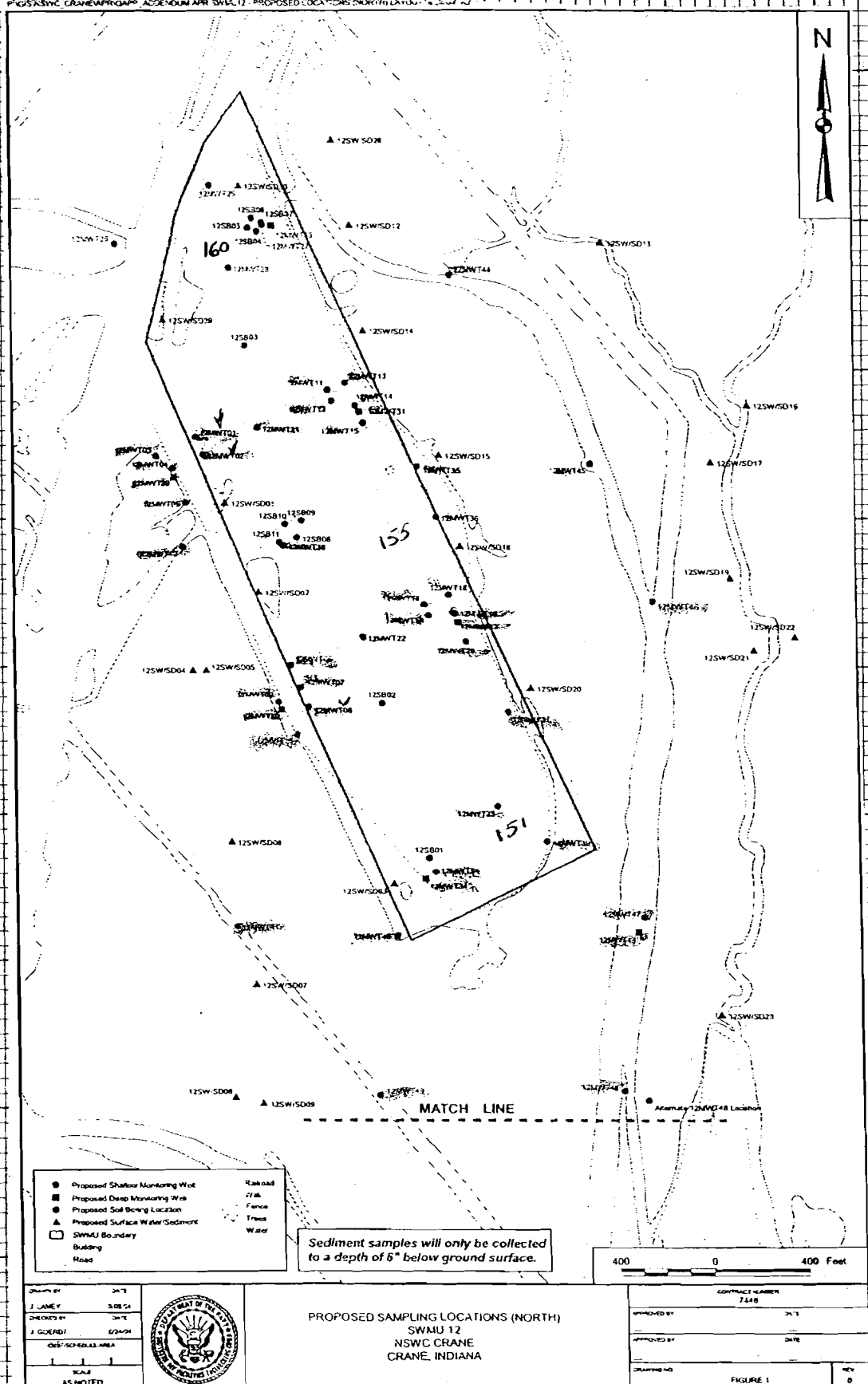
NTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

IATURE DATE 7/29/04

TO AND UNDERSTOOD BY DATE WITNESS DATE

12

MATERIAL HANDLING ARCS OF SAFETY :



PROPOSED SAMPLING LOCATIONS (NORTH)
SWMU 12
NSWC CRANE
CRANE, INDIANA

FIGURE 1

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60655 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SWH 8/1/04 (For additional details see NB 1376 for this date)

Work continued from Page

WEATHER Mostly SUNNY High 80°s

705 Hrs - ARRIVE @ BLDG #3245

PREP to sample GW @ SWMU 13

PREP to DEV. monitoring WELLS @ SWMU 12 - SEEE TABLE BELOW

WELL ID	Start DEV	END DEV.	VOL DEV	COMMENTS	Color
12MWT01	1011	1026	28 gal	H_2O VISABLY CLEAR	CLEAR
12MWT13	1100	1151	16.8 gal	Dry out WELL 3 TIMES,	Brownish
12MWT37	1353	1448	3.0 gal		BRN
12MWT39	1505	1605	8.5 L		BRN
12MWT08	1620	1713	10.5 gal		CLOUDY
12MWT02	1725	1750	30.0 gal	H_2O VISABLY CLEAR	CLEAR

SEE Note book # 1376 FOR SWMUS 13 & 16 FOR REMAINDER OF DAY.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry [illegible]

DATE 8/1/04

OSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

DIGGING PERMIT
NSWC CRANE 11000/3 (REV. 8/02)

4562

REQUESTED BY	DATE
T. NUS Inc/Ralph Basinski 412-921-8208	6/28/04

WORK REQUEST ON E/S NO.	
181017	Mine Fill "A" Area

WORK WILL BE PERFORMED BY	DATE (Start - on or about)
Tetra Tech NUS, Inc.	

WORK DESCRIPTION

Soil samples at various locations at Mine Fill "A" Area. Locations are inside fence, along fence, west side of Hwy 45, & 2 are under powerline right-of-way. Marked with wooden stakes with pink & orange flagging.

EQUIPMENT TYPE

☐ HAND TOOLS ☐ CORE DRILL ☐ TRENCHER ☐ BACKHOE ☐ HEAVY EQUIPMENT

Faxed ZZ 6/28/04

UNDERGROUND UTILITIES LOCATED IN WORK SITE

UTILITY	PRESENT	MARKED	~~NOT LOCATED~~	REMARKS
COMPRESSED AIR ZZ	N/A		Re MARK	J Berlet per phone 7/9/04
HIGH VOLTAGE ELECTRICAL	NA			S.R. 7-6-04
FIRE ALARM ZZ	NA			Wm 6/30/04
GROUNDING ZZ	N/A			6-29-04 BR
* Exp 7/19 NATURAL GAS 0406293083 3096 3088	YES	YES		7/1/04 DEH
SECURITY ALARM ZZ	NA			Wm 6/30/04
* SEWER	YES	YES	Remarked Fax mo	7-7-04
STEAM	N/A			6-29-04 RRT
TELEPHONE Faxed 6/28/03	N/A			7-6-04 YP
* WATER	YES	YES	Remarked Fax mo	7-7-04
* Under Faxed 8/3/04 ZZ SECOND ELECTRICAL	YES	YES	YES BK	6-29-04 D
Faxed 6/28/04 GENERAL DYNAMICS/NMCI	N/A	N/A		6-30-04

In addition to the general precautions for excavating where underground utilites are present, comply with the following:

* Exp 8/9 0407203229, 3230, 3232

Exp 8/23 0408033036 0408033040 0408033045 DEH 8-5-04

PERMIT HOLDER SIGNATURE	DATE
Tey Park X	7/3/04

DIGGING PERMIT APPROVED BY	DATE
Wm. X. Johnson	7/5/04

DISTRIBUTION:

ORIGINAL - Code 09Z5 File

8/10/04

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TUES. 8/10/04 (For additional details see NoteBook 1376 for this date.)

Work continued from Page

0715 Hrs - Arrive @ Public Works - Check on Digging Permit Permit almost ready - Secondary Elec. to sign off Around 0830 Hrs.

0750 Hrs - Return to BLDG # 3245 Asked Stan Conti to Pick up Permit @ 0830 Hrs while I meet Cable Locating crew @ MFB to mark sewer & water

0830 Hrs - S. Conti picked up Permit @ Public Works See Page 16 - Permit # 4562

Remainder of Day See Note Book 1376 Project # 7448

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 8/10/04

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

16

.000/3 (REV. 8/02)

4562

Tech NUS Inc/Ralph Bednski 412-921-8308	DATE 6/28/04
REQUEST ON E/S NO. 21017	Mine Fill "A" Area
WORK WILL BE PERFORMED BY Tetra Tech NUS Inc.	DATE (Start - on or about)

WORK DESCRIPTION

Soil samples at various locations at Mine Fill "A" Area. Locations are inside fence, along fence, west side of Hwy 45, & 2 are under powerline right-of-way. Marked with wooden stakes with pink & orange flagging.

EQUIPMENT TYPE

☐ HAND TOOLS ☐ CORE DRILL ☐ TRENCHER ☐ BACKHOE ☐ HEAVY EQUIPMENT

Faxed ZZ 6/28/04

UNDERGROUND UTILITIES LOCATED IN WORK SITE

UTILITY	PRESENT	MARKED	~~NOT LOCATED~~	REMARKS
COMPRESSED AIR ZZ	N/A		ReMARK	J. Beasley Pa Pkor 7/8/04
HIGH VOLTAGE ELECTRICAL	NA			S.G. 7-6-04
FIRE ALARM ZZ	N/A			WBM 6/30/04
GROUNDING ZZ	N/A			6-29/04 B
* Exp 7/14 3033 NATURAL GAS 0406293076 3088	YES	YES		7/1/04 DEH
SECURITY ALARM ZZ	NA			WBM 6/30/0
*SEWER	YES	YES	8/12 mw Remarked 8-4-04 mo	7-7-04
STEAM	N/A			6-29-04 RR
TELEPHONE Faxed 6/28/03	N/A			7-6-04 KP
*WATER	YES	YES	8/12 mw Remarked 8-4-04 mo	7-7-04
*Remark Faxed 8/3/04 SECOND ELECTRICAL ZZ	YES	YES	8/12/04 8/11/04 YES BR	6-29/04 B
Faxed 6/28/04 GENERAL DYNAMICS/NMCI	N/A	N/A		6-30-04

In addition to the general precautions for excavating where underground utilites are present, comply with the following:

* Exp 8/9 0407203229, 0407203230, 0407203232 DEH 7-22-04
Exp 8/23 0408033036, 0408033040, 0408033043 DEH 8-5-04
Exp 8/31 0408112925, 0408112930, 0408112935 DEH 8-12-04

PERMIT HOLDER SIGNATURE	DATE 7/8/0
DIGGING PERMIT APPROVED BY Donna L. Zellman Donna L. Zellman	DATE 7/8/04 ~~8/10/04~~

DISTRIBUTION

TITLE NSWC CRANE **PROJECT NO.** 6878 **17**

BOOK NO. 1374

THURS ~~WED~~ 8/12/04 (For additional details see Note book 1376 for this date)

Work continued from Page

1115 Hrs - Arrive @ MFA
- Check in w/ drilling crew - About to brake for lunch
- S. Conti & T.R. will check boring & drilling stakes that may have been disturbed by mowers after lunch

1130 Hrs - Lunch

1205 Hrs - Return to MFA
Check all stakes - Need water locator to recheck 12MWT11, 12, 27 & 33 and boring 125807

1310 Hrs - Check in w/ Public Works
- Meet locator for water right away @ MFA

1325 Hrs - Meet Kevin water locator @ MFA
Check above sites

1405 Hrs - Left MFA

1415 Hrs - Pick up Revised Permit # 4562 @ Public works see Page 16.

1430 Hrs - Return to Bldg # 3245
Work on Project 7448 remainder of day

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 8/12/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©

Sampling summary 8/13/04:

Soil Borings collected = 12 SB 12, 13, 14 & 15

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60635 MADE IN USA

FRI 8/13/04 (For additional details see NB #1376 for this date)

Work continued from Page

WEATHER: Mostly Sunny Low 70's High

0830 Hrs - 1015 Hrs - Radio & Phone Check on RR tracks - Goo Hill w/ T. Brent

• Work on swmu 16 until 1600 Hrs

1600 Hrs - Arrive @ swmu 12, check in w/ DPT crew - help clean up

1630 Hrs - Return to BLDG # 3245

• Prep samples on COC #0069 - Package samples for shipment on AB# 8478135 5443

1720 Hrs - Leave BLDG #3245 for FED. EX

1750 Hrs - Drop off samples @ FED. EX

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 8/

LOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLING SUMMARY 8/13/04:

- Collected soil borings: 123801-11 and 18-20
- Collected 2 source water blanks & 4 rinsates
- Samples are on COCs 0070 & 0075-0078.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 53513 MADE IN USA

SUN 8/15/04

Work continued from Page

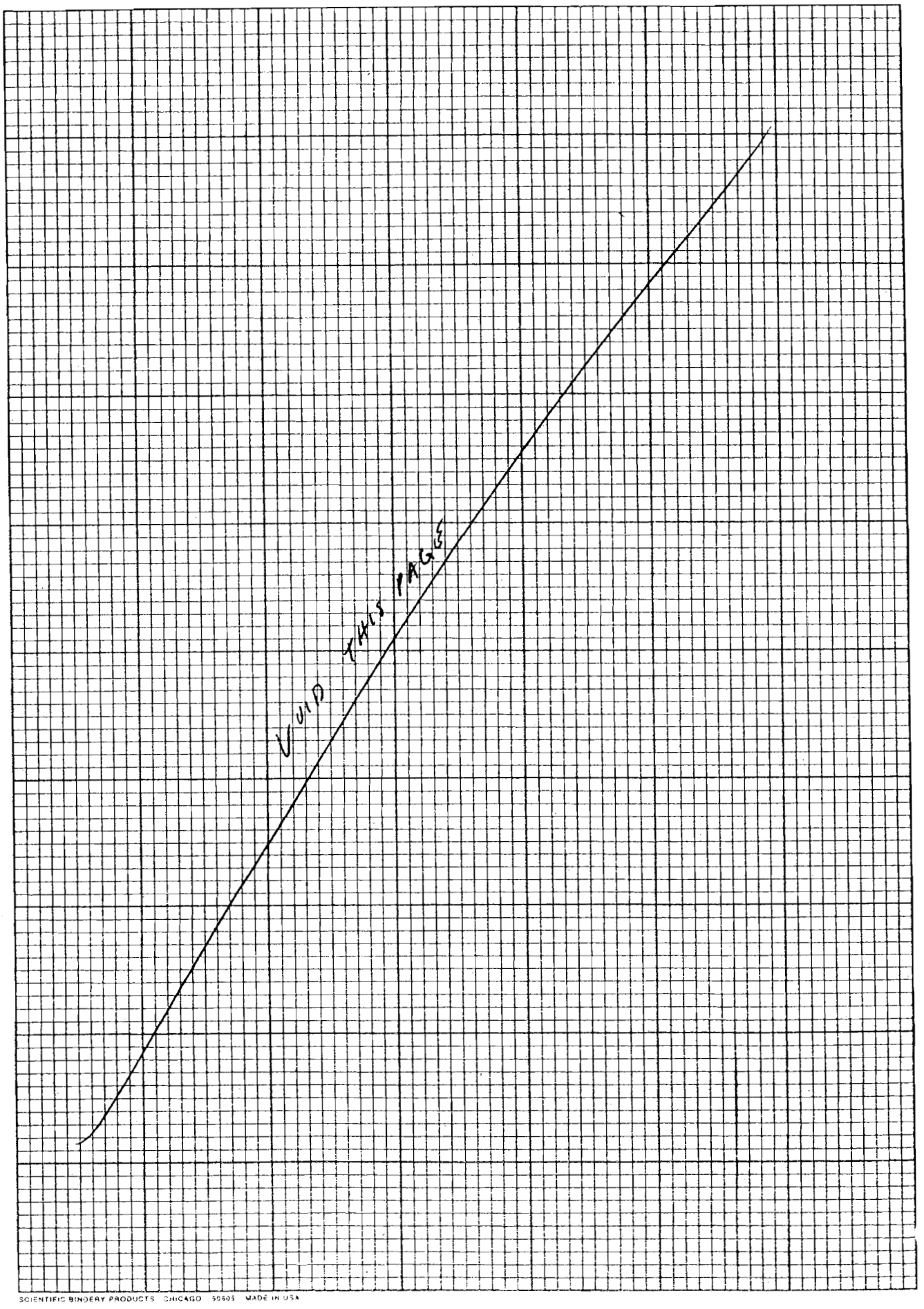
1230 Hrs - Check in on S. Conti & drilling crew
1245 Hrs - Check on DPT crew obtain items to do rinsates
Corer sleeve, cutting shoe, disposable trowel & mixing container.
1307 Hrs - Return to BLDG # 3245
- Collect the Following Rinsates w/ HCL H_2O Ext. 12/
12RB08150401 - mixing container @ 1400 hrs
12RB08150402 - cutting shoe @ 1420 Hrs
12RB08150403 - Trowel @ 1450 Hrs
12RB08150404 - Corer sleeve @ 1510 Hrs
- Collected the Following Source Water Blanks
12SB08150401 - TAP H_2O @ 1530
12SB08150402 - DI H_2O @ 1600
1800 Hrs - Finish processing ABOVE samples w/ help from T. Dickson Arrived ~ 1345 Hrs
1815 Hrs - SHOW T. Dickson SWMU 5 FOR RECON Prior to meeting w/ EME tomorrow FOR SITE PROGRAM (EPA) visit.
1900 Hrs - LEFT NSWC CRANE FOR Motel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 8/15/04
DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE



SCIENTIFIC BINDERY PRODUCTS CHICAGO 50505 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

MON. 8/16/04

Work continued from Page

- SHIPPED SAMPLES COLLECT ON 8/15/04 ON THIS date VIA FED. EX AB # 8447 8135 5844
- SEE NB 1376 on this date FOR Additional INFORMATION.

END

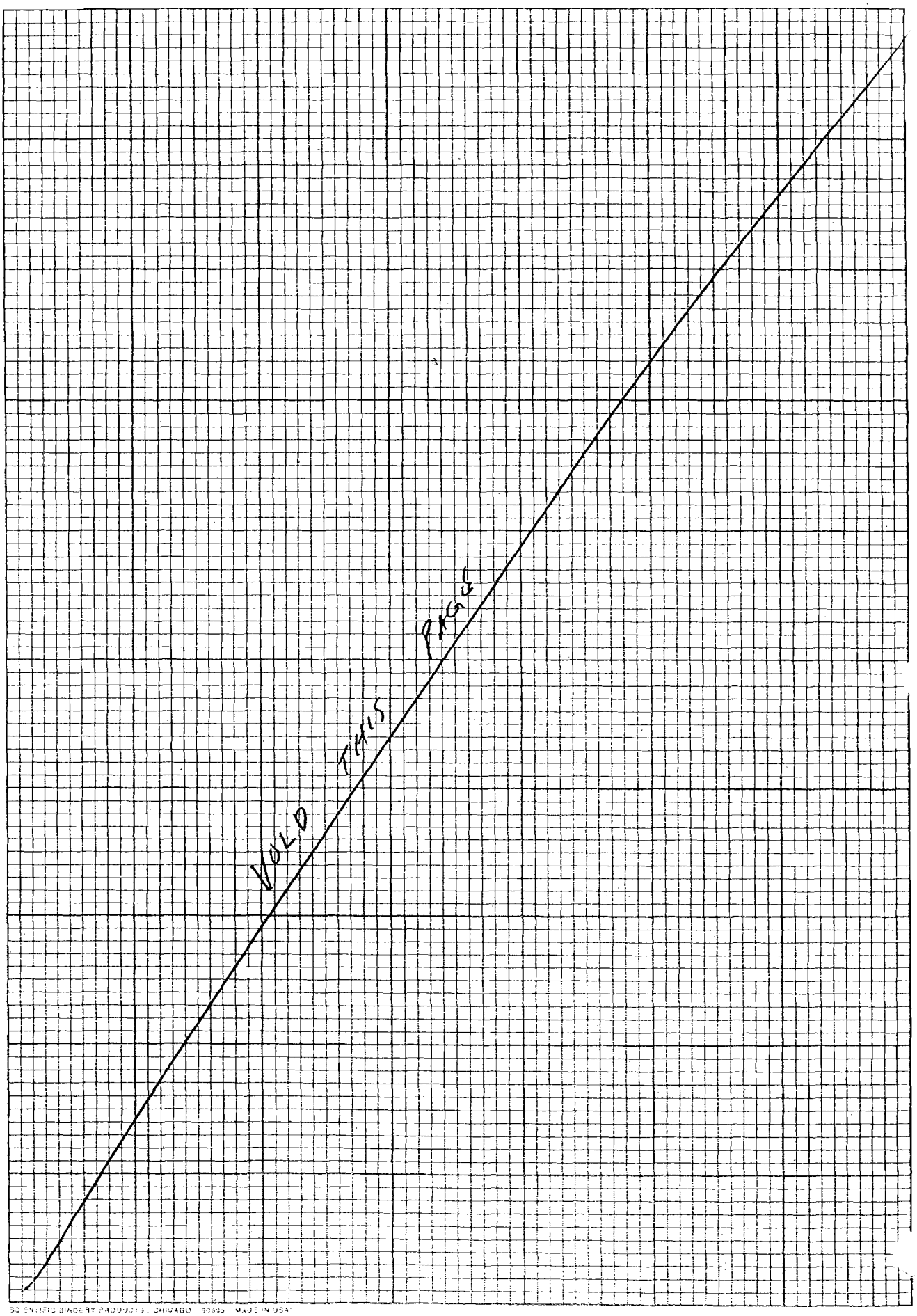
SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 8/16/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE



SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

Work continued from Page

WEATHER: Rain all morning

0655 Hrs - Arrive @ BLDG #3245
- Work on VEHICLE PASSES for S. Conti SUV & the five drilling VEHICLES - drive to decon station to get truck rig & support trucks information.
- STAN Conti gave HES to NEW Drillers
  - KEN BOENMER
  - JOHN DAVIS
  - TOD WOLLENHAUPT

0845 Hrs - Took Ken B. to MFA & MFB - to show him wells that need pads installed & to familiarize K.B. with the sites; Noticed that some of the stakes were disturbed (ie. 12MWT 26, 05 & 42) Also gas line near 12MWT 35 location is questionable

0930 Hrs - Returned to BLDG #3245 & dropped KB off

0950 Hrs - Arrive @ Public Works - talk to Donna Z. About Gas Relocation @ 12MWT 35, water location @ 12MWT 26 & stakes disturbed @ 12MWT 05 & 42. Need to relocate stakes @ 12MWT 05 & 42

1030 Hrs - Arrive @ MFA after trip to B 3245 to pick up stakes (etc.); Relocated 12MWT 05 & 42, moved stake for 12MWT 29 (right on water line) - will have Public Works recheck

1130 Hrs - LUNCH

1200 Hrs - Return to Public Works
They will: Have gas remarked @ 12MWT 35
Have water remarked @ 12MWT 26, 04, 29 & 4
Have sewer & water-marked @ 12MWT 05
Check back Tues. for Permits

1220 Hrs - Return to B-3245
Check in w/ T. Brent - NEW contractor lock on gate NEAR 12MWT 42; No work (only clean up) @ 0815 tomorrow (was confirmed)

Work continued to Page 69

RISK MANAGEMENT WORKSHEET

1. MSN/TASK: Obtain Surface Water, Soil Boring, and Groundwater Samples and Perform Well Development at Various CAAA Areas	2. DTG BEGIN: Routine (Usually Quarterly) END:	3. DATE PREPARED: 20 Aug 2004

4. Risk assessment prepared by: (Rank, last name, duty position, unit) Bob Gillis, CAAA Safety Engineer

5. HAZARDS	6. INIT RISK	7. CONTROLS	8. RESIDUAL RISK LEVEL	11. HOW TO IMPLEMENT	12. HOW TO SUPERVISE	13. CONTROLS EFFECTIVE
This is an update from a previous RA done on 16 Jul 2004. The Groundwater sample collection and well development were added. Surface Water, Soil Boring Sediment, and Groundwater Samples will need to be obtained at various pre-designated locations throughout CAAA's areas of operation and Sampling Well Development will be performed as well. The surface water and groundwater samples are done very simply with handheld collection equipment and pre-installed pumps. The soil boring samples are obtained by tapping into the ground and pulling out a "core" sample from the ground. Well development is the process of "disturbing" (stirring) the soil/water in order to make the collection of water samples at a later date closer to the desired condition. All of the soil boring sampling sites are	IC-H (RAC 2)	The initial risk is based on the fact that CAAA is operating an explosives operation at any given time when these samples are to be collected and/or when well development is conducted. Since the samples can be collected fairly quickly, well development is conducted in a short time span, and these are usually a quarterly event, the exposure time to CAAA's explosives operations is low. To control this, personnel performing these tasks must always provide a 24-hour notice minimum to building supervisors or area foremen, to communicate when these efforts will take place. Upon arriving at any given site, these personnel must ensure the building supervisor or area foreman is aware they will be in the area and exactly where the work is going to occur.	IE-M (RAC 3)	Building Supervisors or Area Foremen and the Personnel collecting the samples and/or doing well development	CAAA Command/Safety Oversight, along with Area Foremen or Building Supervisors	So far the controls have been effective

9. Overall mission/task risk level after controls are implemented (Circle One)

LOW (L) MODERATE (M) HIGH (H) EXTREMELY HIGH (E)

10. RISK DECISION AUTHORITY:

COL Smith, Commander

RANK/LAST NAME/DUTY POSITION

[illegible] 8-25-04

TITLE

Work con

RISK MANAGEMENT WORKSHEET

5. HAZARDS	6. Initial Risk LEVEL	7. CONTROLS	8. RESIDUAL RISK LEVEL	11. HOW TO IMPLEMENT	12. HOW TO SUPERVISE	13. CONTROLS EFFECTIVE
pre-planned and permitted through Public Works to ensure no underground utilities are disturbed. The existing hazard is that the samples and well development will be obtained while normal CAAA operations are ongoing. The sample collection and well development is considered routine, very similar to the contractors that mow the grass or provide janitorial services. A pickup truck-sized vehicle will be used to house the soil boring equipment and carry the other sample collection equipment. Up to approximately four people might be needed for this work at a given time.						

SCIENTIFIC

SIGNATURE

DISCLOSED

H&S AUDIT CORRECTIVE ACTION PLANNING AND TRACKING

Site Location _____ Auditor _____ Date Audited _____

C.A. Tracking No.	Corrective Action to be Taken	Name and Telephone Number of Individual Responsible to Take Action	Date Scheduled for Completion	Date Completed
	Follow up w/ B-M on compressed line couplings -use of retention cables	Chico. fits → YES threaded → NO-but prefer they be used	8/30	8/30 Talk to Jim Niozgorski
	Note- Chip Laney Refresher training expires on 9/5/04	Chip had a Refresher on MARCH 04		mech. will bring some out to be safe
	CHECK Fire Ext.	done		

Mon 8/30/04

Work continued from Page Weather: Mostly Sunny & Temp High 70°s

0645 Hrs - Arrive @ BLDG #3245
- Talked to Donna @ Public Works can pick up Dig Permit today for outside of Fence
- Took care of All H&S Audit Action items SEE P. 28
- Load VEHICLE FOR WELL DEV.
- Talked to T. Brent - Don Mills needs to OK Generator work @ MFA for Lighting
- CHECK IN W/ R. BASINSKI - UP coming SAFT & Lock out/tag out WORK
0845 Hrs - LEAVE B 3245 FOR MFA
0857 Hrs - Arrive @ MFA
- Check in w/ J.G.
- check W.L. in T30 (~3') & T09 (WL @ 12') H2O Colume
0922 Hrs - Start DEV @ 12MWT07
1014 Hrs - Finish DEV. @ 12MWT07, Purged 11 gal, dried out 3 x
1035 Hrs - Start DEV. @ 12MWT06
1054 Hrs - END DEV. Purged 10 gal (WELL cleaned up)
1116 Hrs - Arrive @ Public Works Donna Not @ her desk must be @ Lunch
1125 Hrs - Arrive @ CAFE - LUNCH
1155 Hrs - Stop @ Public Works - talk to Donna - will pick up dig permits tomorrow - SEWER ok NEXT to West Fence
1206 Hrs - Arrive @ BLDG #3245 DECON WHALER PUMPS
1245 Hrs - Dump Purge water @ MH
1255 Hrs - Check on J.G. - watch sampling while J.G. gets lunch
1215 Hrs - JG Returned
1323 Hrs - Start DEV. @ 12MWT23
1406 Hrs - END DEV. @ 12MWT23
1430 Hrs - Stop @ BLDG 3245 to check Generators & Light Regs
- CALL Don Mills Fire INSP. - SET up meeting w/ Capt MARK VAN METER @ MFA main gate @ 1630 Hrs

Present S. Cortez & G. Laney

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 8/30/04

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 8/30/04:

Collect samples @ 12MWT08 & 13,

Developed wells 12MWT06, 07 & 23

SCIENTIFIC RINDERY PRODUCTS CHICAGO 60605 MADE IN USA

Monday 8/30/04 Con't

Work continued from Page

- Talk to T. Brent - regarding security being notified about night shift - he will E-mail security
- Decon Hydraulic pump
- Discuss - Hot Permits & Dig Permits w/ Stan & Chip.
- ~~Talk to~~ Talk to R. Basinski - Staff for next shift & response to questions regarding audit.
- Prep. samples for shipment to Lab on COCs 0086 & 88
- Collect Metals sample @ 3WAM 16 MINT 16

1800 Hrs • Left Blog #3245 for Lowes to shop for lights & extension cords to use in grassy areas and outside fence where the generators w/ mole lights cannot go - due to fire hazard

1846 Hrs : Check out @ Lowes - purchase lighting & elec. cord

1916 Hrs : Check out @ Bigk - Found strainers for geologist @ @ overseeing the drilling - needed to catch rock frags for examination during coring -

1930 Hrs - Return to Motel. E-mail R.B. Sample Summary

EOD

Work continued to Page

SIGNATURE Terry Mogk DATE 8/30/04

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

WELL DEV. SUMMARY:

WELL ID	START DEV	END DEV	VOL. PURGED	Comments
12MWT30	0928	1023	0.6 Bals	(JG) Dried out 3xs
12MWT09	0929	1004	11 gal	(JK) Purged to clear
12MWT34	1041	1145	0.54 gal	(JG) Dried out 3xs
12MWT24A	1055	1200	8 gal	(TK) Dried out 3xs
12MWT35	1353	1452	8 gal	(JG) ↓
12MWT36	1408	1457	7.25 gal	(TK) ↓

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TUES. 8/31/04

Work continued from Page

WEATHER: Mostly Sunny Temp High 70°s

0645 HRS - ARRIVED @ BLDG #3245
- Brief Tailgate
- Prep to Dev. Well @ SWMU 12
- Fax To Johnston Contain Certification For Audit Response Information
- Talk w/T. Brent - Returning personnel for Shift 4.

0845 Hrs - Check w/ Public Works on Extended dig permit - Stop back @ 1500 Hrs should be ready then.

0910 Hrs - Arrive @ SWMU 12 - to dev. wells w/ J.G.

0929 Hrs - Start Dev. @ 12MWT09

1004 Hrs - End Dev; Vol. Purged: 11gal.

1055 Hrs - Start Dev. @ 12MWT24A

1200 Hrs - End Dev; vol Purged - 8gal (Dried out 3 Xs)

1210 Hrs - Arrive @ Cafe for Lunch

1235 Hrs - Arrive @ BLDG #3245
- Decon whaler pumps
- Check in @ office (R. Basinski)

1330 Hrs - Return to SWMU 12
Assist J.G. w/ start up of Dev. @ 12MWT35

1408 Hrs - Start Dev. @ 12MWT36

1457 Hrs - End Dev.; vol purged 7.25 gal (Dry out 3Xs)

1515 Hrs - Stop @ Public Work. check on dig permit - will be ready @ 1630 Hrs - Donna & Wesley to get Gas ticket #.

1540 Hrs - Return to B-3245
Unload vehicle

1630 Hr - Returned to Public Worked - Picked up dig Permit # 4562 Gas Exp 9/20 & other utilities Exp. 9/31/04 - See Page 34.

1650 Hrs - Return to B-3245
Clean office, Lab, etc.; Clean inside of SUV; Prep. Paperwork to return to Pittsburgh

1808 Hrs - Left B-3245 for Car Wash

Work continued to Page

SCIENTIFIC INDEX PRODUCTS, CHICAGO

SIGNATURE [signature] DATE 8/31/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

DIGGING PERMIT
NSWC CRANE 11000/3 (REV. 8/02)

4562

REQUESTED BY: Tetra Tech NUS, Inc/Ralph Badinski 412-921-8308	DATE: 6/28/04
WORK REQUEST ON E/S NO.: 15/017 854-0280 T	Mine Fill "A" Area
WORK WILL BE PERFORMED BY: Tetra Tech NUS Inc. 412-551-2629 Stan	DATE (Start - on or about):

WORK DESCRIPTION: Soil samples at various locations at Mine Fill "A" Area. Locations are inside fence, along fence, west side of Hwy 45, & 2 are under powerline right-of-way. Marked with wooden stakes with pink & orange flagging.

EQUIPMENT TYPE: ☐ HAND TOOLS ☐ CORE DRILL ☐ TRENCHER ☐ BACKHOE ☐ HEAVY EQUIPMENT

Faxed ZZ 6/28/04

UNDERGROUND UTILITIES LOCATED IN WORK SITE

UTILITY	PRESENT	MARKED	~~NOT LOCATED~~	REMARKS
COMPRESSED AIR ZZ	N/A		Remark	J. Beasley for phone 7/8/04
HIGH VOLTAGE ELECTRICAL	NA			S.P. 7-6-04
FIRE ALARM ZZ	N/A			WDM 6/30/04
GROUNDING ZZ	N/A			6-29/04 BR
* NATURAL GAS Exp 7/19 3083 0406293076 3088	YES	YES	Exp 9/6 0408272263	8/31/04 B.155 7/1/04 DE
SECURITY ALARM ZZ	NA			WDM 6/30/04
* SEWER	YES	YES Remarked 8/27	8/12 mw Remarked 8-4-04 mo	7-7-04
STEAM	N/A			6-29-04 RRT
TELEPHONE Faxed 6/28/03	N/A		L mw	7-6-04 KP
* WATER	YES	YES Remarked 8/27	8/12 mw Remarked 8-4-04 mo	7-7-04
* Remark Faxed 8/3/04 SECOND ELECTRICAL ZZ	YES	YES	8/12/04 8/11/04 YES BR	6-29/04 B
Faxed 6/28/04 GENERAL DYNAMICS/NMCI	N/A	N/A		6-30-04

In addition to the general precautions for excavating where underground utilites are present, comply with the following:

* Exp 8/9 0407203229, 0407203230, 0407203232 DEH 7-22-04
Exp 8/23 0408033036, 0408033040, 0408033043 DEH 8-5-04
Exp 8/31 0408112925, 0408112930, 0408112935 DEH 8-12-04
0408312644, 0408312650, 0408312661 Exp 9/20

PERMIT HOLDER SIGNATURE: Tony Neal	DATE: 7/8/04
DIGGING PERMIT APPROVED BY: Donna L. Zollmer Donna L. Zollmer	DATE: 7/8/04 ~~8/10/04~~ 8/12/04 8/31/04

DISTRIBUTION:
ORIGINAL - Code 09Z5 File
YELLOW - Supv. At work site
PINK - Permit requestor

TUES 9/7/04

Work continued from Page

1257 Hrs - Arrive @ BLDG #3245
- Check in w/ T. Brent
- S. Cont. Called in w/ arrival plans for tomorrow
- Called ~~U.S. ENV.~~ Sandy to order Conductivity Cali. Sol. for YSI Probe & Checked MNA Reagents - NEED Nitrite Reagent Cat # 25120-25

1453 Hrs - Ran Absorbance Standards on DR/890 Colorimeter U.S. ENV. Rental Core # U504 SN # 021090022862

DR/Check™
Absorbance Standard
SECONDARY STANDARDS KIT
For Instrument Performance Verification
STORE KIT IN THE UPRIGHT POSITION
CAT NO. 27639-00
HACH COMPANY WORLD HEADQUARTERS
P.O. Box 389, Loveland, CO 80539 USA
(970) 669-3050
Lot A3281
Exp. Feb-05
AR603A

HACH DR/Check™
Absorbance Standard
CERTIFICATE OF ANALYSIS

WL nm	Std No. 1 ABS Lot 43	Std No. 2 ABS Lot 43	Std No. 3 ABS Lot 43
420	0.610 ± 0.050	1.199 ± 0.050	1.770 ± 0.050
520	0.617 ± 0.050	1.220 ± 0.050	1.804 ± 0.050
560	0.593 ± 0.050	1.212 ± 0.050	1.756 ± 0.050
610	0.621 ± 0.050	1.227 ± 0.050	1.786 ± 0.050

- Certified at 25°C -
SIGNED: Patrick J. Hahnen
for and on behalf of the Hach Company
NOTE: This certificate may be removed and affixed to a laboratory notebook or other quality record. AR603A
Kit Lot Number 3281 Expiry Date Feb 2005
27639-07A

HACH DR/Check™
Absorbance Standard
INSTRUMENT READING

WL nm	Std No 1 ABS Lot 43	Std No 2 ABS Lot 43	Std No 3 ABS Lot 43
420	0.596	1.204	1.785
520	0.626	1.222	1.799
560	0.601	1.195	1.731
610	0.623	1.252	1.802

RECORD INITIAL VALUES IN ABOVE TABLE
NOTE: This certificate may be removed and affixed to a laboratory notebook or other quality record. AR603A
Kit Lot Number 3281 Expiry Date: Feb 2005
27639-07B

1531 Hrs - Run Accuracy Check Standard Solution Method for Nitrite - Results should be between 0.090 & 0.110 mg/L NO_2-N
Results = 0.091 (on same meter as above) Standard Exp. 10/20/04 Lot # 4202
- Clean Glassware
- Prep. for well dev. for tomorrow

1620 Hrs - Talk to J. Schubert for prioritized list of wells to sample - J.S. will get back to me or leave a message on the phone

1630 Hrs - Prep. to leave

1640 Hrs - Left Bldg # 3245
Picked up drinking water @ store

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Fogt

DATE 9/7/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

Drilling Summary 9/8/04:

Completed 12MWT05.

Sampling Summary 9/8/04:

Dev the Following wells: 12MWT11, 12, 16, 17 & 28.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60653 MADE IN USA

TITLE NSWC CRANE

S. Conti
J. Walsh
J. Dean
T. Wollenhaupt

PROJECT NO. 6878

BOOK NO. 1376

WED 9/8/04

Work continued from Page

WEATHER: Mostly cloudy Temp 60°s

0600 Hrs - Get list of priority wells to sample from J.S. (via e-mail) they are:
12MWT01, 02, 05, 06, 07, 09, 11, 12, 16, 17, 23 & 28

0700 Hrs - Arrive @ BLDG # 3245
- Prep. to Dev. wells
- Load SUV
- Cali. Meters YSI & LaMotte 2020

0838 Hrs - Arrive @ 12MWT12

1009 Hrs - End Development @ 12MWT12; Purge 34gal

1026 Hrs - Start Dev. @ 12MWT11

1116 Hrs - End Dev @ 12MWT11, Purge 7gal.; Dry out 3x.

1130 Hrs - Dump Purge water @ MH #327

1144 Hrs - Arrive @ Cafe.

1210 Hrs - Arrive @ BLDG #3245
- Decon whaler pumps (2)

1235 Hrs - Arrive @ 12MWT16

1330 Hrs - End Dev. @ 12MWT16; purge 3gal; Dry out 3x.

1345 Hrs - Start Dev @ 12MWT17

1426 Hrs - End Dev. @ 12MWT17; purge 2.3gal; Dry out 3x.

1447 Hrs - Start Dev @ 12MWT28

1532 Hrs - End Dev @ 12MWT28, purge 5.25gal; Dry out 3x.

1555 Hrs - Dump Purge water @ #327 MH

1610 Hrs - Check in w/ Drillers and S. Conti @ SWMU 12

1640 Hrs - Return to BLDG #3245
- Check in w/ office (R. Basinski)
- Paperwork
- Decon whaler pumps (3)
- Call ESO Lab w/ sample info for this week - what to expect (GW samples 4-6 for Sat delivery.

1730 Hrs - Left BLDG #3245 for Motel.
E-mail R.B. PPT info & sampling & drilling summary

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Pagel

DATE 9/8/04

DISCLOSED TO AND UNDERSTOOD BY | **DATE** | **WITNESS** | **DATE**

SAMPLE SUMMARY 9/9/04:
SAMPLE 12MWT07 AND PURGE (ONLY) 12MWT23

DRILLING SUMMARY 9/9/04:
SET & INSTALL 10MWT21 @ 95'

SCIENTIFIC BINDERY PRODUCTS CHICAGO 50605 MADE IN USA

Drilling crew same as on Page 37.

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

THURS. 9/9/04

Work continued from Page WEATHER: Mostly sunny Low 70's

0655 Hrs - Arrive @ B-3245
- Call YSI & La Motte
- Get Contractor Pass for SUV
- Prep. to same bwl @ SWMU 12 & Collect MNA

0905 Hrs - Arrive @ 12MWT23
Start Purge = 0927 Hrs
END Purge = 1119 Hrs; vol = 9.6 L (DRY OUT)

1130 Hrs - Finish clean up @ 12MWT23

1135 Hrs - Lunch

1200 Hrs - Arrive @ B-3245 - to check Sp. Cond. Probe

1229 Hrs - Arrive @ 12MWT07
Start Purge = 1245
END Purge = 1535; Vol. = 139 L

1540 Hrs - Start sampling @ 12MWT07 & Run MNA

1703 Hrs - Finish clean up @ 12MWT07

1720 Hrs - Arrive @ B3245
- Secure samples in Frig.
- Return Sandy D's call regarding Nitrite Reagent order
- Drop off EQ

1740 Hrs - Leave B#3245 for Motel
E-mail R.B. with sample summary from Motel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE | DATE

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 9/10/04:

SAMPLE MONITORING WELLS 12MWT23 & 07
PURGE MONITORING WELL 12 MWT17 DRY WELL
SAMPLE 9/11.

Drilling Summary 9/11/04:
Complete installation of 12MWT29 @ 88' &
12MWT09 @ 24'

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

Drilling crew same as on page 31.

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

FRI 9/10/04

Work continued from Page

Weather - Sunny & 70's

0630 Hrs - Arrive @ # B 3245
- Cali. YSI & LaMotte
- Prep to sample GW
- Check in w/ R. Basinski - discuss shift 5 & travel
- Call travel make res. for car & air

0825 Hrs - Arrive @ 12MWT23

0840 Hrs - Start sampling @ 12MWT23 & run MNA

0955 Hrs - Finish clean up @ 12MWT23

1018 Hrs - Start Purge @ 12MWT09

1158 Hrs - End Purge

1200 Hrs - Start Sampling @ 12MWT09, ran MNA

(TM) 1325 Hrs - Finish clean up @ 12MWT09

(TM) 1345 Hrs - Start Purge @ 12MWT17

1433 Hrs - Finish Purge @ 12MWT17 (Dried out)

1443 Hrs - Finish clean up @ 12MWT17

1505 Hrs - Return to Bldg # 3245
- Paperwork
- Fax COC #0089 to office & lab
- Prep. samples for shipment on Fed. Ex AB# 8447 8135 5487
- Called H. Prentice to check on fax - received it ok

1700 Hrs - Left B # 3245 for Fed. Ex.

1740 Hrs - Drop of Samples on COC #0089 @ Fed. Ex.
E-mail R. Basinski Sample summary from Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Tony Rosal

DATE 9/10/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 9/21:

Collected groundwater samples @ 12MWT01 & 17,
Also purged 12MWT16 & Developed 12MWT05

Drilling Summary 9/11: Drilled and
Installed 12MWT22 & 38 @ 24'.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60625 MADE IN USA

DRILLING CREW SAME AS IN PAGE 37.

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1574

SAT 9/11/04

Work continued from Page

Weather: Mostly Sunny High 70's

0705 Hrs - Arrive @ B#3245
- Call KST & LaMotte
- Pick Vehicle for Dev. @ 12MWT05

0800 Hrs - Arrive @ 12MWT05
Start Dev = 0815 Hrs
End Dev = 0856 Hrs, Vol Purged 48 gal. max vol =

0915 Hrs - Finish clean up @ 12MWT05

0930 Hrs - Dump Dev. H_2O @ MH 327

0942 Hrs - Arrive @ B#3245
- Drop off Dev. EQ & Pick up Sampling EQ

0955 Hrs - Arrive @ 12MWT17

1010 Hrs - Begin Sampling 12GWT1701

1137 Hrs - Finish clean up @ 12MWT17

1150 Hrs - Lunch @ B#3245
- Pick up supplies

1230 Hrs - Arrive @ SWMU12

1250 Hrs - Start Purge @ 12MWT01

1518 Hrs - Start Sampling @ 12MWT01; Collected FD091104001 & RAN MW.

1720 Hrs - Start Purge @ 12MWT16

1835 Hrs - Finish Purge @ 12MWT16 will sample tomorrow - dried out well

1855 Hrs - Left SWMU 12, after clean up @ 12MWT16

1905 Hrs - Arrive @ B 3245
- Secure samples in Frig.
- Decon whaler pump
- Drop off EQ

1930 Hrs - Leave B-3245 for Motel
E-mail RBasinski Summary of Sampling Activities

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature]

DATE 9/11/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

Sample summary 9/12/04

Collected groundwater samples from 12MWT02 & 2816

Also purged 12MWT28

Drilling summary 9/12/04

Installed monitoring wells 12MWT21, 25 & 26.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

Drilling crew same as on page 37?

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SUN 9/12/04

Work continued from Page

WEATHER: AM. Mostly Sunny 70's Low
PM. Partly Cloudy High 70's Low 80's & Humid

0645 Hrs - ARRIVE @ B 3245
CALL YSI & LAMOTTE
PREP to SAMPLE GROUNDWATER
0745 Hrs - ARRIVE @ SHAW 12
0808 Hrs - Start Purge @ 12MWT02
1033 Hrs - END Purge @ 12MWT02 ; 1035 Hrs Sample Time; RAN M
1339 Hrs - Finish Clean up @ 12MWT02
1400 Hrs - Arrive @ 12MWT16
1410 Hrs - Start Sampling (Purged 9/11); RAN MNA
1531 Hrs - Arrive @ 12MWT28 after finishing up @ 12MWT16
1542 Hrs - Start Purge @ 12MWT28
1942 Hrs - END purge @ 12MWT28 ; Purged 19.8 L.
Will sample 9/13 after well recharges
2000 Hrs - Arrive @ B-3245
Secure samples in Frig.
Drop off equipment
2015 Hrs - LEAVE B-3245 for Hotel
E-MAIL R Basinski Sample Summary Info

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE | DATE

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLING SUMMARY 9/13/04:

Collect groundwater samples @ 12MWT11 & 28
SHIP SAMPLES ON COC 0092 VIA FED EX AB#
8447 8135 5800

DRILLING SUMMARY 9/13/04:

PREP. WELLS @ SWMU 13, SWMU 16 (16MWT21)
and SWMU 12 (THOSE WELLS outside ACES
FOR B-155 & 160, FOR B-151 WELLS South END
OF MRA) FOR CONCRETE POUR ON 9/14; ALSO
CLEAN UP DECON AREA & EQ, etc.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

DRILLING CREW SAME AS ON PAGE 37.

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

MON 9/13/04

Work continued from Page

WEATHER: Mostly Sunny, 70's & Humid

0705 Hrs - Arrived @ B 3245
- Call YSI or LaMotte
- Prep Vehicle for sampling GW

0820 Hrs - Arrive @ SWMU 12

0845 Hrs - Start Purge @ 12 MWT11

1150 Hrs - End Purge @ 12 MWT11

1316 Hrs - Finish @ 12 MWT11

1318 Hrs - Arrive @ 12 MWT28

1333 Hrs - Start sampling @ 12 MWT28 (Purge 9/12)

1507 Hrs - Finish Collecting 12GWT28

1525 Hrs - Return to B#3245
- Package samples for shipment on COC 0092 To be shipped via FED EX AB# 8447 8135 5800
- Fax COC to Lab & office (Ed Sedlmyer)
- Unload vehicle of EQ - Make Room for FED EX shipment

1700 Hrs - Left B-3245 for FED EX

1736 Hrs - Drop off samples @ FED-EX-

END

E-Mail R.B. with sample summary

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Hoyt

DATE 9/13/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

TUES 9-14-01

Work continued from Page

WEATHER: AM - Cloudy, Light Rain, Temps High 60's
PM - Partly Sunny & 70's

0645 Hrs - Arrive @ B 3245
Call YSI & LaMotte
Pick vehicle for GW sampling
0742 Hrs - Arrive @ SWMU 12
0757 Hrs - Start Purge @ 12MWT06
0927 Hrs - End Purge
0930 Hrs - Start sampling @ 12MWT06
1030 Hrs - Finish @ 12MWT06
1050 Hrs - Start Purge @ 12MWT12
1220 Hrs - End Purge
1223 Hrs - Start sampling @ 12MWT12
1324 Hrs - Finish @ 12MWT12
1345 Hrs - Start Purge @ 12MWT05
1530 Hrs - End Purge
1532 Hrs - Start sampling @ 12MWT05
1615 Hrs - Finish @ 12MWT05
1623 Hrs - Arrive @ B-3245
- Unloaded Rental SUV
- Paperwork & Packaged samples on CoC # 0093 for shipment via FED EX AB# 8487 8135 5785

1720 Hrs - Left B-3245 for FED. EX.
1757 Hrs - Drop off samples @ FED EX

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Ty Rapil

DATE 9/14/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

WED 9/15/04

Work continued from Page

0655 Hrs - Arrive @ B 3245
- Prep. EQ to return to U.S. EAV.
- MA { M-Scope (1)
  Bladder pump Control Box w/Hoses, etc (1)
- NJ { SUN RAE PID (1)
- Survey & MOB, OFFICE, LAB, Bathroom etc.
- FAX COC 0093 to LAB & OFFICE
- Organize Bottle ware & cooler in Garage

0945 Hrs - Leave B-3245 for FED. EX then Airport - Remainder of day travel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 9/15/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 9/21/04:

Collect 7 EXCAVATION CONFIRMATION SURFACE SOIL SAMPLES @ SUMMIT BATTERY SITE.

SHIP SAMPLES ON COC # 0094 VIA FED EX AB# 8447 8135 5741

SCIENTIFIC BINDERY PRODUCTS CHICAGO 53995 MADE IN USA

TITLE NSWC CRANE

TTNUS
J. Gocrdt
T. Rosahn

PROJECT NO. 6928

BOOK NO. 1374

TUES 9/21/04

Work continued from Page

WEATHER Mostly Sunny 70°s

0730 Hrs - EHRIS PLEEMAN requested TTNUS assistance to preform conformation sampling @ SWMU 12 Battery site.

- PREP FOR SAMPLING SOIL

0815 Hrs - ARRIVE @ SWMU 12 Battery Site

- WAIT FOR completion of EXCAVATION activities
- PREP. sample containers & paperwork

1107 Hrs - Collected 1255210002

1109 Hrs - Collected 1255220002

1115 Hrs - Collected 1255230002

1119 Hrs - Collected 1255240002

1130 Hrs - ARRIVE @ CAFE

1200 Hrs - ARRIVE @ BLDG #3245

- PACKAGE SAMPLES ON COC #0094
- Contact S. Conti (Picking up Dry ICE) Stan will deliver samples on COC #0094 to FED. EX FOR SHIPMENT VIA FED EX AB# 8447 8135 5741

1300 Hrs - PREP to SAMPLE VEGATATION @ SWMU 13

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE T. Rosahn

DATE 9/21/04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLE SUMMARY 9/22/04

SAMPLED - 12MWT35

PURGED - 12MWT30, 34 & 39

SCIENTIFIC BINDERT PRODUCTS CHICAGO 53695 MADE IN USA

TITLE NSWC CRANE

WEO 9-22-04

THS
J. Goardt
S. Conti
T. Rosahn

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page WEATHER - Mostly sunny 70's

0650 Hrs - Arrive on site (B-3245)

- Fax COCs 0094 0095 & 0097 to office & LAB
- Prep. to DEV. WELLS
- Select wells to be sampled for JG
- Paperwork

DEV. Summary

WELL ID	Start DEV	END DEV	VOL. PURGED	COMMENTS
12MWT33	0928	1050	45gal	(TR) deep well very good recharge
12MWT27	1100	1131	5gal	(SC) Dried out w/ very slow recov.
12MWT15	1255	1337	6gal	(TR) dried out 3X
12MWT20	1358	1439	5gal	(TR)
12MWT14	1300	1355	2.25gal	(SC)
12MWT19	1448	1525	1.25gal	(SC) dried out 2X didn't recover
12MWT18	1459	1539	4gal	(TR) dried out 3X
12MWT10	1605	1645	4gal	(SC) dried out 3X

1600 Hrs - Return to B-3245

- Package tissue samples on COCs # 0095 & 0097
- Called Hugh Prentice w/ Air Bill #s of shipment
  8366 3236 2343 Plant tissue w/ dry ice
  8497 8135 5720 Rinsate water w/ ice

1708 Hrs - Left B 3245 for FED. EX.

1740 Hrs - Drop off samples @ FED. EX.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] **DATE** 9/22/04

DISCLOSED TO AND UNDERSTOOD BY **DATE** **WITNESS** **DATE**

DEV. SUMMARY 9/23/04 8

S. Conti & T. Rojahn dev. 10 wells 12MWT34, 03, 04, 42, 40, 25, 22, 26, 21 & 38

SAMPLE SUMMARY 9/23/04:

SAMPLED 12MWT24A

Started SAMPLING 12MWT39

12MWT30 & 34 were dry

SCIENTIFIC LINDEN PRODUCTS CHICAGO 33303 MADE IN USA

B-M Drillers arrive late afternoon this Date

TITLE NSWC CRANE

J. WALSH
J. DEAN
T. Wollenhaupt
C. Mahaffey

THURS 9-23-04

PROJECT NO. 6978
BOOK NO. 1374

T+NUS
J. Gocrdt
S. Cont:
T. Kolahn

Work continued from Page

Weather: Mostly Sunny High 85°F

0650 Hrs - Arrive @ B-3245
- Paperwork
- Prep to Dev wells @ SWMU 12
- Decon Whaler

Development Summary

Well ID	Start DEV	End DEV	Vol. Purged	Comments	
12MWT34 (TB)	0825	0924	9.25 gal	(SC/TR)	Dried out 3X
12MWT03	0952	1034	5.5 gal	(TR)	Dried out 3X
12MWT04	0958	1042	4.0 gal	(SC)	Purged clear
12MWT42	1100	1150	11.5 gal	(TR)	Dried out 3X
12MWT40	1210	1252	5.0 gal	(SC)	Dried out 3X
12MWT25	1308	1347	3.75 gal	(TR)	Dried out 3X
12MWT22	1328	1414	4.25 gal	(SC)	Dried out 3X
12MWT26	1433	1515	7.5 gal	(TR)	Dried out 3X
12MWT21	1538	1620	4.5 gal	(TR)	Dried out 3X
12MWT38	1609	1650	6.0 gal	(SC)	Dried out 3X

1635 Hrs - Finish development for the day park @ Main Gate to wait for J. Walsh so that he could access SWMU 12 to work on well pad installation.

1712 Hrs - Prep to leave SWMU 12 - J. W arrived & S.C. finish w/ well dev. - S.C. will over see drillers install well pad forms & dig ballard post holes

1720 Hrs - Arrive @ B#3245
- Decon (3) Whaler pumps
- Clean YSIs & LaMotte meters
- Paperwork

1840 Hrs - Leave B-3245 for Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 9/23/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 9/28/04:

SAMPLED - 12MWT39 (start on 9/23) & 12MWT36
Started sampling 12MWT37 (low yield well)
Purged - 12MWT14 & 19
Split samples on COC0098

DEV. SUMMARY

12MWT29 & 32.

DRILLING SUMMARY

Poured 20 well pads.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 53595 MADE IN USA

CREWS SAME AS ON PAGE 57.

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

FRI. 09/24/04

Work continued from Page WEATHER: PARTLY CLOUDY TEMP 70's

0650 Hrs - ARRIVE @ B #3245

- SELECT WELLS FOR SAMPLING
- ESCORT DRILLERS INTO SWMU 16 to retrieve WELL PAD FORMS @ 16MWT 12 & 21
- XEROX WELL DEV. RECORDS FOR FIELD USE

0840 Hrs - LEAVE B #3245 FOR SWMU 12

0855 Hrs - START DEV @ 12MWT 32

0944 Hrs - END DEV @ 12MWT 32, PURGE 11.5 gal DRIED OUT 3 xs

1008 Hrs - START DEV @ 12MWT 29

1106 Hrs END DEV @ 12MWT 29, PURGED 11 gal DRIED OUT 3 xs

1135 Hrs - LUNCH

1210 Hrs - ARRIVE @ B #3245

- DUMP DEV. WATER
- CALL in TIME to PITTSBURGH
- DISCUSS UPCOMING SHIFTS W/ R. BASINSKI
- PREFORM DR 850 COLORIMETER QA/QC SN 980950003985 TETKA TECH INST.

HACH DR/Check™
Absorbance Standard
INSTRUMENT READING

WL nm	Std No 1 ABS Lot 43	Std No 2 ABS Lot 43	Std No 3 ABS Lot 43
420 520 560	0.632	1.221	1.807
810	0.622	1.237	1.810

RECORD INITIAL VALUES IN ABOVE TABLE

NOTE: This certificate may be removed and affixed to a Laboratory notebook or other quality record AR683A

Kit Lot Number 3281 Expiry Date: Feb 2005 /27639976

ABSORBANCE Standard INFO & ACCEPTABLE RANGES SEE PAGE 35.
METER DR 850 PASSED

RUN ACCURACY CHECK STANDARD Solution METHOD FOR Nitrite
EXP. date 10/20/04 Lot # 4202
Nitrite = 0.093 mg/L

- PAPERWORK

1600 Hrs - ARRIVE @ SWMU 12 to check in w/JGS progress/any samples for shipment

1620 Hrs - RETURN to B #3245 - PREP SAMPLES on COC #0098 FOR SHIPMENT

1705 Hrs - LEFT B 3245 FOR FED. EX

1740 Hrs - DROP OFF SAMPLES on AB # 8447 8135 5708

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 9/24/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 9/25/04 :

WELLS SAMPLED : 12MWT10, 27 & 19

WELL PURGED ONLY : 12MWT18 & 14 (IR)

Cont sampling : 12MWT37

Start collecting : 12MWT14

DRILLING SUMMARY 9/25/04 :

POURED THE REMAINDER ON WELL PADS

Started painting stickups & Bollards

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

Crews Same as on Page 57

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SAT. 9/25/04

Work continued from Page

WEATHER: Partly Sunny Temp 80's

0640 Hrs - ARRIVE @ B3245; FAXED COC # 0098 @ 0603 From Hotel
- Stock containers in office
- Paperwork; H&S Tailgate
- Prep to Dev 16MWIT 21 - will do WED.
- SELECT WELLS FOR SAMPLING

0845 Hrs - ARRIVE @ SWMU 12

0900 Hrs - Start Purge @ 12MWT18

1138 Hrs - END Purge @ 12MWT18 Dried out will sample tomorrow

1145 Hrs - Exist SWMU 12
- Pick up supplies @ B3245 & dump purge water
- Pick up sandwich @ Subway

1220 Hrs - Return to SWMU 12

1232 Hrs - Start Purge @ 12MWT10

1632 Hrs - END purge @ 12MWT10, Removed 16.9L

1635 Hrs - Begin Sampling 12GWT1001

1810 Hrs - Finish sampling 12GWT1001

1817 Hrs - ARRIVE @ B3245
- Secure samples in Frig. / Some Prep for tomorrow
- Put Battery on charge
- Drop off meters

1854 Hrs - LEAVE B3245 FOR Hotel
E-mail R. Basinski ~~with~~ Sampling summary

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature]

DATE 9/25/04

DISCLOSED TO AND UNDERSTOOD BY | **DATE** | **WITNESS** | **DATE**

SAMPLING SUMMARY 9/26/04:

WELLS SAMPLED: 12MW17 18, 26 & 33 & ~~40~~ 14

SAMPLING IN PROGRESS: 12MW17 14 & 37

WELLS PURGED ONLY: 12MW17 03 & 40

DRILLER SUMMARY 9/26/04:

FINISHED WELL PAD & BALLARD INSTALLATIONS & RESTORATION; SC PROVIDED OVERSIGHT

SCIENTIFIC BINDERY PRODUCTS CHICAGO 30533 MADE IN USA

CREWS SAME AS ON Page 57

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SUN 9/26/04

Work continued from Page

Weather : Mostly Sunny & 70's

0650 Hrs - Arrive @ B# 3245

- Prep for GW sampling @ SWMU 12
- Select wells for sampling this date

0820 Hrs - Left Drillers inside SWMU 12

0839 Hrs - Start sampling @ 12MWT18 (Purged 9/25)

1000 Hrs - Finish @ 12MWT18

1024 Hrs - Start Purge @ 12MWT26

1424 Hrs - End Purge @ 12MWT26

1425 Hrs - Start Sampling & Ran MNA

1550 Hrs - Finish @ 12MWT26

1612 Hrs - Start Purge @ 12MWT03

1854 Hrs - Dry out 12MWT03

1905 Hrs - Check on JG @ 12MWT40 ... well about ready to sample ... JG will call me when he gets to the hotel.

1915 Hrs - Arrive @ B 3245

- Drop off SQ
- Secure samples in Frig

1930 Hrs - Leave B 3245 for Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Tony Royal

DATE 9/26/04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLING SUMMARY

Wells sampled: 12MWT03, 15, 20, 31 & 40

WELL w/ sampling in Progress: 12MWT37

Finished sampling: 12MWT14

Collected Rinsate Blanks also

(TC) ~~Note~~: BLADDER Pump & Peristaltic Tubing

J.G. dropped off Samples on COCs 0099 & 0100 via ABA

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 66605 MADE IN USA

MON 9/27/04

Work continued from Page

WEATHER: Mostly Sunny & 70s

0650 Hrs - Arrive @ B 3245
- Prep to sample 12MWT37, 40 & 03
- Select wells for sampling this date for JG. & SC.
- Assist S.C. to prep for GW sampling

0855 Hrs - Arrive @ SWMU 12

0910 Hrs - Collect Total Metals Sample @ 12MWT37
This is a very low yield well purged on 9/23 by JG

0935 Hrs - Start Collecting samples @ 12MWT40
purged on 9/26/04 by JG.

1045 Hrs - Finish @ 12MWT40

1053 Hrs - Start Collecting samples @ 12MWT03
purged on 9/26/04 by TR.

1140 Hrs - Finish @ 12MWT03

1120 Hrs - Checked in w/ JG & SC (Purging wells T31 & T15)
Got lunch order from them

1200 Hrs - Lunch Pick up

1215 Hrs - Drop off Lunch for - (JG & SC).

1230 Hrs - Return to B#3245
- Made Travel Arrangements for Shift 6
- Paperwork & Sample Packaging on COCs 0099 & 0100
- Check Nitrogen Tanks & order more Nit. Cyl.
- Prep. to collect Rinsate Blanks

1650 Hrs - 12RB092704 01 - Bladder Pump & tubing NEAL DI Lot # 1209163
1800 Hrs - 12RB092704 02 - Peristaltic tubing
- Prep. Bottle sets for tomorrow
- Restocked Bottles in office
- Decon Bladder Pumps

1920 Hrs - Leave B#3245 for Hotel
E-mail R Basinski Sample summary

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 9/27/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©

SAMPLE SUMMARY 9/29/04:

WELLS SAMPLED: 12MWT04, 29, 32, 42 and
Finished sampling 37.

SHIPPED SAMPLES this date on COC II 01101

SCIENTIFIC BINDERY PRODUCTS CHICAGO MADE IN USA

TITLE NSWC CRANE

TUES 9/28/04

CREW
J. Goerdt
S. Curtis
T. Lojahn

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

WEATHER: Mostly sunny low 70's

0645 HRS - ARRIVE @ B# 3245
- CHECK IN W/ T. BARNT - Regarding Hertz pick up today of Light Stands
- FAX LAB & OFFICE COCs FOR MON shipment (Also FAXED OFFICE COCs FOR Friday's shipment)
- PREP. FOR GW SAMPLING
- Assembled Baddick Pumps decon'd last night

0840 HRS - ARRIVE @ SWMU 12
0854 HRS - Collect Dis. Metals & Hg @ 12MWT37
0930 HRS - Start Purge @ 12MWT42
1330 HRS - END Purge @ 12MWT42
1332 HRS - Start collecting 12GWT4201 & Run MNA
1458 HRS - FINISH @ 12MWT42
1510 HRS - CHECK IN W/ SC & JG
1530 HRS - ARRIVE @ B 3245
- PAPERWORK & PACKAGING SAMPLES ON COC #0101
- PREP. U.S ENV. EQ FOR RETURN ON AB# 8947 8135 5502; Return:
  1) Control box
  1) Water level indicator
  1) Peristaltic Pump
  1) YSI
  1) LaMotte Turbidity meter

1745 HRS - LEAVE B# 3245 FOR FED. EX.
1825 HRS - DROP OF SAMPLES & EQ. @ FED EX
Samples shipped via AB# 8947 8135 5498
E-mail R. Basinski Sample Summary

END

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE			DATE
Terry Lojahn			9/28/04
DISCLOSED TO AND UNDERSTOOD BY	DATE	WITNESS	DATE

Samples Summary 9/29/04

- Ship sample (RCBWT 3201) this date on COC #0102 via FED EX, AB# 8447 8135 5513
- FAX COC #0101 & 0102 to both LAB & OFFICE

[illegible]
0750
0830

TITLE NSWC CRANE

WED 9/29/04

Crew
S. Conti
T. Rojahn

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

0645 Hrs - Arrive @ B 3245
Prep to Dev. 16 MW T 21
0730 Hrs - Start Dev @ 16 MW T 21
0830 Hrs - End Dev
0840 Hrs - Arrive @ B 3245
- Package Samples on COC #0102 & AB# 8447 9135 5523
- Prep. DR 890 & Bladder Hoses & Regulator to Return to U.S. Env on AB# 8447 8135 5524
- Discuss SW & SD Sampling w/S.C. for Next Shift in PRGR. - check over tables & Figures

1045 Hrs - Left NSWC Crane for Fed. Ex.
1110 Hrs - Drop off Shipments - See above
Remainder of day Travel to Pittsburgh
End

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE Ty Rojahn

DATE 9/29/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 10/11/04

SEDIMENT LOCATIONS SAMPLED:
12SD07, 08, 09, 10, 24, 25 & 26

SURFACE WATER SAMPLED: 12SW25
W/DUP & MS/MSD

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 53625 MADE IN USA

TITLE NSWC CRANE

MON 10/11/04

CREW
S. CONTI
J. GOERDT
T. ROLAHN

PROJECT NO. 6878
BOOK NO. 1374

Work continued from Page

TRAVEL DAY

1215 Hrs - Pick up supplies @ Lowe's
1245 Hrs - Pick up supplies @ SAMS CLUB
1320 Hrs - Pick up BADGE
1335 Hrs - Arrive @ BLDG 3245
- PAPERWORK
- PREP. SAMPLES FOR SHIPMENT ON COFCs 0105 & 0114
- CHECK IN W/OFFICE - R. BASINSKI
- MAKE FLIGHT ARRANGEMENT FOR NEXT SHIFT

1600 Hrs - J.G & S.C. ARRIVE @ B 3245
- PREP SAMPLES FOR SHIPMENT ON COFCs 0106 & 0107 VIA FED EX AB# 8447 8135 5568

1725 Hrs - LEAVE B 3245 FOR FED EX
1800 Hrs - DROP OFF SAMPLES @ FED EX.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Goerdt

DATE 10/11/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 10/12/04:

SEDIMENT LOCATIONS SAMPLED:

12SD 01 → 06, 11, 19, 21, 22 & 27

SURFACE WATER LOCATIONS SAMPLED:

12SW 01, 04, 11 & 27

SCIENTIFIC BINDERY PRODUCTS CHICAGO 53515 MADE IN USA

Work continued from Page

WEATHER: Periods of RAIN - Temp 60's OVERCAST

0700 Hrs - ARRIVE @ B-3245
- FAX LAB & OFFICE SAMPLE COCs # 0103, 0104, 0106 & 0107
- CHECK IN w/ R. BASIASK - discuss surveying status, CREW & MAPS / tables
- Prep to SAMPLE SEDIMENT & SURFACE WATER

0925 Hrs - LEAVE B-3245 FOR SWMU 12
0937 Hrs - ARRIVE @ SWMU 12
1015 Hrs - SAMPLED 12SD060004 SW - DRY
1110 Hrs - SAMPLED 12SD050004 SW - DRY
1135 Hrs - SAMPLED 12SW0401
1140 Hrs - SAMPLED 12SD040004
1230 Hrs - LUNCH
1300 Hrs - ARRIVED @ B-3245
- PROCESSED MORNING SAMPLES
- Restock VEHICLE FOR AFTERNOON SAMPLING EFFORT

1345 Hrs - LEFT - B 3245 FOR SWMU - 12
1355 Hrs - ARRIVE @ SWMU - 12
1400 Hrs - SAMPLED 12SD030004 SW - DRY
1425 Hrs - SAMPLED 12SD020004 SW - DRY
1445 Hrs - SAMPLED 12SW0101
1510 Hrs - SAMPLED 12SD010004
1550 Hrs - ARRIVE @ B-3245
- PROCESS SAMPLES FOR SHIPMENT
- ~~PACKAGE~~ TA PACKAGE SAMPLES ON COCs # 0110 & 0112

1745 Hrs - LEAVE B-3245 FOR FED. EX.
1820 Hrs - DROP OFF SAMPLES ON FED. EX. AB# 8447 8135 5579
E-mail Ralph B. SAMPLE SUMMARY FOR 10/12/04

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers
DATE 10/12/04
DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 10/13/94:

SEDIMENT LOCATIONS SAMPLED: 12SD12-18, 20
23, 29 & 30

SURFACE WATER LOCATIONS SAMPLED:
12SW 12, 13, 16 & 23

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60625 MADE IN USA

WED 10/13/04

Work continued from Page

WEATHER - OVERCAST w/ Periods of Light Rain 60°

0700 Hrs - ARRIVE @ B-3245
- PREP. PAPERWORK & SUV FOR SD/SW SAMPLING
- CHECK IN W/ R BASINSKI
- TALK to A. JANOCHA regarding MAPS FOR SURVEYING CREW
- FAX COC FROM TUES SHIPMENT to OFFICE & LAB

0850 Hrs - LEAVE B-3245 FOR SWMU 12
0905 Hrs - ARRIVE @ SWMU 12
0935 Hrs - SAMPLED 12SD290004 SW-DRY
1000 Hrs - SAMPLED 12SD300004 SW-DRY MS/MSD
& 12FD10130401
1045 Hrs - SAMPLED 12SD150004 SW-DRY
1100 Hrs - SAMPLED 12SD180004 SW-DRY
1130 Hrs - SAMPLED 12SD200004 SW-DRY
1200 Hrs - SAMPLED 12SD140004 SW-DRY
1225 Hrs - RETURN to B# 3245
- CLEAN GARAGE CONSOLIDATE Coolers & Sample Containers
- ORGANIZE SAMPLE Container IN OFFICE
- ROUGH CLEANING IN OFFICE
- Complete COC #0121 FOR Filtered samples collected on 10/12/04
- PREP Coolers FOR SHIPMENT
- PAPERWORK
- PACKAGE SAMPLES ON COCS 0119, 0120 & 0121

1710 Hrs - LEAVE B 3245 FOR FED EX
1743 Hrs - DROP OFF SAMPLES ON AB# 8447 8135 5580

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 10-13-04

CLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 10/14/04:

SAMPLE 12SD28 0004

SURVEY CREW - START SET UP OF SURVEY
Control FOR SWMU 12, SURVEY MWE5B@ SWMU 13

ID ALL MONITORING WELLS & 11 OF 12 STAFF
GAUGE LOCATIONS (7 INSIDE MPA & 4 OUTSIDE)

SG# ALL MARKINGS IN Black Paint marker EXCEPT FOR 6 (WH. PT.)

12SG01 - INSIDE FENCE @ NEW 12SW/SD14 Location (Top of Culvert)

12SG02 - INSIDE FENCE @ NEW 12SW/SD15 Location (Top of Culvert)

12SG03 - " " " + 12SW/SD18 Location (Top of Culvert)

12SG04 - " " " NEW 12SW/SD20 Location (Top of Culvert)

12SG05 - " " @ 12SW/SD03 (Top of Culvert)

12SG06 - " " @ 12SW/SD02 (Top of Culvert)

12SG07 - " " @ 12SW/SD01 (Invert of Gal. Pipe)

12SG08 - EDGE OF Concrete structure (NEAR top) upstream side of H-99 W of DKMC

12SG09 - " " " " (" ") upstream side of H-99 E of DKMC

12SG10 - EDGE OF Concrete structure (NEAR top) upstream side of H-98

12SG11 -

12SG12 - INVERT OF Concrete structure under upstream side of Road (H-58)

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

T. ROSAHN & survey crew E. Allen & G. WOOD

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

THURS. 10/14/04

Work continued from Page Weather overcast, periods of rain & 50°s

0700 Hrs - Arrive @ B-3245
- Fax CCCs 0119, 0120 & 0121 to Lab & office (E.S.)
- Prep for surveyors arrival

0800 Hrs - Cary Allen & Gary Wood of BT&R arrive @ B-3245
- Discuss survey approach (start w/ SWMU 13 & set control for SWMU 12) & H&S issues

0830 Hrs - Arrive @ SWMU 13
- Show survey crew Monitoring Wells 13MWT48 → 51
- Show survey crew all new Boring locations some disturbed by mowers but was able to find or replace staked out locations

0935 Hrs - Arrive @ SWMU 12
- Show survey crew all Borings & MW locations as well as staff Gauge & SW/SD locations within the fenced area of MFA - Discussed survey should take place on Fri & Sat when no dangerous goods handling takes place - Fri is a clean up day

1015 Hrs - Survey crew to set up control - Return to office to do paperwork - Pick up sandwich @ Subway

1115 Hrs - Meet w/ surveyors - and oversight boring survey within SWMU 13

1200 Hrs - Finish survey within SWMU 13
- Surveyors will finish up the day working outside of SWMUs 13 & 12

1215 Hrs - Return to B-3245 - Prep to sample SW/SD @ 16SW/SD16 & 12SW/SD28

1335 Hrs - Sampled 16SD1602 - SW Dry

1355 Hrs - Arrive @ SWMU 12 - Check, mark all wells for ID prior to survey by BT&R; Also ID & mark all 7 staff gauges within MFA fence

1540 Hrs - Sampled 12SD280004 - SW Dry
Remainder of afternoon ID staff gauges outside SWMU 12

1710 Hrs Left Site for Hotel

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE

DATE 10/14/04

CLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SURVEY CREW

SURVEY ALL WELLS, BORINGS, SURFACE WATER / SEDIMENT & STAFF GAUGE locations within MFA FENCE, and ALL WELLS & BORING locations outside of MFA FENCE.

SURVEY CREW:

ARRIVE: 0800 HRS

DEPART: 1600 HRS

SCIENTIFIC BINDERY PRODUCTS CHICAGO 50605 MADE IN USA

TITLE NSWC CRANE

FRI - 10/15/04

CREW
T. Rojahn
C. Allen
G. Wood

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

WEATHER - AM OVERCAST & COOL

0700 Hrs - Arrive on site B-3245
- Paperwork
- Prep. for surveyors

0800 Hrs - Survey crew arrived - discuss day's activities

0830 Hrs - Allow survey crew access to MEA

0895 Hrs - Return to B-3245 - Work on swmu 16 the remainder of the day

END

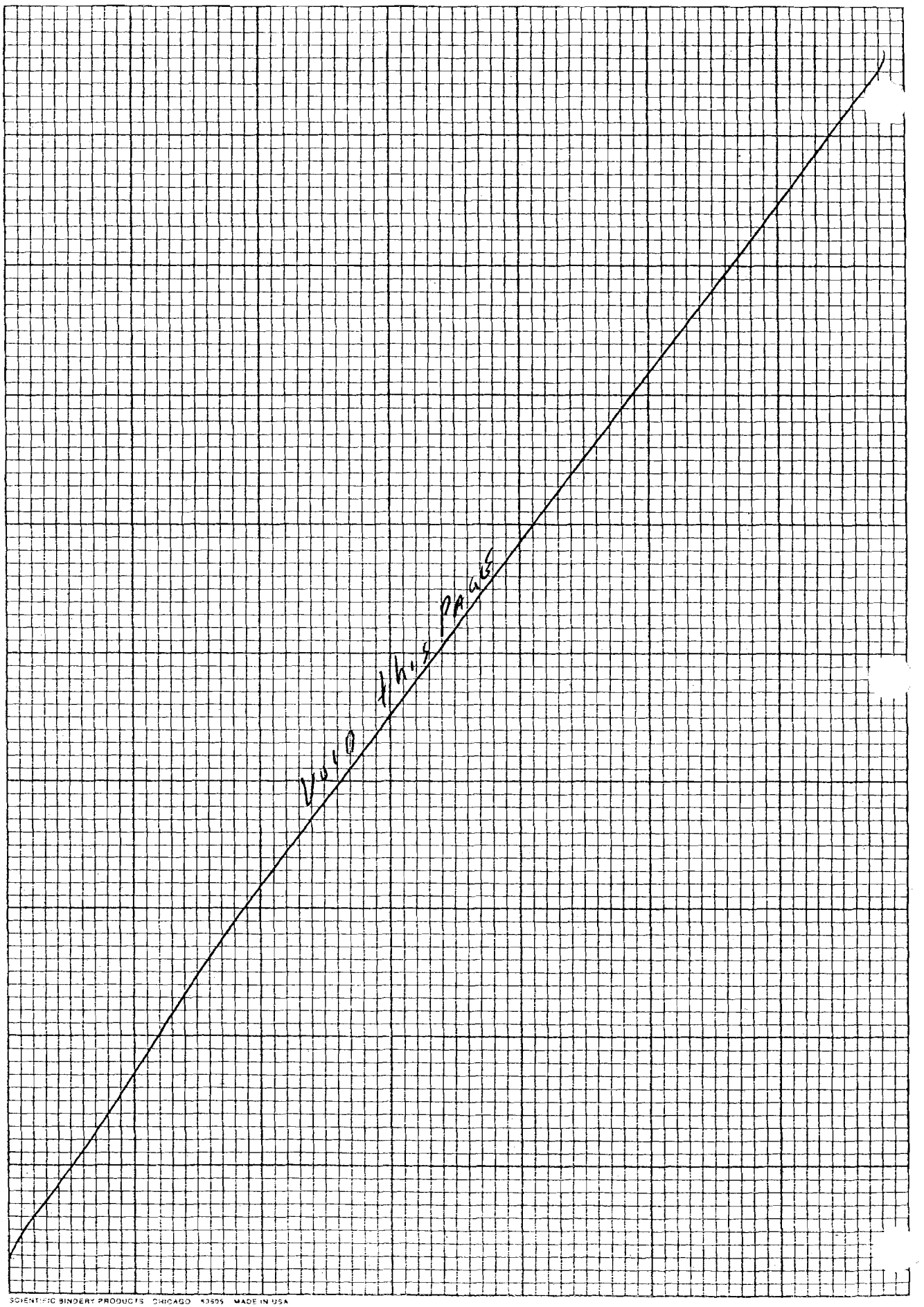
SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Ty Rojahn

DATE 10/15/04

CLOSED TO AND UNDERSTOOD BY | **DATE** | **WITNESS** | **DATE**



SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SAT - 10/16/04

Work continued from Page

WORKED @ SWMU-16 ONLY this date

END

5

10

15

20

25

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35

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogal

DATE 10/16/04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

B 100 P ©

SWMU 12 WATER LEVELS 10/17/04

ID OF WELL	W.L.	PID	TIME	
T01	11.10	1.3	1551	3 Bailards
T02	10.02	9.0	1547	
T03	16.91	0.0	1540	
T04	14.94	0.0	1538	
T05	10.12	0.0	1533	
T06	9.64	1.7	1518	
T07	11.80	0.0	1516	
T08	12.03	0.0	1505	
T09	13.44	0.0	1510	
T10	15.77	0.0	1458	
T11	15.55	0.5	1340	
T12	13.03	0.0	1338	
T13	8.21	0.0	1342	
T14	19.51	0.0	1346	
T15	16.32	1.3	1349	
T16	20.37	0.0	1415	
T17	22.79	0.0	1413	
T18	21.55	0.0	1417	
T19	25.83	0.0	1411	
T20	23.86	0.0	1402	
T21	21.42	1.3	1529	
T22	16.56	0.0	1501	
T23	27.20	0.0	1447	
T24	32.07	0.0	1442	
T24A	34.68	0.0	1438	
T25	17.80	0.8	1328	
T26	10.56	0.0	1611	
T27	10.96	0.0	1333	
T28	12.96	0.0	1323	
T29	59.97	0.0	1536	
* T30	92.71	0.0	1513	
T32	85.17	0.0	1489	NO J. RING
T31	68.55	0.0	1345	
T33	44.99	0.3	1331	
* T34	88.42	0.0	1556	
T35	12.33	0.0	1355	
T36	13.15	0.0	1358	
T37	22.20	0.0	1423	
T38	10.03	0.0	1524	
* T39	35.83	0.0	1539	
T40	22.23	0.0	1453	
T42	15.03	0.0	1543	

* REMOVE BAILER

SCIENTIFIC BINDERY PRODUCTS CHICAGO 53533 MADE IN USA

TITLE NSWC CRANE

SUH 10-17-04

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

WEATHER - Mostly Sunny & 50's

0800 Hrs - ARRIVE @ B3245

- CAL: PID
- TRANSFER MAP INFO WITH SG. INFORMATION FOR SURVEY CREW
- PAPERWORK
- PREP FOR WORK @ SWMU 16

1318 Hrs - ARRIVE @ SWMU 12

1323 Hrs - Start WATER LEVELS @ SWMU 12

1611 Hrs - Complete WATER LEVELS @ SWMU 12

1620 Hrs - ARRIVE @ B-3245

- GENERAL OFFICE CLEAN UP
- CLEAN OUT SUV - REMOVE SAMPLING EQ & SUPPLIES
- PREPARE COCs 0122 & 0123
- PAPERWORK

1810 Hrs - LEAVE BLDG FOR HOTEL

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Pogue

DATE 10/17/04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLING SUMMARY 10/10/04

- Stake out contingency wells @ SWMU 12
  12MW17 at ~ 43 → 50
- Ship samples on COCs # 0122 & 0123
  (samples on COC 0122 were from SWMU 18)
- Subcontracts CANCELED due to RAIN

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60505 MADE IN U.S.A.

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

MON 10-18-04

Work continued from Page

WEATHER: RAIN (heavy @ times) & Temp 50°s

0700 Hrs - Arrive @ B-3245
- Paint Metal Stakes for Staff Gauges
- Transfer Staff Gauge info to survey maps
- Prep for stake out of contingency wells @ SWMU 12
- Prep. to install Staff Gauges & Freeze Protection @ SWMUs 13 & 16; Freeze Protection is for Dedicated Bladder Pumps
- Paperwork

1100 Hrs - Lunch

1130 - 1435 Hrs - Staked out contingency wells @ SWMU 12 12MWT41, & 43 → 50. Along the RR tracks @ 600 Hill & Transmission Line Corridor West of SWMU.

1435 Hrs - Talked to Donna Z about clearing utilities for the 9 contingency wells @ SWMU12 - Donna said the dig permit should be ready by the 25th of Oct - call Thursday to check.

1500 Hrs - Arrive @ B-3245
- Fax J. Schaeff & S. Conti water levels on Page 82.
- Fax Lab & Office COCs #0122 & 0123 of today's shipment.
- Prep Samples for shipment on FED.EX. AB #8447 8135 5590

1610 Hrs - Leave B-3245 for FED.EX.

1650 Hrs - Drop off samples @ FED EX.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers

DATE 10-18-04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

86

DIGGING PERMIT

NSWC CRANE 11000/3 (REV. 8/02)

4648

REQUESTED BY: Terry Rothwell TETRATECH 412-921-8857	DATE: 10/18/04
WORK REQUEST ON E/S NO.:	SWMU 12 - Minefill "A" along R-1
WORK WILL BE PERFORMED BY: TetraTech	DATE (Start - on or about): 10/25/04

WORK DESCRIPTION: Install ground water sampling wells outside Minefill "A" area. Two locations for 6 wells along RR-1 on the east side & the other 3 locations are on the west side in the power line right-of-way. Areas are marked with wooden stakes with ribbons.

EQUIPMENT TYPE:

- [ ] HAND TOOLS
- [x] CORE DRILL
- [ ] TRENCHER
- [ ] BACKHOE
- [ ] HEAVY EQUIPMENT

UNDERGROUND UTILITIES LOCATED IN WORK SITE

UTILITY	PRESENT	MARKED	NOT LOCATED	REMARKS
COMPRESSED AIR	N/A			RHW 10/19/04
HIGH VOLTAGE ELECTRICAL	N/A			RHW 10/19/04
FIRE ALARM	N/A			RHW 10/19/04
GROUNDING	N/A			RHW 10/19/04
NATURAL GAS	N/A			RHW 10/19/04
SECURITY ALARM	N/A			RHW 10/19/04
SEWER	N/A			RHW 10/19/04
STEAM	N/A			RHW 10/19/04
TELEPHONE Faxed 10/19/04	N/A			LR 10-22-04
WATER	N/A			RHW 10/19/04
SECOND ELECTRICAL	N/A			RHW 10/19/04
GENERAL DYNAMICS/NMCI	N/A			RHW 10/19/04

In addition to the general precautions for excavating where underground utilites are present, comply with the following:

PERMIT HOLDER SIGNATURE: [signature]	DATE: 10/25/04
DIGGING PERMIT APPROVED BY: Donna L. Bollman	DATE: 10/25/04

DISTRIBUTION:

ORIGINAL - Code 09Z5 File

TITLE NSWC CRANE

Drilling Crew
J. Walsh
J. Dean
T. Wollenhaupt
S. Conti (oversight) & Geo.

PROJECT NO. 6878
BOOK NO. 1374

Mon 10-25-04

Work continued from Page

1330 Hrs - ARRIVE @ B 3245
- Fill out Contractor Vehicle Pass
- Call T. Patton for Sampling EQ.
- Check in w/ T. Brent

1445 Hrs - SET Staff Gauge @ 12 56 11

1503 Hrs - Pick up Dig Permit for MFA (RR tracks & Transmission line corridor)

1528 Hrs - Return to B-3245 - B-M Crew Arrived
J. Walsh
J. Dean
T. Wollenhaupt
- Check in w/ R. Basinski
- Xerox Dig Permit for NB 1374, Page 86
- Obtain Vehicle Passes for B-M Support trucks
- RR Track H&S Meeting
- Drillers Receive Shipment from Global Supplies

1700 Hrs - Leave B3245 for Motel

END

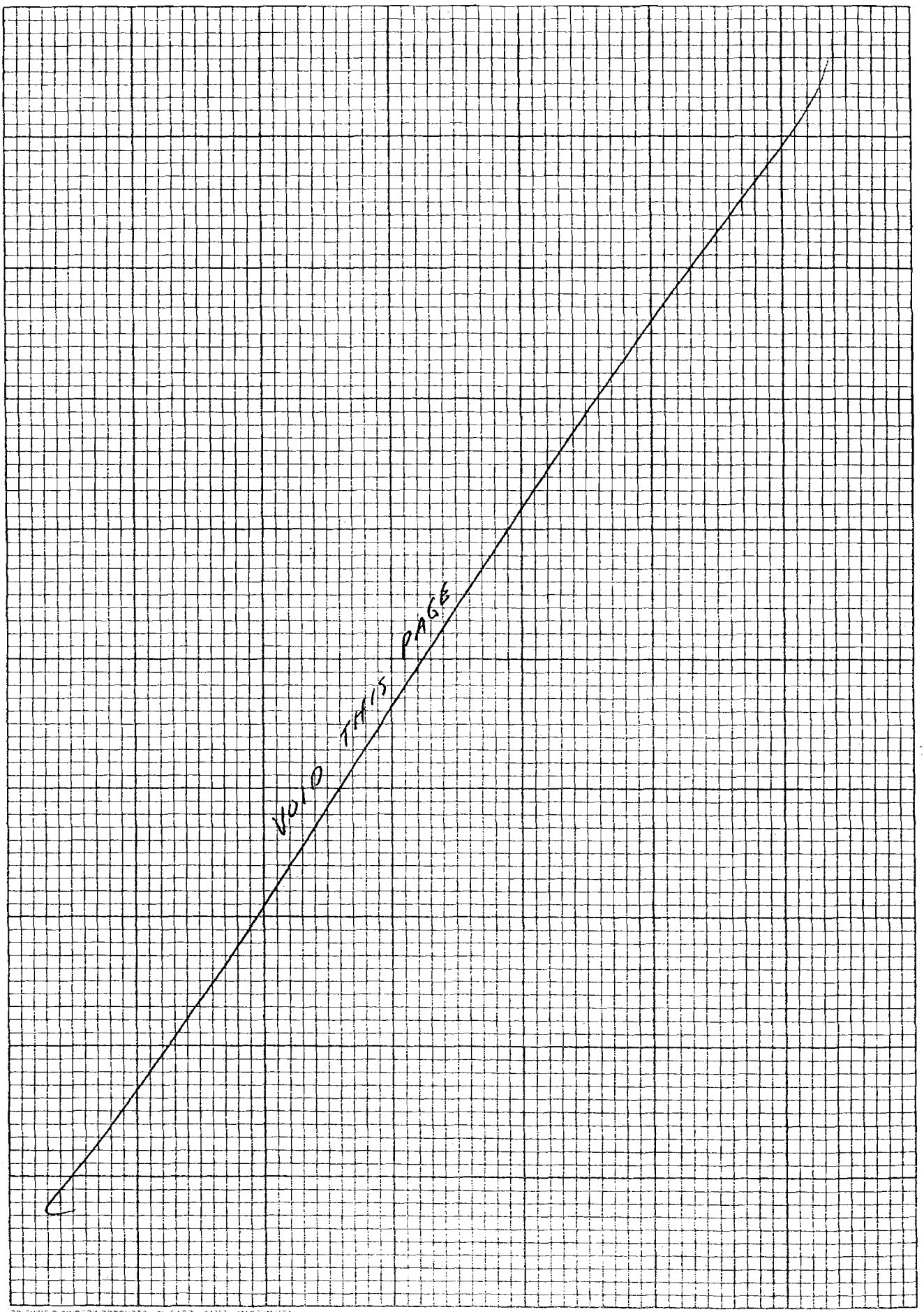
Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE Terry Ryan

DATE 10/25/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE



SCIENTIFIC BINDERY PRODUCTS CHICAGO 51695 MADE IN USA

SAME AS ON PAGE 87

TITLE NSWC CRANE

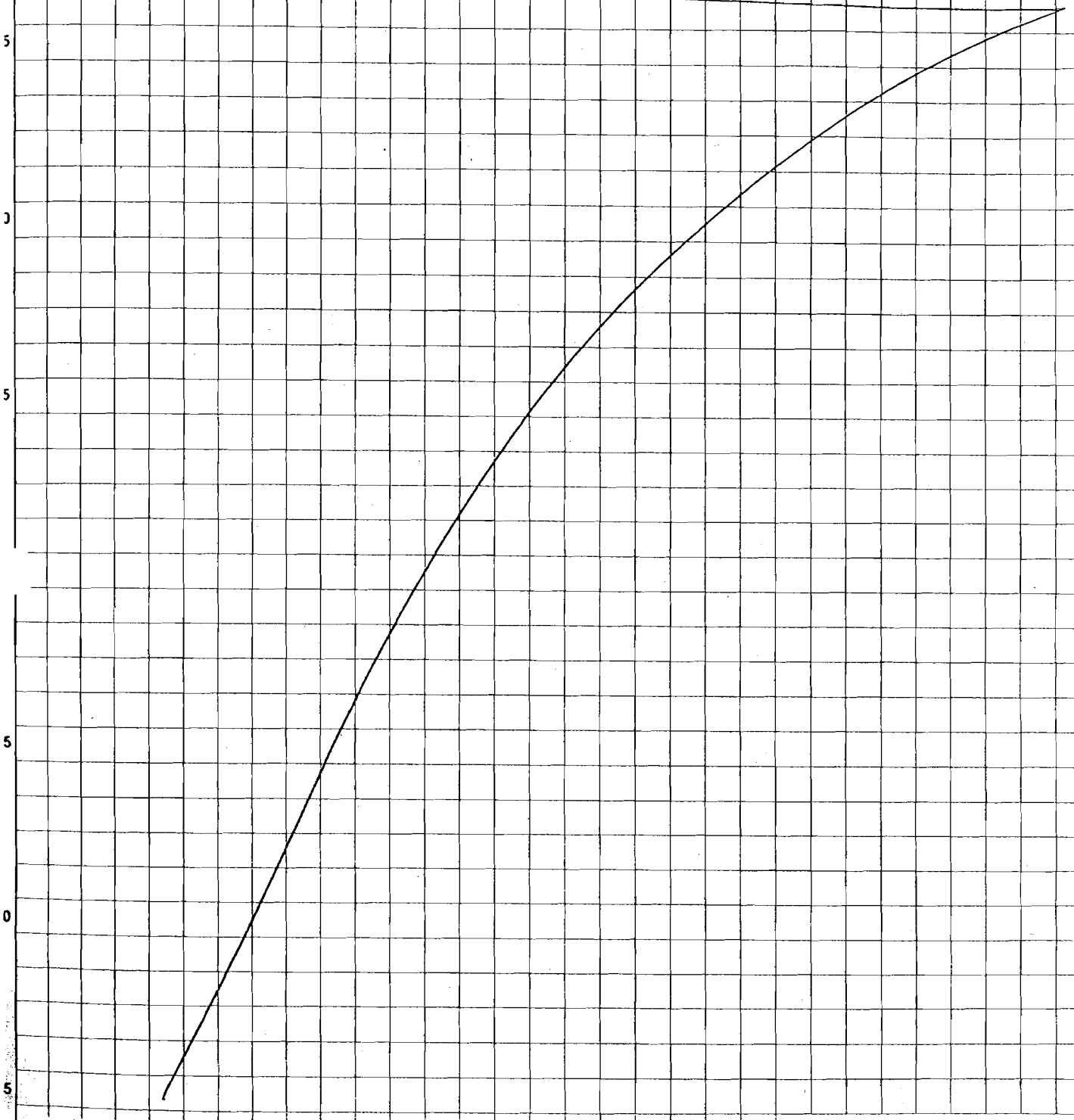
PROJECT NO. 6878 ~~9448~~ TR

BOOK NO. 1374

TUES 10-26-04

Work continued from Page

WORKED @ SWMU's 13 EIG this date
Drilling - ~~start~~ 12 MWT 44
END



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature]

DATE 10-26-04

DISCLOSED TO AND UNDERSTOOD BY | **DATE** | **WITNESS** | **DATE**

SAMPLE SUMMARY 10-27-04

Collected SURFACE WATER SAMPLES -
12 SW 26, 24, 10, 9 & 8

SHIPPED SAMPLES ON COC 0126 VIA
FED. EX AB# 8487 8135 6623

Drilling - Complete 12 MWT 44 & 41

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

Drilling Crew Same as on Page 87

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

WED 10/27/04

Work continued from Page

WEATHER - Overcast Mild Temp in 60's

1215 Hrs - Arrive @ SWMU 12

1230 Hrs - Collected 12SW2601

1306 Hrs - Collected 12SW2401

1400 Hrs - Collected 12SW1001

1440 Hrs - Collected 12SW0801

1455 Hrs - Collected 12SW0901

1550 Hrs - Arrive @ B-3245

- Prep samples on COC 0126 for shipment from SWMU 12; Also prep samples on COCs 0124 & 0125 ~~for~~ from SWMU 13 ~~Also~~ for shipment this date

1745 Hrs - Leave B-3245 for FED. EX.

1820 Hrs - Drop off samples on AB # 8447 8135 6623

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rock

DATE 10-27-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 10/28/04:

COLLECTED SURFACE WATER SAMPLES:
12SW02, 03, 05 & 06
DRY LOCATION: 12SW07

DRILLING - START DRILLING @ 12MWT50

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

THUR. 10-28-04

Work continued from Page

WEATHER: OVERCAST & 60's

0655 HRS - ARRIVE @ B-3245
- FAX COCs to LAB & OFFICE
- Discuss RR ACCESS w/ Drilling Crew & S.Conti
  Got RADIOS FROM T. Brent

0820 HRS - WALK RR tracks to RECON DRILLING Locations
CHECK RADIOS & ground CLEARENCE on tracks (7 3/16")

1010 HRS - Return to OFFICE - Drillers & S.C. comin Along Rt 58
PREPING EQ
- CALL R. Basinski with work progress & possibility to rent something w/ better ground clearance
  J. Goerdt will look into vehicles w/ better clearance
- Called Hertz & National - to check on Gators
- S.C. called - Drillers are renting a EZGO
  FROM Hertz - NEED to tell T. Brent about Friday morning delivery

1130 HRS - LUNCH

1200 HRS - Return to BLDG 3245
- Message from Laucks regarding sampling sch.
- CHECKED IN w/ LAB
- Cal: YSI & LaMotte
- CHECK IN w/ T. Brent
- Load vehicle FOR SW sampling

1322 HRS - ARRIVE @ SWMU 12

1340 HRS - 12SW07 DRY

1355 HRS - Collected 12SW0601

1440 HRS - Collected 12SW0201

1508 HRS - Collected 12SW0501

1535 HRS - Return to B-3245 DROP OFF SAMPLES IN FRIG & Pick up 2 CASES OF 1L Ambers FOR MS/MSD & DUP OF SVOCs @ 12SW03.

1630 HRS - Collect 12SW0301

1740 HRS - Return to B 3245
Drop OF EQ & REFRIGERATE SAMPLE 12SW0301

1800 HRS - LEAVE B3245 FOR Motel

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 10-28-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 10/29/04:

Collected SURFACE WATER SAMPLES:
12 SW 17, 19, 21 & 22
2 SAMPLES on COCS 0127 & 0120 via FEDEX AB# 8947 8135 6612
Also, SURVEYORS OVERSIGHT
CREW - C. Allred
L. Wood

DRILLING:
DRILLERS - J. Walsh
J. Dean
T. Wallenhaupt

Drilling complete @ 12MWT50 & 12MWT45

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

FRI 10-29-04

Work continued from Page WEATHER: OVERCAST & High 70's

0650 Hrs - Arrive @ Bloomington Gate; Pick up NEW PASS
0710 Hrs - Arrive @ B-3245
- Meet w/ Drilling Crew
- Call R. Basinki w/ work summary for 10/28
0840 Hrs - Survey Crew Arrives C. Allen & G. Wood
- Meet w/ Survey Crew Need to Access MFA
0910 Hrs - Arrive MFA to Assist Survey Crew
- let them in MFA
0945 Hrs - Surveys OK - outside fence work only @ SWMU 12 for the remainder of the day
0953 Hrs - Arrive @ B-3245
- Process samples from 10/28
- Call VSI & LAMott
- Prep. vehicle for surface water sampling
1150 Hrs - Arrive @ SWMU 12
1250 Hrs - Collect surface water sample 12SW1501
1320 Hrs - Collected 12SW2201
1340 Hrs - Collected 12SW2101
1420 Hrs - Collected 12SW1701
1515 Hrs - Arrive @ B 3245
- Process sample listed above
- Prep samples for shipment on COCs 0127 & 0128 via Fed. Ex. AB# 8447 8135 6612
1750 Hrs - Left B-3245 for Fed. Ex.
1823 Hrs - Drop off samples @ Fed. Ex.
1906 Hrs - Fax COCs to LAB from Motel

END

SIGNATURE [signature] DATE 10-29-04
DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

Sampling Summary 10/30/04
Collected Surface water samples @:
12 SW 28 & 20
Began collecting GW @ 12 MWT 39.
12 MWT 30 was dry.

Drilling Summary 10/30/04
Installed 12 MWT 46

SCIENTIFIC BINDERY PRODUCTS CHICAGO, 60605 MADE IN USA

SAT 10/30/04

Work continued from Page WEATHER - Mostly sunny & mild (Temp 70's)

0705 Hrs - Arrive @ B-3245
- CLEAN UP USED Boxes Break them down to recycle
- Restore Container in office
- Call VSI & LaMotte
- Prep & Load VEHICLE FOR SW sampling @ SWMU 12

0920 Hrs - Arrive @ SWMU 12
0940 Hrs - Collected 12SW2801
1015 Hrs - 12SW30, 29, 18, 15 & 14 WERE DRY
1030 Hrs - Collected 12SW2001 (DUP & MS/MSD Collected)
1130 Hrs - LUNCH
1200 Hrs - PROCESS 12SW2001 SAMPLES @ BLDG #3245
- PREP to collect Groundwater samples From previous DRY wells 12MWT34 & T30

1330 Hrs - BEGIN Collecting EXP sample @ 12MWT34 ~1/3 FULL 1L Bottle
1440 Hrs - Attempt sampling T30 - DRY
1450 Hrs - Return to T34 to continue sampling ~3" recharge every 15 min or so.
1535 Hrs - DRY - Not recharging total vol. ~500ml will RETURN tomorrow.
1600 Hrs - Arrive @ SWMU 16
BEGIN sampling 16MWT08
1734 Hrs - LEAVE BASE FOR Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE | DATE
DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©

Sample Summary 10/30/04:

Wells Dev. - 12MWT 41 & 44

Note: Attempt to Continue sampling monitor well 12MWT 34 - Well Dry

Drilling Summary 10/30/04:

Installed 12MWT 47

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

Sun 10-31-04

Work continued from Page

WEATHER: Partly Cloudy Temp 60's

0700 Hrs - Arrive @ B 3245
- Paperwork
- Call Motors
- Meet w/ drillers
- Prep. vehicle for well dev.

0945 Hrs - Arrive @ SWMU 12

1000 Hrs - Start Well Dev @ 12MWT41
Start Purge - 1000 Hrs
End Purge - 1055 Hrs Vol. Pumped = 8.4 gal

1115 Hrs - Check surface water location 12SW07 - Dry

1120 Hrs - On the way to 12MWT44 - get vehicle stuck
- Attempt to free vehicle but assist fail
- Walk to drilling location 12MWT47

1400 Hrs - Rig pulled out vehicle

1418 Hrs - Start well dev. @ 12MWT44
End well dev. 1457 Hrs Vol Purged 3 gal

1510 Hrs - End cleanup @ 12MWT44

1525 Hrs - Drive off base for lunch (Subway closed

1600 Hrs - Arrive @ 12MWT34 to continue collecting ex. vol.
Well dry

1615 Hrs - Arrive @ 16MWT08 continue collecting ex. vol.
Collect ~200 ml before well dries

1650 Hrs - Return to B-3245
- Decon whaler pumps used to dev wells
- Decon of EQ

1730 Hrs - Leave B-3245 for Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers

DATE 10/31/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLING SUMMARY 11/1/04

Collected SURFACE WATER SAMPLES

12 SW 07, 14, 15, 18, 29 & 30

S. Cont. also continued the sampling

of 12 MW 1 38 & 16 MW 1 08

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60405 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6078

BOOK NO. 1374

Mon 11/1/04

Work continued from Page

WEATHER - AM RAIN 60's PM OVERCAST & 60's

0650 Hrs - Arrive @ BLDG #3245
- Check in w/ Ralph Rosinski
- Fax COCs from File to office
- Fax Daily Activities sheets to office
- Cal: Meters
- Prep. SUV for surface water sampling

0955 Hrs - Collected 12SW30

1015 Hrs - Collected 12SW29

1055 Hrs - Collected 12SW14

1115 Hrs - Drop off samples @ B3245

1122 Hrs - Lunch

1245 Hrs - Collect 12SW07

1320 Hrs - Collect 12SW15

1335 Hrs - Collect 12SW18

1405 Hrs - Arrive @ B-3245
- Process samples for shipment on COCs #0129 & 0130
- S. Cont. continue sampling 12MWT34
- Unload SUV prep for shipment of samples

VIA FED. EX AB# 8447 8135 6597

1645 Hrs - Left B-3245 for FED EX

1720 Hrs - Drop off samples @ FED. EX.

1800 Hrs - Pick up supplies @ Sam's Club

END

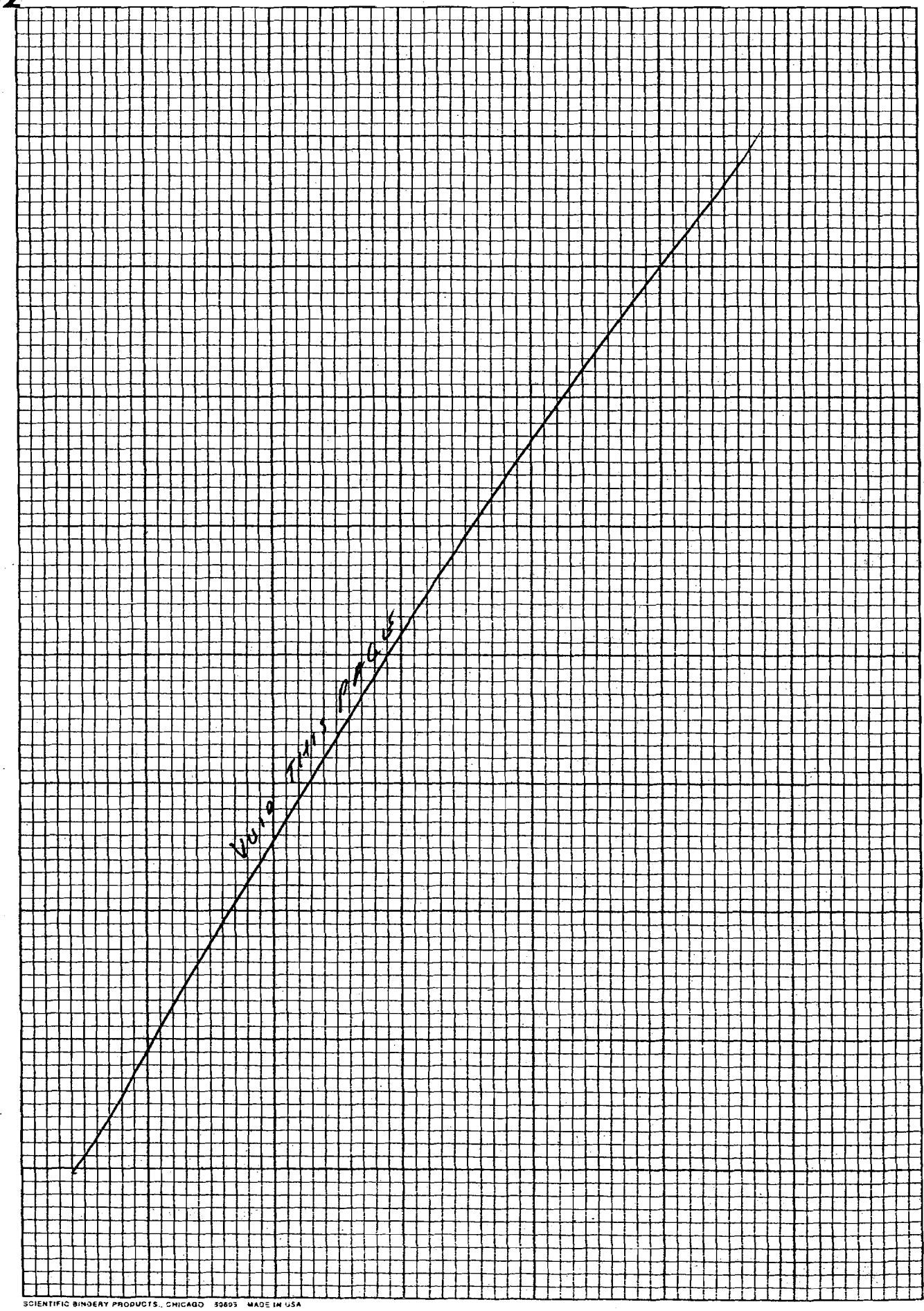
SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 11/1/04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE



SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

TUES 11-02-04

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

SHIP GW SAMPLE (12GWT34) ON COFC #0132
VIA FED EX AB# 8447 8135 6601

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Tony Rock

DATE 11-02-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

TRAVEL DAY 11-08-04

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60603 MADE IN USA

MON 11-8-04

Work continued from Page

1350 Hrs - Arrive @ B-3245
- Travel Day
- T. Brent & C. Freeman - Needed information on ice used by Tanks - NAVFAC doesn't want billed (ENV. Not under NAVFAC) - will seek payment elsewhere.

1430 Hrs - Drillers Arrive
J. Walsh
J. Dean
C. Mahaffey

1450 Hrs - B&E Surveyors check in with some questions about staff gauge locations
Surveyors - C. Allen & G. Wood

1530 Hrs - Called Laucks - ordered bubble wrap & coolers

1545 Hrs - Left B3245 for ~~Lunch~~ Manard's & ~~Sam's Club~~ Kroger

1620 Hrs - Stopped @ Manards - No stopping time

1810 Hrs - Picked up wet ones & drinking water @ Kroger -

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 11-8-04

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLING SUMMARY 11-9-04 :

DEVELOPE MONITORING WELLS 12MW1 45 → 47

SURVEY CREW :

C. ALLEN IN = 0815

Jim. SNELL OUT = 1545

Drilling - COMPLETE 12MW1 48

& Started drilling @ 12MW1 49

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

Drilling crew same as on Page 105 w/ Scott as Geologist

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

TUES 11-09-04

Work continued from Page Weather - Mostly Sunny 50's

0655 Hrs - Arrive @ B-3245
- Call YSI & LaMotte
- Order Nitrogen From IH Oxygen Pick up 4 large cyl & 1 small and drop off 4 sm Item 40 (SCUBA size) for RR wells
- Prep to Dev. wells along RR tracks

0845 Hrs - C. Freeman called - Public Works will let us have ice

0900 Hrs - Pick up 50 bags of ice @ Public Works

0925 Hrs - Load ice mach behind B 3245 w/ ice

0940 Hrs - Talked to RR Dispatcher - Heads up from office phone

0955 Hrs - Arrive @ SWMU2
- Got ride on train eng to 12MWT47

1025 Hrs - Began well Dev. @ 12MWT47

1040 Hrs - End development, purged 24 gal.

1127 Hrs - Began well Dev @ 12MWT46

1208 Hrs - End development; purged 0.25 gal; Dried out 3 Xs

1231 Hrs - Began well Dev @ 12MWT45
End development; purged 4.75 Gal; Dried out 3 Xs

1350 Hrs - Off tracks / Back @ truck - in contact w/ RR/Dispatcher since 0940 Hrs - Left Dispatcher know when I was on and off tracks

1410 Hrs - Arrive @ B-3245
- Paperwork
- Unload vehicle - Including work cart
- Decon (3) Whaler pumps, meters & m-scope
- Receive Nitrogen cylinders (4) Item 40 & return (1) Item 40 & (4) Items 102
- Began prep for GW sampling tomorrow

1415 Hrs - Leave B-3245 for Lowes - need strapping tape
- Lowes no strapping tape

1425 Hrs - Purchase strapping tape @ Office Depot

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Tim Pont

DATE 11-9-04

CLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLE SUMMARY 11-10-04:

COLLECTED GW SAMPLES @ 12MW141 & 44

DRILLING SUMMARY 11-10-04:

INSTALLED 12MW149, START DRILLING 12MW143

SCIENTIFIC BINDERY PRODUCTS CHICAGO 30605 MADE IN USA

Drilling crew same as on Page 105

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

WED. 11-10-04

Work continued from Page

WEATHER: Mostly Cloudy temp 50's

0655 Hrs - Arrive @ B 3245
- Cali YSI & Lamotte
- Prep to sample GW @ SWMU 12

0850 Hrs - Arrive @ 12MWT44; 0925 Hrs Start Purge

1325 Hrs - END PURGE ; PURGED 14.0L

1325 Hrs - Start SAMPLING 12GWT4401
- WHILE BOTTLES WERE FILLING started purge @ 12MWT41.

1355 Hrs - Start Purge @ 12MWT41

1705 Hrs - END PURGE @ 12MWT41; Vol. Purged = 19L

1706 Hrs - Start collecting 12GMWT4101

1825 Hrs - Arrive @ B 3245
- Unload Pick up
- Secure Samples in Frig.
- Call Lab - check on MS/MSD VOL. for EXP & MISC EXP. 4-6 Liters OK

1840 Hrs - Leave B 3245 For Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Bjel

DATE 11-10-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 11-11-04:
SHIP SAMPLES ON COC #0134 VIA
FED EX 48 # 8447 8135 6586

NO DRILLING @ CRANE this date (11/11)

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

DRILLING CREW SAME AS ON PAGE 105

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

THURS 11-11-04

Work continued from Page

WEATHER: RAIN & 50°s

0645 HRS - ARRIVE @ B-3245
- CALI YSI & LaMotte
- PREP FOR SW SAMPLING (RAIN PRESENTLY) @ SWMU 16
- PAPERWORK

0930 HRS - Start sampling @ SWMU 16

1215 HRS - RETURN to B-3245
- PACKAGE SAMPLES collected FROM SWMU 12 Groundwater ON COC #0134

1730 HRS - Drop OFF SAMPLE SHIPMENT ON AB # 8447 8135 6586 @ FED EX

1810 HRS - FAX OFFICE & LAB COPY OF COC # 0134 FROM HOTEL

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Royal

DATE 11-11-04

CLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLING SUMMARY 11-12-04:

DEV. MONITORING WELL 12MWT48

PURGE MONITORING WELLS 12MWT43 & 46

DRILLING SUMMARY 11-12-04:

INSTALL MONITORING WELL 12MWT43

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

Drilling Crew same as on P. 105

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

FRI 11-12-04

Work continued from Page

WEATHER: MOSTLY SUNNY & 40's

0655 Hrs - ARRIVE @ B3245
- CALL YSE & LAMOTTE
- Assist drillers in getting security approval to PARK SUPPORT VEHICLE (IN NEED OF MAINTAINANCE) outside CRANE GATE - Got ASSISTANCE FROM Jim HUNSICKER (T. Brent & C. FREEMAN ON LEAVE)
- Got PERSONNEL NAMES to J. HUNSICKER FOR WEEKEND SECURITY letter
- Prep to ~~SAMPLE~~ TO DEV. & PURGE WELLS ALONG RR tracks

0915 Hrs - ARRIVE @ SWMW 12 H-58 & RR tracks
PREP. PULL CART W/ EQ FOR DEVELOPMENT & WELL PURGING

1010 Hrs - ARRIVE @ 12MWT50 - WELL DRY

1030 Hrs - ARRIVE @ 12MWT49 - WELL DRY

1055 Hrs - START DEVELOPMENT @ 12MWT48

1147 Hrs - COMPLETE DEV @ 12MWT48; PURGED 7 L

1210 Hrs - RETURN to CAR on H58 & MOVE it to H45 to FACILITATE EXIST @ END OF DAY

1255 Hrs - ARRIVE @ 12MWT46
Start PURGE = 1316 Hrs
END PURGE = 1434 Hrs VOL. PURGED = 20 L

1446 Hrs - ARRIVE @ 12MWT45
Start PURGE = 1454 Hrs
END PURGE = 1552 Hrs VOL. PURGED = 15 L

Note - ABOVE WELLS WERE PURGED DRY (slow recharge wells)
- to facilitate sampling on the RR tracts, difficulty in moving EQ - WELLS will be SAMPLED tomorrow

1615 Hrs - WALK out to RTE-45; load Pick up with pull cart & EQ

1635 Hrs - ARRIVE @ B-3245
- Unload Pick up truck & CLEAN EQ.

1700 Hrs - LEFT B-3245 FOR Bloomington

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Ted Brent DATE 11-12-04

CHECKED TO AND UNDERSTOOD BY DATE WITNESS DATE

B 100 P ©

SAMPLE SUMMARY 11-13-04:
COLLECTED GW SAMPLES 12MWT 45, 46 & 47

DRILLING SUMMARY 11-13-04:
INSTALL WELL MOS @ 12MWT 45 - 50.

SCIENTIFIC SINDERY PRODUCTS CHICAGO 60605 MADE IN USA

Drilling Crew Same as on P. 105

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SAT 11-13-04

Work continued from Page

WEATHER: Mostly SUNNY & 40's - low 50's

0045 Hrs - ARRIVE @ B3245
- CALL VSI & LAMOTTE
- Prep. FOR SAMPLING GROUNDWATER

0900 Hrs - ARRIVE @ SWMU12; MOB EQ VIA PULL CART

0945 Hrs - Start SAMPLING 12MWT46 (PURGED 11/12)

1050 Hrs - Start SAMPLING 12MWT45 (PURGED 10/12)

1200 Hrs - ARRIVE @ 12MWT47 - will wait until drilling CREW FINISH WELL PAD installation

Start PURGE = 1303

END PURGE = 1353

VOL. PURGED = 10L

SAMPLE TIME = 1355

Collect - 12GWT4701 & 12FD1113040 1; along w/ MS/MSD

1545 Hrs - FINISH CLEAN UP @ 12MWT47

1630 Hrs - ARRIVE @ B3245
- UNLOAD PICK UP
- SECURE SAMPLES in Frig.

.55 Hrs - LEAVE B3245 FOR Bloomington

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Tony Rogers

DATE 11-13-04

READ TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 11-14-04:

DEV. 12MW1T43

PURGE & START SAMPLING 12MW1T48

SLOW RECHARGE WELL

DRILLING CREW 11-14-04:

INSTALL PADS @ 12MW1T41, 43 & 44

~~Paint bollards & stick ups~~ (74)

SCIENTIFIC BINDERY PRODUCTS CHICAGO 93605 MADE IN USA

TITLE NSWC CRANE **PROJECT NO.** 6878 **117**

BOOK NO. 1374

SUN 11-14-04

Work continued from Page

WEATHER: Mostly Sunny & 40's

0650 Hrs - Arrive @ B 3245
Call VSL & LaMothe
Prep. to DEV 12MWT43 & SAMPLE 12MWT48

0830 Hrs - Arrive @ SWMU 12; 12MWT43
Start DEV = 0855 Hrs
END DEV = 0939 Hrs VOL PURGED 5.5 L

0950 Hrs - Park Pick up @ S. END of RR tracks
Load Pull Cart w/ EQ & sample containers

1025 Hrs - Start Purge @ 12MWT48
END Purge @ 1040 Hrs - Purged 4 Volumes = 4L

1045 Hrs - Began Sampling - AFTER 1.5 L well went dry

1125 Hrs - Return to Pick up Truck
• Loaded Pull Cart & EQ, Etc

1140 Hrs - Lunch - Pick up Sub & Return to B-3245 drop off sample.

1205 Hrs - Begin prep. to collect W.L. @ SWMU 13

END

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE Terry Rose DATE 11-14-04

SEN TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE summary 11-15-04:

- Finish Sampling 12MW148
- Purge 12MW143
- Ship samples on COC #0137
- Locate Soil Borings @ SWMU 8

Drilling Summary 11-15-04:

Paint bollards & stick caps & demob activities

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60695 MADE IN USA

Drilling Crew same as on P. 115

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

Mon 11-15-04

Work continued from Page

WEATHER: Mostly Sunny & 50's

0650 Hrs - Arrive @ B3245
- Call YSI & Lamotte
- Pick up FED. EX. Delivery next day
- Prep to sample 12MWT48 & Purge & Sample 12MWT43

0815 Hrs - Arrive @ SWMU 12 S. END of R.R tracks

0830 Hrs - Continue sampling 12GWT4901

0915 Hrs - Sampling Completed

1000 Hrs - Start Purge @ 12MWT43
END PURGE @ 1020 Hrs Vol. Purged = 1.75L or 3½ casing volume

1045 Hrs - Return to B3245
- Paperwork
- Check in w/ R. Basinski
- Unload Pick up Truck

1200 Hrs - Lunch

1230 Hrs - Load Boring Cores for storage @ Mag, 1370

1300 Hrs - Load Core Boxes into Mag

1330 Hrs - Return to B-3245
- ~~Prep. Labs~~ Locate Soil Borings @ SWMU 8 until 1630 Hrs

1630 Hrs - Return to B-3245 - Prep. samples for shipment to Laucks via FED EX AB# 8447 8135 6277 on COC #0137

1730 Hrs - Leave B3245 for FED. EX

1805 Hrs - Drop off samples @ FED. EX.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 11-15-04

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE Summary 11-16 04:
start SAMPLING 18MWT43

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 59505 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

TUES 11-16-04

Work continued from Page WEATHER - Mostly sunny & 50's

0630 Hrs - Arrive @ Lowe's - Purchase stakes, Paint etc. to lay out boring locations @ SWMU 15

0735 Hrs - Arrive @ B3245

- Fax COC #0137 to LAB & OFFICE
- PAPERWORK
- PREP to SAMPLE 12MW T43

0850 Hrs - Arrive @ SWMU 12

0910 Hrs - Start SAMPLING 12MW T43

SLOW RECHARGE WELL - yielded 1.2L & dried out

1015 Hrs - Arrive @ B-3245 PREP to lay out borings @ SWMU 15

1030 Hrs - Arrive @ SWMU 15 - begin layout

1205 Hrs - Lunch

1230 Hrs - Return to SWMU 15 continue boring layout

1695 Hrs - Finish @ SWMU 15, Return to B-3245

- PREP. EQ. FOR RETURN to U.S. ENVIRONMENTAL
- Organize OFFICE, PREP COC FOR 12MW T43

1900 Hrs - LEAVE B3245 For Bloomington

END

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE

DATE 11-16-04

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLE SUMMARY 11-17-04:

COMPLETE SAMPLING OF 12MW143 & SHIP SAMPLE TO LAB ON COC #0142

RETURN ALL EQ. TO U.S. ENV.

SHIP PAPERWORK TO PITTSBURGH

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 57505 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

WED 11-17-04

Work continued from Page

WEATHER - Mostly Cloudy & 50's

0700 Hrs - Arrive @ B 3245

- Continue to PACK EQ FOR Return to U.S. Environmental
- Prep. PAPERWORK & QAPPs FOR return to Pittsburgh

0830 Hrs - Sample 12MWT43 - For Dis Metals, Hg, NH3 & Ammonia

0917 Hrs - Arrive @ Public works - talk to Dawn Z.

- About SURPLUS 8 & 15 - Barrings were located & ready to be cleared

0935 Hrs - Return to B-3245

- Process 12GWT4301 FOR SHIPMENT to LAB ON COC # 0142 VIA FED EX AB# 8447 8135 6303
- Load EQ FOR Return to U.S. ENV. in Pioneer truck 11 items on AB# 8447 8135 5351 INS. FOR $25000
- Load Paperwork Coolers (2) on AB# 8447 8135 6314
- FAX COC to LAB
- Clean & mop OFFICE, LAB, Bathroom & Hallways

1100 Hrs - LEAVE B-3245 FOR Airport & FED. EX.

1130 Hrs - Drop OFF SHIPMENTS @ FED. EX.

Remainder OF DAY TRAVEL

END

NEBIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

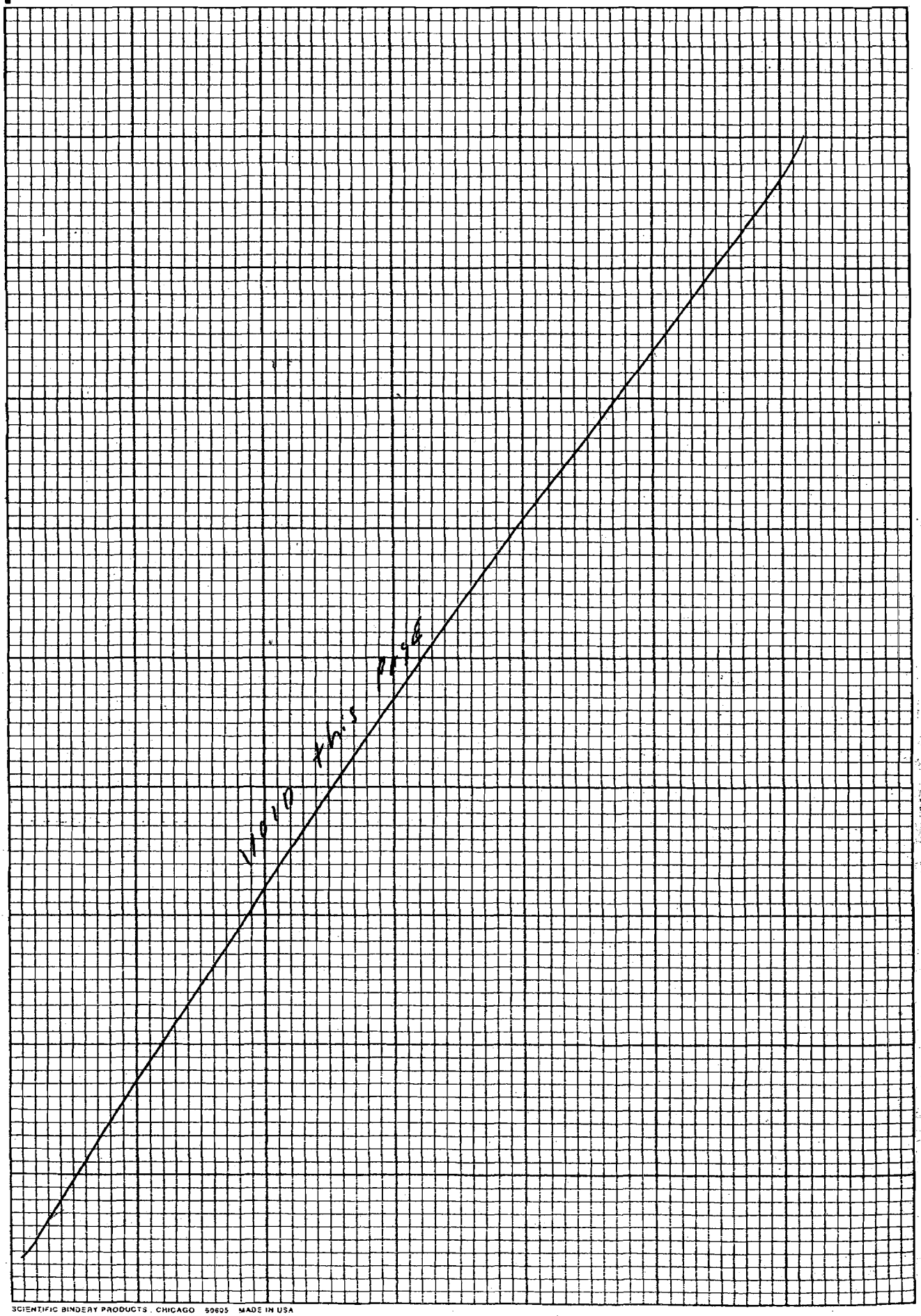
DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE 11-17-04

DATE



SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

WED. 12/15/04

Work continued from Page

1830 Hrs - Finish @ SWMU 16 - SEE Note Book # 1376 for Details
S. Cont & J. Goerdt measured well water levels this Date.

	STAFF GAUGE		WATER LEVEL			Flow gpm
1256	1	0935	STAGNANT 0.42 + 2.77 = 3.19			—
	2	0938	DRY			—
	3	0940	1.87		STAGNANT POOL	—
	4	0945	4.50		" "	—
	5	0947	DRY			—
	6	0950	3.75		.05 x 1' / 1 sec	224
	7	0955	4.28		.1 x 1.7' / 5 sec	15
	8		5.05	@ 0851	.1 ft x 3 ft / 3 sec/ft	44
	9		17.24	@ 0916	.3 x 2.2' / 1 ft / sec	295
	10		14.58	@ 0900	1.75 x 24' / 3 sec/ft	6265
	~~12~~				~~.3 x 2.2' / 1 ft/sec~~	TC
TC	~~12~~ 11	→	20.00	@ 908	15 x .7 / 1 ft/sec	4704
	12	→	~~6.50~~ TC 6.02	@ 927	6.5 x .05 / 2 sec/ft	73

315 Hrs - Return to B-3245; Prep. to leave for Airport & clean out rental car.

1100 Hrs - D. Westerhoff & T. Rosahn leave for Airport
Remainder of day travel
S. Cont & J. Goerdt - take water levels at SWMU 12 (they fly out on 12/16)

END

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Ted Rosahn DATE 12/15/04

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

APPENDIX D.1.2

SWMU 12

SITE LOGBOOK ROUND 2

1374

* START ROUND 2 *

SUMMARY 1-18-05

MEAS. WATER LEVELS @ SWMU 12 (Monitoring Wells & Staff Gauges) P. 127 & 129

MEAS. WATER LEVELS @ SWMU 9 P. 138

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60265 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

TUES 1-18-05

Work continued from Page

WEATHER - Cold, Partly Sunny, Temp 20's

10 Hrs - Active @ B-3245 - Prep. to meas. water levels & staff gauges.

MW ID	WL	TIME
12MWT01	9.34	1339
02	8.32	1332
03	16.00	1340
04	13.35	1348
05	8.41	1345
06	10.75	1324
07	13.42	1321
08	13.19	1310
09	13.40	1314
10	14.19	1315
11	12.88	1229
12	9.95	1227
13	4.63	1230
14	20.75	1222
15	19.17	1220
16	22.13	1240
17	24.63	1241
18	23.06	1235
19	27.77	1242
20	25.35	1245
21	19.54	1341
22	17.71	1320
23	28.65	1250
24	32.34	1258
25	17.35	1214
26	11.01	1402
27	9.24	1218
28	12.78	1211
29	61.34	1349
30	92.69	1313

MW ID	WL	TIME	
T 31	68.72	1225	
32	86.11	1244	
33	41.80	1217	
34	88.12	1358	
35	12.70	1233	
36	14.58	1234	
37	26.24	1248	
38	10.63	1330	
39	35.82	1252	
40	23.18	1306	
41	20.42	0955	
42	12.13	1343	
43	78.56	1415	
44	26.58	0958	
45	16.03	0913	
46	16.02	0918	
47	12.67	0922	
48	30.41	0929	
49	25.66	0935	TO 31.99
50	35.34	0938	TO 35.63
~~51~~ 24A	35.23	1254	
71	20.41	1445	BY ROAD
72	34.26	1107	
73	28.82	1100	
74	26.53	1443	REPAIRED
75	29.25	1103	

CIE INDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

GNATURE

DATE 1-18-05

SCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

WRAP THIS PAGE

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60405 MADE IN USA

TUES 1-18-05 Cont

Work continued from Page

STAFF GAUGE ID	WATER LEVEL	TIME	FLOW - MEAS. OR ESTIMATE	FLOW GPM
125G 01	DRY	1224	NA	—
02	"	1232	NA	—
03	"	1235	NA	—
04	"	1247	NA	—
05	"	1308	NA	—
06	3.95	1327	~1 gpm	~1
07	4.26	1335	~3-5 gpm	3-5
08	5.23	845	1 ft/sec .2 x 1.3'	116
09	17.40	1041	1 ft/sec .2 x 2.5'	225
10	19.69	1026	2 sec/ft 2' x 20'	8960
11	19.94	1010	1 ft/sec 0.9 x 15'	6048
12	6.05	1049	1 ft/sec 0.06 x 8'	215

10 - 1632 Hrs - Measure water levels @ Sump 9
SEE P. 131

1645 Hrs - Return to B-3245
- Made travel arrangements for Jan 31 - Feb 9, 2005
- Prep to leave B3245

1715 Hrs - Left B-3245 for Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

BY [signature] DATE 1-18-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

B 100 P ©

TITLE NSWC CRANE
TUES 1-18-05

PROJECT NO. 6878
BOOK NO. 1374

Work continued from Page

Project Name: NSWC Crane
Project No.: 6878
Location: SWMU 9
Personnel: G. Doolan & T. Kojahn
Weather Conditions: Cold (20's) & Partly Sunny
Measuring Device: M-Scope
Tidally Influenced: Yes ___ No ___
Remarks:

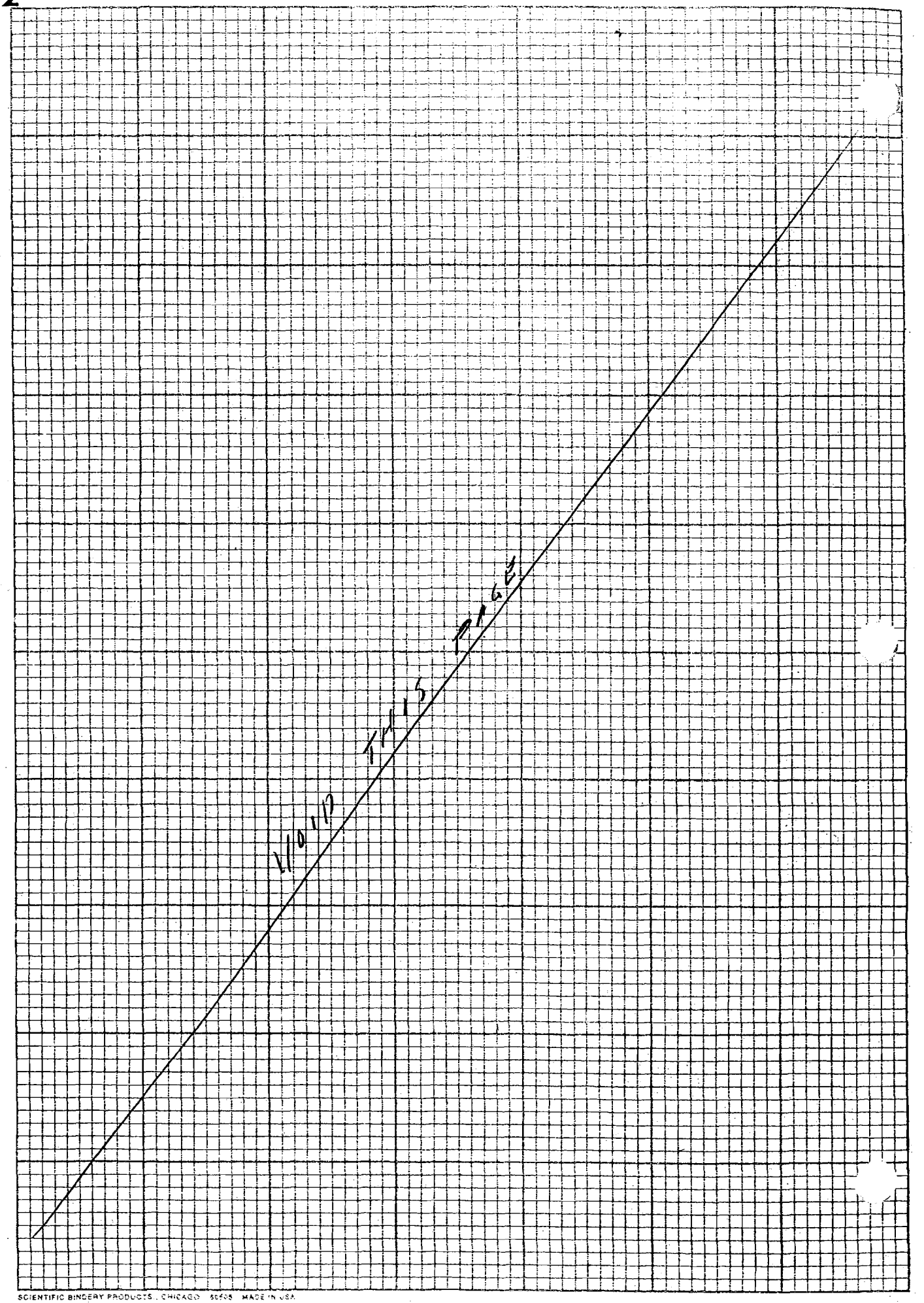
Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)	Groundwater Elevation (feet)	Comments
0901	1/18/05	1512			10.87			
0902		1620			8.60			
0903		1557			3.42			
0904		1531			16.45			
0905		1528			12.13			
0906		1617			DRY			TD 2.61
0907		1625			17.84			
0908		1526			12.68			
0909		1622			6.89			
0910		1503			3.24			
0911		1549			10.06			
0912		1600			4.69			
0913		1603			5.83			no cap
0914A		1605			DRY			@ TD ~53.4
09C01		1551			118.99			
09WTP1		1524			11.33			
09WTP2		1521			9.22			
09WTP3		1516			8.66			
09WTP4		1523			7.45			
09WTP5		1522			3.22			
09WTP6		1508			11.91			
09T01		1632			12.45			
09T02		1539			10.76			
09T03		1456			3.44			
09T04		1458			4.73			
09T05		1612			5.48			

* All measurements to the nearest 0.01 foot

Page ___ of ___ 5

Tim Kojah

DATE 1/18/05



SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

THURS 2/3/05

CREW
J. Goerdt (JG)
C. Doolan (CO)
T. Rujahn (TR)

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

WEATHER - Mostly Sunny & 40's

05 Hrs - ARRIVE ON SITE

SEE Notebook #1376 for most of this days activities PAGES 145-147

- SAMPLED this date 12 MWT 05 & PURGED 12 MWT 25
- R. Basinski CONFIRMED NO MNA PER PHONE CONVERSATION

SAMPLE ID	Start PURGE	END PURGE	VOL PURGED	SAMPLE TIME	SAMPLER
12GWT0502	1320	1500	11L	1505	JG
12GWT2502	1415	1634	17.4L	NA	CO

1731 Hrs - ABOVE SAMPLE SHIPPED THIS DATE ON COC #3602 VIA FED. EX. AB# 8447 8135 7413.

END

INDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

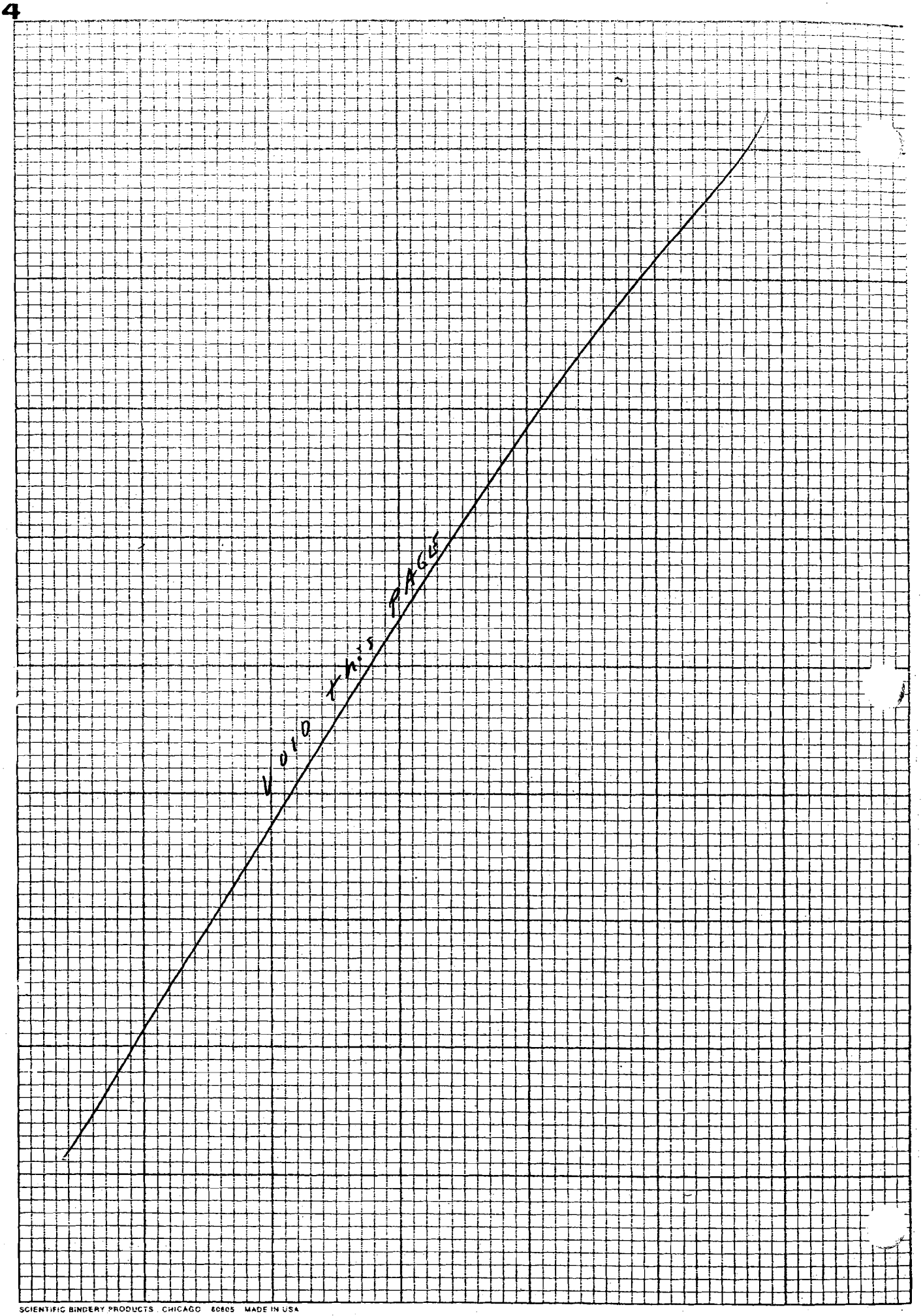
DATE 2/3/05

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE



SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

CRAW
JG
TR
CO

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

ERL 02-04-05

Work continued from Page

WEATHER - Mostly Sunny & 40's

1345 Hrs - C. Doolan sampled Monitoring well KCGWT 2502
SEE PURGE INFO. on Page 133.

ABOVE SAMPLE SHIPPED this date on COFC # 3684
VIA FED EX AB # 8997 8135 7424

1739 Hrs - Drop off SAMPLES @ FED. EX.

END

SC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers

DATE 2-04-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 02-06-05 :

SAMPLE 12MWT01

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

CREW
CD
TR
JG

PROJECT NO. 6878

BOOK NO. 1374

SUN 02-06-05

Work continued from Page

WEATHER - OVERCAST and 50's

CD SAMPLED SAMPLED 12MWT01 - OTHER TANKS
Personnel worked on SWMU 16.

1300 Hrs - Start Purge @ 12MWT01
1440 Hrs - END Purge ; Vol. Purged = 17.9 L
1445 Hrs - Sample 12GWT0102
1520 Hrs - Finish Clean up @ 12

END

CIE NDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2-06-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 2-07-05 :

SEE TABLE ON PAGE 139

SHIP SAMPLES ON COC # 3606 VIA
FED. EX AB # 8447 9135 7457

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

MON 2/07/05

CREW
CD
JG
TR

PROJECT NO. 6878
BOOK NO. 1374

Work continued from Page

WEATHER - OVERCAST & RAIN - TEMP 41°F

0745 Hrs - ARRIVE @ B3245

- FAX OFFICE COCs # 3683 & 3684 (3683 IS OF B2930 soil monitoring)
- SELECT WELLS FOR SAMPLING & PREP PAPERWORK
- PREP. Bottle sets
- PREP. FOR GW SAMPLING @ SWMU 12

SAMPLE ID	Start PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	SAMPLER
12GWT2702	0855	1255	20.8 L	1300	CD
12GWT3102	0940	1340	24.0	1345	JG
12GWT1002	1020	1420	12.2	1422	TR
12GWT2002	1505	1635	7.4	1640	CD

1610 Hrs - Return to B-3245

- FINISH PAPERWORK
- PACKAGE SAMPLES FOR SHIPMENT

1735 Hrs - Check on CD @ 12MWT20 then leave site for FED. EX

1820 Hrs - DROP OFF SAMPLES @ FED. EX.
SAMPLES FROM SWMU 12 SEE Note Book # 1376 page 157
& SAMPLES ON COC 3686 via FED EX AB#
8447 8135 7457

END

FIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2-07/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 2/08/05:

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	SAMPLE TIME	SAMPLER
12GWT3202	0820	1220	25.5L	1230	JG.
12GWT1502	0915	1315	~~132~~ 20.4L	1320	CD

- DEV. 7/2, 7/3 & 7/5 @ DUMP SITE A
- SHIP SAMPLES ON COC # 3688 VIA FED EX.
  AB # 8447 8135 7479

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

CREW
CD
JG
TK

PROJECT NO. 6828
BOOK NO. 1374

TUES. 2/08/05

Work continued from Page

WEATHER -

700 Hrs - Arrive @ B-3245
- Pax COCs to LAB & OFFICE FROM 2/07/05 SHIPMENT
- Select wells to be sampled by CD & JG
- PREP. Bottle Sets

0800 Hrs - Survey CREW FROM BT&K ARRIVED
Corey Allen & Jim Snell

0820 Hrs - Show survey CREW DUMP SITE A wells 7/1 through 7/5; Checked well tags @ SWMU 13 (all tags NEED replaced) due to INFO. #

0845 Hrs - Return to B-3245
- PREP to dev. monitoring wells @ DUMP SITE A
- Check in w/ R. BASINGER.

0945 Hrs - ARRIVE @ SWMU 12 (DUMP SITE A)

WELL ID	START PURGE	END PURGE	VOL PURGED
WES-7-3-81	1003	1046	6.5 gal
WES-7-2-81	1120	1205	7.0 gal
-7.5-81	1345	1434	17.5 gal
WES-7-4-81	Appears that ~14.42' of foreign material has entered the well - damaged @ ground level - Repaired 2-18-05		

1215 Hrs - Lunch

1240 Hrs - Arrive @ B 3245
- Decon WHALE PUMPS

1330 Hrs - Return to Dump site A
SEE ABOVE table

1455 Hrs - Return to BLDG 3245
- Decon WHALE PUMP
- PREP. SAMPLES ~~FOR~~ on COC # 3688
- PREP. EQ FOR Return to U/S. ENV. - (2) Peristaltic Pump & Battery Control Boxes w/hoses, M-Scope, YSI, Turbidity meter. - on FED EX AB# 8447 8135 7480

705 Hrs - LEAVE B-3245 FOR FED EX

735 Hrs - Drop of samples on AB# 8447 8135 7479 & EQ for U.S. ENV.

Hrs WASH RESTAURANT @ CARWASH

Work continued to Page

BINDER PRODUCTIONS CHICAGO ROCKFORD MADE IN USA

SIGNATURE

DATE 2/08/05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

TRAVEL DAY 2-03-05

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60525 MADE IN USA

TITLE NSWC CRANE

CREW
TK
CO

PROJECT NO. 6878

BOOK NO. 1374

WED 2-9-05

Work continued from Page

1125 Hrs - ARRIVE @ B 3245

- FAX COC #3688 to OFFICE & LAB
- CLEAN & ORGANIZE OFFICE
- MOP OFFICE LAB HALLWAYS & Bathroom
- Clean out the inside of car rental
- Call U.S. ENU. ask for Peristaltic Pump tube returned

0947 Hrs - LEAVE B 3245 FOR AIRPORT

TRAVEL REMAINDER OF DAY

END

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2/9/05

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLE SUMMARY 02/15/05:

SAMPLE ID	PURGE START	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT2802	0900	1300	20.2L	1305	(CD)
12GWT4802	0950	0953	1.2L	1000	(TC) very slow Recharg
12GWT4901	1030	1033	3.7L	1035	(TC) Dry Round 1
12GWT30	—	—	—	—	(TC) Dry well
12GWT3902	—	—	—	1340	(TC) 1L of sample extremely slow Rec
12GWT30	—	—	—	—	(TC) Dry well
12GWT3902	1410	1412	0.9L	1415	(TC) very slow Recharge 2L in 150min
12GWT1602	1505	1632	10.0L	NA	(CD) Purge only

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TUES 2/15/05

Work continued from Page

WEATHER - MILD IN 60'S & SUNNY

10 Hrs - ARRIVE @ B-3245
PREP. to SAMPLE GROUND WATER
SELECT WELLS to be sampled this DATE

0930 Hrs - ARRIVE @ SWMU 12
PREP. to SAMPLE WELLS on RR. TRACKS
SEE PAGE 144 for details

1138 Hrs - ARRIVE @ CAFE FOR LUNCH

1205 Hrs - ARRIVE @ B 3245 to PROCESS SAMPLES & PAPERWORK
of SAMPLED WELLS 12 MWT 48 & 49
Also, CHECKED WEL @ 12 MWT 50 - DRY WELL STILL

1330 Hrs - ARRIVE @ SWMU 12
• INITIATE SAMPLING @ 12 MWT 34 & 39
• CHECK 12 MWT 30 - DRY WELL

1645 Hrs - LEAVE SWMU 12

1655 Hrs - ARRIVE @ B-3245
DROP OFF EQ & METERS ETC

1715 Hrs - LEAVE B-3245 FOR BEDFORD

END

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 2/15/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

B 100 P ©

SAMPLE SUMMARY 2-16-05

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	SAMPLE TIME	COMMENTS
12GWT35G02	0835	1235	24.7L	1240	(CO)
12GWT24A02	0930	1330	19.4L	1335	(TK)
12GWT39G02	02-15-05	→	→	1510	(TK) Total Metals only
12GWT17G02	1510	1532	3.5L	NA	(CD) Purge c
12GWT16G02	02-15-05	→	→	1335	(CD)

SCIENTIFIC BINDERY PRODUCTS CHICAGO 50505 MADE IN USA

TITLE NSWC CRANE

WED 2/16/05

CREW
CD
TR

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

WEATHER: Mostly Cloudy Temp in 30°s

50 Hrs - Arrive @ B-3245
- Prep to sample Bladder wells
- Select wells for sampling this date
- Check in w/ office R. Basinski
- Paperwork

0910 Hrs - Arrive @ swmu 12 (12MWT24A)
- Purge & sample 12 MW T24A
- Check 12 MWT34 - Dry (end sampling started 2/15)
- 1510 Hrs collect metals @ 12MWT39

1530 Hrs - Return to B-3245
- Paperwork & prep samples for shipment on COFCs 3695 (N6878) & 3694 (N1245)
- Check in w/ V. Gobert regarding well tags

1650 Hrs - Left B-3245 for FED EX

1725 Hrs - Drop off samples on AB# 8447 8135 7490 @ Bloomington FED. EX.

1 Hrs - Arrive @ Motel in BEDFORD

END

NTIFI FRY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

ATUR. Terry Rogers

DATE 2-16-05

OSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLE SUMMARY 2-17-05:

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT0202	0915	1115	19.44	1117	(FC) Collect MS/MSD & 12FD0217050
12GWT2602	0850	1050	21.24	1255	(CD)
12GWT3902	2/25/05	→		1515	(FC) Complete sample w/ the collection of Dis. metals & Nitrate, Nitrite & Ammonia.
12GWT1702	2/16/05	→		1930	(CD) Begin to collect sample - EXPLOSIVES & metals
12GWT1902	1535	1556	2.42	NA	(CD) Purge only

SCIENTIFIC BINDERY PRODUCTS CHICAGO MADE IN U.S.A.

TITLE NSWC CRANE

THURS. 2-17-05

CREW
CD
TR

PROJECT NO. 6878
BOOK NO. 1374

Work continued from Page

WEATHER - Partly Sunny w/ Temp 38°

0655 Hrs - Arrive @ B 3245
- Select wells for sampling; Prep. Bottle sets
- FAX COCs 3699 & 3695 to office & LAB from 2/16 shipment
- Prep. to sample groundwater w/ peristaltic pump

0850 Hrs - Arrive @ SWMU 12 monitoring well 12MWT02
Collect 12GWT0202, MS/MSD & 12FD02170501

1330 Hrs - Finish @ 12MWT02

1345 Hrs - Return to B-3245
Paperwork
Check in w/ office - R. Basinski request TR recon SWMU 9 (Former Post. mixing bldg) w/ T. Brent

1400 Hrs - Recon SWMU 12 w/ T. Brent

1430 Hrs - Return to B-3245
Check back w/ R. Basinski - Foundation of bldg concrete slab ~4"-6" thick - DPT ok for job (shouldn't need coring drill)

1515 Hrs - Return to SWMU 12
Cont. to sample 12MWT39 - Collect Dis metals & Nitrate, Nitrite & Ammonia.

1600 Hrs - Return to B-3245
Process samples
Paperwork
Secure EQ & samples

1650 Hrs - Leave B-3245 for Motel

END

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGN: Ted Nagel

DATE 2-17-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 02/10/05:

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT3302	0925	1240	37L	1242	(TR)
12GWT4002	0955	1255	16L	1300	(CD)
12M0021805U1	—	—	—	1515	(TH) Blade Rinse Rinse
12GWT1902	2/17/05	→		1535	(CD) EPA, MISC. EPA & Total Metals & Hg
12GWT3702	1400	1402	0.3L	NA	(TR) Purge and Go

SCIENTIFIC BINDERY PRODUCTS., CHICAGO 80605 MADE IN USA

TITLE NSWC CRANE

CREW
CD
TR

PROJECT NO. 6878

BOOK NO. 1374

FRI. 2-18-05

Work continued from Page

WEATHER -

53 Hrs - ARRIVE @ B-3245
- SELECT WELLS FOR SAMPLE collection & PREP. Bottle sets
- Prep to sample bladder well
- PAPERWORK
- PICK UP LUNCH @ CAFE

0853 Hrs - ARRIVE @ SWMU 12 (12MWT33) - SAMPLING Complete @ 1345

1350 Hrs - ARRIVE @ SWMU 12 (12MWT37) - DRY out WELL

1415 Hrs - FINISH @ 12MWT37

1420 Hrs - CHECK on CD @ 12MWT40

1435 Hrs - ARRIVE @ B 3245
- Unload Rental
- DECON Bladder pumps
- Collect Rinsate Blank of bladder pump @ 1515 Hrs
  NREL DI REAGENT Grade H_2O Lot # 1009064
  EXP. DATE 10-2005
- 1535 Hrs Finish Processing Rinsate blank
- PACKAGING samples on COC # 3696 FOR SHIPMENT
  ON AB # 8447 8135 7505

1730 Hrs - LEAVE B-3245 FOR FED. EX.

1800 Hrs - DROP OFF samples @ FED. EX.

1906 Hrs - FAX COC # 3696 to LAUCKS LAB FROM HOTEL.

END

NDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2-18-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 2-19-02

SAMPLE ID	Start PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT4202	0815	1215	17.9L	1220	(CD)
12GWT4402	0835	1235	10.9L	1237	(TR)
12GWT1902	2/17/05	→		1540	(CD) Collected only Dis Metals & HA in NH4 Ammonia
12GWT4102	1316	1621	10.3L	1623	(TR)
12GWT2302				NA	(CD) PURGED ONLY
12GWT3702	2/18/05	→		1530	(CD) Start sampling got <100ml

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

SAT. 2-19-02

Work continued from Page

WEATHER - Partly sunny 30's & 40's

:50 Hrs - Arrive @ B-3245

- Select wells to be sampled this date
- Prep. to sample GW, prep. sample containers

0855 Hrs - Leave B-3245 for SWMU 12

0908 Hrs - Arrive @ SWMU 12

Sample monitoring wells 12MW41 & 44

See page 152 for details

1810 Hrs - Leave SWMU 12 for B-3245

1818 Hrs - Arrive @ B-3245

- Secure samples in frig.
- Drop off DO, meters, nitrogen cylinder etc.

1832 Hrs - Leave B-3245 for Bedford

END

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE 02/19/05

DATE

SAMPLE SUMMARY 2/20/05 :

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT3802	0830	1230	21.7L	1235	(CD)
12GWT2902	0910	1330	19.5L	1332	(TC)
12GWT2302	2-19-05	→		1720	(CD)
12GWT3702	→ WELL DRY AGAINOOD SAMPLING				<100 ml in 2 days
12GWT2202	1415	1606	19.6L	NA	(CD) PURGE ONLY

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

SLH 2-20-05

Work continued from Page Weather - Rain/overcast & 50's

0803 Hrs - Arrive @ B-3245

- Select wells for sampling this date
- Prep. Bottle sets
- Prep. to sample groundwater, load SUV
- Call R. Basinski leave message of 2/19/05 sample summary

0845 Hrs - Arrive @ SWMU 12 (12MWT29)

See page 154 for details

1450 Hrs - Finish cleaning up @ 12MWT29

1505 Hrs - Arrive @ B-3245

- Pick up sample containers for 16MWT11

1515 Hrs - Arrive @ SWMU 16 (16MWT11)

- Sample 16MWT11 see Notebook #1376 page 159

1620 Hrs - Finish cleaning up @ SWMU 16

1630 Hrs - Arrive @ B-3245

- Unload EQ, supplies, gas cylinder etc
- Secure samples in frig.
- Start paperwork (COCs 3698-3700 & Airbills etc.)
- Decon Bladder pumps

1700 Hrs - Leave B-3245 for BED END

END

SAMPLE SUMMARY 02-21-05 :

SAMPLE ID	Start PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT0602	0850	1015	10.1L	1015	CO
12GWT0702	0855	1140	12.4L	1142	TR
12GWT0802	1120	1330	11.2L	1335	CO
12GWT2202	2-20-05	→		1450	CO

SCIENTIFIC BINDERY PRODUCTS.. CHICAGO 60605 MADE IN USA

MON 2-21-05

Work continued from Page

WEATHER - OVERCAST & 40°S

653 Hrs - ARRIVED @ BLDG 3245
- PREP to SAMPLE GROUND WATER
- SELECT WELLS to be sampled organize labels & paperwork
- Work Nitrogen cylinders
  - Chain All cylinders w/ gas to fence (5 item 102s)
  - SECURE All "MT" cylinders to fence w/ yellow poly Rop & CALL IN. oxygen to pick up the (6) six MT items 102s & (1) one MT item 40
- CHECK IN W/ R. Basinski

0840 Hrs - ARRIVE @ SWMU 12 to sample 12MWT07
SEE details on P 156

1345 Hrs - FINISH CLEAN UP @ 12MWT07
CHECK w/ C.D. - Will pick up subway sub for him & bring back to 12MWT08

1405 Hrs - Return to SWMU 12 to drop off sub for C.D.

1418 Hrs - Arrive @ B-3245 - Set sub & mob for soil boring stake out @ SWMU 9

Hrs - Stake out 6 soil boring locations @ SWMU 9 Former BLDG #2454 & 55

1550 Hrs - Return to B-3245
- PREP. SAMPLES FOR SHIPMENT on COFCs:
  #3698 } ← microscops → AB# 8447 8135 7527
  #3699 } SWMU 16 - 16MWT11 ← LAUCKS
  #3700 } SWMU 12 LAUCKS } AB# 8447 8135 7516

1705 Hrs - LEFT B-3245 FOR FED. EX

1735 Hrs - DROP OFF SAMPLES ON ABOVE COCs @ FED EX.

FAXED COCs to OFFICE & LAB FROM Motel

END

C.BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Ty Rogal DATE 2-21-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 02-22-05

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT1102	0825	1005	10.7 L	1015	(CD)
12GW0501	0925	1225	27.5 L	1227	(TR) DO MS/MSD Collect 12MD02220.
12GWT1202	1230	1350	10.5 L	1355	(CD)

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TUES 2-22-05

Work continued from Page WEATHER - OVERCAST & 40's

0705 Hrs - ARRIVE @ B-3245
- PREP Bottle sets
- SELECT WELLS to be sampled
- PREP to sample GW - load SUV

0830 Hrs - ARRIVE @ Public Works - talk to D. Zollman REGARDING SWMU 9 soil boring - borings were staked out 2-21 site ready for CLEARANCE

0900 Hrs - ARRIVE @ SWMU 25 25MW05
SEE DETAILS on page 158

1515 Hrs - Finish Cleanup @ 25MW05

1525 Hrs - ARRIVE @ B-3245
- Restock Bottles in office (CO)
- PREP. SAMPLES FOR SHIPMENT on COC #3701
- Clean out inside of SUV

1708 Hrs - LEAVE B3245 FOR Blounting Ford FED. EX.

1745 Hrs - Drop off samples @ FED EX. (AB# 8447 8135 6406)

1710 Hrs - Stop @ car wash - wash SUV

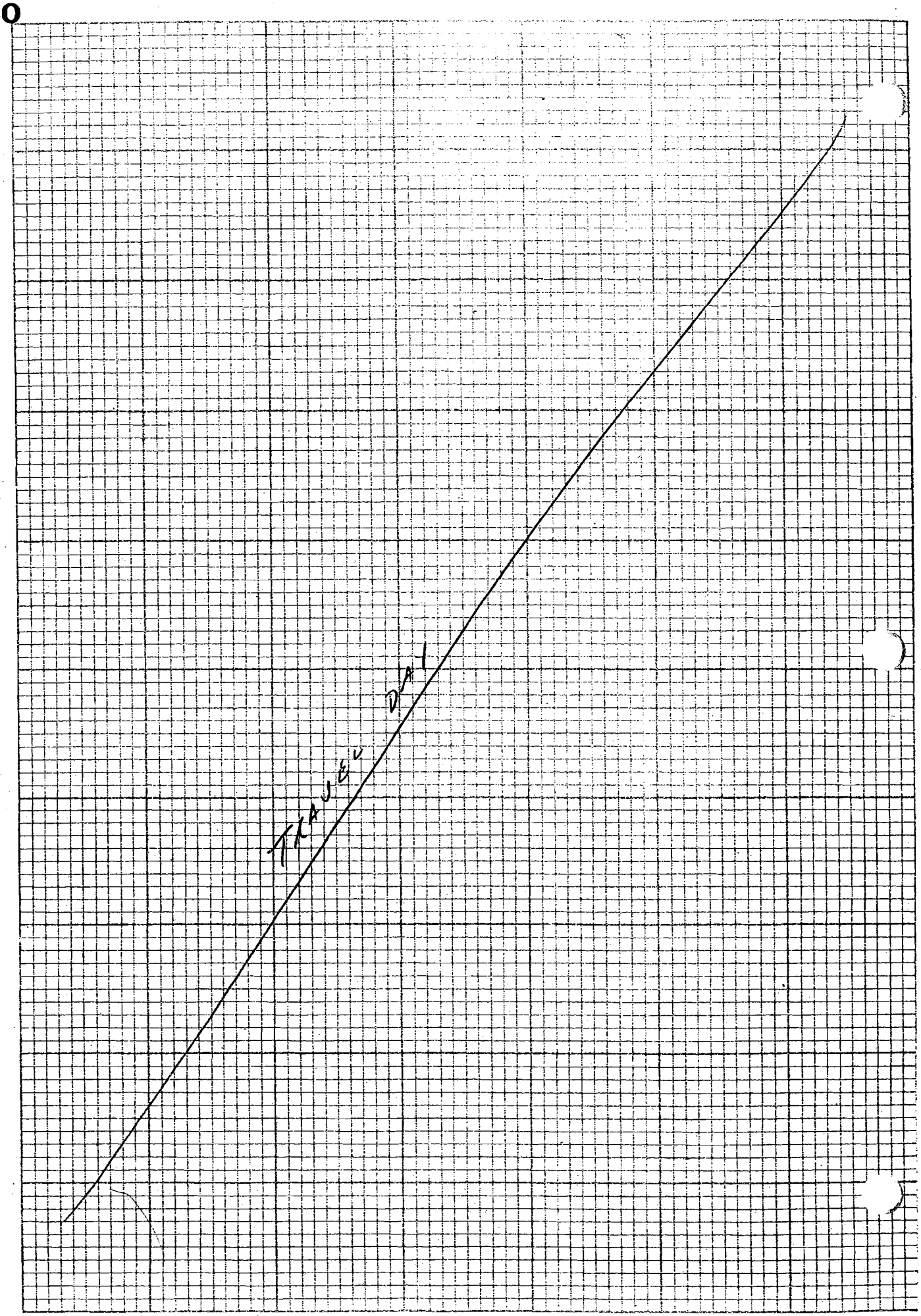
7 Hrs - ARRIVE @ BEDFORD Motel

END

Work continued to Page

SIGNATURE [signature] DATE 2-22-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE



SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

WED 2-23-05

Work continued from Page

0715 HRS - ARRIVE @ B-3245

- FAX COC # 3701 to OFFICE & LAB
- PREP (2) HAND Augur Kits, 2 bladder PUMPS, 1 set OF Hoses, Regulator & control box for RETURN to U.S. ENVIRONMENTAL
- CLEAN & MOP Floor OF bathroom, hallway LAB & OFFICE

0930 HRS - PREP to leave B-3245

REMAINDER OF day travel

END

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

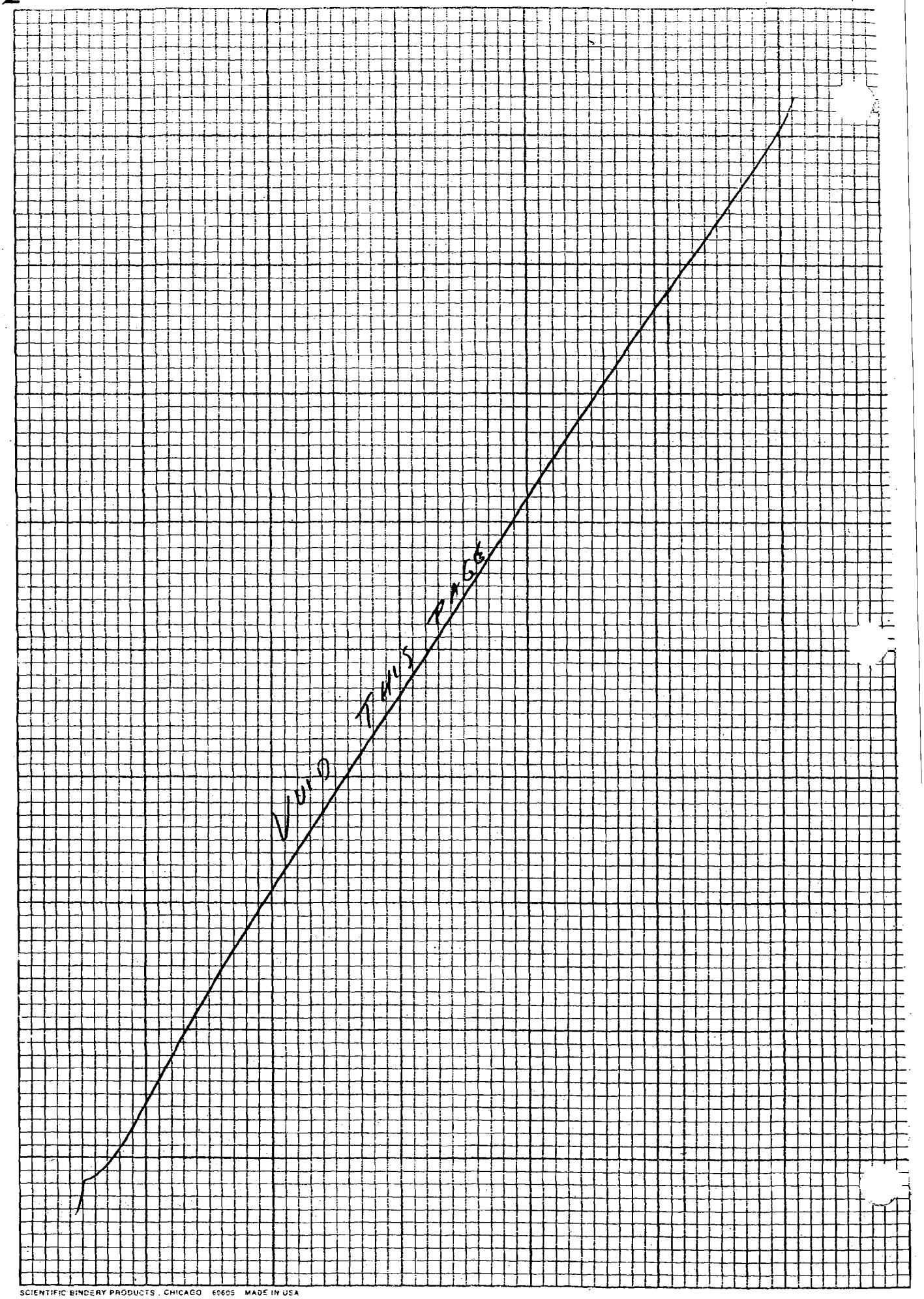
Work continued to Page

SIGNATURE

DATE 2-23-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©



SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

Mon 2-28-05

Work continued from Page

TRAVEL DAY

PREP to sample soils @ SWMU 09

END

FIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2-28-05

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SAMPLE SUMMARY 3-02-03

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT4702	1000	1055	9.84	1057	(TK)
12GWT4602	1158	1302	18.6	NA	(TK) PURGE ONLY
12GWT4502	1330	1438	19.5	NA	(TK) PURGE ONLY
12GWT03	0915	1205	27.5	NA	(JG) PURGE ONLY
12GWT14	1310	1435	8.0	1310	(JG) METALS NH3 & AMMONIA
12GWT18	1500	1630	9.6	NA	(JG) PURGE ONLY
12GWT37					DRY WELL
12GWT09	1640	1805	8.5	1810	JG.

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 80505 MADE IN USA

WED 3-02-05

Work continued from Page WEATHER - COLD (20-30°) MOSTLY SUNNY

0655 Hrs - ARRIVE @ B-3245
- SELECT WELLS to be SAMPLED / PURGED this data
  JG - 12 MWT 03, 14, 18, 37 & 43 (SLOW RECHARGE WELLS)
  TR - 12MWT45, 46, 47 (R.R. TRACK WELLS - 45 & 46 SLOW RECHARGE WELLS)
- PREP. to SAMPLE GW @ SWMU 12
- PREP. SAMPLE CONTAINERS
- LOAD SUV w/ PULL CART & EQ & SUPPLIES to PURGE & SAMPLE R.R. TRACK WELLS.

0910 Hrs - STOP @ CAFE get lunch to EAT IN FIELD

0940 Hrs - ARRIVE @ 12 MWT 47
SEE PAGE 166 FOR details

1150 Hrs - ARRIVE @ 12 MWT 46
SEE Page 166 FOR details

1323 Hrs - ARRIVE @ 12 MWT 45
SEE PAGE 166 FOR details

1505 Hrs - RETURN to & load RENTAL CAR w/ PULL CART & EQ USED to SAMPLE & PURGE R.R. TRACK WELLS

1510 Hrs - CHECK on J.G. @ 12 MWT 18

1530 Hrs - ARRIVE @ B-3245
- PAPERWORK & PACKAGING SAMPLES FOR SHIPMENT ON COC # 3693 to LAUCKS VIA FED. EX. AB# 8447 8135 6391.

1730 Hrs - LEAVE B-3245 FOR FED. EX.

1800 Hrs - Drop off samples @ FED. EX.

END

IC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 3-2-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 3-3-05

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT0302	3-2-05	→	→	0820	(JG)
12GWT4602	3-2-05	→	→	0913	(TR) min vol
12GWT4502	3-2-05	→	→	1000	(TR) min vol
12GWT0402	0905	1020	9.0L	1025	(CD) MS/MSD 12ED030305
12GWT4302	1215	1230	9.0L	1232	(TR) REGAN SAMPL
12GWT1402	3-2-05	→	→	1340	(JG) EXPLOSIVES & MISC. EXP
12GWT1802	3-2-05	→	→	1420	(JG)
25GW10301	1357	1517	5.8L	1520	(TR)

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 80605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

THUR. 3-03-05

Work continued from Page Weather - Mostly Sunny Temp 30's & 40's

0705 - Arrive @ B-3245
- Fax COCs to office & lab
- Checked in w/ R. Basinski w/ Sample Summary for 3/2
- Select wells to sample this date
- Load SUV w/ Pull cart, EQ. Etc
- Prep. Bottle Sets

0900 Hrs - Arrive @ 12 MWT 46 on RR Tracks (600 HW)
See Page 166 for details

0950 Hrs - Arrive @ 12 MWT 45
See Page 166 for details

1100 Hrs - Return to Rental Car from RR Tracks

1110 Hrs - Drop off samples & Pull cart @ B-3245

1135 Hrs - Lunch

1155 Hrs - Arrive @ Shimli 12 (12 MWT 43) → walk to along utility line
See Page 166 for details

1345 Hrs - Arrive @ 25 MWT 03 (7/3 @ Dump site A)
See Page 166 for details

1450 Hrs - Arrive @ B-3245
Paperwork
Process samples from 7/3
Secure samples in Frig.
Unload SUV

1730 Hrs - Leave B-3245

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

IG

DATE 3-3-05

ISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 03-04-05:

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT4302	3-3-05 →			0900	(TR) Cont. & Comple: sampling
12GWT2102	0825	1010	7.4L	1015	(JG)
256W0201	1420	1425	3.0L	1427	(TR) min. vol.
12GWT3602	1215	1425	8.5L	1430	(JG) MS/MSD 5' pure oil NH4 & Amm only
12GWT1302	1530	1650	12.0L	1655	(JG)

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

FRI 3/4/05

Work continued from Page

Mostly Sunny 20°S

705 Hrs - Arrive @ B-3245
- Select wells to sample this date PREP PAPERWORK FOR EACH
- Sample sets prepared
- PREP - to sample GW @ SWMU 12 & soil, surface water, groundwater, sediment & TEMP WELL Installation

0845 Hrs - Arrive @ SWMU 12

0900 Hrs - Arrive @ 12MWT43 to continue sampling SEE PAGE 168 FOR DETAILS

0936 Hrs - Finish collection & Processing of sample from 12MWT43

0940 Hrs - Begin working @ SWMU 9

1410 Hrs - Return to SWMU 12 / Dump Site A WELL 7/2
- Start sampling 7/3 @ 1427 SEE Page 168 for details

1505 Hrs - Finish @ monitoring well 7/3

1510 Hrs - CHECK ON J. Goerdt - obtain samples & Paperwork FOR 12MWT21 & 36 (SEE PAGE 168 FOR DETAILS)

2 Hrs - Arrive @ B-3245
- PAPERWORK & PREP samples on COC #s 3703 & 3704 FOR SHIPMENT to LAUCKS on AB # 8447 8135 6380

1745 Hrs - LEAVE B-3245 FOR FED. EX.

1820 Hrs - Drop off samples @ FED. EX. (Also ship samples from SWMU 9)

1845 Hrs - FAX COCs 3703 & 3704 to LAUCKS FROM Motel PAPERWORK & E MAIL J. JOHNSTON in ALEXANDRIA

END

'C BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers

DATE 3-4-05

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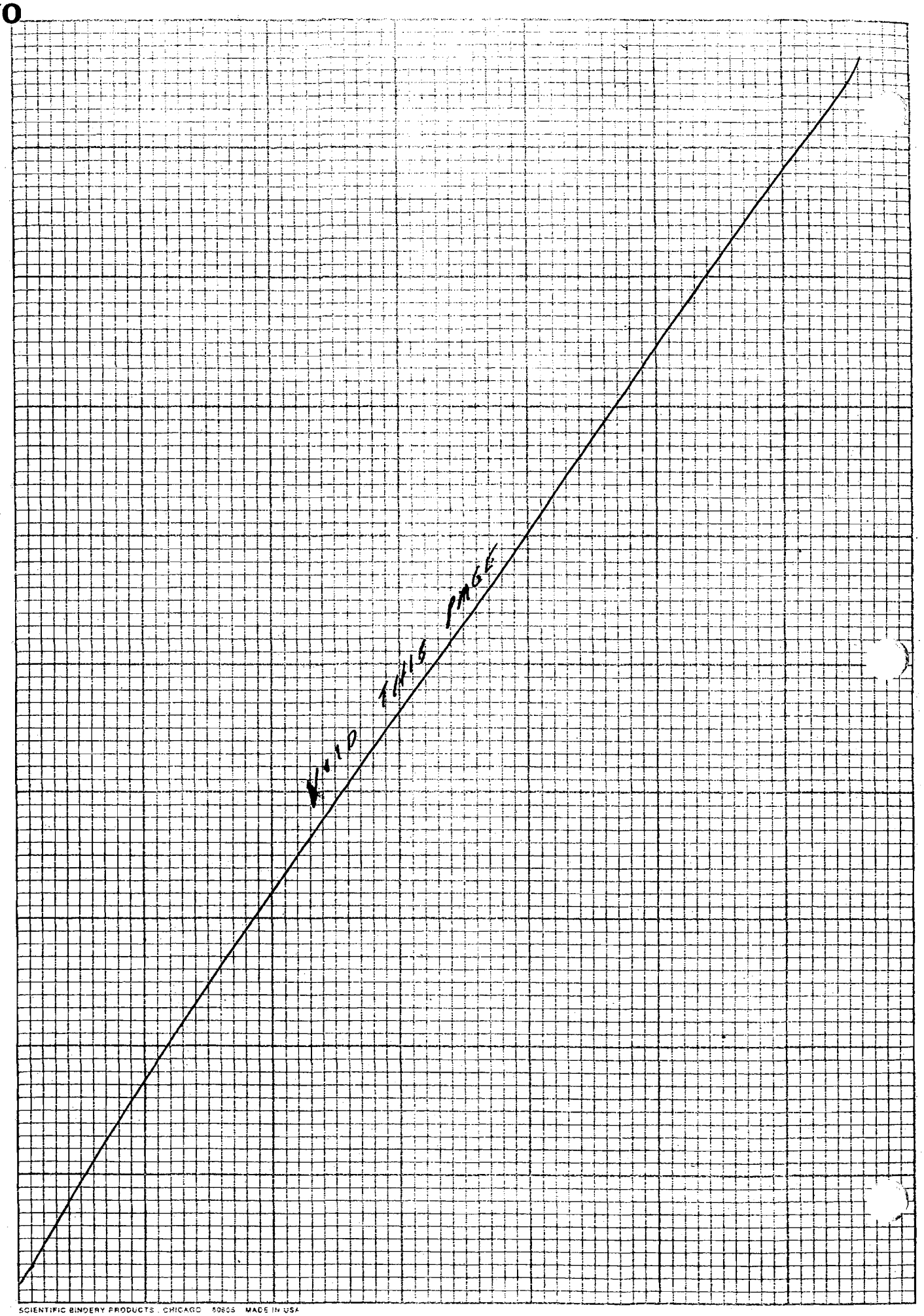

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 50505 MADE IN USA

SAT 3/5/05

Work continued from Page

Weather - Partly Cloudy - Sunny 40's - 50's

700 Hrs - ARRIVE @ B-3245

• PREP. to SAMPLE SURFACE WATER @ SWMU 12

0830 Hrs - ARRIVE @ SWMU 12

TIME	SAMPLE ID	PHOTO #
0850	12SW2702	1128
0907	12SW1102	1130
0945	12SW2602	1131
0958	12SW2502	1132
1020	12SW2402	1133

1045 Hrs - ARRIVE @ SWMU 9 - Collect ~300ml of GW FROM 09TW002

1110 Hrs - LUNCH @ B-3245

1140 Hrs - PREP. SUVs to sample SURFACE WATER ALONG R.R. tracks @ Hill 600 - take Pull cart to facilitate sample collection (PARK SUV1 N. OF HILL 600 take SUV2 S. OF HILL 600)

5 Hrs - RETURN to SWMU 12

TIME	SAMPLE ID	PHOTO #	
1225	12SW2302	1134	
1245	12SW2102	DRY NO SAMPLE OR Photo	
1250	12SW2202	↓	
1255	12SW1902		
1333	12SW1602	1135	
1344	12SW1702	1136 → 1138	
1415	12SW1302	1139	
1435	12SW1202	1140	
1450	12SW3101	1141	NEW LOCATION
1500	12SW3201	1142	NEW LOCATION

1525 Hrs - ARRIVE @ SUV1 North of Hill 600 load Pull cart & SAMPLES Drive south of Hill 600 Pick up 2ND SUV

1545 Hrs - ARRIVE @ B-3245 - PROCESS AFTERNOON SAMPLES

700 Hrs - LEFT B-3245 FOR Bloomington & Taylorville

Work continued to Page

BINDERY PRODUCTIONS CHICAGO 60608 MADE IN USA

SIGNATURE [signature] DATE 3-5-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

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SCIENTIFIC BINDERY PRODUCTS, CHICAGO 69605 MADE IN USA

SUN 3-06-05

Work continued from Page Weather - Mostly Sunny 40's - 50's

115 Hrs - Arrive @ B-3245
- Prep to sample surface water

0815 Hrs - Arrive @ SWMU 12

	TIME	SAMPLE ID	PHOTO # / COMMENTS
	0830	12SW1002	1144
	0918	12SW0802	1145
	0925	12SW0902	(TR) ~~0925~~ 1146
	1005	12SW0602	1147
	1045	12SW2802	1148
	1110	12SW3301	1149 (NEW LOCATION)
	1340	12SW0502	1150 12FD03060501
	1350	12SW0402	1151
	1445	12SW0202	(TR) ~~1445~~ 1156 12FD03060502
NEW LOCATIONS	1500	12SW3401	1157
	1510	12SW3501	1158 & 1159 (Corresponding PHOTOS 1152 - 1155 & 1161)
	1515	12SW3601	1160 & 1161
*	0955	12SW07	* DRY (NO SAMPLE)

1130 - 1200 Hrs - Collect ~400ml of GW @ 09TW002
1200 - 1230 Hrs - Lunch
1230 Hrs - Drop off morning samples @ B-3245
Restock SUV w/ additional sample containers
1250 Hrs - Return to SWMU 12
Recon possible new sample locations
1530 Hrs - Process samples from 12SW02, 34, 35 & 36
- Drop off samples & EQ. @ B 3245
- Restock samples containers in office
- General clean up

1700 Hrs - Leave B-3245 for motel

Paperwork & E-mail sample summary to T. Johnston in Evening

C BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

GN. E DATE 3-06-05

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SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

MON ~~TUES~~ 03-07-05

Work continued from Page WEATHER: OVERCAST & 50°S

700 HRS - ARRIVE @ B-3245
FAX COCs to OFFICE FOR FRIDAY'S SHIPMENT
PREP. to sample SURFACE WATERS
0800 HRS - ARRIVE @ SWMU 12

TIME	SAMPLE ID	COMMENTS	
0800	12SW30	DRY NO SAMPLE	(TK)
0805	12SW1402	SEE ROUND 1 PHOTO	(TK)
0810	12SW0302	" " " "	(JG)
		MS/MSD & 12FD0307050	1
0835	12SW1802	SEE ROUND 1 PHOTO	(TK)
0855	12SW2002	" " " "	(TK)
0920	12SW29	DRY NO SAMPLE	(TK)
0830	12SW15	DRY NO SAMPLE	(TK)
1000	12SW0102	SEE ROUND 1 PHOTO	(JG/TK)

1030 HRS - RETURN to B-3245
- UNLOAD SUVs
- PROCESS 12SW0102
- COMPLETE COC 3711 FOR ABOVE SAMPLES

LUNCH @ 1130
1200 HRS - ARRIVE @ SWMU 9 - collect ~400ml of GW FROM 09TW002
1235 HRS - RETURN to B-3245
- PREP. SAMPLES ON COCs # 3706-3710 FOR SHIPMENT this date VIA ABF 8447 8135 7569 (10 Coolers)
- PREP. U.S. BHU. RENTAL EQUIPMENT FOR SHIPMENT VIA ABF 8447 8135 7550 (9 packages)
- PURCHASE 30 bags of ice @ BASE GAS Station
- CLEAN Garage storage AREA
- BEGIN DEMOB PROCESS - CLEAN/organize OFFICE

1700 HRS - LEAVE B 3245 FOR Bloomington

END

BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers DATE 3/7/05
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SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE **PROJECT NO.** 6878 **177**

BOOK NO. 1374

TUES 03-08-05

Work continued from Page

710 Hrs - ARRIVE @ B-3245

DEMOB - ORGANIZE OFFICE, DESK, WORK TABLES, SHELVES & CLEAN SAME.

DEMOB PAPERWORK OLD REPORTS & WORK PLANS ETC

PACKAGE - FILES, PAPERWORK ETC.

SHIP 4 PACKAGES ON AB # 8447 8135 4594

PACKAGE - EQ. to SHIP to WAREHOUSE ON AB # 8447 8135 4620

1200 Hrs - LUNCH

1230 Hrs - PREP. PAPERWORK (COC # 3711) to FAX to LAUCKS & OFFICE

1300 Hrs - MEET w/ T. Brent to visit SWMUS 15 & 12 to identify AREAS FOR RESTORATION

1) SWMU 15 - truck tracks up gradient OF where DPT Rig got stuck

2) SWMU 15 - the area itself where DPT rig got stuck - along stream & ~ 1/2 the distance up slope

3) SWMU 12 - Ruts Around 12MW105 - 12MW103

4) SWMU 12 - South END OF POWER LINE ~ 5th transmission Line Pole

1500 Hrs - Returned to B-3245

- Package samples on COC # 3711
- Inventory sample containers, stock & disposables

635 Hrs - LEAVE BLDG # 3245 FOR FED. EX. to Drop OFF SAMPLE to be shipped to LAUCKS on AB # 8447 8135 4610

708 Hrs - Dropped OFF SAMPLES, & other packages see Above

725 Hrs - ARRIVE @ Car WASH - WASH SUV

745 Hrs - Finish Car WASH

END

Work continued to Page

ENT INDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

NAME Ty Nagel DATE 3-08-05

CLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

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SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. C878

BOOK NO. 1374

WED 03-09-05

Work continued from Page

Weather:

0745 Hrs - Arrive @ site
- Unload personal items
- Load well abandonment eq. & chips (bentonite)
- Clean out can
- Sweep office to bathroom
- Prep for surveyors to arrive - maps of new locations (SW/SD) @ SWMU 12 12 SW/SD 31 - 36 & SWMU 09 map w/ added location 09 SB 18.

0820 Hrs - ~~Surveyor~~ Surveyors arrive (C. Allen & G. Wood)
- Point out areas where survey locations are @ SWMU 12
- Take surveyors to SWMU 09 & show survey points
- Abandon temp. wells @ SWMU 09

0915 Hrs - Pull rebar stakes @ SWMU 15

0935 Hrs - Return to B-3245
- Continue demob - clean out can
  Package personal items to ship back to Pittsburgh & mop floor of offices, lab, hallways & bathroom.

1045 Hrs - Leave B-3245 for airport (INDY)
Remainder of day - Travel

END

NDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

CLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE 3/09/05

DATE

APPENDIX D.2

SWMU 12

SITE NOTEBOOK

WC CRANE

N6878

CTO-

WMU 12

2576

LOGBOOK

ART:

NO:

TABLE OF CONTENTS

Subject	Page

TITLE NSWC CRANE
THURS JULY 8 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page

AT SITE: SJC, TR, JG, CL } T+ NUS

BK, DN } BM

AM: MOSTLY SUNNY WARM
PM: PARTLY CLDY WARM.

TRAVEL DAY TO SITE. GET PASSES AT MAIN GATE AT FIELD OFFICE AT 1300 HRS.

1300 UNPACK EQUIP - BOXES - SUPPLIES

1330 DRILLERS ARRIVE (4) - 2 WILL LV.

1430 TR CONDUCTS H&S TRAINING FOR 4 BOWSER-MORNER, 4 T+ NUS.

1600 SJC/TR WENT TO SEE DONNA Z. WAS ABLE TO GET DIGGING PERMIT FOR SWMU 12 AND FOR THE 4 WELLS AT SWMU 13.

1700 BOWSER-MORNER BUILDS TEMP PAD NEAR FIELD OFFICE AND BEGINS TO DECON TOOLS ETC.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Jones
DATE 7-8-
WITNESS
DATE

TITLE NSWC CRANE
THURS (CONT)

PROJECT NO. N 3
BOOK 2576

Work continued from Page

PERMIT FOR SWMU 12 4562

1800 BOWSER-MORNER LUS SITE WILL START ≈ 0700 ON FRIDAY.

1900 LU SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 7/8/04

WITNESS DATE

TITLE NSWC CRANE
FRI JULY 9 2004

PRC NO. N687
BOOK 2576

Work continued from Page

AT SITE SJC TR NUS
BK
DN BM

AM: CLOUDY, WARM, BREEZY.
PM: CLOUDY, V. WARM

0650 AT SITE CALIB PID — LOAD UP VAN.

0715 B/M ARRIVES — RESUME LOADING UP SUPPLIES AND GET WATER. TAILGATE M

0830 SJC/TR GO TO SWMU 12 TALK TO DAVE BAKER (SUPV) OF SWMU - SAID OK TO WORK IN HERE TODAY. TR WILL CHECK ON DECON PAD LOCATION

0900 TAKE DRILL RIG, ETC TO SWMU 12 - SHO BRUCE POTENTIAL DECON AREA.

0930 SET UP ON 12MWT01 — ATV-CME 550X - RIG — START WITH 4¼" ID HSA - SPLIT SPOONS - AUTO HAMMER.

1200 AT ≈ 9' — SAMPLED CONTINUOUSL TO 9'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 7/9-04

WITNESS DATE

TITLE NSWC CRANE FRI (CONT)

PROJECT NO. N6878

BOOK 2576

Work continued from Page

1230 WERE INFORMED BY TR - THAT WE CANNOT WORK AT OUR LOCATION DUE TO SOME ARMY SAFETY CODE. OUR OFFICE IS LOOKING INTO THIS. APPARENTLY THIS STOPPAGE CAME AS A RESULT OF AN INCIDENT THAT OCCURRED YESTERDAY BY ANOTHER CONTRACTOR

1400 AT FIELD OFFICE - TR TALKS TO TOM JOHNSON - TR STATES THAT WE WILL ALL HAVE TO DEMOB UNTIL THE BASE CLEARS US TO WORK - BM WILL HAVE TO PULL RIG OFF OF HOLE TEAR DOWN DECON PAD, ETC.

1500 MOVE RIG OFF OF 12MWT01 - BACK FILLED W/ BENT PELLETS - MOVE RIG TO FIELD OFFICE.

1700 DECON RIG/TOOLS TAKE DECON WATER TO BE DUMPED

1800 LU SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 7/9/

WITNESS DATE

TITLE NSWC CRANE SAT JULY 10 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page SJC, JG, TR, CL

DEMOB FROM SITE DUE TO SHUT DOWN BY NWSC CRANE - WILL AWAIT UNTIL WE GET PERMISSION TO START AGAIN.
4 HRS STANDBY (BOWSER-MOVER) 9' HSA + 1 DRUM

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 7-10-04

WITNESS DATE

TI . NSWC CRANE PROJECT NO. N6
THURS JULY 22 2004 BOOK 2576

Work continued from Page AT SITE SJC, TR, JG } TH NUS

AM: CLEAR WARM
PM: OVERAST V. WARM HUMID

RE MOB TO NSWC

0700 EST AT AIRPORT - READ OVER NOTES

1230 CST ARRIV. SITE - START TO UNPACK EQUIP THAT WE HAD TO PACK UP ON THE 9TH JULY, 2004.

1330 TR/SJC MET W/ DONNA ZOLMAN TO GET A: REISSUE OF DIG PERMIT MFA
~~B: DIG PERMIT MFB (WE SJC~~
B: DIG PERMIT FOR 2 WELLS SWMU16

1430 TR, SJC, TOM BRENT WENT TO LOOK AT POTENTIAL DECON LOCATION JUST WEST OF SWMU 12 - TOM B APPROVES LOCATION

1600 W SITE - CHECK IN - WENT OUT TO PURCHASE SUPPLIES.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conde DATE 7/22/04
WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878
FRI JULY 23 2004 BOOK 2567

Work continued from Page AT SITE SJC, TR, JG } TH NUS

AM: OVERCAST WARM
PM: " V WARM HUMID

0700 AT SITE - UNLOAD VANS - RESTOCK SUPPLIES, WATER, ETC.

0800 GET PAPERWORK READY, LOAD VAN W/ EQUIPMENT ETC FOR DRILLING WORK - GO OVER WORK PLAN.

0830 FILL OUT SAFE WORK PERMITS FOR DECON AND BORING OPERATIONS. DRILLERS NOT DUE UNTIL LATER TODAY AS DISCUSSED WITH OUR OFFICE AND BOWSER MORNER EARLIER THIS WEEK.

0930 MET W/ FIRE DEPT TO GO OVER LOC OF DECON - HE SAYS AREA LOOKS GOOD WILL MEET W/ ME LATER TO GIVE US A PERMIT

1030 START TO INSTALL WELL WIZARDS IN WELLS AT SWMU 13.

1200 AT FIELD OFFICE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conde DATE 7-23-04.
WITNESS DATE

TITLE NSWC CRANE FRI (CONT)

PROJECT NO. N6878

BOOK 2576

Work continued from Page

1330 PREPARE ADDL WELL WIZARDS FOR INSTALLATION - GET H&S MATERIALS READY FOR BOWSER-MORNER. DRILLERS ARRIVE.

1430 RCD BURN PERMIT FROM FIRE DEPT (DANIEL NEEF) ← SO

1500 SJC PROVIDES SITE H&S TRAINING TO CHAD MAHAFFEY - JIM IS FIX THE ANGLE DRIVE ON THE ATV.

1600 H&S SESSION OVER. JIM W PROCEEDS TO REPAIR THE RIGHT ANGLE DRIVE ON THE RIG. AND CHAD BUILDS DECON PAD NEAR BLDG 3245.

1830 LV SITE

ANY ITEMS TODAY - PROBABLY MOB

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conta

DATE 7/23'

DATE

TITLE NSWC CRANE SAT JULY 25 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

AT SITE: SJC JW, CM, JD } BM

AM: SUNNY, WARM. BREEZY.

PM: MOSTLY SUNNY WARM BREEZY

0700 AT SITE - CALIB PID - LOAD VAN. BM LOADING EQUIP/SUPPLIES BEFORE GOING TO SWMU 12. WILL RESUME AT LOCATION 12MWT01.

0800 DRILLERS GET WATER IN ALL 3 VEHICLES RIG, AND 2 PICK UPS. TAILGATE MTG.

0830 SIGN IN AT MAIN GATE (SWMU 12) SET UP RIG OVER NEW 12MWT01 - AUGER TO ≈ 9' - PULL AUGERS SET TEMP CASING TO 9' - ONTOP OF SOME BENTONITE PELLETS TO SEAL OFF. CHAD UNLOADER SOME ITEMS AT DECON PAD - WENT TO GET COMPRESSOR

0930 HOOK UP COMPRESSOR - GET CORING TOOLS READY, ETC.

1000 START UP COMPRESSOR - START CORING.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conta

DATE 7/24/04

WITNESS

DATE

TITLE NSWC CRANE SAT (CONTINUED) **PROJECT NO.** N6878 **BOOK** 2576

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1050 RUN ① COMPLETE 9.5-18.5

1135 RUN ② COMPLETE 18.5-28.5

1335 RUN ③ COMPLETE 28.5-38.5

1415 BEGIN TO REAM W/ 5½" BIT

1500 DONE REAMING - BEGIN TO SET WELL 2" ϕ 24-34
SAND 21-35
PELLETS 11-21

1530 GO TO DECON PAD - PROCEED TO DECON TOOLS ETC. JIM GOES AFTER MORE CEMENT AND CASING.
CLEAN UP AT 12MWT01

1640 MOVE TO 12MWT02 - SET UP ATV.

1700 START SS SAMPLING W/ HSA

1735 START CORING - THRU 6" CASING

SCIENTIFIC SINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

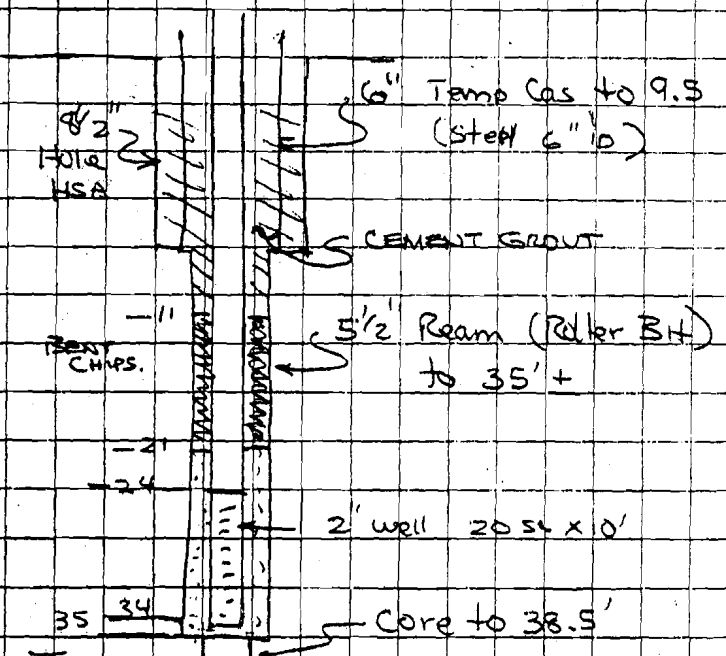
SIGNATURE SJ Conte DATE 7 24 04

WITNESS DATE

TITLE NSWC CRANE SAT (CONT) **PROJECT** N6878 **BOOK** 2576

Work continued from Page

12MWT01



ITEMS	Temp Casing	CORE/REAM	2" WELL	ATV DRILL W/SAMPLE	ATV DRILL NO/SAMP
12MWT01	9.5	29'	34'		
12MWT02	9.5	20'		9.5	9.5
	19.0	49'	34'	9.5	9.5

29.5
9.8
20.

SCIENTIFIC SINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 7 24 04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SAT JULY 24, 2004 (CONT) **BOOK** 2576

Work continued from Page

1825 GOING FOR RUN (2) 19.5 - 29.5

1900 RUN (2) DONE - HOLE MAKING GOOD WATER DURING THIS RUN.

1930 BOX UP CORE - CLEAN UP

2000 LV SITE

Work continued to Page

SIGNATURE SJ Conte DATE 7/24/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN JULY 25 2004 **BOOK** 2576

Work continued from Page AT SITE SJC JW, CM, JD } BM.

AM: CLOUDY, COOL - RAIN. STOPS ≈ 0930

PM: " " " .

0700 AT SITE CALIB PID - NOTES - LOAD VAN

0745 AT 12 MW TO 2 - WILL SET UP TO REAM HOLE. TO ≈ 29'. SHORT TAILGATE MTG

0800 SET REAMING TOOLS IN HOLE (5½" ϕ BIT) BEGIN TO REAM - WILL GO TO ≈ 29'

0837 PULLING RODS FROM TO 2 (REAMING TOOLS)

0850 SET WELL 18-28
SAND 15-29
BENTON CHIPS 15-6 - PULLED CASING WHILE PLACING CHIPS

0915 GO TO DECON PAD - DECON ALL DOWN HOLE TOOLS.

0950 AT 12 MW TO 8 - DECIDE TO TO THIS ONE FIRST AS IT IS THE EASIER ACCESS DUE TO RAIN.

Work continued to Page

SIGNATURE SJ Conte DATE 7-25-04

WITNESS DATE

TITLE SWC CRANE (7/25/04) 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

ATV

	OB NO SAMPLES	OB CONTIN	ROCK NO CORING	CORE REAM	TEMP CASING
• 12MWT01	9.5	9	—	29	9.5
• 12MWT02	—	9.5	—	20	9.5
12MWT03		9.5		16.5	9.5
12MWT04	9.5		15.5		9.5
12MWT05		9.5		15.5	9.5
12MWT06		9.5		15.5	9.5
12MWT07	9.5		15.5		9.5
• 12MWT08		9		15	9
12MWT09	9.5		15.5		9.5
12MWT10		9.5		15.5	9.5
12MWT11	9.5		15.5		9.5
12MWT12		10		15	9.5
12MWT13		9.5		11.5	9.5
12MWT14					11
12MWT15		9		16	9
12MWT16		9		16	9
12MWT17	9.5		16.5		9.5
12MWT18					9.5
12MWT19					10.5
12MWT20					11
12MWT21		9.5		15.5	9.5
12MWT22		9.5		15.5	9.5
12MWT23		9.5		21.5	9.5
12MWT24A	9.5				

Work continued to Page 44.5

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 6060

SIGNATURE S. Conte

DATE 7/25/04

WITNESS

DATE

TITLE NSWC CRANE (7-25-04) 2004

PROJECT N6878

BOOK 2576

Work continued from Page

TRUCK

PERM CASING	2" WELL	OB NO SAMPLES	OB CONTIN	ROCK NO CORING	CORE REAM
—	34	—	—	—	—
—	28	—	—	—	—
	25				
	24				
	24				
	23				
	24				
—	23	—	—	—	—
	24				
	24				
	24				
	24				
	20				
	25	11		15	
	25				
	24				
	25				
	25		9.5		16.5
	26		10.5		16.5
	25	11		15	
	24				
	24				
	30				
	54				

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 6060

Work continued to Page

SIGNATURE S. Conte

DATE 7-25-04

WITNESS

DATE

TITLE NSWC CRANE SUN (CONT) **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

1010 AT 12 MWT08 - WT REF @ 4.5± WEATH SANDSTONE WILL AUGER TO 9'.

1038 START CORING

1050 RUN ① 9 TO 14 OUT

1153 RUN ② HAD TROUBLE PULLING RODS

1230 LOG IN RUN ② - B/M HAD TO GET SPARE CORE BARREL - THEY HAD SOME TROUBLE GETTING THE INITIAL CORE BARREL TO LOOSEN - THE THREADED ENDS BECAME "BELLED OUT" WHEN PULLING OUT OF HOLE. (WENT AFTER SPARE)

1315 RETURN - ARE NOW TRYING GET RC TO UNTHREADED SO THEY CAN USE IT.

1400 - JIM WANTS TO REAM TO 24' TO CLEANOUT WHATEVER OBSTRUCTION IS THERE - HOWEVER DURING THIS WAIT - HOLE IS MAKING WATER - TOWARDS THE UPPER PORTION OF HOLE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte DATE 7/25/04

WITNESS DATE

TITLE NSWC CRANE SUN (CONT) 2004. **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

1300 - CLEAN OUT HOLE @ 24' DEPTH WITH WATER - WAIT 20 MINS - HOLE IS MAKING ENOUGH WATER TO INSTALL WELL. TOLD JIM TO CLEAN OUT, REAM TO 24 - SET WELL AT 23'

1540 SET WELL 12MWT08 - PLACED WELL FROM 13 TO 23 (TD=24) SAND 24 TO 9 CHIPS TO 3' - CLEAN UP AT T08

1630 AT DECON PAD - WILL DECON TOOLS AND ALSO BACK OF RIG.

1730 DONE DECON - LV SITE @ 1830 HRS

QUANTITIES SUN

	2" WELL	ATV DRILL/ SAMPLE	ATV CORE/ REAM	TEMP CASING
12MWT02	28	—	—	—
12MWT08	23	9'	15	9'
	51	9	15	9

08 24
9
15

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte DATE 7/25/04

WITNESS DATE

TITLE JSWC CRANE
MON JULY 26 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page

AT SITE: SJC — JW, CM, JD } BM

AM: CLOUDY, RAIN, COOL
PM: ——

0700 AT SITE - CALIB PID - B/M GETS WATER.
GO OVER DAILY QUANTITIES.

SEE NB 2577

SEPARATE JOB NO.

Work continued to Page

SIGNATURE SJ Conte — DATE 7/26/04
WITNESS — DATE

TITLE NSWC CRANE
THURS ~~MON~~ JULY 29 (CONT) 2004

PROJECT NO. N6878
BOOK 76

Work continued from Page

AT SITE: SJC — JW, CM, JD } B/M

AM: PARTLY CLDY WARM
PM: CLOUDY V WARM

1000 - CONTINUED FROM NB 2577 - WILL NOW RESUME WITH N6878 (SWMU 12)

1100 B/M STILL WORKING ON PADS AT SWMU 16

1200 GET COMPRESSOR AT FIELD OFFICE GET SUPPLIES FOR GOING INTO SWMU 12.

1330 SET UP OVER 12MW T37 WITH ATV.

1400 DOWN ≈ 8' REF @ 7'± (Sandstone)
WILL SET TEMP CASING TO ≈ 9 or 9.5'.

1430 START CORING (See boring log)

1540 DONE CORING @ 25' - HIT A FEW WATER PRODUCING JNTS WILL SET WELL ≈ 24 AFTER REAMING TO 25

1640 DONE REAMING W/ 5½" R. BIT

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SIGNATURE SJ Conte — DATE 7/~~26~~ 29/04
WITNESS — DATE

TITLE NSWC CRANE
THUR (CONT) 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page

1645 BEGIN TO SET WELL.

1730 WELL SET @ 24 → 18
SAND 23 – 11
CHIPS 11 – 6 – THEN GROUT

1800 DECON

1900 LU SITE

QUANTITIES ON THURS

	OB CONTIN	Temp Cas	Core Ream	2" well
12MWT37	~~1.3~~ 10	9.5	15.5	24

24.0
9.5
15.5

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conta

DATE 7/29/04

DATE

TITLE NSWC CRANE
FRI JULY 30 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page

AT SITE: SJC JW, CM, JD } BM

AM: CLOUDY WARM –
PM. " " RAIN (1230

0650 AT SITE – CALIB PID – DAR – LOAD VAN – BM GET WATER.

0800 20.5 BGS 12MWT37 TD 24 BGS

0810 B/M SETTING UP AT 12MWT39 (ATV) 4¼" ID HSA TO START

0815 START SAMPLING

0850 DOWN TO 19' (ALL OB – NO WATER) BM HAD TO GET MORE CASING. ROCK OBVIOUSLY IS DEEPER AT THIS LOCATION.

0930 B/M BACK WITH CASING. (6" Φ STEE B/M DECIDES TO USE 6¼" ID AUG INSTEAD OF 6" CASING – DUE TO DIFFICULTY IN THREADING THE 6" CASING TOGETHER.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conta

DATE 7 30 04

WITNESS

DATE

TITLE NSWC CRANE FRI (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

1000 6¼" HSA TO 20'

1005 START CORING RUN (1) 20-25

1035 START CORING RUN (2) 25-30

1130 WAIT TO SEE IF HOLE MAKES ANY WATER AT 30' TD

1215 NOT MUCH WATER IN HOLE ≈ 1' BUT RODS ARE PROBABLY KEEPING SOME WATER FROM ENTERING.

1230 B/M WENT TO HELP UNLOAD SUPPLIES, WHICH WERE DUE IN AROUND NOON.

1300 B/M ARRIVES BACK AT SWMU12

1340 CORE RUN (3) TO 35 - HOLE IS MAKING A LITTLE WATER - DECIDE TO SET WELL 34 - 24
SAND 20.5 - 35
CHIPS 20.5 - 15.5
THEN CEMENT GROUT.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conti DATE 7/30/04

WITNESS DATE

TITLE N6878 NSWC CRANE FRI (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

1420 - PLACED WELL TO ≈ 34 - PLACING SAND PACK.

1445 PLACING BENTONITE CHIPS (MWT 39)

1530 19.8' BGS (T37) TD = 24' BGS

1630 CLEAN UP GO TO DECON PAD

1730 DONE AT PAD

1830 LV SITE.

QUANT FRIDAY

	OD CONTIN	TEMP CAS	CORE REAM	2" WELL
12MWT 39	20	20	15	34

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conti DATE 7/30/04

WITNESS DATE

TITLE NSWC CRANE

PROJECT NO. N6878

BOOK 2576

Work continued from Page

ATV

WELL NO	OB NO SAMP	OB CONTIN	ROCK NO CORING	CORE/ REAM	TEMP CAS
12MWT24		10		21	10
12MWT25		9.5		16.5	9.5
12MWT26		9.5		15.5	9.5
12MWT27					11
12MWT28		9.5		16.5	9.5
12MWT29	9.5		30	49	9.5
12MWT30	9.5		80.5		9.5
12MWT31					9.5
12MWT32					10
12MWT33					10.5
12MWT34	(9.5)		(30)	50.5	
12MWT35		12		15	12
12MWT36					10.0
12MWT37		10	–	15.5	9.5
12MWT38		9.5		15.5	9.5
12MWT39		20	–	15	20
12MWT40		14.5		15.5	14.5
12MWT41					
12MWT42	9.5		19.5		9.5
12MW43					
12MW44					
12MW45					
12MW46					
12MW47					
12MW48					
12MW49					

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE DATE

WITNESS DATE

TITLE NSWC CRANE

PROJECT NO. N6878

BOOK 2576

Work continued from Page

TRUCK

PERM CAS	2" well	OB NO SAMP	OB CONTIN	~~ROCK~~ NO ~~CORE~~ ~~REAM~~	CORE REAM
	30				
	25				
	24				
	25	11		15	
	25				
40	88				
40	90				
40	88	9.5			49.5
40	99	10		29.5 + 59.5	
35	94	10.5		30 + 24.5 + 5.5	53.5
40	86				
	26				
	25		10		16
	24				
	24				
	34				
	28				
	28				

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE DATE

WITNESS DATE

TITLE NC CRANE 2004 PROJECT NO. N6878 BOOK 2576

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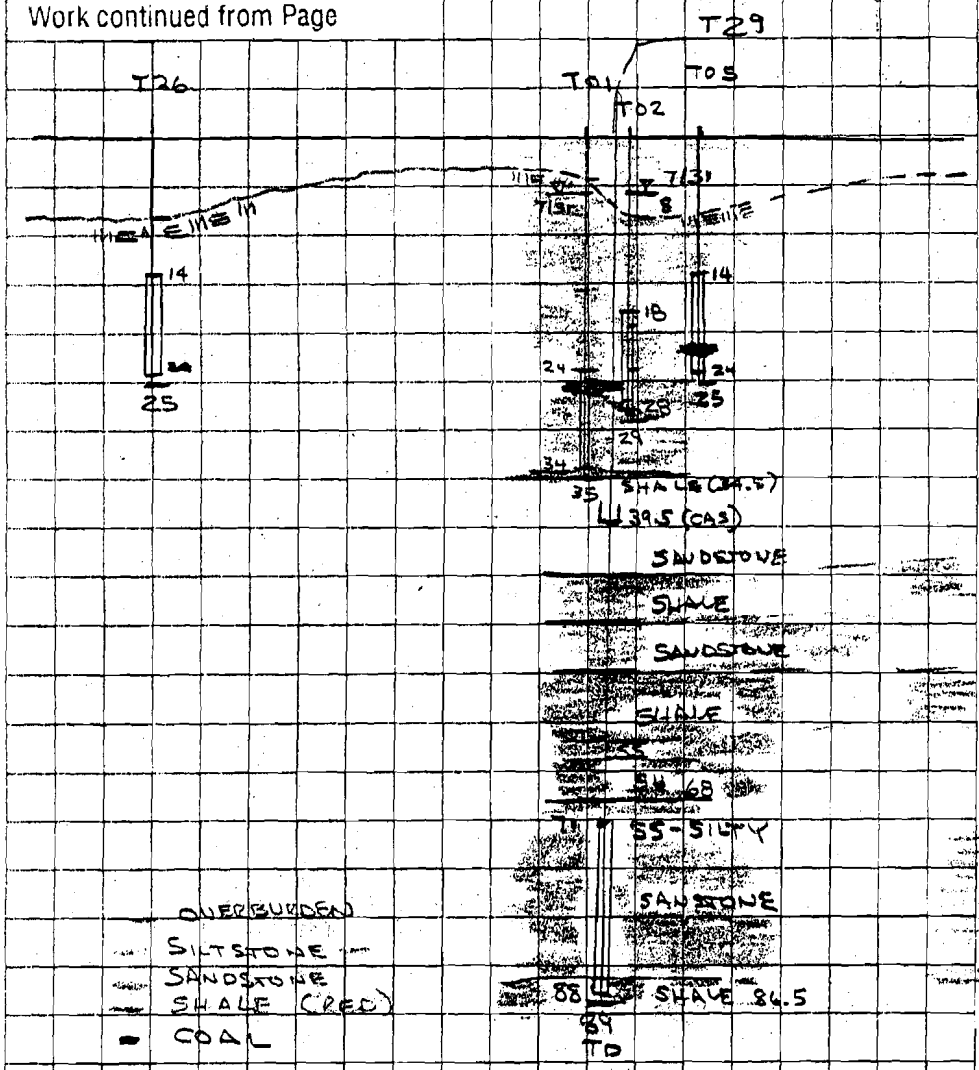

T01
26PM @ 6' DD
(DEV)

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SIGNATURE S. Conte DATE 8/1/04

WITNESS DATE

TITLE NSWC CRANE 2004 PROJECT NO. N6878 BOOK 2576

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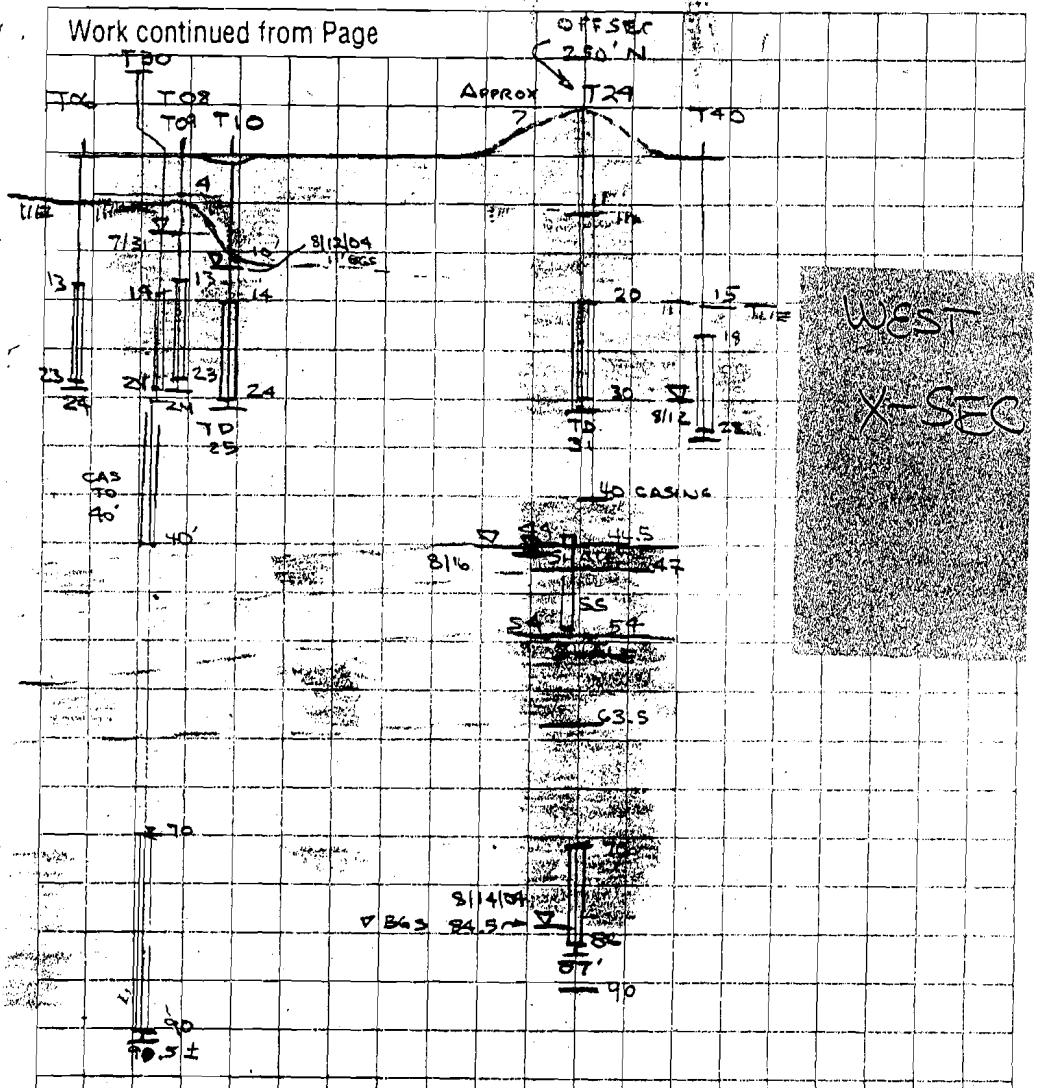

NOTE: X-SECS FOR FIELD USE ONLY.
ELEV (GS) HAS NOT BEEN DETERMINED

Work continued to Page

SIGNATURE S. Conte DATE 8/1/04

WITNESS DATE

TITLE NSWC CRANE 2004 **PROJECT NO.** N6878 **BOOK** 2576

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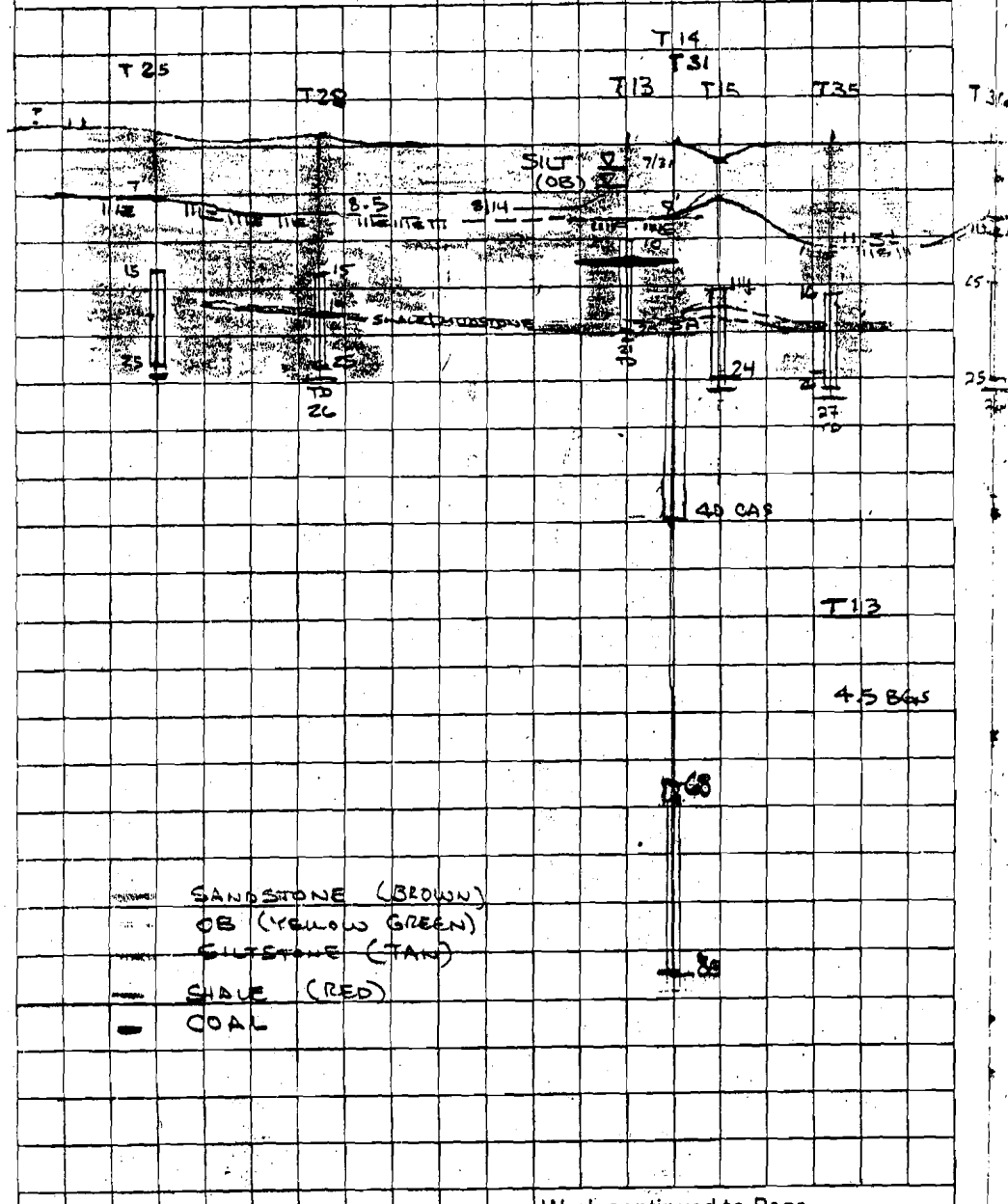

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SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

SIGNATURE SJConte DATE 8/1/04

WITNESS DATE

TITLE NSWC CRANE 2004 **PROJECT** **BOOK**

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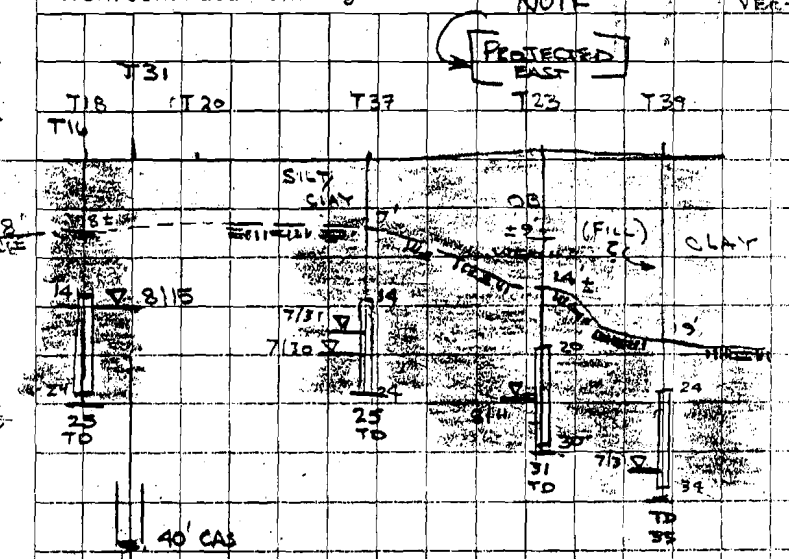

T23 25' BGS 8/13/04 8/4/04

T39 33' BGS

NOTE: X-SECS FOR FIELD USE ONLY - ACTUAL GS ELEV HAVE NOT BEEN DETERMINED

EAST SIDE X-SEC

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

SIGNATURE SJConte DATE 8/1/04

WITNESS DATE

TITLE SWC CRANE **PROJECT NO.** N6878

SAT JULY 31 2004 **BOOK** 2576

Work continued from Page

AT SITE SJC JW, JD, CM } B/M

AM: CLOUDY WARM BREEZY

PM.

0650 AT SITE CALIB PID - LOAD VAN GO OVER DAR's. GO TO SWM12

0800 18.4 WL BGS 12MWT37

0807 32.5 WL BGS 12MWT39 STILL RISING -

0820 SET UP ON 12MWT13 W/ ATV.

0830 START

0900 HIT BR @ 8' & SET 6" CAS TO

0910 START TO CORE

0930 CORE RUN (1) 9.5 - 15

1000 CORE RUN (2) 15 - 20 WILL REAM TO 21 - PLACE WELL 10-20 - SAND 9-21 - CHIPS TO 3

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 7 31 04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SAT (CONT) 2004 **BOOK** 2576

Work continued from Page

1035 JIM W. SAYS THAT HE IS HAVING PROB W/ RIG - KELLEY BAR / SWIVEL IS GETTING WEAK - BEARING MAY BE GOING.

1100 FINISH REAMING. - PROCEED TO SET WELL.

1200 RIG IS DOWN - BEARINGS SHOT ON KELLY SWIVEL - CANNOT REPAIR TODAY OR GET RIG OUT.

1230 DECON RIG - MOVE TO FIELD OFFICE

1400 AT SWMU - DECIDE TO BUILD PADS AROUND WELLS.

9.5

(QUANT SAT)

	OB/W COATING	TEMP CAS	CORE/REAM	2" WELL
12MWT13	9.5 ~~9.5~~ 10	9.5	~~10~~ 5 ~~5~~ 115	20

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 7/31/04

WITNESS DATE

TITLE NSWC CRANE
SAT (CONT) 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page TOOK WL

1400	12MWT13	WL	2.8 BGS
1408	12MWT37	"	18.2 BGS
1410	12MWT39	"	32.5 BGS
1417	12MWT08	"	8.2 BGS
1425	12MWT02	"	5.8 BGS
1430	12MWT01	"	6.0 BGS

JOHN SHORT - MECHANIC
TENT. TUES AFTERNOON.
TO FIX RIG.

1500 B/M STILL WORKING ON PADS
THEY WILL NOT COMPLETE THEM AS
THEY WILL PROB BRING IN A CONCRETE
TRUCK TO FINISH THEM ALL AT ONCE.

1700 AT FIELD OFFICE - COMPLETE NOTES

1800 LV SITE - WENT TO LOOK FOR
WATER CONTAINERS.

1900 COULD NOT FIND ANY.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605

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SIGNATURE SJ Conti
DATE 7/31/04
WITNESS
DATE

TITLE NSWC CRANE
SUN AUG 1 2004

PROJECT NO.
BOOK 2576

Work continued from Page AT SITE SJC TR
TENUS JG TENUS
CL

AM: SUNNY, WARM, HUMID
PM: " HOT, HUMID

0700 AT SITE - CALIB PID - B/M NOT
ON SITE - THEY DO NOT HAVE MUCH
TO DO SINCE THE RIG IS DOWN -
JIM W CHOOSES TO TRAVEL BACK
TODAY. MECHANIC IS DUE HERE
ON NEXT TUES.

0800 COMPLETE NOTES AND TABLES
GET BORING LOGS ORGANIZED - PREPARE
TO HELP TR.

0830 13MWT41 (HELP SAMPLE TR)

1000	6.5' BGS	(12MWT01)	START DEV	
1052	2.9' BGS	(12MWT13)	"	"
1353	18' + BGS	(12MWT37)	"	"
1502	32.8 ± BGS	(12MWT39)	"	"
1635	8.0' ± BGS	(12MWT08)	"	"
1730	—	12MWT02	"	"

1900 LV SITE.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti
DATE 8/1/04
WITNESS
DATE

TITLE SWC CRANE
MON AUG 9 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page AT SITE SJC, TR, JG, CL.

AM: SUNNY WARM
PM: " V. WARM

0700 AT AIRPORT IN PGH FLT TO IND

1300 ARRIVE ON SITE - SORT OUT EQ
LOAD UP VAN

1400 GIVE JOSH OF EFS HES SITE
SP. TRAINING (BRIEF) HE WAS HERE
IN APRIL.

1445 BOWSER/MORNER ARRIVE - UNLOAD
SOME SUPPLIES.

1530 GREASE RIG - SIGN SAFE WORK PERM.

1600 MOVE RIG TO DECON PAD - PERFORM
DECON OPERATIONS

1730 BACK AT FIELD OFFICE.

1830 LU SITE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conta
DATE 8/9/04
WITNESS
DATE

TITLE NSWC CRANE
TUE AUG 10 2004

PROJECT N6878
BOOK 2576

Work continued from Page AT SITE SJC JW, JD, CM } BM

AM: SUNNY WARM
PM: " " BREEZY LO 80°s

0650 AT SITE CALIB PID - LOAD VAN.

0715 B/M GETS WATER - TR WENT AFER
RENEWED DIG PERMIT

0730 WAIT FOR DIG PERMIT

0830 DIG PERMIT READY - GO TO SWMU 12
12MWT23 - HIT ROCK ≈ 6.5 SET CAS @ 10'

0925 PREPARE TO CORE

1136 DOWN 30' - CORED 9.5 - 30 WILL
WAIT TO SEE IF HOLE MAKES WATER

1236 HOLE HAS ≈ 1' WATER IN IT AND
RISING - WILL REAM TO ≈ 31

1300 START TO REAM HOLE TO 5½"

1330 DONE REAMING.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conta
DATE 8/10/04
WITNESS
DATE

TITLE NSWC CRANE TUE (CONT) 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

1340 SET WELL 20-30
SAND 16-31
CHIPS 8-16 ±

1400 DECON

1430 START AT 12MWT24.

1454 AT 10' SET CASING (TEMP 6")

1510 START CORING RUN 1

1702 DONE CORING RUN 4

1730 START TO REAM W/ 5 1/2" ROLLER BIT

	ITEMS OB W CONTIN	MON TEMP CAS	CORE REAM	2" WELL	STANDBY
12MWT23	9.5	9.5	21.5	30	1
12MWT24	10	10	21	30	—

DONE REAMING

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S Conte DATE 8/10/04

WITNESS DATE

TITLE NSWC CRANE TUES (CONT) 2004

PROJECT NO. [illegible]

BOOK 2576

Work continued from Page

1800 SET WELL 20 → 30
SAND 16 → 31
CHIPS →

1830 WELL IS SET

1900 CLEAN UP AND LEAVE SITE.

SJC ALSO NOTES THAT GRASS CUTTING CONTRACTOR WAS WORKING IN THE AREA OF BLDG 155 AND 160 - I AM JUST CURIOUS AS TO WHY THEY CAN WORK WITHIN THE "ARC" AND THUS CANT. THIS IS JUST AN OBSERVATION, ALTHOUGH I WOULD LIKE TO KNOW WHY THEY CAN WORK AND WE CANNOT. I LEFT A MSSG FOR RALPH.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S Conte DATE 8/10/04

WITNESS DATE

TITLE SWC CRANE WED AUG 11 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

AT SITE: SJC JW CM BM JD

AM: PARTLY CLDY, COOL

PM: " " WARM

0645 AT SITE - CALIB PID - LOAD VAN FINISH UP DAILY ACT RECORD TAILGATE

0730 TR- HANDS OUT VEHICLE PASSES.

0800 AT SWMU 12 - GRASS CUTTING CONTRACTOR WORKING WITHIN BLDG 155 ARC (Weed Wackers)

0805 WL T23 26' BGS

0815 WL T24 DRY TODAY

0840 B/M ARRIVE @ T34 TO INITIATE THE SETTING OF THE 6" PERM CAS. WILL SET 8¼" ID AUGERS TO ROCK. WHICH WILL MAKE ≈ 10" HOLE, WILL SET A PIECE OF 8¼" ID CASING THEN REAM W/ 8" ROLLER BIT TO ≈ 39' THEN SET THE 6" Φ CASING AND GROUT IN PLACE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 8/11/04

WITNESS DATE

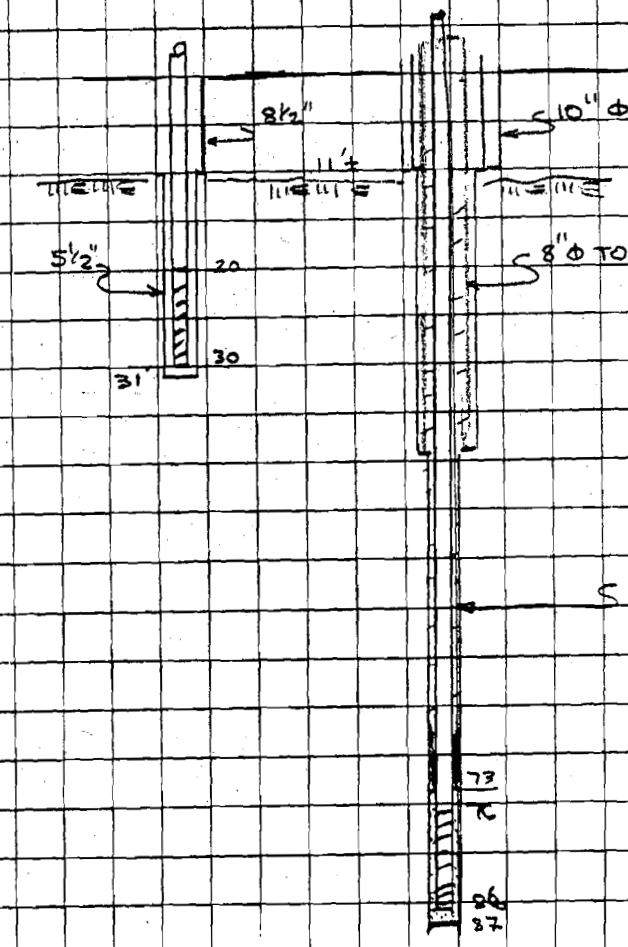
TITLE NSWC CRANE WED (CONT) 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

12MWT34 PERM CASING DETAILS.



10" Φ (HSA) SET 8¼ Temp TO 9.5

① - HSA 10" OD to ≈ 9.5' BGS - Set 8¼" Temp casing to 9.5' BGS

8" Φ TO 39'±

② - Drill thru 5¼" with 8" R.B to 39.5 BGS

③ - Set 6" Perm Casing to 39.5 BGS and Grout in place

④ - After Min 24 hrs NX core to find H2O.

⑤ - Ream to 5½" TO 87.

⑥ - Set Well (2" Φ)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 8/11/04

WITNESS DATE

TITLE NSWC CRANE
WED 8/11 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page

0900 SETTING THE 8" ID CASING INTO THE 10" HOLE.

0930 BEGIN TO DRILL 8" AIR ROT HOLE THRU THE 8 1/4" CASING. HOLE IS NOT MAKING MUCH WATER, AS EXPECTED FROM THE PREVIOUS T24'S STATUS - NO ADDL WATER WAS ENCOUNTERED FROM 30 → 39.5 WHICH IS JUST BELOW THE DEPTH OF SHALLOW WELL.

1100 DOWN TO ≈ 39.5' W/ 8" HOLE - BEGIN TO REMOVE RODS.

1115 START TO SET 6" PERM STEEL CASING TO ≈ 39.5' (10' SECTIONS - FLUSH-JNT THREADED)

1130 CASING (6" Φ) SET AT ≈ 39.5 BGS WILL PROCEED TO MIX CEMENT/BENT GROUT TO SEAL CASING IN PLACE.

1145 PROCEED TO MIX AND PUMP GROUT TO SEAL IN 6" Φ CASING. REMOVED 8".

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conti
DATE 8/11/04
WITNESS
DATE

TITLE NSWC CRANE
WED (CONT) 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page

1200 6" PERM CASING IS NOW SET AND GROUTED IN PLACE.

1230 WENT AFTER MORE BENTONITE CHIPS

1300 CLEAN UP AT 12MWT34 - MOVE RIG, ETC TO 12MWT10

1330 SET UP / BEGIN AT T10

1430 CORE RUN (1) STARTED

1535 CORE RUN (3) DONE

1605 ≈ 1' WATER IN HOLE AND RISING

	QUANT Perm Casing	WED DRILL W/ CONTIN	TEMP CAS	CORE REAM	2' WELD
12MWT34	~~39.5~~ 40				
12MWT10		9.5	9.5	15.5	24

1615 WILL REAM TO 25 - WELL 14 → 24, SAND 12 TO 25, CHIPS TO ≈ 6', MOVE OFF, HOLE, CLEAN UP, DECON, MOVE BACK INTO SWMU 12

1800 LEAVE SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conti
DATE 8-11-04
WITNESS
DATE

TITLE ISWC CRANE
THURS AUG 12 2004

PROJECT NO. N6878
BOOK 2576

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AT SITE: SJC JW, CM, JD } BM

AM: SUNNY, COOL, BREEZY.
PM: BECOMES CLOUDY WARM TO COOL BREEZY

0645 AT SITE - CALIB PID - LOAD VAN
GO OVER DAILY ACT RECORDS

0700 B/M ARRIVE - GET WATER FOR VEHICLES

0730 LOAD UP SUPPLIES

0800 GO TO SWMU 12 (12MWT40)

0900 DOWN 15' BGS - HIT ROCK - HOLE
DRY - WILL CORE.

0945 START CORING RUN (1) 14.5 → 20

1115 RUN (3) DONE 25-30 HAD SOME
TROUBLE PULLING RODS - WHILE TRYING
TO FREE UP RODS - LOST THE CORE.

1200 HOLE HAS ≈ 2' WATER - WILL SET WELL
28-18 - SAND 29 → 15.5 THEN
GRADE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conti DATE 8/12/04
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TITLE NSWC CRANE
THUR (CONT) 2004

PROJECT NO. N6878
BOOK 2576

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1330 WELL SET - PLACING SAND PACK
TO 15.5 - A

1400 WL ≈ 25' BGS AFTER INSTALLATION
AND RISING SLOWLY

1415 MOVE RIG FROM T40 - SJC LOCKS S.
GATE. MOVE BACK ONTO T34

1435 SET UP RIG AT T34 - DROP OFF
COMPRESSOR - WENT TO DECON - TOOLS

1525 12MWT10 WL 11' BGS

1535 BACK FROM DECON. JIM WILL CLEAN
OUT PERM CASING W/ ROLLER BIT
THEN CORE.

QUANTITIES - THURS

	DRILL CONTIN	TEMP CAS	CORE REAM	2" WELL
12MWT40	14.5 ✓	14.5 ✓	15.5 ✓	28 ✓
12MWT34			18.5 ✓	
			39.5 → 58	

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TITLE NSWC CRANE **PROJECT NO.** N6878

THUR (CONT) 2004 **BOOK** 2576

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1600 BEGIN CORING FROM 40'

1625 RUN (1) DONE 40-45

1645 RUN (2) " 45-50

1745 RUN (3) " 50-58

1800 LOG IN SAMPLE 50-58

1900 LU SITE

Work continued to Page

SIGNATURE SJ Conte DATE

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

FRI AUG 13 2004 **BOOK** 2576

Work continued from Page AT SITE SJC JW JD CM B/M

AM: SUNNY COOL BREEZY

PM: SUNNY WARM

0640 AT SITE - CALIB PID - TALK TO J SCUBERT - TOLD HIM ABOUT T24 BEING DRY - HE ASKED IF I WENT TO THE BASE OF SS. I SAID WE SET WELL BASED ON WATER HIT ≈ 20 TO 30 IF WE GO TO BASE OF SS (IT MAY BE DRY) ALSO TOLD HIM WE SET CASING AT 39.5' AT T34 - I ASK HIM IF I SHOULD LOOK FOR FIRST WATER OR GO DEEPER, HE SAID TO GO DEEPER (70-90) TO FIND A MORE SIG WATER ZONE - WL AT T34 @ ~~50~~ 58' DEEP WAS AT ≈ 50' BGS NOT SURE - BUT I THINK IT IS COMING IN ≈ 40-45. BUT BASED ON J.S. WE SHOULD GO DEEPER.

0800 ALSO OF NOTE - WE ARR AT MAIN GATE - NO GUARD - DECIDED TO USE MY KEY BUT GATE WAS UNLOCKED AND SECURED WITH A "BUNGIE" CORD. I DECIDED TO CALL DAVE BAKER FROM THE GUARD SHACK

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TITL NSWC CRANE PROJECT NO. N687
FRI (CONT) 2004 BOOK 2576

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BUT DAVE WASNT IN - TALKED TO JIM BURTON - ASK HIM IF IT WAS OK TO ENTER AND GO TO T34 - HE SAID OK - BUT HE ALSO SAID THEY WERE ONLY DOING MAINTENANCE TODAY. I INQUIRED FURTHER AND HE THAT THEY WERE SHUTING DOWN TODAY DUE TO US DOING THE DRILLING ?? - HE SAID THEY DIDNT WANT TO BE IN PRODUCTION WHILE WE WERE IN HERE - BUT WE HAVE BEEN IN ALL WEEK - WORKING IN THE SOUTH END WHERE WE SHOULD BE ALLOWED CLEARANCE ANYWAY. I ALSO FIND IT HARD TO BELIEVE THAT ANY OPERATIONS AT THE BASE WOULD SHUT DOWN DUE TO AN OUTSIDE CONTRACTOR.

0830 ENTERED SWMU 12 - I ALSO CALLED TERRY R FROM THE GUARD SHACK AND TOLD HIM ABOUT MY CONVERSATION WITH JIM BURTON - I TOLD HIM TO CHECK WITH TOM BRENT AND CLARIFY THE SITUATION WITH HIM REGARDING SWMU 12 MAINTENANCE ONLY FOR TODAY.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TITLE NSWC CRANE PROJ NO. N6878
FRI (CONT) 2004 BOOK 2576

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0845 MADE DECISION TO KEEP CORING AT T34 BASED ON TALKING W/ J SCHUBERT THIS MORNING - THERE WAS SOME DISCUSSIO WITH ME AND B/M TO SET WELL ≈ 44-54 BUT DECIDED TO GO DEEPER - BASED ON AGAIN THE TALK W/ SCHUBERT -

0846 START RUN (4)

1130 PULLING OUT RUN (7) 83 → 90.
RUN (6) 73 → 83 HAD SEVERAL H2O BEARING ZONES - DECIDE TO MAKE RUN (7) TO 90' TO LOOK AT CORE BELOW 83'

1145 RUN (7) 83-90 OUT, BUT NO RECOVER CORE APPARENTLY WAS BLOWN OUT TRYING TO FREE UP THE RODS. BASED ON THE CORE - SAND FROM 73-87
SCREEN 76 → 86 - WILL REAM TO 87

1215 START TO REAM W/ 5 1/2" BIT

1450 DONE REAMING @ 87' ± BGS - BEGIN TO PULL TOOLS.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S J Conti DATE 8/13/04

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TITLE NSWC CRANE **PROJECT NO.** N6878

FRI 8/13/04 2004 **BOOK** 2576

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1515 SET 2" WELL TO 76' TO 86' ± BGS - SAND FROM 73 TO 87' BGS, CHIPS TO APROX 63 - BEGIN MIXING CEMENT GROUT

1600 CLEAN UP AT T34 - GO DECON.

1700 DONE AT DECON - MOVE RIG, ETC TO 12MWT12. MOVE COMPRESSOR INTO POSITION - LAY OUT AIR HOSE TO RIG. BACK TOOL TRAILER INTO POSITION.

1728 START TO AUGER @ T12 REF @ 9.5' ± SET TEMP CAS 9.5'

1815 CASING SET, CLEAN UP.

QUANT FRIDAY

	CORE/REAM	2" WELL	DRILL W/ CONTIN	TEMP CAS
12MWT34	32' 58→90	86'		
12MWT12			10 ~~9.5~~ SJC	9.5

1900 LV SITE

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SIGNATURE S J Conti DATE 8/13/04

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TITLE NSWC CRANE **PROJECT NO.** N6878

SAT AUG 14 2004 2004 **BOOK** 2576

Work continued from Page SJC JW, JD, CM } B/M

AM: PARTLY CLOUDY COOL
PM: TO SUNNY AND WARM.

0640 AT SITE - CAL BD - LOAD VAN

0700 B/M ARR - GET WATER - DAR - TAILGATE.

0740 GO TO 12MWT12 - NO GUARD - SJC USES CONTRACTORS KEY TO OPEN GATE AND LOCKED IT AFTER ENTERING

0800 RESUME AT T12 - PREPARE TO CORE. STARTING AT 10'

0900 RUN (2) 15 → 20 DONE.

0930 RUN (3) 20 → 25 DONE - BEGIN TO REAM TO 25' W/ 5½" RB.

1015 @ 25' (T12) CLEANING OUT W/ SOME ~~WATER~~ PULL RODS - SET WELL (2' PVC) FROM 14 TO 24, SAND 25 TO 12 - CHIPS TO 3' ±.

1100 PULL RIG ONTO T11 - GO DECON.

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TITLE NSWC CRANE SAT (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

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1120 DECIDE TO ADVANCE T11 WITHOUT SAMPLING AND W/O CORING - SINCE IT IS SO CLOSE TO T12 - WILL SET WELL IDENTICAL TO T12.

1200 BEGIN TO REAM TO 5½" - RB

1220 WL @ T34 = 84.5 BGS
1226 WL @ T12 = 9' BGS

1300 SET WELL (T11) FROM 14 TO 24 SAND 12 TO 25 CHIP TO 3

1330 MOVE TO/ SET UP AT 12MWT16 - THEN WENT TO DECON.

1415 BACK FROM DECON - START @ T16.

1450 HIT ROCK @ 8'±

1505 START CORING RUN (1) 9-15

1600 RUN (3) 20-25 (START)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TITLE NSWC CRANE SAT (CONT) 2004 **PROJE** **IO.** N6878 **BOOK** 2576

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1625 RUN (3) DONE - WILL REAM (5½) TO 25 AND SET WELL @ 14-24.

1700 STIEL REAMING.

1720 SET WELL 14-24, SAND 11→25, CHIPS TO 3

1742 WL AT T11 ≈ 12' BGS
1748 WL AT T16 ≈ 21' BGS SHORTLY AFTER INSTALL.

1750 START HSA AT T17 - JD & CM TO DECON

1800 AUGER TO 9.5' (NO SAMPLES) SET 6" TEMP CASING TO 9.5 @ 1820 HRS.

1915 LU SITE.

QUANT (SAT)

	DRILL CONTIN	TEMP CAS	CORE REAM	2" WELL	DRILL NO SAMPLES	ROCK DRILL NO CORE
12MWT12	—	—	15 ✓	24 ✓	—	—
12MWT11	—	9.5 ✓	—	24 ✓	9.5 ✓	15.[illegible]
12MWT16	9 ✓	9 ✓	16 ✓	24 ✓	—	—
12MN T17		9.5 ✓			9.5 ✓	

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conta DATE 8/14/04

WITNESS DATE

TITLE NSWC CRANE
SUN AUG 15 2004

PROJECT NO. N6878
BOOK 2576

Work continued from Page AT SITE SJC

JW, JD, CM } B-M

AM: SUNNY COOL TO WARM
PM:

0640 AT SITE - CALIB PID - DARS - LOAD VAN

0700 DRILLERS GET WATER - TAILGATE MTG.

0745 GO TO SWMU 12 [WL 15' BGS T16]
RESUME AT T17 WILL NOT SAMPLE OR CORE - WILL USE T16 AS REFERENCE FOR T17.

0802 START AIR ROTARY FROM 9.5' (T17)

0930 AIR ROT TO ≈ 26' SET WELL 15 TO 25, SAND 12 TO 26, CHIPS TO 3'±

1015 MOVE RIG TO T06

1024 [84.5 WL T34 BGS]

1030 SET UP OVER T06 - GO DECON AT 1045

1130 DONE DECON.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TITLE NSWC CRANE
SUN (CONT) 2004

PROJECT NO. N6878
BOOK 2576

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1200 RETURN TO T06 - BACK TOOLS INTO POSITION

1215 START @ T06 - WIT BR ≈ 5'±

1250 START CORING W/ NX (CONVENTIONAL)

1310 RUN (1) DONE 9.5 → 15

1335 RUN (2) DONE 15 → 20 - LOST IN HOLE WILL TRY TO RECOVER DURING RUN (3).

1340 [WL @ T10 11' BGS]

1420 RUN (3) IS OUT - NOT MUCH REC APPARENTLY CORE IS FALLING OUT OF CORE BARREL - DECIDE TO INSTALL

QUANT SUN

	DRILL CONT	TEMP CAS	CORE/ REAM	2" WELL	DRILL OB NO SAMPL	ROCK NO CORE
12MWT17	—	—	—	25	—	16.5
12MNT06	9.5	9.5	~~14.5~~ 15.5	23½	—	—

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TITLE JSWC CRANE PROJECT NO. N6878

SUN (CONT) 2004 BOOK 2576

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WELL BASED ON OTHER WELLS NEARBY AND BASED ON JNT AT 14' - I ALREADY KNOW THE WELL SHOULD BE SET AT 13 TO 23 W/O LOOKING AT CORE - WILL CORE TO 7 WHEN WE GET TO IT

1500 BEGIN TO REAM HOLE. TOO REAM TO ≈ 24

1600 SETTING WELL 13-23
SAND 11-25
CHIPS TO 3'

1700 DONE W/ THA WELL - CLEAN UP GO TO DECON PAD

1800 DONE DECON - DRILLERS GO GET FUEL ETC

1845 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S. Conte DATE 8/15/04

WITNESS DATE

TITLE NSWC CRANE PROJECT N6878

MON AUG 16 2004 BOOK 2576

Work continued from Page AT SITE SJC JW JD CM } BM

AM: SUNNY, COOL TO WARM
PM: SUNNY V WARM.

0630 AT SITE: CALIB PID - LOAD VAN COMPLETE DARS. GAVE JEFF S. A CALL BUT HAD TO LV. A MSSG.

0700 JS CALLED BACK - SAID OK TO PUT ANOTHER WELL NEAR T24 - CAN GO TO THE 2nd SHALE IF NO WATER IS FOUND ABOVE THE 1rst SHALE - SEE PG 27. HE SAID CAN PUT A 10' SCREEN 44 TO 54 IF THAT IS THE AREA MAKING WATER.

0715 DRILLERS ARRIVE - TAILGATE MTG - GET WATER - GET SUPPLIES FOR GOING TO 12MWT24A (A = ALTERNATE)

0830 START AT 12MWT24A - ALTERNATE TO T24 - WHICH HAS BEEN DRY.

0900 HSA TO ≈ 9.5' - SETTING 6" CASING (TEMP) TO 9.5'.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S. Conte DATE 8/16/04.

WITNESS DATE

TITLE NSWC CRANE MON (CONT) 2004

PROJECT NO. N6878

BOOK 2576

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0900 START REAMIN W/ 5 1/2" ROLLER BIT.

0930 DOWN TO 20' WAIT 1/2 HR - HOLE DRY @ 20'

1000 RESUME REAMING-

1100 ≈ 35' HOLE APPEARS TO BE DRY WILL GO TO 40 AND LET IT SET FOR A WHILE.

1200 HOLE DRY @ 40' TD - WILL GO TO 54 - WHERE THE TOP OF THE THICKER SHALE UNIT IS LOCATED.

1230 AT ≈ 54 - WILL WAIT TO SEE IF HOLE MAKES WATER - M-SCOPE WAS WET WHEN CHECKED AT 1238, WILL CHECK ≈ 1300.

1300 HOLE APPEARS TO BE MAKING WATER WL WAS ≈ 50' BGS (54' TD) DECIDE TO PULL RODS & SET WELL 44-54. SAND TO 40, CHIPS TO 28' ± WILL GROUT LATER.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S J Conte

DATE 8/16/04

WITNESS

DATE

TITLE NSWC CRANE MON (CONT) 2004

PROJECT NO. N6878

BOOK 2576

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1400 WL T24A 45.5 BGS.

1430 WENT TO DECON TOOLS, RIG, CASING PRIOR TO MOVING TO SWMU 16.

1600 MOVE RIG TO BLDG 3245 - MOVE COMPRESSOR ALSO. TAKE CASING TO DECON PAD.

1730 PREPARE ARE CASING, TOOLS, RIG CEMENT ETC FOR MOVING TO SWMU 16 ON TUES

1830 LV SITE.

QUANT MON

	Temp GAS	OB DRILL NO SAMPLE	DRILL ROCK NO CORE	2" WELL	SB
12MWT24A	9.5	9.5	44.5	54	L

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S J Conte

DATE 8/16/04

WITNESS

DATE

TITLE NSWC CRANE **PROJECT NO.** N6878
TUE · AUG 17 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC JW JD CM } B/M

AM: SUNNY, WARM
PM:

0630 AT SITE - CALIB PID, CLEAN OUT BLDG 3245 AREA - COMPLETE DARS

DRILLERS ARRIVE, GET WATER, TAILGATE MTG. WILL GO SET CASING @ 16MWT21

SEE NOTEBOOK 2577 FOR SWMU 16 ACTIVITIES

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conde DATE 8/17/04
WITNESS DATE

TITLE NSWC CRANE **PROJECT** N6878
WED AUG 25 2004 **BOOK** 2576

Work continued from Page AT SITE SJC

AM: SUNNY WARM
PM: " "

TRAVEL DAY TO CRANE - PGH TO IND

1400 AT SITE. DRILLERS ARRIVE UNLOAD EQUIP

1600 GET PAPER WORK RENT LOAD VAN

1830 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conde DATE 8/25/04
WITNESS DATE

TITLE NSWC CRANE THURS AUG 26 2004

PROJECT NO. N6878

BOOK 2576

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AM RAIN

PM: CLOUDY HOT

AT SITE SJC
JW
JD
CM

0630 AT SITE – RAINING

0800 CONDUCT BRIEFIES FOR NEW DRILL CREW.

0900 SJC/TR/KEN B DRIVE TO LOCATIONS FOR PADS – GO TO SWMU 12 – GAURD STATES THAT ON FRI – JUST CLEANUP SO WE SHOULD BE ABLE TO WORK

1000 TR CHECKS W/ T BRENT (OK TO WORK AT SWMU 12 ON FRI.

1030 SJC/TR RE-MARK SOME LOC A SWMU 12 GO TO SEE DONNA T. SO SHE CAN CLEAR UTIL.

1230 B/M PROCEEDS TO START ON PADS AND JIM W MOVES RIG FROM SWMU 16 – TO GET READY FOR MOVING TO SWMU 12 –

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte

DATE 8/26

WITNESS

DATE

TITLE NSWC CRANE THURS 2004

PROJECT NO. N6878

BOOK 2576

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1430 B/M FINISH PAD FORMS AT SWMU 13. MOVE TO 12.

1500 START ON PAD FORMS – COMPLETE
8 AT SWMU 12
4 AT " 13
BUT DID NOT POUR CONC AS WE ARE GOING TO START AT SWMU 12 (DRIWING)

1845 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte

DATE 8/26/04

WITNESS

DATE

TITLE NSWC CRANE **PROJECT NO.** N687
FRI AUG 27 2004 **BOOK** 2576

Work continued from Page AT SITE SJC JW, CM, JD } BM

AM: CLOUDY WARM BREEZY
PM: " V WARM. ~~M~~ SOLTIS ≈ NOON TE NUS

0630 AT SITE. CALIB PID - BRIEF CHID C. ON SWMU 12 WORK

0700 DRILLERS GET WATER / TAILGATE MTG

0800 GO TO SWMU 12 - 12MWT35

0830 START SAMPLING (CME 550 ATV)

0845 DOWN ≈ 12 - TOP WEATH ROCK AT 11.5

0900 SETTING TEMP 6" CASING TO 12'

0910 BEGIN CORING 12 → 17 RUN (1)

1030 BEGIN RUN 22 → 27 RUN (3)

1055 RUN (3) COMPLETED TO 27

1120 START REAMING w/ 5½" BIT TO 27

1200 DONE REAMING / PULL RODS

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S. Contes DATE 8/27/04
WITNESS DATE

TITLE NSWC CRANE **PROJ NO.** N6878
FRI (CONT) 2004. **BOOK** 2576

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1205 PROCEED TO SET WELL 16-26. SAND 13.5 TO 27. CHIPS TO 3' (2" Φ PVC 20 SL X 10 SCR

1230 GO TO DECON RIG.

1330 AT SWMU 12 - MOVE TO 12MWT 07 WILL NOT SAMPLE OR CORE DUE TO CLOSE PROXIMITY TO TOG AND TOS. NOTICED POSSIBLE UG ELEC - CALLED DONNA Z. DAVE FISHER ARRIVES

1430 DAVE SAYS SHOULD BE OK - MOVED LOCATION 3' SW - RESUME DRILLING

QUANT FRI (BOTH RIGS)

	DRILL w/ CONTIN	TEMP CAS	CORE / REAM	2" WELL	DRILL NO SAMPLE	REAM NO CORE
12MWT 35 (ATV)	12	12	15	26	—	—
12MWT 07 ~~TRUCK~~	—	9.5	—	24	9.5	15.5
12MWT 36 (TRUCK)	10	10	16	25	—	—
12MWT 18 (TRUCK)	9.5	9.5	16.5	25	—	—

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SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S. Contes DATE 8/27/04
WITNESS DATE

TITLE NSWC CRANE FRI (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

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REASON I CALLED DONNA WAS THAT EVEN THO I HAD A DIG PERMIT - I FELT THAT THIS AREA SHOULD POSSIBLY BE MARKED, BUT WASNT - DAVE AGREED THAT THERE IS PROBABLY AN UG LINE LEADING TO THE LIGHT POLE

1600 DOWN @ 25' AT T07 - W 5½" AIR ROT PULLING RODS NOW.

SET WELL 14 TO 24, SAND 10 TO 25 PELLETS/CHIPS TO 3'

1700 CLEAN UP AT T07 - SET UP RIG AT T30 - WENT GET CASING FOR DEEP WELL AND DECON.

1830 LU SITE

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605

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SIGNATURE [signature] DATE 8/27/04

WITNESS DATE

TITLE NSWC CRANE SAT AUG 29 2004 **PROJECT NO.** N6878 **BOOK** 2576

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AT SITE: SJC, MS, JW, JD, CM } B/M

AM: CLOUDY WARM, HUMID.

PM:

0600 AT SITE - CALIB PID - PREPARE FOR LOCK OUT/TAG OUT AT SWMU 12 AND START UP OF DRILLING AT 12MWT30.

0700 AT SWMU 12 MAIN GATE TO PERFORM LOCK OUT TAG OUT (STEVE REDDICK) PUBLIC WORKS OVERSEES - EMPLOYEE PERFORM - SHUT OFF OF POWER FOR DRILLING T30 - T09

0800 AT 12MWT30 - SET UP RIG. 6¼" HSA TO @ 9' SET TEMP 8" Ø CASING BY @ 0900

0905 JIM IS WORKING ON BEARINGS AT THE RIG - APPARENTLY THEY ARE GOING BAD AGAIN - HE USED SOME DUCT TAPE TO HOLD IN THE RETAINER RING THAT HOLDS THE BEARINGS IN PLACE AND WILL RESUME DRILLING USING 8" Ø BIT.

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605

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WITNESS DATE

TITLE NSWC CRANE SAT (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

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1015 DOWN TO ≈ 40 WITH 8" BIT

1035 RODS PULLED - PROCEED TO SET 6" CASING AT ≈ 39'

1055 BEGIN TO MIX GROUT - PERM CASING GROUTED IN TO ≈ 39' - USED 10 SECTIONS - OF FLUSH JNT THREADED STEEL 6" ID CASING.

1120 DONE GROUTING - MOVE RIG TO SHALLOW WELL. T09.

1200 TAKE EQUIP TO DECON PAD.

1230 R. BASINSKI CALLS AT FIELD OFFICE. SJC GIVES UPDATE TO RALPH B.

1305 AFTER DECON CREW MOVES BACK INTO SWMU 12 (T09) FUELING AIR COMP NOW

1400 SET UP AT T09 - MOVE TOOLS

1500 STARTS TO LIGHTNING.

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SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

SIGNATURE SJ Conte DATE 8/28/04

WITNESS DATE

TITLE NSWC CRANE SAT (CONT) 2004 **PROJECT** N6878 **BOOK** 2576

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1600 STILL LIGHTNING/RAINING.

1700 B/M DECIDE NOT TO DRILL TODAY AT T09 TOO LATE TO START - STILL RAINING.

1500 LU SITE - WORK ON QUANT IN ROOM.

QUANT SAT

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	DRILL NO SAMPLES	REAM NO CORE	PERM CAS
12MWT30	—	9.5	—	—	9.5	30.5	40
(ATV) 12MWT09							
(TRUCK) 12MWT14	10.5	10.5	16.5	26			

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte DATE 8/28/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN AUG 29 2004 **BOOK** 2576

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AT SITE SJC

JW
JD
CM

AM: CLOUDY WARM
PM: " "

0630 AT SITE - CALIB PID - LOAD VAN

0700 DRILLERS GET WATER - ETC SUPPLIES

0720 H&S BRIEFING AND DAR'S

0740 AT SWMU 12 - WILL START AT T09
WILL NOT SAMPLE OR CORE - USED WELLS
T07, T08 & T10 FOR REFERENCE. AUGER
TO ≈ 9.5 SET 6" TEMP CAS TO 9.5
REAM W/ 5½" BIT TO 25'.

0900 SETTING 2" Φ WELL TO 14-24
SAND 18 - 25
CHIPS TO 3'

0930 GO DECON TOOLS ETC.

1030 RE SET UP ON T30 (DEEP WELL) SET UP
TOOL TRAILER, COMPRESSOR ETC.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conti DATE 8/29/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN (CONT) 2004 **BOOK** 2576

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1130 AFTER 24 HRS OF GROUT SET UP PROCEED
TO REAM BELOW CASING (5½"Φ) AT T30
WILL NOT CORE DUE TO TIME RESTRAINTS
SET BY THE SHUT DOWN OF POWER - THE
BASE WOULD LIKE TO TURN ON POWER
TONIGHT - WE WOULD NOT FINISH IF WE
HAD TO CORE - WE WILL LOG CUTTINGS
AND WAIT FOR WATER IF WE HAVE TO

1305 CHECKED FOR WATER @ ≈ 71' DEPTH - DRY.
THIS WAS AFTER C ½ HR WAIT - WILL CONT
TO DRILL.

1400 DRILL TO ≈ 88' - WAIT FOR WATER - CALLED
JEFF SCHUBERT - TOLD HIM OUR SITUATION.
HAVING TROUBLE FINDING WATER - HE SAID
WE SHOULDN'T GO TOO MUCH DEEPER THAN

QUANT SUN

		DRILL CONT	TEMP CAS	CORE REAM	2" WELL	DRILL NO SPLS	REAM NO CORE	PERM CAS
(ATV)	12MWT09	—	9.5	—	24	9.5	15.5	—
	12MWT30	—	—	—	90	—	50.5	—
TROC	12MWT32	—	~~10.5~~ 12	—	~~.100~~	~~28.5~~ 30		40'
	12MWT31	—	~~10.5~~ 9.5	—	~~9.5~~	~~28.5~~		40'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page 39.5→90

SIGNATURE SJ Conti DATE 8/29/04

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TITL. NSWC CRANE PROJECT NO. N6878

SUN (CONT) 2004 BOOK 2576

Work continued from Page

90' - SAID WE COULD SCREEN (20') SAY 70 TO 90 IF WE HAD TO - IF WE GO TOO DEEP WE WILL BE DEEPER THAN T34 AND WE STILL MAY NOT HIT MUCH WATER - AND POSSIBLY IN ANOTHER AQUIFER

1430 HOLE IS "FAIRLY" DRY - ADDED WATER TO CLEAN OUT HOLE - AFTER DOING THIS TWICE - APPEARS THAT THERE MAY BE SOME MOISTURE IN THE HOLE - DECIDE TO STOP AT 90' - WILL PULL RODS

1500 RODS OUT - CALLED STEVE REDDICK - BASE UTILITIES - HE SAID HE WOULD BE OUT TO RE-CONNECT THE POWER IN A FEW HOURS. - B/M PROCEED TO SET WELL 70-90 - SAND 65 ~~60~~ SJC TO 90.5 CHIPS TO ~~40~~ 49. SJC

1630 GO TO DECON PAD

1745 DONE DECON.

1830 LU SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TITLE NSWC CRANE PROJECT N6878

MON AUG 30 2004 BOOK 2576

Work continued from Page AT SITE SJC JW JD CM B/M

AM - NA (START NITE SHIFT)
PM - SUNNY, WARM.

1430 AT SITE FOR START OF NIGHT SHIFT

1500 CALIB PID - GO OVER DARS - TAILGATE

1600 B/M HOOKS UP TO LIGHTS - GO TO SWMU 12 -

1630 MET W/ FIRE DEPT RECD HOT WORK PERMIT FOR OUR LIGHTS (MARK VAN MEER)

1645 SET UP ON 12MWT28 - HIT ROCK @ 8.5

1850 DONE CORING AT 25' WILL REAM TO 26'

1920 REAM TO 26 - PULLING RODS.

1930 SETTING WELL - 15-25, SAND 12-26 CHIPS TO 3'.

2000 SET UP AT 12MWT15 - GO DECON

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJConta DATE 8/30/04

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TITLE NSWC CRANE **PROJECT NO.** N6878

MON (CONT) 2004 **BOOK** 2576

Work continued from Page

2100 DONE DECON MOVE TO T15
MOVE LIGHTS INTO POSITION – MOVE
ALL OTHER EQUIP INTO POS

2140 READY TO START DRILLING (T15)

2220 HIT ROCK @ 4' – SAMPLE INTO WEATH
ROCK FOR LITH AND TO ADVANCE HOLE
DEEP ENOUGH TO SET TEMP CAS TO 9.5

2230 START CORING (RUN 1) 9–15

2355 DONE W/ RUN 3 20–25 (DONE CORING)

0010 BEGIN TO REAM W/ 5½ BIT – AIR
ROTARY

0055 DONE REAMING – PULLING RODS NOW

0100 PROCEED TO SET WELL (2" Φ PVC)
FROM 14 TO 24, SAND 10 TO 25
CHIPS TO 3' ±.

0120 CLEAN UP – RODS, MOVE HOSES
MOVE RIG OFF HOLE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conte DATE 8/30/04

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TITLE NSWC CRANE **PROJECT NO.** N6878

MON (CONT) 2004 **BOOK** 2576

Work continued from Page

0130 ATV RIG HOOKS UP TO COMPRESSOR

0200 MOVE EQUIP TO DECON PAD

0230 RIG TO FIELD OFFICE FOR
REPAIRS.

0300 LV SITE

QUANT MON

	LIGHTS	DRILL CONT	TEMP CAS	CORE/ REAM	2" WELL	DRILL NO SAMPL	REAM NO CORE	PERM CAS
(ATV) 12MWT28	1	9.5 ✓	9.5 ✓	16.5 ✓	25	–	–	–
(ATV) 12MWT15		9 ✓	9 ✓	16 ✓	24	–	–	–
(TRUCK) 12MWT31		–	–	49.5 ✓	38	–	–	–
(TRUCK) 12MWT14		–	11 ✓	–	25	11	15	–

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conte DATE 8/30/04 & 8/31/04

WITNESS DATE

TITL NSWC CRANE PROJECT NO. N6878
TUES AUG 31 2004 BOOK 2576

Work continued from Page

AT SITE: SJC JD, JW, CM } B/M

AM: NA

PM: SUNNY, WARM.

1430 ~~0230~~ AT SITE - CALIB PID - TAILGATE

1500 LOAD VAN - GO OVER DARS WITH CHIP.

1530 B/M GET CASING AND WATER - GO TO DECON PAD - FINISH DECON.

1630 GO TO SUMW 12 TOWARD T03 - RIG WONT START WHILE GOING THRU GATE TO T03

1705 RIG STILL DOWN - (STARTER)

1730 SET UP OVER 12MWT03 - HIT ROCK SHALLOW = 2.5 REFUSAL. AUGERED TO 9' - SET TEMP CASING.

1820 START CORING RUN (1)

1920 DONE CORING RUN (3)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conte DATE 8/31/04

WITNESS DATE

TITLE NSWC CRANE PROJECT N6878
TUES CONT. 2004 BOOK 2576

Work continued from Page

1925 - START REAMING w/ 5½" BIT. TO 26

2015 - PULL RODS - SET WELL 15-25 SAND 12 TO 26, CHIPS TO 3'.

2030 - MOVE TO T29 - JIM, CHAD & JOSH TAKE TOOL TRAILER TO DECON PAD, THEN GO AFTER CASING AT OUR FIELD OFFICE

2100 AT DECON PAD - DECON - HOOK UP TO LIGHTS ETC. STEAM CLEAN CASING AND TOOLS

2200 OVER AT T29 SET UP LIGHTS MOVE RIG INTO POSITION - ALL THIS TAKES TIME AT NIGHT.

QUANT TUES

	Drill Cont	Temp Cas	Core Ream	2" Well	Drill No Samples	Ream No Core	Perm Cas
12MWT03	9.5	9.5	16.5	25	—	—	—
12MWT29	—	9.5			9.5	30	40 ~~34.5~~
12MWT33		10.5			10.5	~~25.5~~ 35	
12MWT32	—	—			—	—	

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conte DATE 8/31/04

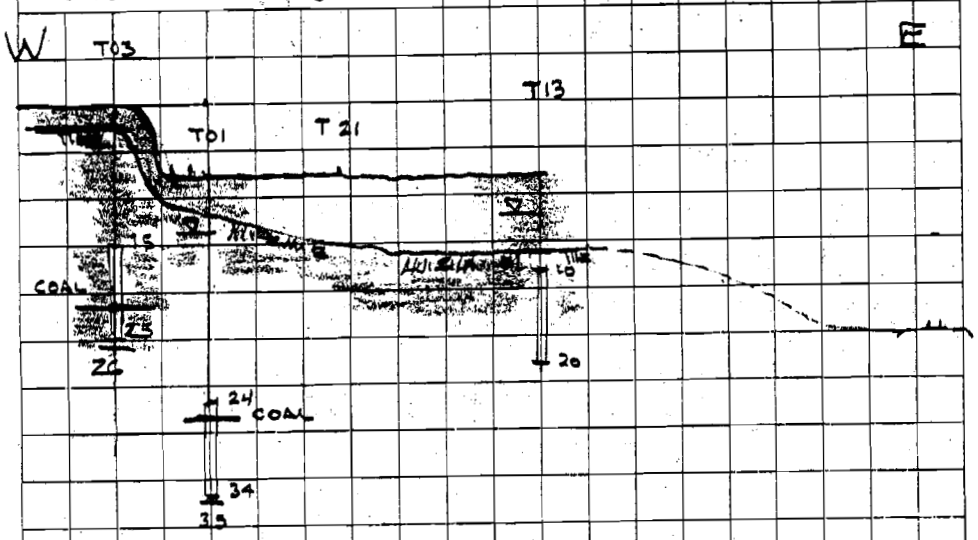
WITNESS DATE

TITLE NSWC CRANE 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte

DATE 9/1/04

WITNESS

DATE

TITLE NSWC CRANE TUES CONT 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

2300 READY TO AUGER (6¼" Φ) TO MAKE HOLE FOR 8" CASING.

2320 8" SET AT ≈ 9' – START 8" ROT

0030 DOWN TO ≈ 39.5 W/ 8" BIT PULL TOOLS – PROCEED TO SET 6" PERM STEEL CASING.

0100 CASING @ ≈ 39.5 BGS – BEGIN TO MIX CEMENT / BENTONITE GROUT.

0130 CASING GROUTED IN PLACE – CLEAN UP – SHUT DOWN LIGHTS GO TO DECON PAD

0230 CHIP HAS HIS CREW STOP AT 89' FOR TONITE WILL SEE IF IT MAKES WATER OVERNITE.

0245 LV SITE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte

DATE 9/1/04

WITNESS

DATE

TI: NSWC CRANE PROJECT NO. N687

WED SEPT 1 2004 BOOK 2576

Work continued from Page

AT SITE: STC JW, JD, CM } B/M

AM: —

PM: SUNNY, WARM

1230 TALKED TO J. SCHUBERT — TOLD HIM T31 IS DRY SO FAR - I WANTED TO KNOW HOW TO APPROACH T32, WHICH IS NOW 89'. HE SAID THAT THE LIMESTONE IS ~120' DEEP AND THAT OUR WELLS SHOULD NOT GO MUCH DEEPER THAN 100 OR 110 FT. WOULD LIKE TO BOTTOM OUT IN SHALE IF POSSIBLE - IDEALLY WE WOULD LIKE TO HIT WATER JUST BELOW THE 2ND THICKER SHALE UNIT. IF WE DONT HAVE WATER AT T32 WHEN WE GO OUT WE SHOULD GO 10 OR 15 MORE FEET AND AS PER JS - SCREEN IT (20')

1430 AT SITE - CALIB PID - LOAD VAN DRS - TAILGATE MTG.

1500 DRILLERS GET WATER - GO DECON

1615 ENTER SWMU 12.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte DATE 9-1-04

WITNESS DATE

TITLE NSWC CRANE PROJECT N6878

WED CONT. 2004 BOOK 2576

Work continued from Page

1630 PULL RIG ONTO T42 - WILL INSTALL THIS WELL - NO SAMPLES - NO CORING AS WE CANT GET ANY LIGHTS TO THIS AREA - WILL DO IT DURING DAYLIGHT IF WE SAMPLE & CORE IT WE WONT HAVE ENOUGH DAYLITE.

1655 BACKING IN COMPRESSOR NOW.

1710 START AUGERING - HIT WEATH ROCK ≈ 2.5' SET TEMP CAS TO 9.5. REAM TO 29' - NOT MUCH WATER OBSERVED DECIDE TO SET 15' SCREEN FROM 28 TO 13, SAND TO 11, CHIP TO 3'.

1850 SETTING WELL NOW AS DES. ABOVE.

QUANT (WED)

		DRILL CONT	TEMP CAS	CORE REAM	2" WELL	DRILL NO SAMP	REAM NO CORE	PERM CAS
(ATV)	12MWT42	—	9.5	—	28	9.5	19.5	—
	12MWT05	9.5	9.5	10.5			~~10.5~~	
(Track)	12MWT32	—	—	—	99	—	~~59.5~~	—
	12MWT20		11		25	11	~~15~~	
	~~12MWT33~~		30		152			

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 9/1/04

WITNESS DATE

TITLE NSWC CRANE WED SEPT 1 2004 **PROJECT NO.** N6878 **BOOK** 2576

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1905 [WL AT T42 ≈ 25 BGS]

1910 SETTING ATV UP A 12MWT05.

1930 MOVE LIGHTS INTO POSITION

2000 GO TO DECON PAD

2100 START AT T05 HIT ROCK ≈ 5.5 TO 9'- AUGER TO 9.5' SET 6" CAS TEMP TO 9.5

2130 PREPARE TO CORE (NX)

2145 CORE RUN (1) DONE

2230 APPARENTLY THE WATER SWIVEL SEAL HAS BROKEN - CANT GET AIR THRU THE RODS TO DRILL WITH - CANNOT GET IN TOUCH WITH ANYONE - DURING THE LATENESS OF THE HOUR. JIM IS TRYING TO DETERMINE HIS OPTIONS.

2300 CANNOT DRILL WILL GO HELP OTHER CREW.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte. DATE 9/1/04

WITNESS DATE

TITLE NSWC CRANE WED/THURS. 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

2330 RESUMP CORING - BELOW THE CASING AT 40' - USED JIM W CORE BARREL SO THAT NOW WE ARE USING 2 CORE BARRELS

0100 MAKING 10' RUNS W/ TRUCK RIG AT T33.

0300 DOWN TO 94' - WILL SET WELL DURING THURS NITE SHIFT.

0330 W SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte DATE 8-2-04

WITNESS DATE

TIT NSWC CRANE PROJECT NO. N6878

THURS AUG 2 2004 BOOK 2576

Work continued from Page AT SITE: SJC JD B/M JW

AM: —

PM: CLOUDY WARM.

1400 AT SITE - CALIB PID - LOAD VAN

1500 DRILLERS ARR GET WATER - GO OVER DARS - TAILGATE MTG.

1530 JIM W SAYS THAT HE CANT GET THE PARTS TO FIX HIS RIG UNTIL NEXT SHIFT SO HIS RIG WILL BE DOWN TODAY - HE WILL DECON AND CLEAN UP AT T05 AND HELP THE TRUCK RIG WHEN NEEDED

1630 CALLED RALPH - GAVE HIM OUR PROGRESS AND SCH FOR NEXT SHIFT

1730 AT SWMU 12 - JIM'S CREW DECON

1915 JIM CLEANS UP AT T05 WILL LV RIG THERE TILL NEXT SHIFT - WILL TAKE 1 SET OF LIGHTS TO FIELD OFFICE AND WILL BE PICKED UP ON FRIDAY. ONE SET WILL STAY TILL

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 9-2-04

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

THURS (CONT) 2004 BOOK 2576

Work continued from Page

NEXT SHIFT (B/M) WILL NOT CHARGE US FOR THEM UNTILL THEY ARE USED AGAIN

2000 KEN B AND CREW WORK AT T33, T27 CLUSTER.

2100 DONE AT T33, T27 - SEE CHIP L. NOTES

2130 BEGINS TO STORM.

2200 AT SITE OFFICE - CLEAN UP

QUANT (THUR)

TRUCK	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	DRILL NO SAMPL	REAM NO CORE	PERM CAS
12mw T33			53.5	94		5.5	
12mw T27		11		25	11	15	
				119		20.5	

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 9/2/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

WED SEPT 8 2004 **BOOK** 2576

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AT SITE: STC JW, JD } B/M, TW

AM: CLOUDY WARM

PM: " " BREEZY.

TRAVEL DAY TO SITE. (PGH TO INDY)

1500 ARRIVE AT SITE - GET PASS - GO TO BLDG 3245. LOAD VAN CALIB. PID - TAILGATE.

1600 - B/M TO DECON PAD - PICK UP SUPPLIES

1630 - GO INTO SWMU 12 - REPAIR WATER SWIVEL RESUME CORING FROM 20' AT 12MWT05

1715 DONE WX CORING AT 25' - (RUN 3)

1720 BEGIN TO REAM W/ 5½ BIT USING AIR ROTARY METHOD.

PULL TOOL AND PROCEED TO SET WELL.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conte DATE 9/8/04

WITNESS DATE

TITLE NSWC CRANE WED (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

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1800 SET WELL 14 TO 24, SAND 11 TO 25 - CHIPS TO 3'

1830 CLEAN UP MOVE RIG & EQUIP TO DECON AREA.

1930 LV SITE

QUANT. WED

	CORE REAM	2" WELL
12MWT05 CORE 20-25	5'	24'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 9-8-04

WITNESS DATE

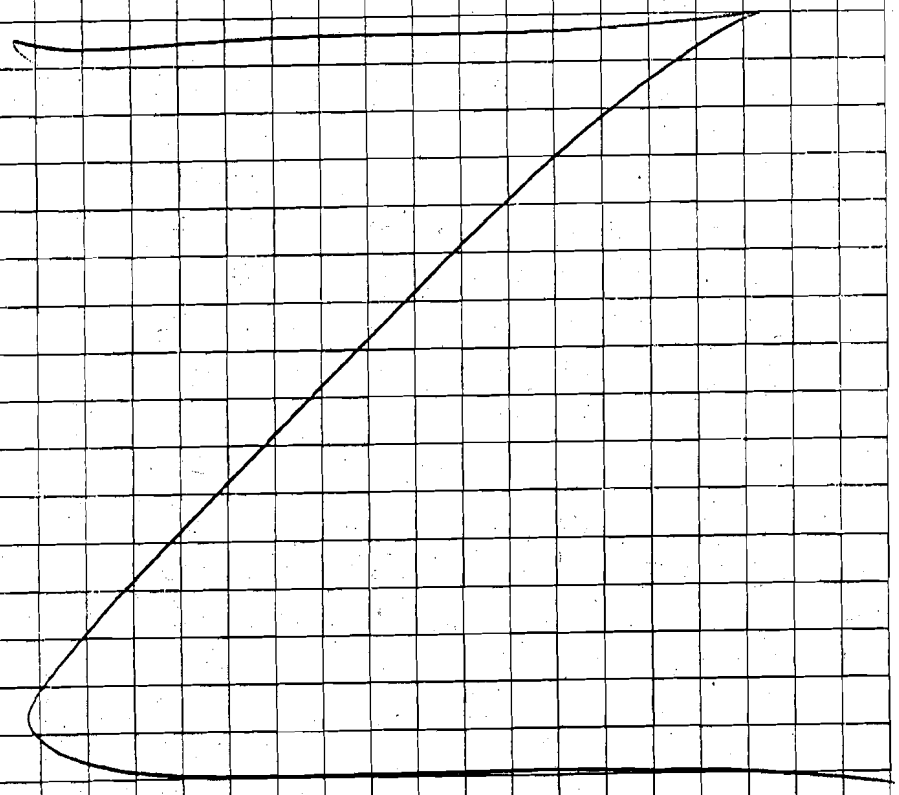
TIT NSWC CRANE PROJECT NO. N687
THUR SEPT 9 2004 BOOK 2576

Work continued from Page AT SITE: SJC TUNOS JW JD TW B/M

AM: CLOUDY COOL.
PM: ———

SEE NB 2577

SWMU 16



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 9/9/04.
WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878
FRI SEPT 10 2004 BOOK 2576

Work continued from Page AT SITE: SJC JW JD TW B/M

AM SUNNY, COOL TO WARM.
PM: " WARM HI 70° → LO 80° F

0630 AT SITE - CALIB PID - LOAD VAN

0700 DRILLERS ARR - GET WATER - DO DARS
CONDUCT TAILGATE MTG.

0800 GO TO DECON PAD GET RIG, ETC. GO
TO SWMU 12 (T29)

0830 SET UP ON T29 (Resume Drilling)
CLEAN OUT CASING W/ ROLLER BIT

0840 BEGIN NX CORING AT 40'

1000 GOING FOR RUN (3) 59 → 69.

1115 RUN (4) 69-79 DONE.

1200 WAIT FOR WATER - ≈ 1' IN HOLE

1235 RUN (5) 79 → 89 STARTED

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 9/9/04
WITNESS DATE

TITLE NSWC CRANE FRI (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

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1300 RUN (5) DONE 79-89.

1330 BEGIN TO REAM TO 89'

1440 DONE REAMING TO 89 - PULL RODS INSTALL WELL (T29) SCREEN 70 TO 88 - SAND 68 TO 89 CHIPS TO 58. WILL GROUT LATER

1500 WELL INSTALLED - MOVE TO 12MWT04 SET RIG UP. WILL INSTALL WELL NO SAMPLING/ NO CORING. JOSH WENT TO DECON SOME AUGERS AND RODS

1530 DONE DECON - PROCEED TO AUGER AT T04 FOR SETING TEMP CAS.

1545 AUGER TO 9.5 SET CASING AT 9.5 (TEMP)

1600 BEGIN TO REAM HOLE TO 25' WITH 5 1/2" ROLLER BIT (AIR ROT)

1630 DOWN AT 25' - PULLING TOOLS

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S J Conti DATE 9-10-04

WITNESS DATE

TITLE NSWC CRANE FRI (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

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1640 SETING WELL T04 - 14 TO 24, SAND 11 TO 25', CHIPS TO 3'.

1705 BEGIN TO CLEAN UP AROUND T04 T29 LOCATIONS.

1800 GO TO DECON PAD, THEN SET UP RIG AT 12MWT22

1900 LU SITE.

200 SEND RALPH B & VALERIE P VIA E-MAIL - EST OF B/M INVOICES.

QUANT (FRI)

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	DRILL NO SAMPS	REAM NO CORE
12MWT29	—	—	49'	88	—	—
(40 → 89)	—	—	—	—	—	—
12MWT04	—	9.5	—	24	9.5	15.5

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S J Conti DATE 9/10/04

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TITLE NSWC CRANE PROJECT NO. N6878

SAT SEPT 11 2004 BOOK 2576

Work continued from Page

AT SITE: SJC (T&NS) JW, JD, TW } B/M

AM: SUNNY, WARM

PM: SUNNY, V. WARM TO PLTY CLDY.

0630 AT SITE - CALIB PID - LOAD VAN.

0700 DRILLERS ARRIVE - GET WATER - GO OVER DARS - TAILGATE MTG.

0730 DECON A FEW TOOLS, RODS ETC

0800 MOVE TO 12MWT22

0833 DONE SPOON SAMPLING. WT BR ≈ 7'± WILL SET TEMP CAS TO ≈ 9.5

1010 DONE WX CORING @ 1010 (RUN 3) TO 25

1025 START REAMING WITH 5½" BIT

1045 DONE REAMING / PULLING RODS.

1100 SET WELL 14 TO 24, SAND 11 TO 25 CHIPS TO 3'.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJConte DATE 9/11/04

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TITLE NSWC CRANE PROJECT . N6878

SAT (CONT) 2004 BOOK 2576

Work continued from Page

1200 DECON AUGERS, TOOLS, RODS ETC.

1245 AT 12MWT38 - FUELING UP COMPRESSOR.

1305 START 2" SPOON SAMPLING AT T38 TOP ≈ 6.2' (REFUSAL) AUGER TO 9.5 SET TEMP CAS TO 9.5.

1335 START CORING RUN (1) 9.5' → 15'

1435 DONE W/ RUN (2) 15-25 PULL CORE

1445 START TO REAM W/ 5½" Φ

1530 SETTING WELL 14-24, SAND 11 TO 26, CHIPS-3'

QUANT (SAT)

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL
12MWT22	9.5	9.5	15.5	24
12MWT38	9.5	9.5	15.5	24
12MWT21	9.5	9.5		

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJConte DATE 9-11-04

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TITLE NSWC CRANE **PROJECT NO.** N6878

SAT (CONT) 2004 **BOOK** 2576

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1600 GO DECON TOOLS, ETC.

1635 BACK AT 12MWT21

1700 DOWN TO ≈ 9.5 W/ HSA.

1730 CASING (TEMP) SET @ 9.5

1800 SET CORING TOOLS INTO HOLE.

1830 CLEAN UP - WILL COMPLETE ON SUN

1900 LV. SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJConte DATE 9-11-04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN SEPT 12 2004 **BOOK** 2576

Work continued from Page AT SITE SJC JW, JD, TW } B/M

AM: SUNNY COOL TO WARM

PM:

0630 AT SITE - CALIB PID - LOAD VAN.

0700 DRILLERS GET WATER - GO OVER DARS TAILGATE MEETING.

0730 GO TO SWMU 12 - RESUME AT T21

0750 BEGIN CORING (NX) RUN (1) 9.5 → 15

0825 " RUN (2) 15 → 25

0930 SETTING WELL T21 - SCREEN 14-24, SAND 11 TO 25, CHIPS TO 3'.

1000 MOVE TO 12MWT25 - THEN TO DECON.

1040 START SAMPLING AT T25 - HT TOR ≈ 7'. SET TEMP 6" CAS TO 9.5 ±

1105 CASING SET - PROCEED TO BEGIN NX CORE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 9-12-04

WITNESS DATE

TIT. NSWC CRANE PROJECT NO. N687
SUN (CONT) 2004 BOOK 2576

Work continued from Page

1210 DONE CORING RUN (2) 15-25. WAIT FOR HOLE TO MAKE SOME WATER

1300 ≈ 1' H_2O IN HOLE – DECIDE TO REAM TO 26, SET WELL AT 25' – 15

1330 PULLING RODS AFTER REAMING TO 26'

1345 SET WELL (2"Φ) PVC – SCREEN 15-25 SAND 10 TO 26, CHIPS TO 3' ±.

1405 MOVE TO T26 – TOOK PHOTO LOOKING WSW AT PREVIOUS DAMAGE DONE BY OTHERS (BACKHOE, I THINK) B/M DID NOT MAKE THESE RUTS.

1410 PULLED ATV OVER LOCATION T26 WENT TO DECON TOOLS ETC.

1430 START SAMPLING HIT ROCK (REFUSAL) AT ± 8'. SET TEMP GAS TO 9.5

1450 START RUN (1) 9.5 → 15.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conti DATE 9-12-04

WITNESS DATE

TITLE NSWC CRANE PROJECT N6878
SUN (CONT) 2004 BOOK 2576

Work continued from Page

1515 DONE WITH RUN (1)

DONE WITH RUN (2) 15-25'

1630 DONE REAMING TO 25' – PULL RODS

1700 SET WELL SCREEN 14 TO 24, SAND 11 TO 25, CHIPS TO 3'

1800 CLEAN UP AROUND T26 – TAKE EQ. TO DECON PAD.

1900 LV SITE.

QUANT SUN

	DRILL CONT	TEMP GAS	CORE REAM	2" WELL
12MWT21	—	—	15.5	24
12MWT25	9.5	9.5	16.5	25
12MWT26	9.5	9.5	15.5	24
	19	19	47.5	73

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conti DATE 9-12-04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

MON SEPT 13, 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC JW, JD, TW } B/M

AM: SUNNY WARM
PM: " HOT

0630 - PROCEED TO WRITE UP REQUEST FOR SLUG TEST EQUIP. - MADE RESERVATIONS FOR NEXT SHIFT

0800 CALLED TOM PATTON TO LET HIM KNOW I WAS SENDING HIM A EQ REQUEST

0900 AT SITE - BOWSER/MOPNER CLEANUP AT DECON PAD - DECON RIG ETC. SJC HELP TR GET COOLERS READY ETC FOR SHIPPING -

1100 STILL CLEAN UP AT DECON PAD.

1300 RIG LOADED ONTO FLATBED MOVE EQUIP TO FIELD OFFICE -

1500 GO TO SWMU 16 TO REPAIR FLUSH MOUNT

1615 FUSHMT PAD CUT WILL POUR ON TUES GO HELP TR PACK SAMPLES.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S. Conta DATE 9-13-04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

TUES SEPT 14, 2004 **BOOK** 2576

Work continued from Page AT SITE SJC JW, JD, TW } B/M

AM: CLOUDY WARM
PM: CLOUDY, WARM

0650 AT SITE - TR PREPARES FOR SAMPLING.

0730 B/M ARRIVE - GO TO SWMU 16 - PREPARE FLUSH MOUNT AND T21 FOR PADS.

0930 AT SITE OFFICE - PREPARE COOLERS FOR SAMPLE PREP. CLEAN UP FIELD OFFICE

1030 FINISH TAKING PHOTOS OF CORE BOXES THAT CHIP HAD COLLECTED AND HAD NOT TAKEN PHOTOS -

1130 WAITING FOR CONCRETE TRUCK TO ARRIVE.

(2) [16MWT21, FLUSH MT @ 16] (16) SWMU
(4) SWMU [13MWT5], 50, 49, 48 (13) SWMU
(12) 12MWT10, T40, T39, T23, T24, T24A
(7) T34 - WORKED ON THESE PADS, WHIC ARE NOW POURED 12 STICK UPS +
(13) 1 REPAIR FM @ SWMU 16. END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S. Conta DATE 9-14-04

WITNESS DATE

TI : NSWC CRANE PROJECT NO. N687
TUES SEPT 21 2004 BOOK 2576

Work continued from Page AT SITE: SJC

AM: SUNNY, COOL TO WARM
PM: " WARM

TRAVEL DAY TO CRANE - TR REQUESTS ME TO PICK UP THE DRY ICE.

1330 PICK UP DRY ICE AT PAIN INC. HAD DELAY DUE TO TRYING TO FIND OUT IF IT WAS PAID FOR - WHICH IT WAS

1400 LV PAIN.

1500 ARR AT SITE - DROP OFF DRY ICE LOAD VAN, ETC

1600 CHECK OUT SLUG TEST EQUIP THAT WAS ORDERED.

1700 TAKE 1 PACKAGE TO FED EX

1800 PICK UP SOME SUPPLIES

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 9/21/04
WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878
WED SEPT 22 2004 BOOK 2576

Work continued from Page AT SITE: SJC, TR.

AM: SUNNY WARM.
PM: " WARMER - LO 80s

0650 AT SITE - LOAD VAN - CALIB. YSI PROBES - CLEAN UP EQUIP.

0830 GO TO SWMU 12 BEGIN DEV. DEV WELLS 12MWT 33 SJC/TR
12MWT 27 " "
12MWT 14 SJC
12MWT 19 SJC
12MWT 10 SJC

1700 AT WELL 12 MWT 10 - USING WHALE PUMP.

1800 LV SWMU 12 - GO CLEAN UP.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 9/22/04
WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878
THUR SEPT 23 2004 **BOOK** 2576

Work continued from Page AT SITE SJC, TR, JG.

AM: SUNNY COOL TO WARM
PM: SUNNY WARM TO V. WARM.

0630 AT SITE - CALIB YSI PROBE, CLEAN OFF PUMPS (WHALE PUMPS)

0800 PROCEED TO SWMU 12 TO RESUME DEVELOPMENT.

DEV WELL	12MWT31	TR/SJC
	12MWT04	SJC
	12MWT40	SJC
	12MWT22	SJC
	12MWT38	SJC

1530 B/M ARRIVE - GO TO SWMU 12 - FORM PADS

1600 SJC FINISHES DEV @ T38 THEN WORK W/ B/M ON PADS

1900 LV SITE - B/M WORKED ON ~ 11 PADS WILL RESUME IN MORNING. (NO QUANT TODAY FOR B/M)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 9/23/04
WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878
FRI SEPT 24 2004 **BOOK** 2576

Work continued from Page AT SITE SJC/TR JW, JD, TW, CM } B/M

0650 AT SITE - CALIB YSI

0715 B/M ARRIVE - GET FORMS READY. JOSH WENT TO SITE 16 TO STRIP SOME FORMS THERE.

0815 SJC & B/M GO INTO SWMU 12 - B/M WILL RESUME PADS - SJC/TR WILL DEV T32. DEV WELLS T32, T29 BY NOON

1230 START POURING PADS; START WITH T26:

T26	T18
T25	T19
T28	T32
T33	T20
T27	T16
T11	T17
T12	T37
T13	T08
T14	
T31	
T15	
T35	

FRI QUANT

20 - PADS

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 9/24/04
WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

SAT SEPT 25 2004 BOOK 2576

Work continued from Page AT SITE SJC

JW, JD, CM, TW } B/M

AM: CLOUDY COOL
PM: PARTLY CLDY WARM

0630 AT SITE: WORK ON DARS FOR BOTH SWMU'S.

0705 B/M ARRIVE - PROCEED TO SWMU 12 TO PREP PADS. PREP PADS UNTIL ≈ 0930 HRS - WAIT FOR CONC TRUCK.

1030 CONC ARRIVES - START AT 12MWT01

	T01	T38	7
T21	~~T21~~	T06	20
	T42	T07	15
	T03	T09	42 TOTAL @ SWMU 12
	T04	T30	
	T29	T22	
	T05	T36	
	T02		

1300 DONE POURING PADS AT SWMU 12. QUANT = 15 PADS

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 9/25/04

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

SUN SEPT 26 2004 BOOK 2576

Work continued from Page AT SITE SJC

JW, JD, CM, TW } B/M

AM: SUNNY, COOL → WARM
PM: " WARM

0645 AT SITE - COMPLETE DAR'S

0715 DRIVERS ARRIVE: GET WATER - GO OVER DARS.

PROCEED TO SWMU 12 TO WORK ON PADS PAINTING, RAKING, CLEAN UP.

1350 STILL WORKING ON PADS, STRIPPING FORMS, PAINTING, GENERAL CLEANUP AROUND PADS. ALSO PAINTED AT WELLS AT SWMU 16 (T21) AND THE 4 AT SWMU 13.

1600 STILL WORKING ON PADS - STRIPPING FORMS PAINTING, FILLING POSTS W/ CONCRETE AND GENERAL CLEANUP

1930 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 9/26/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

MON SEPT 27 2004 **BOOK** 2576

Work continued from Page AT SITE SJC, TR, JG

AM: SUNNY COOL → WARM
PM: " WARM.

0650 AT SITE CALIB YSI – LOAD VAN.

0900 AT 12MWT15 – SET UP TO SAMPLE.

0920 START TO PURGE USING PERISTALTIC

1320 START TO SAMPLE 12MWT15

1440 GO TO 12MWT 20 START TO PURGE.

1600 SAMPLE TIME FOR 12MWT 20 – SEE SAMPLE LOG SHEETS

1720 RETURN TO FIELD OFFICE – PLACE SAMPLES FROM T20 INTO FRIDGE – CLEAN OUT VAN – COMPLETE SLS, ETC AND EMPTY PURGE WATER STC SAMPLED 2 WELLS TODAY

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 9/27/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

TUES SEPT 28 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC, TR, JG.

AM: SUNNY COOL TO WARM
PM: " WARM – V. WINDY

0630 AT SITE – CALIB YSI METERS LOAD VAN

0830 GO TO SWMU 12 SET UP AT T04

0900 BEGIN TO PURGE

1040 SAMPLE TIME FOR 12GWT0401 TOOK MS/MSD ALSO

1340 DONE SAMPLING – TOOK ≈ 3HRS TO FILL 18 CONTAINERS.

1400 GO TO T32 – SET BLADDER PUMP IN WELL FOR JIM G. – SET AT ≈ 1' FROM BOTM.

1515 AT T37 – TRY TO GET ENOUGH SAMPLE FOR NITRATE/NITRITE.

1900 PACKAGE, SHIP SAMPLES

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 9/28/04

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N68
WED SEPT 29 2004 BOOK 2576

Work continued from Page AT SITE TR/SJC

AM: CLEAR, COOL
PM:

0630 AT SITE - CALIB YSI & TURBIDITY METER - GO TO SWMU 16 TO DEV T-21

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJCorta DATE 9/29/04
WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878
SATURDAY OCT 9 2004 BOOK 2576

Work continued from Page AT SITE STC, JG.

AM: CLOUDY - DRIZZLE COOL
PM: " WARM.

0630 AT SITE - CHANGE OVER FROM SW/SD SAMPLING TO GW SAMPLING AT SWMU 12 - DUE TO SOME PRELIM DATA FROM THE WELLS, THE OFFICE WOULD LIKE US TO COMPLETE THE GW (4WELLS) SAMPLING AT SWMU 12 INITIALLY WE WERE TO CONCENTRATE ON SW/SD SAMPLING.

0730 CALIB INSTRUMENTS ETC. LOAD VAN W/ GW SAMPLING EQUIP.

1034 SAMPLED 12GWT21 01

1300 " 12GWT38 01

SET UP ON 12GWT25, AND 22, BOTH WERE PURGED DRY, WILL SAMPLE ON SUNDAY.

1880 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJCorta DATE 10/9/04
WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUNDAY OCT 10 2004 **BOOK** 2576

Work continued from Page AT SITE SJC/JG

AM: SUNNY, COOL
PM: ——

0630 AT SITE - WRITE UP NOTES FROM SAT. CALIBRATE INSTRUMENTS GET BOTTLE SETS READY.

0830 SAMPLE 12GWT2501

0840 " 12GWT2201

1030 AT FIELD OFFICE - CHANGE OVER TO SW/SD SAMPLING AT SWMU 16 SEE NB 2577 FOR DETAILS OF THIS AM SAMPLING OF SW/SD.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 10/10/04

WITNESS DATE

1

TITLE NSWC CRANE **PROJECT NO.** N6878

MON OCT 11 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC / JG

AM: PARTLY CLDY, COOL
PM: " " WARMER

0630 AT SITE - PREPARE FOR SWMU 12 SW/SD GET PAPERWORK READY, JARS ETC. CALIB INSTRUMENTS

0815 HEAD FOR LOC 27. ROAD CLOSED WORKING ON RR - WAS ABLE TO PASS

0830 GATE AT ACCESS TO 27 LOCKED WILL HAVE TO COME BACK

0920 Sample [redacted] 12SW2501 DO MS/MSD
0950 " [redacted] 12SD250004

SPENT TIME HERE W LABELS AND MS/MSD -

1110 Sample [redacted] 12SD260004 (NO SW)

1130 " [redacted] 12SD240004 (NO SW)

1320 " [redacted] 12SD100004 (NO SW)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 10/11/04

WITNESS DATE

TI : NSWC CRANE PROJECT NO. N68
MON OCT 11 2004 BOOK 2576

Work continued from Page

1410 Sample [redacted] 12SD080004 (NO SW)

1425 " [redacted] 12SD090004 (NO SW)

1445 " [redacted] 12SD070004 (NO SW) MS/MSD + DUP.

7 LOCATIONS
7 SEDIMENT
1 SW

1600 RETURN TO FIELD OFFICE. TR GETTING SAMPLES READY FOR SHIPMENT

1800. LV SITE - SJC TALKED TO RB AND JS REGARDING PLACEMENT OF WELLS BASED ON RECENT LAB RESULTS OF GW. THEY WILL SEND A REVISED MAP SHOWING LOCATIONS.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/11/04

WITNESS DATE

TITLE NSWC CRANE PROJE. NO. N6878
TUES OCT 12 2004 BOOK 2576

Work continued from Page AT SITE: SJC JG TR

AM: CLOUDY, COOL, LIGHT RAIN, THEN CLEARS
PM: " WARM UT RAIN ≈ 1900 → 1930

0630 AT SITE - PREPARE FOR SW/SD SAMPLING AT SWMU 12 (RESUME) GET BOTTLE

0800 GO TO SITE 16 TO GET THE DISSOLVED METALS AT LOC 24 & 25.

0900 CHECK IN W/ GAURD TO LOC 27 AND 11.

0920 Sample 12SW2701 + F (DISS)
0930 " [redacted] 12SDJ70004

1020 Sample [redacted] 12SW1101 + F (DISS)
1030 " [redacted] 12SD110004

1100 AT FIELD OFFICE JG - FILTERS METALS, SJC MAPS OUT LOCATION TO SW/SD LOCATIONS 21, 22 & 19. STORE SAMPLES COLLECTED TODAY IN FRIDGE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/12/04

WITNESS DATE

TITLE NSWC CRANE TUES (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

1330 Sample [redacted] 12SD220004 (NO SW)

1340 " [redacted] 12SD210004 (NO SW)

1400 " [redacted] 12SD190004 (NO SW)

5 LOCATIONS - 2 SW
5 SD

1550 AT SITE OFFICE, LABEL JARS FILL OUT COCs - GET BOTTLE SETS FOR WED.

1800 LU SITE

Work continued to Page

SIGNATURE SJ Conti DATE 10/12/04

WITNESS DATE

TITLE NSWC CRANE WED OCT 13 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page AT SITE: SJC, TR, JG

AM: CLOUDY - DRIZZLE - COOL - FOG.
PM: CLOUDY - WARMER LT DRIZZLE STOPS IN MID AFT

0630 AT SITE. PREPARE FOR SW/SD CALIB INSTRUMENTS - BOTTLE SETS

0800 HEAD TO 12SW/SD 23 - DROVE ALONG EAST FENCE LINE AT DRMO, THEN WALKED U.S.

0900 Sample 12SW2301 + F
0910 " [redacted] 12SD230004

1030 Sample 12SW1201 + F
1040 [redacted] 12SD120004

1325 Sample [redacted] 12SD170004 (NO SW)

1345 " 12SW1601 + F
1355 " [redacted] 12SD160004

1425 Sample 12SW1301 + F
1440 [redacted] 12SD130004

Work continued to Page

SIGNATURE SJ Conti DATE 10/13/04

WITNESS DATE

TITL: NSWC CRANE PROJECT NO. N6878
WED OCT 13 (CONT) 2004 BOOK 2576

Work continued from Page

1515 RETURN TO VEHICLE - LABEL BOTTLES AND COMPLETE PAPER WORK. COC'S 0119 AND 0120 (SW) (SD)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 10/13/04

WITNESS DATE

TITLE NSWC CRANE PROJECT N6878
MON OCT 25 2004 BOOK 2576

Work continued from Page

AT SITE: SJC/TR

AM: SUNNY COOL (PA)
PM: " WARMER (IN.)

TRAVEL DAY TO NSWC CRANE

1300 ARRIVE ON SITE - GET PASSES ETC.

1400 LOAD VAN W/ EQUIP

1445 SJC/TR LAYOUT SG 11

1530 GET DIG PERMIT FROM DONNA ZOLLMAN

1540 AT FIELD OFFICE - DRIVERS HERE AWAITING SUPPLIES FROM GLOBAL.

1600 CONDUCT BRIEF H&S MEETING FOR THE RR CORRIDOR WORK.

1630 B/M UNLOADS SUPPLIES FROM GLOBAL

1730 FINISH LOADING VANS

1830 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 10/25/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

TUES OCT 26 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC/TR. TENUS

JW
JD
TW

AM: SUNNY, COOL → WARM
PM:

0630 AT SITE - CALIB PID - GET PAPERWORK READY.

0715 B/M ARRIVES - GET WATER - LOAD SUPPLIES

0800 GO TO DECON PAD - SET UP NEW PAD UNLOAD ATV FROM MACK TRUCK AND PERFORM INITIAL DECON - BRIEF TAILGATE MEETING.

0900 DONE WITH DECON, FINISHING LOADING UP - GO TO 12MWT44.

0950 TAKE S-1 0-2 (2" SPOON)

1055 HIT REFUSAL ≈ 18.6 - SANDY SHALE.

1120 WENT AFTER A 2ND PC OF 6" CASING

1145 DECON 2ND PC OF CASING RETURN TO THH.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 10/26/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

TUES (CONT) 2004 **BOOK** 2576

Work continued from Page

1215 PROCEED TO SET 2 SECTIONS OF 6" STEEL CASING TO 19.5

1300 RUN (1) STARTED (19.5 → 25) = 5.5

1330 " (2) START (25 → 30)

1400 DONE WITH RUN (2)

1430 STARTS TO RAIN. SJC LOGS IN RUN (2) - B/M GETS TRUCK STUCK.

1600 AT FIELD OFFICE

1830 SJC LUS SITE

[TUES 10/26/04]

ATV	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	CORE/REAM DEPTHS
12MWT44	19.5	19.5	10.5	—	19.5 → 30

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 10/26/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

WED OCT 27 2004 **BOOK** 2576

Work continued from Page

AT SITE: SJC/TR JW
JD
TW

AM: CLOUDY W/ FOG.

PM:

0630 AT SITE CALIB PID - START DARS

0705 B/M ARRIVE - GET WATER - LOAD VAN

0750 HEAD OUT TO 12MWT44

0840 RUN (3) 30-35 COMPLETE

0910 START REAMING WILL GO TO ≈ 35.5.

0930 SET WELL ≈ 25-35 - SAND, 20-35.5 PELLETS TO ≈ 6'

1040 MOVE - SET UP ON 12MWT41.

1125 REFUSAL AT ≈ 17.5' - AUGER TO 19.5, SET CASING.

1150 CASING SET. WENT AFTER MORE SUPPLIES AT 1220.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/27/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** 878

WED (CONT) 2004 **BOOK** 2576

Work continued from Page

1300 B/M CANNOT GET THEIR TRUCK BACK TO RIG - SJC TAKES SOME PELLETS AND WELL SCREEN & RISER BACK TO RIG

1345 PROCEED TO CORE RUN (1) 19.5 → 25

1530 DONE W/ RUN (3) 30-35

1540 BEGIN TO REAM T41 TO 5½" ϕ

1610 DONE REAMING / PULLING RODS

1620 SETING WELL 24 → 34, SAND 20 → 35 PELLETS TO ≈ 6'.

1700 START TAKING EQUIP OUT OF DRILL LOCATIONS. LV SITE ≈ 1830 HRS

WED

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	
12MWT44	—	—	6	35'	30-35
12MWT41	~~20 ≈ 16 19.5~~ 20 19.5		15	34'	20-35

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/27/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

THUR OCT 28 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC/TR JW, JD } B/M JW

AM: CLOUDY, COOL W/ FOG

PM: " WARMER W/ RAIN

0630 AT SITE - WRITE UP NOTES - CALIB PID. DO DAR'S

0700 B/M ARRIVES - GET WATER.

0800 GO OUT TO SITE NEAR DRMO TO GAIN ACCESS TO RR CORRIDOR.

0830 USE RADIO TO CONTACT DISPATCHER REQUESTED PERMISSION TO WALK THE HILL GOO LINE. GOT OK FROM BEN SHEEL (DISPATCHER) ALL LOCATIONS TO BE DRILLED LOOK "PRETTY GOOD" PER JIM W.

1000 DONE W/ WALK THROUGH - CALLED DISPATCHER - LET HIM KNOW WE WERE DONE WITH OUR WALK-THRU CONTACT HIM AGAIN WHEN WE WILL BRING EQUIP DOWN.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 10/28/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

THUR (CONT) 2004 **BOOK** 2576

Work continued from Page

1030 - B/M TO DECON PAD TO BEGIN LOADING ALL EQUIP ONTO RIG - PRIOR TO ACCESSING THE GOO RR HILL.

1200 CALL DISPATCHER - REQ PERMISSION TO TAKE EQUIP (RIG, COMPRESOR, PICKUP, UP THE CORRIDOR - REQ. 1 HR - OK PER DISPATCHER. PICKUP STRADLED RAILS TO BRING ADDL EQUIP THEN BACKS DOWN AND PARKS IT OFF THE TRACKS (1245)

1245 RIG SETS UP OVER HOLE 12MWT50 WILL WAIT UNTIL TODD RETURNS BEFORE CALLING DISPATCHER TO SAY WE ARE CLEAR

1303 CALLED DISPATCHER - SAID WE STARTED DRILLING AND ARE CLEAR OF TRACKS

1330 HIT REF @ 16' 1" AT T50 - WILL PULL AUGERS AND SET CASING @ ≈18.5

1400 CASING 6" Φ STEEL (TEMP IS SET)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 10/28/04

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

THURS 10/28 2004 BOOK 2576

Work continued from Page

1430 START RUN ①

1450 PULLED RUN ① FROM 18.5 → 25
NO REC - NOT SURE WHY ?

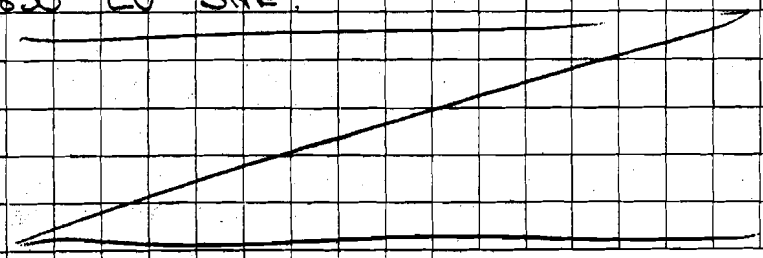
1530 RUN ② 25 → 30 5/5 (SHALY SILTSTONE)

1600 BEGINS TO RAIN - WILL STOP AT 30'
FOR TODAY - CALL DISPATCHER - INFORM
THAT WE WILL BE WALKING OUT OF
GOO HILL CORR. WILL CONTINUE ON
FRI - DISPATCHER ALSO SAYS NO ONE HERE
ON FRIDAY

1630 OUT OF RR ROW. GO TO DECON PAD
TO LOAD UP A FEW MORE ITEMS

1730 AT FIELD OFFICE - WRITE UP NOTES
AND FINISH UP DARS.

1830 LV SITE.



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

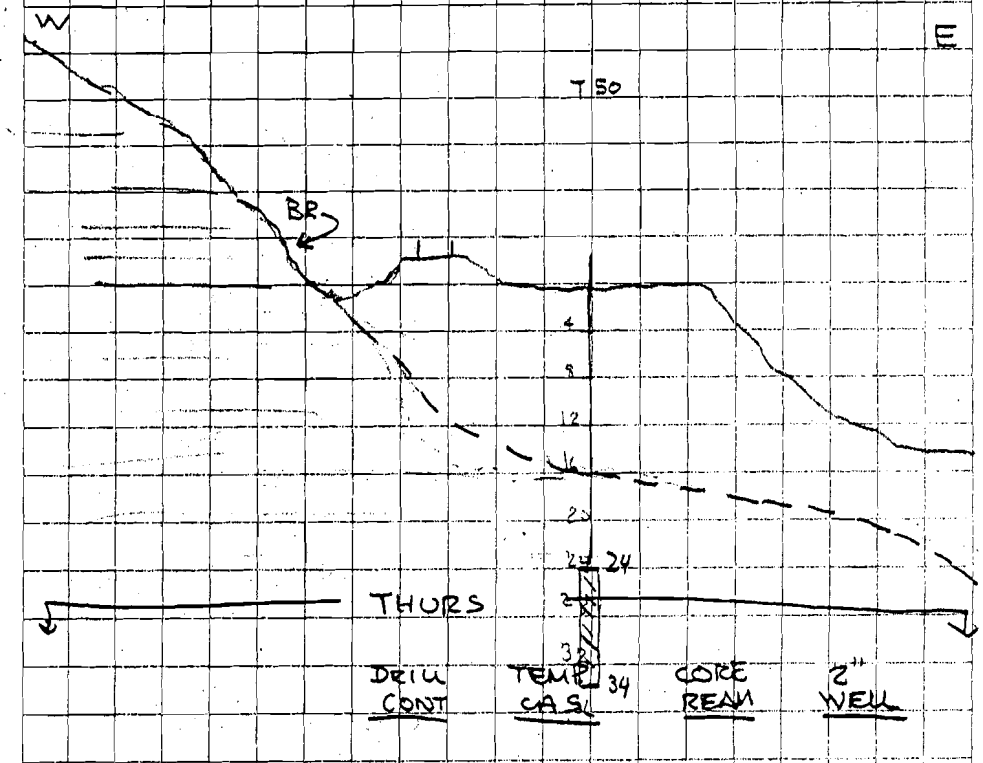
SIGNATURE SJ Conte DATE 10/28/04

WITNESS DATE

TITLE NSWC CRANE PROJECT I N6878

THURS CONT 2004 BOOK 2576

Work continued from Page



30.0
18.5 → 30
11.8

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 10/28/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

FRI OCT 29 2004 **BOOK** 2576

Work continued from Page

AT SITE. STC/TR JW, JD, TW } B/M

AM: CLOUDY WARM - LT RAIN

PM: " "

0630 AT SITE - ~~CALLS PID~~ SGC - PAPERWORK AT GATE

0715 GET NEW BASE PASS - OURS HAD EXPIRED. CALL SECURITY GAVE SCHEDULE

0730 AT SITE OFFICE - CALLS PID. DRILLERS GET WATER. LEFT MSG AT DISPATCHER *

0830 START CORING AT T50 30-35 RUN 3

0900 RUN 3 OUT

0930 START REAMING TO 5½" Φ

1000 DONE REAMING - PULL CASING - SET WELL 24 → 34, SAND 20 → 35, CHIPS TO ± 6'

1030 PULL REST OF CASING CLEAN UP

1100 USE "WORK HORSE GATOR" TO HAUL OUT

Work continued to Page

SIGNATURE SJ Conte DATE 10/29/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

FRI (CONT) 2004 **BOOK** 2576

Work continued from Page

EQUIP AND PERSONEL FOR DECON - MOVE RIG AND COMP AND TOOLS TO T45

DID NOT CALL DISPATCHER (NOT IN TODAY)

1200 GO TO DECON

1300 BACK AT T45 - APPARENTY SOMETHING IS WRONG WITH RIG'S CLUTCH.

1340 START SAMPLING W/ 2" SPOONS

1356 HIT ROCK ≈ 6.3' (REFUSAL) SET CASING (TEMP 6" ST) TO ≈ 9'.

1411 TEMP CAS SET - ADDED 1 BAG CHIPS FOR SEAL AT BOTM.

FRI 10/29/04

	DRIL CONT	TEMP CAS	CORE REAM	2" WELL	
12MWT 50	—	—	5'	34	
12MWT 45	9.5	9.5	15.5	24	9.5 → 25

* NO DISPATCHER ITO, SAT OR SUN ie NO TRAINS SHOULD BE RUNNING STC LVS MSSG.

Work continued to Page

SIGNATURE SJ Conte DATE 10/29/04

WITNESS DATE

TITLE NSWC CRANE FRI (CONT) 2004 PROJECT NO. N6878 BOOK 2576

Work continued from Page

1420 START CORING RUN ① FROM 9.5 → 15

1455 " RUN ② " 15 → 20

1540 DONE W/ RUN ③ 20 → 25

1600 APPROX 1' WATER IN HOLE, BUT IS MAKING WATER - CAN HEAR WATER ENTER BOREHOLE

1615 PROCEED TO REAM HOLE T45 W/ 5½" Φ ROTARY BIT (AIR ROTARY METHOD)

1645 DONE REMMING - PULL RODS SET 2" Φ WELL 14 - 24, SAND 10 → 25, CHIPS TO 3±. ALSO PULL TEMP CAS.

1730 CLEAN UP / PREPARE TO MOVE, SJC WALKS OUT OF SITE TO VEHICLE.

1830 LV SITE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/29/04

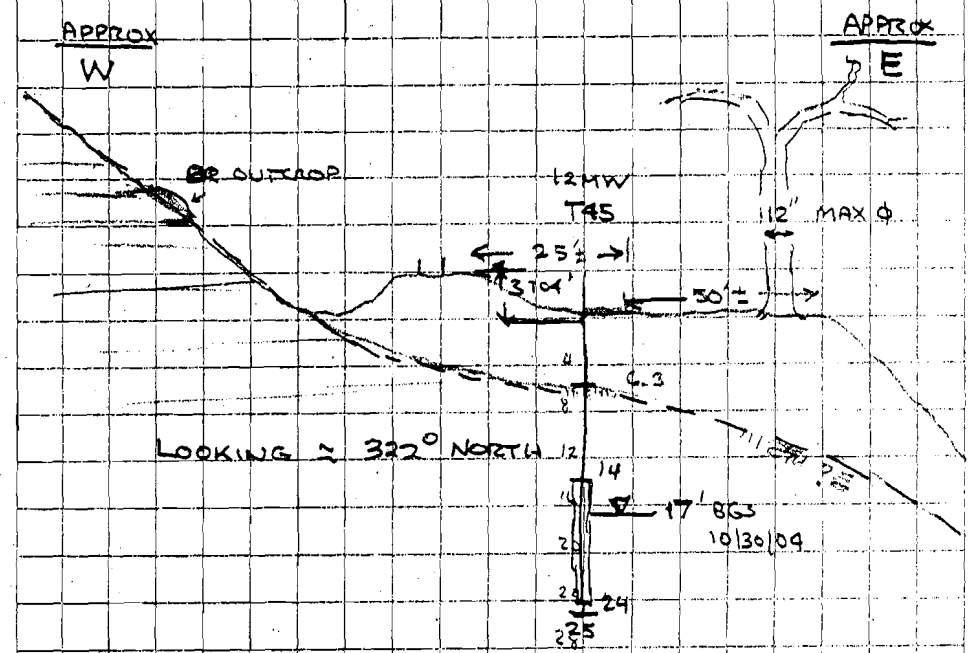
WITNESS DATE

TITLE NSWC CRANE FRI (CONT) 2004 PROJECT I N6878 BOOK 2576

Work continued from Page

12MWT45

GENERALIZED X SEC AT WELL LOCATION NTS



4 WELLS COMPLETE THIS SHIFT SO FAR:

T44	25 - 35
T41	24 - 34
T50	24 - 34
T45	14 - 24

= SCREEN DEPTHS (BGS)

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/29/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SAT OCT 30 2004 **BOOK** 2576

Work continued from Page

AT SITE: SJC/TR JW, TR, TW } B/M

AM: CLOUDY W/ RAIN TO SUNNY WARM

PM:

0630 AT SITE CALIB PID - GO OVER DARS

0700 B/M ARRIVE - GET WATER AND SUPPLIES THEN GO DECON

0830 SJC GOES TO LOAD UP VAN, ETC, CALLED DISPATCHER (RR) NOT IN LEFT MSSG, THEN CALLED SECURITY, TOLD THEM OUR SCHEDULE FOR TODAY.

0843 CALLED "INCHWORM ALPHA" NO ONE THERE - SAID IF ANYONE ON FREQ. THAT WE ARE WORKING ON THE 600 HILL RR. OVER.

0900 B/M HOOKS UP AND TAKES COMP TO T46 - THEN TOOK RIG OUT TO GET FUEL

1030 RIG BACK SETS UP OVER T46.

1130 START DRILLING AT T46 *

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

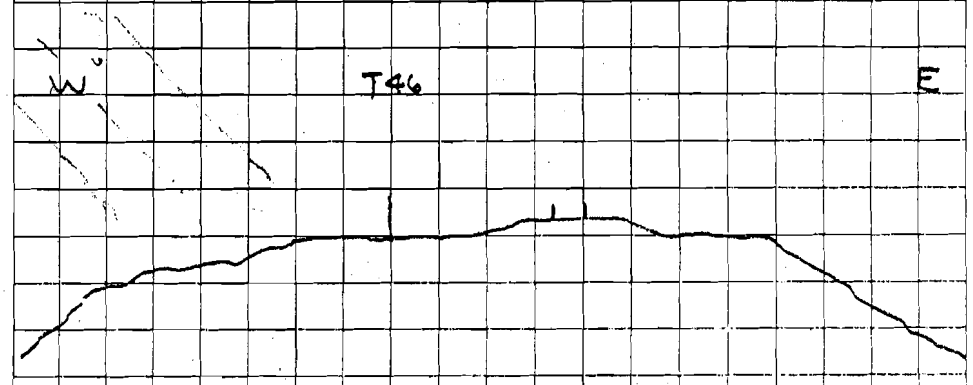
SIGNATURE SJConti DATE 10/30/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SAT (CONT) 2004 **BOOK** 2576

Work continued from Page



LOOKING 359° N

10/30/04

	DRILL CONT	TEMP CAS	CORE READ	2" WELL	ACCESS
12MWT46	10	10	15	24	3HR

* TOOK ≈ 3 HRS FOR SITE ACCESS ON SAT

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConti DATE 10/30/04

WITNESS DATE

TITLE NSWC CRANE SAT (CONT) 2004

PROJECT NO. N6878

BOOK 2576

Work continued from Page

1155 TOOK SAMPLE 10-12 - ROCK FRAGS JIM SET CASING @ ≈ 10' - WILL CORE (1) FROM 12 → 16

1220 RUN (1) OUT - POOR REC - WILL SEE IF WE CAN RECOVER IT DURING RUN (2)

1235 RUN (2) OUT. 16 → 21 - NO REC - WE MAY NOT BE IN ROCK AS YET THE EARLIER PC WE CORED MAY HAVE BEEN A BOULDER ? WILL TRY TO TAKE A SPOON SAMPLE NOW. 21 → 23 WAS CLAY AND WEATH SHALE 23 → 24.5 WEATH SHALE - REF @ 24.5 - RODS WERE WET ≈ 4' - TOOL WL MEAS WAS ≈ 23' BGS AT 1300 AT 1320 IT WAS ≈ 22' ≈ 3' WATER IS IN BOREHOLE - WILL SET AN O.B WELL HERE - IT LOOKS LIKE WE ARE DRILLING IN A VALLEY OR DRAINAGE AREA, SO THIS OVERBURDEN WELL SHOULD INTERCEPT WATER ENTERING THE STREAM CHANNEL FROM HIGHER ELEV AT SWMU 12.

1325 JIM BEGINS TO REAM TO 25' ±

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 10/30/04

WITNESS DATE

TITLE NSWC CRANE SAT (CONT) 2004

PROJECT N6878

BOOK 2576

Work continued from Page

1340 PULLING RODS

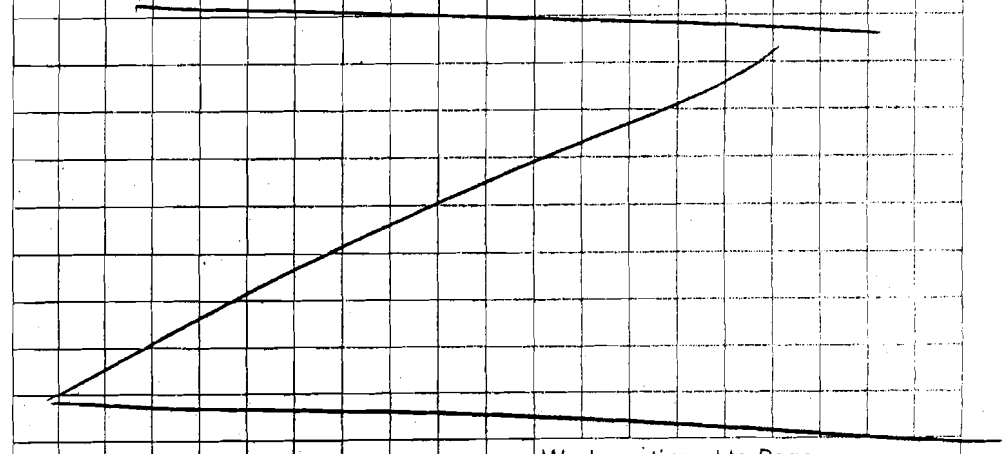
1400 SETTING O.B WELL 14-24 SAND 24.5 TO 10, CHIPS TO 3' ±

1500 WELL IN CLEAN-UP.

1600 MOVE TO NEXT LOCATION T47. MOVE RIG, COMPRESSOR, ALL TOOLS ETC

1700 SET COMP IN PLACE - TAKE RIG OUT TO FIX WATER CONNECTION AND FUEL UP.

1830 LV SITE



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 10/30/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN OCT 31 2004 **BOOK** 2576

Work continued from Page

AT SITE: SJC/TR JW, JD, TW } B/M

AM: PARTLY CLDY COOL

PM:

0630 AT SITE - CALIB PID - FINISH PAPERWORK

0700 DRILLING CO. (B/M) ARRIVE - GET WATER AND LOAD SUPPLIES

0800 B/M TO DECON PAD TO FIX WATER TANK AND TO DECON.

0930 RIG ARRIVES SET UP ON 12MWT 47

0940 FIRST SAMPLE 0-2

0955 ROCK @ ≈ 8.2' REF.

1040 RUN (1) OUT 9.5 → 15 - HIT GOOD WATER ≈ 12 TO 13'

1050 START RUN (2) 15-20

1130 RUN 3 OUT 20-25'0

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/31/04

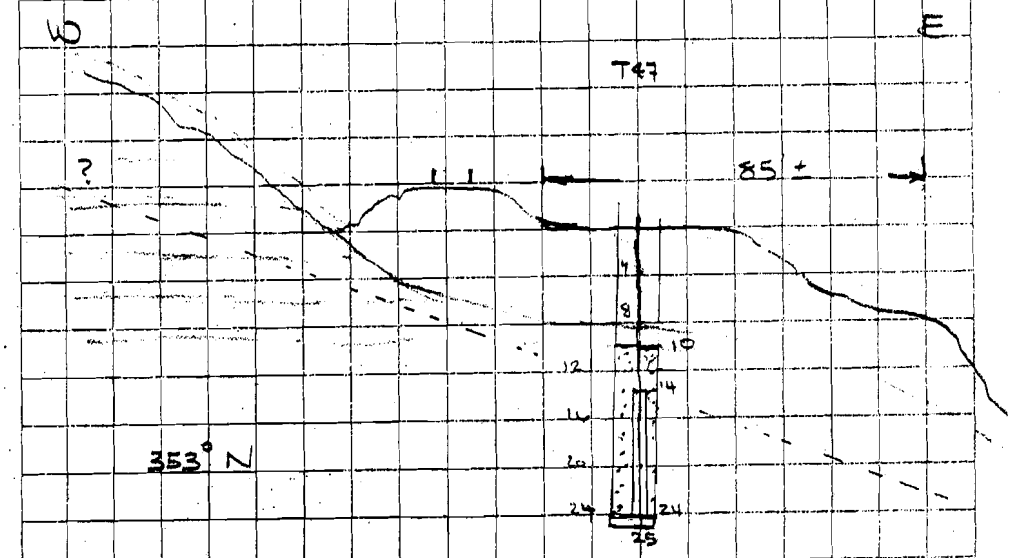
WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN (CONT) 2004 **BOOK** 2576

Work continued from Page

T47 GEN X-SEC



SUNDAY

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	SITE ACCESS
12MWT47	9.5	9.5	15.5	24	3.5

25'0
9.5
15.5

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 10/31/04

WITNESS DATE

TITLE SWC CRANE SUN (CONT) PROJECT NO. N6878 BOOK 2576

Work continued from Page

1200 REAMING TOOLS IN HOLE.

1210 START REAMING T47 W/ 5½" ROLLER BIT

1230 SETTING WELL 2"Φ FROM 24 TO 14. SAND 10 TO 25.

1330 WELL INSTALLED CLEAN UP MOVE TO NEXT HOLE T48

1400 RIG TO DECON PAD - SJC WENT TO FIELD OFFICE - TO PUT RADIO ON CHARGE.

1430 WENT OFF BASE TO GET GAS AND BATERIES AND BUG SPRAY.

1530 BACK ON SITE AT FIELD OFFICE. CHECKED OUT SLUG TEST EQUIP

1630 B/M MOVES RIG TO 12MWT48 BUT DOES NOT START. MOVE OUT OF PR ROW.

1730 AT FIELD OFFICE - LV SITE ≈ 1800.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 10/31/04

WITNESS DATE

TITLE NSWC CRANE MON NOV 1 2004 PROJECT N N6878 BOOK 2576

Work continued from Page AT SITE: SJC/TR JW, JD, TW } B/M

AM: CLOUDY W/ RAIN.
PM: CLOUDY COOL - LT RAIN.

0630 AT SITE - CALIB PID - COMPLETE DARS FOR SUNDAY.

0715 B/M ARRIVES - CHECK HIS DARS.

0755 FAX DARS TO OFFICE. HELP TR LOAD UP TRUCK - B/M TO WAIT TO SEE IF WEATHER CLEARS UP.

0830 BEGINS TO RAIN HARDER - SJC PREPARES COOLERS, COCS, AIR BILL FOR SHIPPING

1030 B/M DECIDES NOT TO WORK TODAY DUE TO RAIN.

1120 TR ARRIVES @ FIELD OFFICE - HELP FILTER METALS AND LABEL BOTTLES.

1230 GO TO 12MWT34 TRY TO GET MORE SAMPLE - BUT IS ESSENTIALLY DRY - WAS ABLE TO BAIL A FEW MORE "DROPS".

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 11/1/04

WITNESS DATE

TITLE NSWC CRANE MON (CONT) 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page

1345 GO TO 16MWT08. - CHECK IN WITH HOWARD - OK TO GO IN - BOTH GATES OPEN.

1355 START BAILING 16MWT08 WITH SMALL Φ BAILER - GETTING VERY LITTLE WATER

1545 TOOK LAST BAILER FROM T08.

1600 AT FIELD OFFICE - PREP SAMPLES

1700 LU SITE

1800 CHECK OUT MINI TROLLS AT MOTEL.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConti DATE 11/1/04

WITNESS DATE

TITLE NSWC CRANE TUE NOV 2 2004 **PROJECT NO.** N6878 **BOOK** 2576

Work continued from Page AT SITE SJC/TR JW, JD, TW } B/M

AM: CLOUDY - WARM RAIN.
PM: " " "

RAIN DAY FOR BOWSER/MORNER - DID NOT DRILL TODAY (THEIR DECISION) ie NO ITEMS TO CHARGE - THEY DID GO OUT AND DRAIN THE WATER FROM THE RIG - SJC GOT PERMISSION FROM THE DISPATCHER TO ACCESS THE GOD HILL TR.

SJC SPENT THE REST OF THE DAY HELPING TR SAMPLING SLW AT SWMU 16.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJConti DATE 11/2/04

WITNESS DATE

TITLE NSWC CRANE. PROJECT NO. N6878
WED NOV 3 2004 BOOK 2576

Work continued from Page

TRAVEL DAY FOR SJC — WENT TO OFFICE IN AFTERNOON TO TURN IN COPIES ETC AND TO TAKE TETRUNX TRAINING FOR TIME AND EXPENSES

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S Conti DATE 11/3/04

WITNESS DATE

TITLE NSWC CRANE PROJECT N N6878
MON NOV 8 2004 BOOK 2576

Work continued from Page

AT SITE: SJC / TR

AM: SUNNY COLD
PM: " COOL

TRAVEL DAY TO CRANE SITE FROM PGH

1330 ARRIVE ON SITE - START LOADING VAN - TR IS CHECKING ON ICE STATUS - NAVFAC IS NOT PAYING FOR IT NOW. HE IS CHECKING WITH CHRIS TO SEE ABOUT GETTING ICE FOR THE ICE MACHINE

1500 VAN LOADED - GET EQUIP, PAPERWORK READY FOR DRIVING ON TUES.

1630 LV. SITE - TAKE MINI TROLL TO ROOM AND WILL WORK ON MAKING SURE THAT EVERYTHING IS WORKING. IT WAS NOT CONNECTING LAST WEEK USING THE USB PORT.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S Conti DATE 11-8-04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.**

TUES NOV 9 2004 **BOOK** 2576

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AT SITE: STC/TR JTO, JD, CM } B/M

AM: SUNNY COLD

PM:

0630 AT SITE - CALIB PID - PAPER WORK ETC

0715 DRILLERS ARR - GET WATER - TAIL-GATE MEETING

0800 GO TO SUMU 12 - LOAD UP EZ GO CART AND CHARGE ITS BATTERY

0830 READY TO ACCESS HIW 600 RR - CALLED SHERE (DISPATCHER) BOTH BY PHONE AND RADIO -- GOT PERMISSION TO ACCESS THE CORRIODOR - WHEN SET UP CALLED AGAIN TO DISPATCHER - SAID WE ARE ALL CLEAR OF RR.

0920 DONE SAMPLING - AUGER TO ≈ 9.5 - SET TEMP STEEL CASING - HOOK UP COMP PREPARE TO CORE.

1130 DOWN TO 30' - WILL WAIT TO SEE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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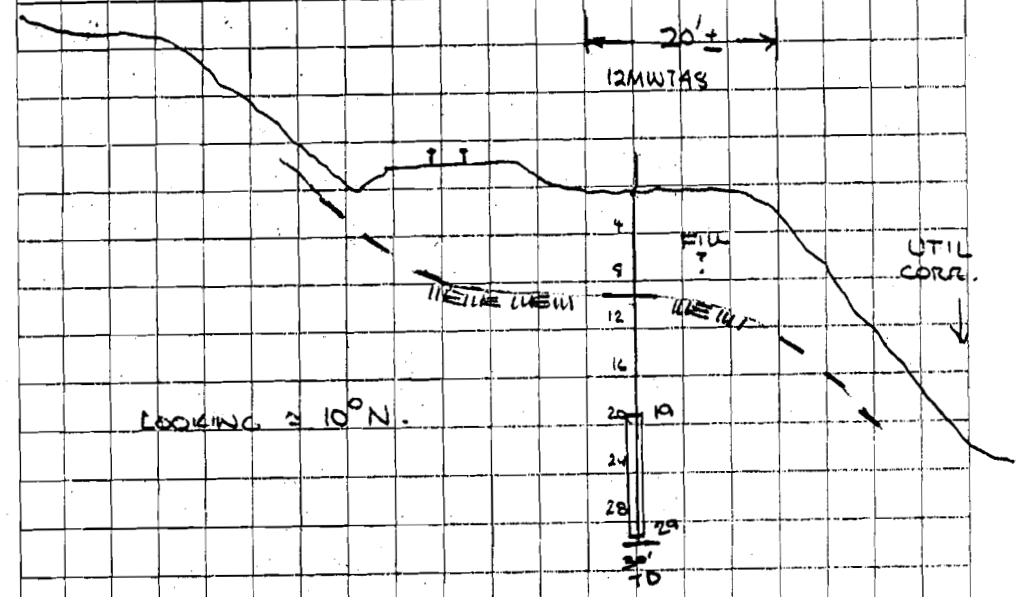
SIGNATURE SJ Conti DATE 11/9/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.**

TUES (CONT) 2004 **BOOK** 2576

Work continued from Page



TUES

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	ACCESS
12MWT 48	9.5 ✓	9.5 ✓	20.5 ✓	29 ✓	1
12MWT 49	9	9	6		1
	18.5	18.5	26.5	29	2

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE SJ Conti DATE 11/9/04

WITNESS DATE

TITI NSWC CRANE PROJECT NO. N6878
TUES (CONT) 2004 BOOK 2576

Work continued from Page

IF HOLE MAKES WATER.

1230 SMALL AMT OF WATER IN 12MWT48 - ALSO - MUDDY - WILL REAM TO 30'± AND SET WELL (≈ 2' WATER IN HOLE AT 30' TD)

1245 START REAMING (5½"Ø) TO ≈ 30'

1330 SETTING WELL (T48) SCREEN 29 → 19 SAND 30 → 14, CHIPS TO ≈ 3'

1400 READY TO MOVE TO T49 - CALL FOR 600 HILL CLEARANCE (OK)

1445 SET UP AT T49 ALL CLEAR - CALL DISPATCHER - TOLD HIM WE ARE ALL CLEAR.

1500 DOWN TO ≈ 9' (REF) T49 SET 6' TEMP CAS TO 9 FT. PREPARE TO CORE

1520 START RUN (1) (NX CORE) 9-16.

1645 CALL DISPATCHER TO CLEAR US

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conti DATE 11/9/04

WITNESS DATE

TITLE NSWC CRANE PROJECT N.. N6878
TUES (CONT) 2004 BOOK 2576

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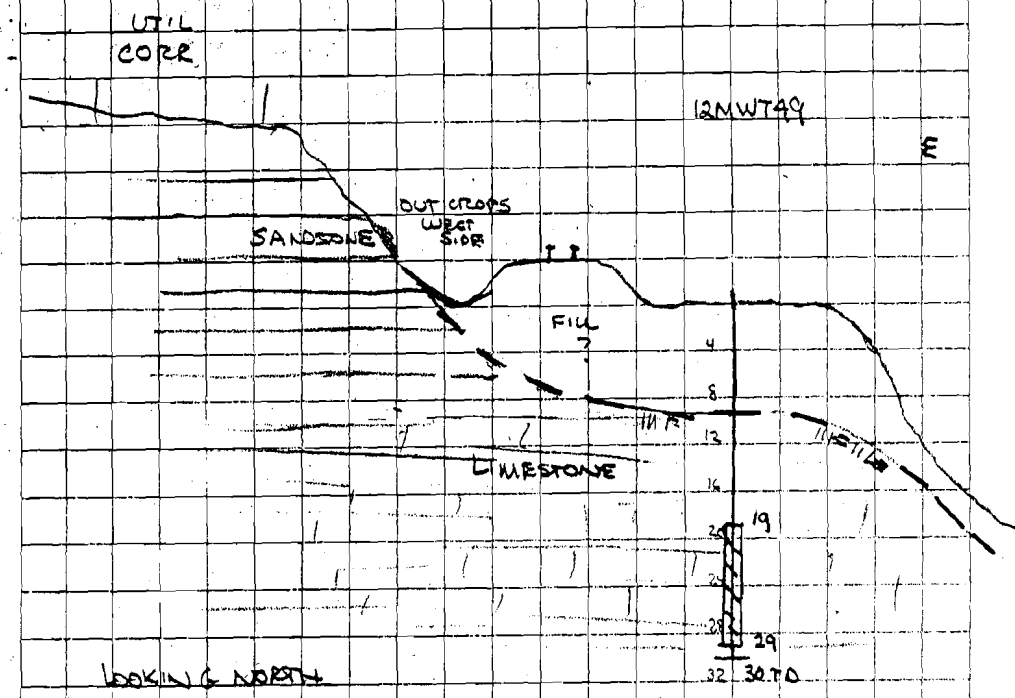

FOR LEAVING THE SITE (GOT OK)

1715 OFF TRACKS - CLEAR.

1730 LV SITE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE S. Conti DATE 11-9-04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

WED NOV 10 2004 **BOOK** 2576

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AT SITE: SJC/TR JW, JD, CM } B/M

AM: PARTLY CLDY - COOL

PM: MOSTLY SUNNY TO CLOUDY WARMER

0630 AT SITE - CALIB PID - PAPERWORK LOAD VAN

0710 B/M ARR - GET WATER - GO OVER DAR'S - TAILGATE MTG.

0800 LOAD UP EZ GO PREPARE TO GO T49

0820 CALL DISPATCHER - REQUEST PERMISSION TO ACCESS 600 HILL RR - GOT OK.

0835 CALL BACK DISPATCHER (ALL CLEAR)

0840 RESUME NX CORING. RUN (2)

1040 RUN (4) 25 → 30 NO REC ?
DECIDE TO REAM TO 30' w/ 5½" Ø

1100 BEGIN REAMING (T49) w/ 5½" Ø. BIT.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 11/10/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

WED (CONT) 2004 **BOOK** 2576

Work continued from Page

1145 DONE REAMING AT 30' - HAD TO FLUSH WITH WATER. PULLED RODS.

1155 PROCEED TO SET WELL 19 → 29, SAND 14 TO 30', CHIPS FROM 3 TO 14.

1230 CALL DISPATCHER - GET CLEARANCE TO TAKE OUT EQUIP (RIG, COMP, EZ GO)

1300 ALL CLEAR FROM RR 600 HILL - CALLED DISPATCHER - TAKE RIG, ETC TO DECON PAD FOR DECON AT ≈ 1330 HRS

1415 FINISHING UP AT DECON PAD. LOAD UP RIG AND TOOLS PROCEED TO T43 @ 1430

11/10/04

WED

	DRILL CONT	TEMP CAS	CORE REAM	2" WELL	ACCESS
RESUME FROM TUES			15 → 30		
12MWT49	—	—	15'	29'	1
12MWT43 (10-25)	10	10	15		2.5
					3.5

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConte DATE 11/10/04

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

WED (CONT) 2004 BOOK 2576

Work continued from Page

1500 START @ T43 - CALLED J. SCHUBERT ASK HIM HOW DEEP I SHOULD GO. WERE I SAID THERE IS A VALLEY BETWEEN THIS WELL AND SWMU 12 - IT ≈ 60 TO 90' BELOW THIS WELL TO THE MAIN STREAM. WE REALLY DONT NEED A WELL THAT IS SHALLOW (≈30') JEFF INDICATED NOT TO GO DEEPER THAN 80 OR 90'. BUT THIS MAY NOT EQUAL THE DEPTHS OF 44 AND 4.

1530 SET TEMP CASING TO 10'

1535 START CORING RUN (1) 10-15'

1700 RUN (3) 20-25 DONE.

1735 CLEAN UP - FINISH LOGGING HOLE

1830 LV SITE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 11/10/04

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

THUR NOV 11 2005 BOOK 2576

Work continued from Page

AT SITE: SJC/TR JW, JD, CM } B/M

AM: CLOUDY COLD - RAIN

PM: " " RAIN

0630 AT SITE - CALIB PID.

0715 B/M ARRIVE - CHECK OVER DAR'S (OK) WILL WAIT OUT RAIN.

0900 TR PROCEEDS TO SAMPLE SW'S. SJC PREPARES, COOLERS, PAPER WORK FOR SAMPLES

1030 B/M LEAVES SITE - THEIR DECISION NOT TO DRILL TODAY DUE TO RAIN. (NO ITEMS)

1100 SJC GENERATES "ROUGH" X-SEC THRU T43, T41 AND T44 TO TRY AND DETERMINE THE TARGET DEPTH OF T43 (SEE PAGE 149)

1200 TR ARR BACK AT FIELD OFFICE W/ JW WATERS - HELP TR W/ SW. SITE 16

1630 LV SITE - WORK ON MINI TROLL IN MOTEL.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conte DATE 11/11/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

FRI NOV 12 2004 **BOOK** 2576

Work continued from Page

AT SITE: SJC/TR JW, JD } B/M, CM

AM: SUNNY COOD

PM:

0630 AT SITE - CALIB PID - LOAD UP VAN

0715 B/M ARRIVE - GET SUPPLIES - AND GET PERMISSION TO LEAVE THE FORD F-450 AT THE CRANE GATE FOR PICKUP

0830 GO TO T43 - TO MUDDY TO DRIVE HAD TO WALK IN.

0930 RUN (4) OUT 25 → 30 - MOSTLY A GRAY INTERBEDDED SILTSTONE AND SANDSTONE

1010 RUN (5) OUT 30-35 - SHALE

1020 START RUN (6) 35 → 45

1300 DOWN ≈ 75' RUN (9) - SILTSTONE HITING TRACES OF MORE WATER

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConti DATE 11/12/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

DRAWN BY SJC 11/11/04 2004 **BOOK** 2576

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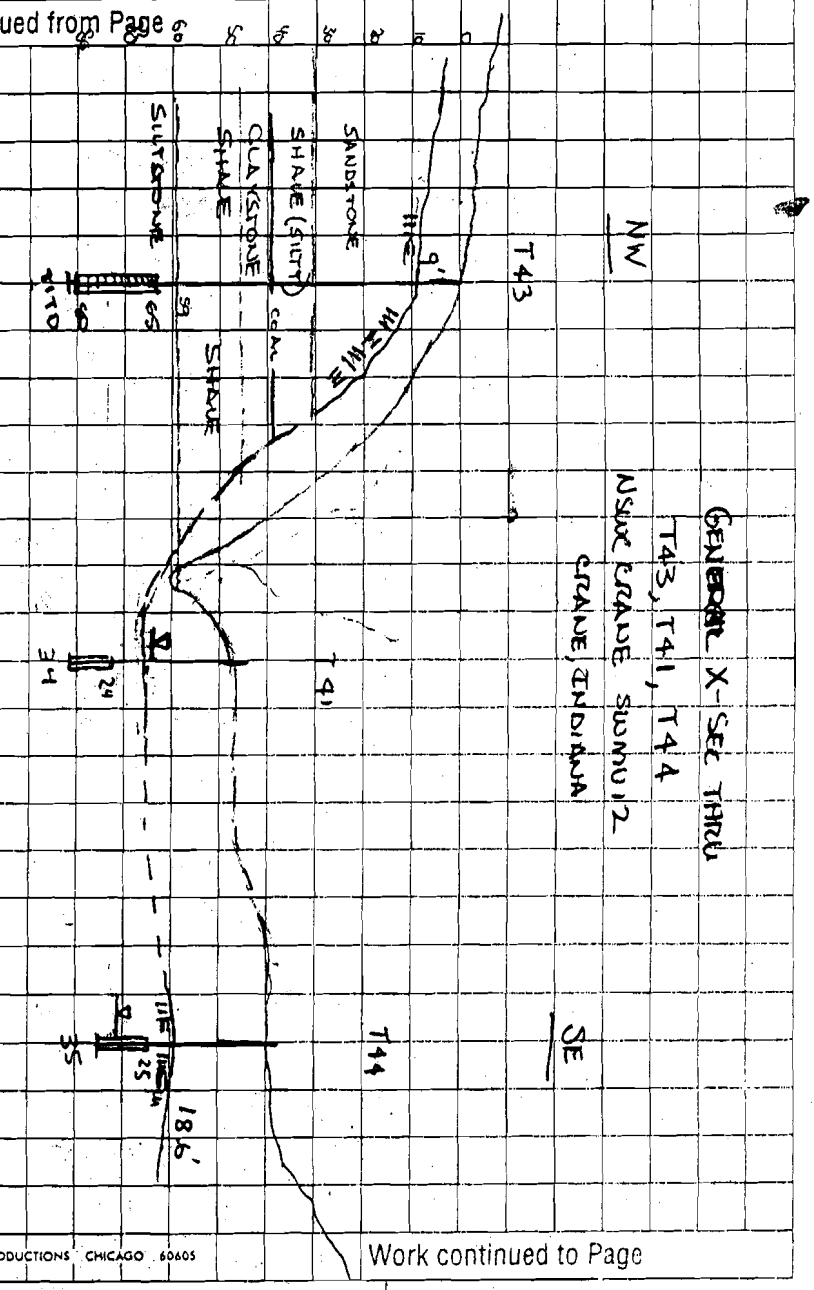


SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJConti DATE 11/11/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878
FRI CONT 2004 **BOOK** 2576

Work continued from Page

1320: START TO REAM - DECIDE TO REAM TO 80' or 81' - NO NEED TO CORE FROM 75 TO 80.

1440 STILL REAMING TO 81'.

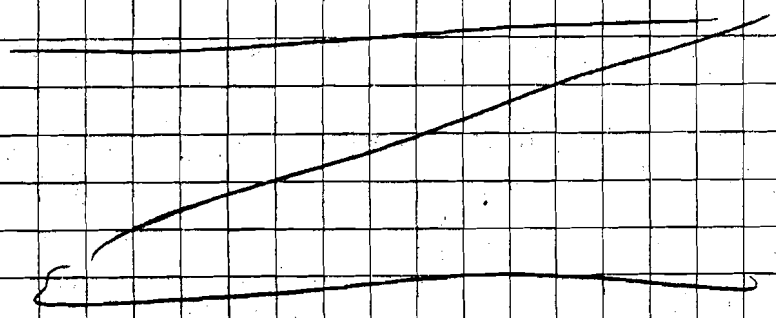
1510 DONE REAMING TO 81' ± BEGIN TO PULL RODS.

1535 RODS OUT - INSTALLING 2" Φ PVC WELL - SCREEN 65 TO 80, SAND 60 TO 81. THEN CHIPS.

1630 WELL SET AT 80' CLEAN UP

1700 OUT OF LOCATION.

1800 LV SITE



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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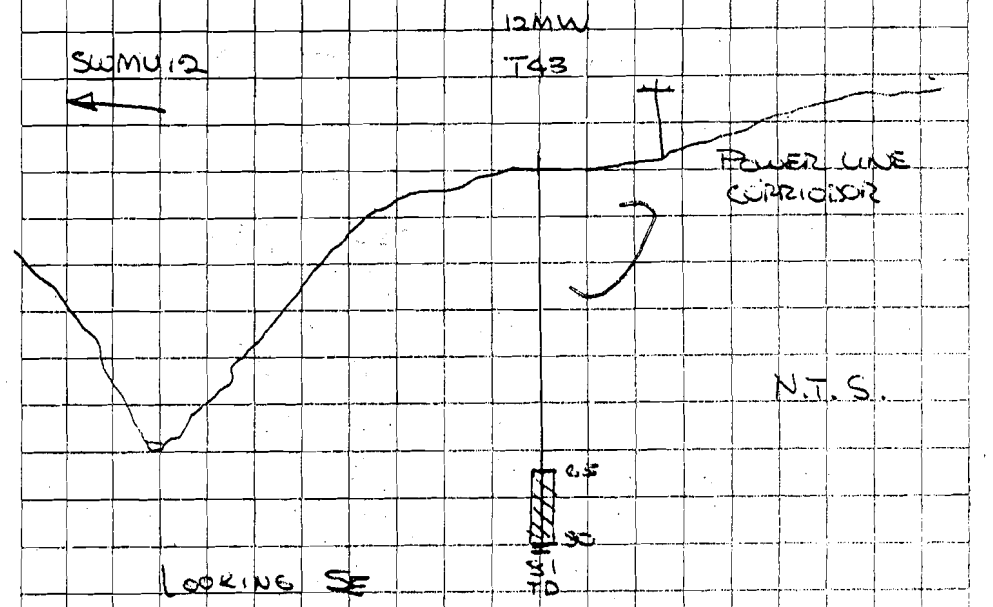
SIGNATURE S. Conte DATE 11/12/04
WITNESS DATE

TITLE NSWC CRANE **PROJECT N** 6878
FRI (CONT) 2004 **BOOK** 2576

Work continued from Page



FRI 11/12/04

Core/Ream 2" Wall

12MWT43 56' 80
25' → 81

81
25
56

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE S. Conte DATE 11/12/04
WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SAT NOV 13 2004 **BOOK** 2576

Work continued from Page AT SITE SJC/TR JW, JD, CM } B/M

AM: CLEAR COLD
PM: " "

0630 AT SITE - WORK ON PAPERWORK

0700 B/M ARRIVE - GO OVER DARS.

0800 → 1700 INSTALL PADS AT

12MWT 45
" 46
" 47
" 48
" 49
" 50

PADS = 6

SAT

45
46
47
48
49
50

6 PADS

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

SIGNATURE [signature] DATE 11/13/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

SUN NOV 14 2004 **BOOK** 2576

Work continued from Page AT SITE - SJC/TR JW JD CM

AM - CLEAR COLD
PM " COOL

0630 AT SITE GET SLUG TEST EQUIP READY - HAD TO USE RENTAL, MINE IS NOT WORKING (COMPUTER) HAD TO CHANGE A LOT OF SETTINGS

0730 B/M GET EQUIP READY FOR MORE PAD INSTALLATION.

0900 SJC GOES TO SWMU 13 TO RUN SLUG TESTS - HAD TROUBLE WITH FIRST MINITROL - NOT READING CORRECTLY - HAD TO REDO 3 WELLS.

SLUG TEST ON 13MWT48 R
13MWT49 R
13MWT51 R
" " F
START 13MWT50 F

B/M - DID 3 PADS, 41, 44, 43

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

SIGNATURE [signature] DATE 11/14/04

WITNESS DATE

TITL NSWC CRANE PROJECT NO. N6878
MON NOV 15 2004 BOOK 2576

Work continued from Page AT SITE ; STC/TR

JW
JD
CM

AM CLEAR, COLD
PM PARTLY CLDY COOL

0630 AT SITE - PAPERWORK DAR[5]
LOAD UP FOR SLUG TESTING

0730 B/M ARRIVE - GET WATER FOR DECON

0800 GO TO DECON PAD - WAIT FOR JOSH
TO GET PAINT ETC READY FOR PAINTING
WELLS ALONG RR GOO HILL. CALLED
DISPATCHER @ 0800 FROM OFFICE - SAID
HE HAD TO GET A TRAIN UP AND DN
THE GOO RR HILL.

0900 GOT OK VIA RADIO TO ACCESS THE
HILL GOO CORRIDOR (1 HR STANDBY)
PAINTED ALL (6) WELLS AND POSTS
ALONG THE CORRIDOR - T45 → T50

1045 STC CALLS DISPATCHER TOLD HIM
WE ARE ALL CLEAR. STC GOES
TO DECON PAD - CHECK ON CHAD.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJConti DATE 11/15/04
WITNESS DATE

TITLE NSWC CRANE PROJECT N6878
MON (CONT) 2004 BOOK 2576

Work continued from Page

1100 AT 13MWT 50 - PULLED MINI TROLL
AND DL DATA ON DATA SHEETS - REC
TOOK ALL NITE - DECIDE NOT TO RUN
RISING HEAD TEST

1200 CALL FROM RB & JC - MAY HAVE TO
REDRILL T49, T50 - SINCE THEY ARE
DRY - STC SENT COPIES OF LOGS
TO J. SCHUBERT VIA FAX.

1300 LOAD CORE BOXES - TAKE TO BUNKER
1970 - B/M HELPED - (2 HRS STANDBY)

1400 AT FIELD OFFICE - UNLOAD COOLERS
FROM FED EX

1430 GO TO 16MWT 21 - RUN SLUG TEST

1500 START FALLING HEAD TEST

1615 DECIDE TO LEAVE OVERNITE - SLOW REC

1640 RETURN TO OFFICE - HELP TR PACK

1800 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJConti DATE 11-15-04
WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

TUES NOV 16 2004 **BOOK** 2576

Work continued from Page AT SITE SJC/TR. JW, JD } B/M, CM

AM: CLOUDY COOL - LT RAIN.
PM: " " "

0630 AT SITE - DOWNLOAD SOME SLUG TEST DATA. FINISH NOTES

0715 B/M HERE - RIG IS LOADED ON FLAT-BED - B/M WILL PREPARE TO DEMOB

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE SJ Conti DATE 11/16/04

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

WED DEC 15 2004 **BOOK** 2576

Work continued from Page AT SITE JG/ SJC

WATER LEVELS

TIME	WELL	WL	TIME	WELL	WL
0850	12MWT01	9.68	1019	12MWT16	21.95
0852	12MWT21	19.92	1021	12MWT18	22.61
0857	12MWT28	12.78	1023	12MWT36	14.19
0903	12MWT02	8.63	1026	12MWT35	12.53
0909	12MWT03	16.21	1027	12MWT15	18.52
0911	12MWT29	61.20	1028	12MWT14	20.05
0912	12MWT04	13.67	1030	12MWT31	68.86
0914	12MWT05	8.72	1031	12MWT12	10.61
0920	12MWT42	13.02	1032	12MWT11	12.96
0930	12MWT38	10.64	1034	12MWT13	5.30
0933	12MWT06	10.51	1036	12MWT33	42.44
0939	12MWT07	13.05	1037	12MWT27	9.35
0941	12MWT30	92.74	~~1040~~	~~12MWT33~~	~~42.44~~
0942	12MWT09	13.60	1040	12MWT25	17.35
0945	12MWT08	13.05	1043	12MWT26	10.91
0947	12MWT22	17.40	1051	12MWT43	78.15
0949	12MWT10	14.67	1106	12MWT44	26.25
0952	12MWT24A	35.00	1110	12MWT41	20.33
0954	12MWT34	88.32	1235	12MWT45	17.07
0955	12MWT24	32.38	1239	12MWT46	16.07
1000	12MWT23	28.22	1242	12MWT47	12.85
1003	12MWT39	36.05	1246	12MWT48	30.50
1006	12MWT40	23.11	1252	12MWT49	30.03
1013	12MWT37	25.74	1300	12MWT50	DRY
1014	12MWT20	24.97			
1015	12MWT32	85.93			
1017	12MWT19	27.06			
1018	12MWT17	24.11			

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE DATE

WITNESS SJ Conti DATE 12/15

TITLE NSWC CRANE PROJECT NO. N6878

TUES JAN 4 2005 BOOK 2576

Work continued from Page SJC.

- TRAVEL DAY TO CRANE.
- LOAD VAN - PREPARE FOR SLUG TESTS

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 1/4/05

WITNESS DATE

TITLE NSWC CRANE PROJECT N 16878

WED JAN 5 2005 BOOK 2576

Work continued from Page AT: SJC, JG, C, TR

AM: CLOUDY COLD W/ RAIN
PM: " " "

0630 AT SITE - PREPARE FOR SLUG TESTS.

0730 US ENV SENT PDA INSTEAD OF LAPTOP - WILL HAVE TO GO GET CO. COMPUTER AND LEARN HOW TO USE PDA.

0830 LEFT MSG W/ J SCHUBERT - HE CALLED BACK AND LEFT MSG W/ ME SHOULD TRY TO MEAS WL AND BE SURE THEY ARE STABLE - MAY HAVE TO WAIT TILL RAIN SUBSIDES.

1000 STILL RAINING - PROCEED TO WORK W/ PDA - HAD TO DL - ACTIVE SYNC - AND POCKET SITU -

1300 HAD TO CAN - IN-SITU - RAN MOCK TEST - TO SEE IF ALL IS WORKING.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conti DATE 1/5/05

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

THUR JAN 6 2004 **BOOK** 2576

Work continued from Page AT SITE: SJC TH WUS

TODAY 30.35 in/Hg

AM: CLOUDY, COLD WINDY
PM: " "

0630 AT SITE - PREPARE FOR SLUG TESTS
LOAD VAN - GET PAPER WORK READY

0730 HEAD OUT TO SWMU 12.

0800 TAKE WL AT 12MWT01 - WAIT
TO SEE IF STABLE

0900 SLUG TEST
1 12MWT01-F
12MWT01-R
2 12MWT03-F
3 12MWT06-F
12MWT06-R
4 12MWT08 F
12MWT08 R

1600

1800 LU SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 1/6/05

WITNESS DATE

TITLE NSWC CRANE **PROJECT NO.** N6878

~~FRI~~ SAT JAN ~~8~~ 9 2005 **BOOK** 2576

Work continued from Page AT SITE - SJC, CD

AM: CLOUDY COLD
PM: " "
1 16MWT15
2 16MWT20 F, R

1230 ARR SWMU 12 - SEE NB 2577
FOR SWMU 16 WORK

1300 SET UP AT 12MWT10 - F - SLUG
REC WILL ONLY RUN FALLING
HEAD TEST.

3 ~~12MWT10 F~~
4 12MWT13 F, R
5 12MWT21 R

1730 →

1800 → LU SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 1-8-05

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

SUN JAN 9 2005 BOOK 2576

Work continued from Page AT SITE: STC

AM: CLOUDY COLD, BREEZY
PM: SUNNY COLD

0630 AT SITE - PREPARE FOR MORE SLUG TESTS.

0730 GO TO SUMP 12 - 12MWT15 R
(TROUBLE W/ COMPUTER)
START @ 10(45) 12MWT17 R
RISING ONLY AT T17 DUE TO WL - PUT SLUG IN - TAKING FOREVER TO REC - WILL RUN RISING TEST AND LOOK AT DATA

1128 START — 12MWT36 F, R
NOTE SHORTER MINI TROLL IS SN. 8927
LONGER TROLL IS SN 4880

1325 START FALLING H 12MWT25 F, R
TAKING LONG TIME
MAKE UP A 2ND SLUG
GO TO T28, USE TROLL 4880

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 1/9/05

WITNESS DATE

TITLE NSWC CRANE PROJECT N 6878

SUN (CONT) 2005 BOOK 2576

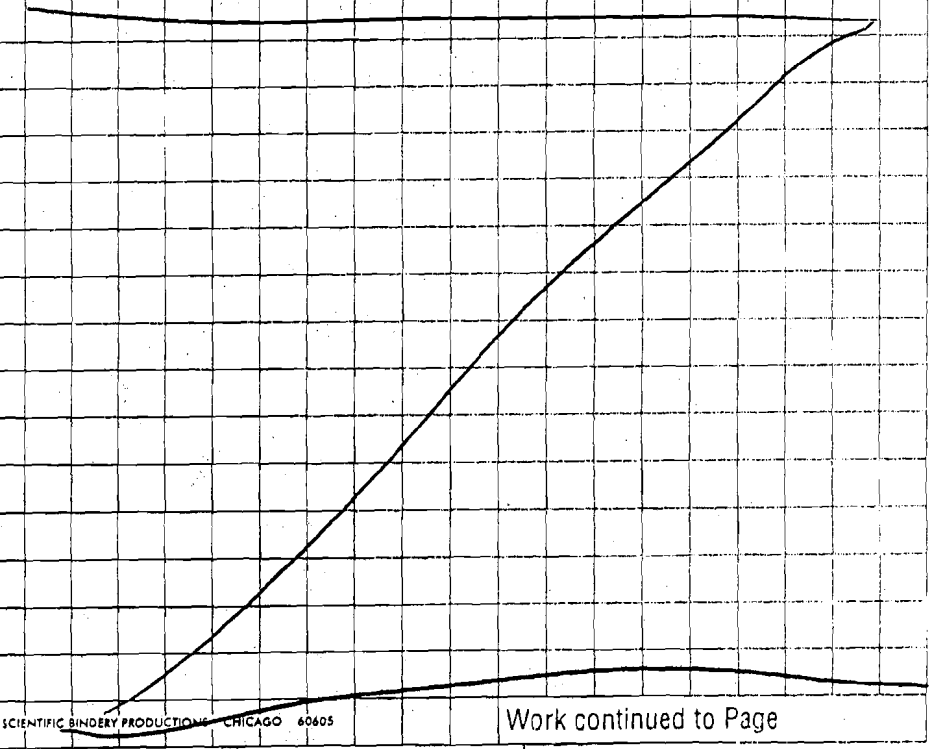
Work continued from Page

1430 START TEST AT 12MWT28 F

LEFT T25 & T28 BOTH RUN OVER NITE - VERY SLOW REC.

1700 LV SITE - WENT TO DUMP DATA AND E-MAIL FILES TO J SCHUBERT

1830 DONE



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 1-9-05

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

MON JAN 10 2005 BOOK 2576

Work continued from Page AT SITE : SJC

AM: CLOUDY LT DRIZZLE COLD MISERABLE
PM:

0630 AT SITE - CHECK SWMU 12 NOTE BOOK (CHIP L.) FOR DEPTH OF T33 WAS 74-94 SCREEN

0730 PREPARE VAN FOR SLUG TESTS

0800 GO TO SWMU 12 - STOP BOTH TESTS AT T25 AND T28 FROM RUNNING - AND SAVE DATA.

0850 GO TO T38 12MWT 38 F, R

1015 START RISING HEAD

1145 DONE AT T38 - PREPARE TO GO ALONG THE RR.

1355 START FH @ 12MWT45 F, R

1600 (MINI TROLL NOT CONNECTING) BATTERY? 12MWT 46 F

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S J Conte DATE 1/10/05

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

MON (CONT) 2005 BOOK 2576

Work continued from Page

WENT TO 12MWT47 R, F

1618 START F.H TEST @ T46 USING SHORTER MINI TROLL. THE OTHER ONE MAY NEED A BATERY.

1710 STOP T46 - USED PDA - SINCE COMP BATERY CRASHED. CLEAN UP GO TO FIELD OFFICE

1740 AT OFFICE.

1800 LV SITE - DUMP DATA FROM PDA TO PC IN ROOM AND REPLACE BATERY IN LONGER MINI TROLL.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S J Conte DATE 1/10/05

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878

TUES JAN 11 2005 BOOK 2576

Work continued from Page AT SITE SJC

AM: CLOUDY W/ RAIN.
PM: CLOUDY, COOL

0630 AT SITE - PREPARE FOR SLUG TESTS

0720 AT SWMU 12 12MWT33 F R

1000 WENT TO 12MWT23 - HAD TROUBLE W/ MINI TROLL AGAIN SWITCHED OUT THE GOLD PLATED FILM ABOVE THE BATTERY. WENT TO T29.

1215 START F.H. AT 12MWT29 F VERY SLOW TO REC - WILL LET RUN ALL NITE.

1300 WENT BACK TO T23 WILL TRY SHORTER MINI TROLL (8937) APPEARS TO BE WORKING EVEN THO I PUT THE GOLD PLATED FILM FROM THE OTHER MINI TROLL - INTO THIS ONE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 1/11/05

WITNESS DATE

TITLE NSWC CRANE PROJECT N 6878

TUES (CONT) 2005 BOOK 2576

Work continued from Page

WILL RUN RISING HEAD ONLY (DUE TO WATER LEVEL. 12MWT23 R

1600 DONE AT T23 - GO TO FIELD OFFICE DUMP DATA, ETC

1800 LV SITE.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE SJ Conte DATE 1/11/05

WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878
WED JAN 12 2005 BOOK 2576

Work continued from Page AT SITE: STC

AM: CLOUDY, COOL
PM: " " WINDY

0630 AT SITE - GO TO SLUMP 12
SET UP COMPUTER ETC - WILL GO
TO T29 - TO SEE IF IT IS DONE

0715 COMPUTER SET UP ETC - GO TO T29.

0800 TEST SEEMS OF - GOOD GRAPH
WILL NOT RUN RISING HEAD DUE
TO LONG REC TIME - WILL HAVE
TO PACK UP EQUIP AND SHIP.

1000 RETURN TO FIELD OFFICE - PACK
UP EQUIP AND PERSONAL ITEMS
CLEAN UP VAN ETC

1500 DUMP DATA FROM SLUG TESTS

1800 LV SITE

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE S Conti DATE 1/12/05.
WITNESS DATE

TITLE NSWC CRANE PROJECT NO. N6878
2005 BOOK 2576

Work continued from Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 Work continued to Page

SIGNATURE DATE
WITNESS DATE

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Subject	Page

TITLE 8/13/04

PROJECT NO.

BOOK

Work continued from Page

1300 Arrive @ Site 12. Terry R. shows me around the site & the DPT Boings while the driller & Jim set up on the Battery Site.

1345 4 Attempts made to advance 12SB17. Each time DPT could not get deeper than 6" bgs. It is noted that there are large boulders exposed on the surface area of the site, as well as concrete rubble & asphalt debris. Some attempts were made with 12SB16 with the same results.

1410	Collect Sample 12SS13ØØØ2	12SB13
1420	Collect Sample 12SB13Ø2Ø4	
1442	Collect Sample 12SB13Ø6Ø7	
1444	Collect Sample 12SS15ØØØ2	12SB15
1455	Collect Sample 12SB15Ø2Ø4	
1504	Collect Sample 12SB15Ø6Ø7	
1521	Collect Sample 12SS14ØØØ2	12SB14
1532	Collect Sample 12SB14Ø2Ø4	
1540	Collect Sample 12SB14Ø6Ø7	
1555	Collect Sample 12SS12ØØØ2	12SB12
1607	Collect Sample 12SB12Ø2Ø4	

1645 Return to office. Unload sampler.

1800 Leave site.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE [signature] **DATE** 8/13/04

WITNESS **DATE**

TITLE 8/15/04 **PROJECT NO.** **BOOK**

Work continued from Page

0645	Arrive @ Office on Base. Calibrate PID. Load up truck & supplies.		
0815	Arrive @ site 12 and prepare to begin DPT work.		
0831	Collect	12SS10 0002	12SB10
0834	Collect	12SB10 0205	
0838	Collect	12SB10 0508	
0902	Collect	12SB09 0002	12SB09
0908	Collect	12SB09 0205	
0911	Collect	12SB09 0508	along w/MS/MSD
0928	Collect	12SS08 0002	12SB08
0931	Collect	12SB08 0204	
0934	Collect	12SB08 0507	
0945	Collect	12SS11 0002	12SB11
0952	Collect	12SB11 0205	along w/Dup
		12FD0815041	
0954	Collect	12SB11 0507	
1028	Collect	12SS04 0002	12SB04
1037	Collect	12SB04 0207	
1039	Collect	12SB04 0712	
1055	Collect	12SS07 0002	12SB07
1101	Collect	12SB07 0206	
1103	Collect	12SB07 0610	

Work continued to Page

SIGNATURE Charles C. Ty III DATE 8/15/04

WITNESS DATE

TITLE **PROJECT NO.** **BOOK**

Work continued from Page

1240	Collect	12SS05 0002	12SB05
1245	Collect	12SB05 0204 along w/Dup:	
		12FD0815041 02	
1248	Collect	12SB05 0509	
1304	Collect	12SS06 0002	12SB06
1310	Collect	12SB06 0205 along w/MS/MSD	
1315	Collect	12SB06 0509	
1348	Collect	12SS03 0002	12SB03
1354	Collect	12SB03 0608 along w/MS/MSD	
1425	Collect	12SS02 0002	12SB02
1432	Collect	12SB02 0608 along w/Dup:	
		12FD0815043	
1505	Collect	12SS01 0002	12SB01
1520	Collect	12SB01 0609	
1550	Collect	12SS20 0002	12SB20
1557	Collect	12SB20 0204	
1600	Collect	12SB20 0608	
1617	Collect	12SS19 0002 along w/MS/MSD	12SB19
1643	Collect	12SB19 0204	
1655	Collect	12SS18 0002	12SB18
1701	Collect	12SB18 0204	
1705	Collect	12SB18 0608 along w/Dup:	
		12FD0815044	

Attempted more borings 12SB16 & 17 again. Several different locations w/in the boundaries of the

Work continued to Page

SIGNATURE Charles C. Ty III DATE 8/15/04

WITNESS DATE

TITLE

PROJECT NO.

BOOK

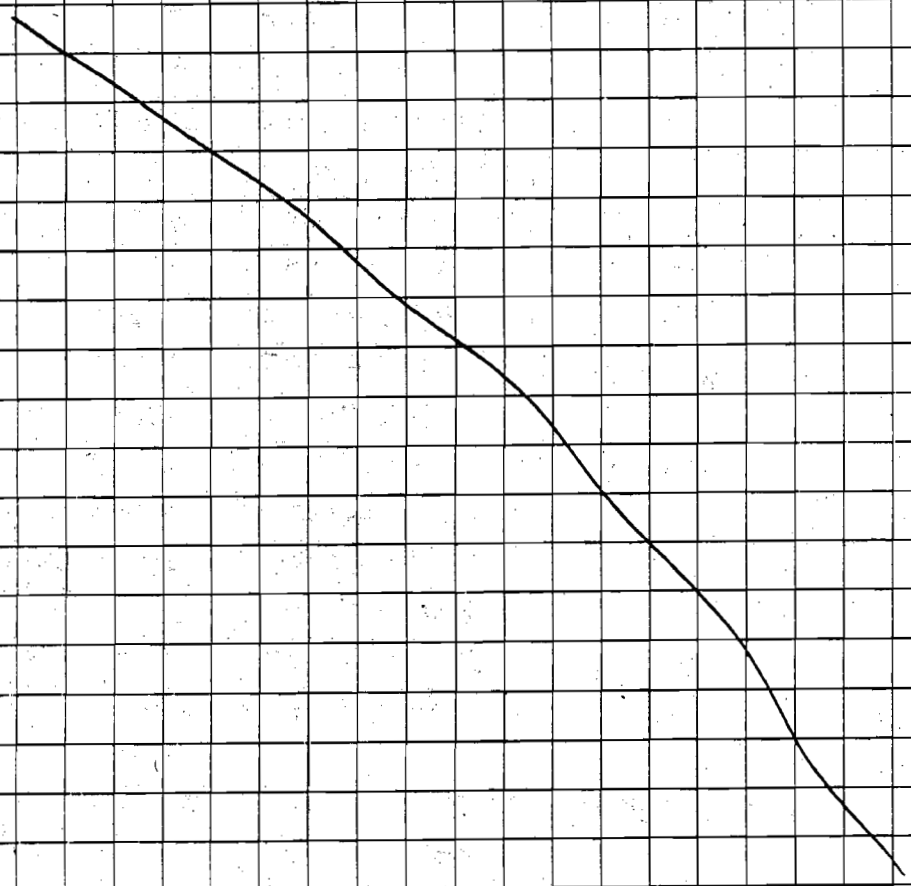
Work continued from Page

"Soil Area". Results same as during 8/13/04.

DPT could not get beyond 0.5'.

1745 Return to office. Unload samples & supplies.

1830 Leave site for the day.



SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Clinton C. Ly III

DATE 8/18/04

WITNESS

DATE

TITLE

PROJECT NO.

BOOK

8/27/04 Overcast & 78°F

Work continued from Page

0700 Arrive @ Crane & prepare for drilling @ Site 12.

Drilling Crew Includes:

Ken Boehmer

John Davis

Tod Wollenhaupt

0800 Arrive @ Site 12. Set up on 12MWT36.

Well Construction Supplies include:

① Johnson PVC Screen & Riser Pipe

② Global Filter Pack #5 SAND

50 lb. Bag / Global Drilling Suppliers, Inc.

1-800-356-6400

③ Pure Gold Medium Chips

CETCO / 50 lb. Bag

1500 West Shore Drive

Arlington Heights, IL 60004

1-800-527-9948

0800 - 0850 Auger down to 10' bgs. Top of Bedrock appears to be @ 9' bgs. 6" Steel Casing set to 10' bgs. Coring Begins.

1110 Coring Ends. 25' bgs. Next we will ream the hole to 26' bgs.

Well 12MWT36 Set. Screen from 15'-25' bgs

#5 Sand from 16.5' - 26' bgs.

Bentonite Chips from 3 - 10.5' bgs.

Drillers go down.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Clinton C. Ly III

DATE 8/27/04

WITNESS

DATE

TITLE

PROJECT NO.

BOOK

Work continued from Page

1430 Set up on 12 MWT 18. Auger down to 10' bgs.
Top of Bedrock @ 9.5' bgs. Casing set to 9.5' bgs.
1530 Coring Begin
1650 Coring Ends. 25' bgs. Hole Reamed to 26' bgs.
1715 Set Well 12MWT 18. Screened from 15'-25' bgs.
#5 Sand from 12-26' bgs.
Bentonite Chips from 3-12' bgs.
1745 Drillers go to Decon pad.
1830 Leave site for the day.

TOTALS FOR THE DAY	WELL # T-36	WELL # T-18
① over cont. Sampling Truck	10'	9.5'
② Rock, cont. Sampling Truck	16'	16.5'
③ Temp. Casing Inst.	10'	9.5'
④ 2" PVC Well Inst.	25'	25'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Charles C. Smith III DATE 8/27/04

WITNESS DATE

TITLE

PROJ NO.

8/28/04 overcast & 76°F BOOK

Work continued from Page

0700 Arrive @ Office BLDG. Terry is going my drilling crew the H&S Briefing & Safe Work Permit.
Calibrate PID. Load up supplies.
0730 Meet with Stan and discuss my drilling crew options. Discuss with driller same.
When the full crew arrives we decide to Mob to Boring 12 MWT 19. (Shallow Well).
0800 - 0900 Auger down to 12' bgs. Top of Bedrock appears to be @ 10' bgs. Drillers have to go back to office to get / cut more casing.
1000 Casing @ 12 MWT 19 set @ 10.5' bgs
Coring Begin
1130 Coring Ends. 26' bgs. Next we will ream the hole to 27' bgs.
1300 Reaming Begin
1330 Reaming Ends. Set well 12 MWT 19
Bottom of hole = 27' bgs
Bottom of Screen = 26' bgs
Top of Screen = 16' bgs
#5 SAND from 13'-27' bgs
Bentonite Chips from 3'-13' bgs
Drillers take rods to decon pad to clean & to pick up some items at the office.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Charles C. Smith III DATE 8/28/04

WITNESS DATE

TITLE **PROJECT NO.**

BOOK

Work continued from Page

1400 Begin setup on Boring 12MWT32. At this time there are a lot of threatening clouds & you can hear thunder. No lightning observed.

1430 Drillers helpers arrive. Lightning is now observed. Decide to all mob to decon pad & discuss w/ all drillers & Stan.

1500 Heavy Rain & Lighting. Decision is made to cease operation for the day since according to weather reports this will probably last the rest of the day & night.

TOTALS FOR THE DAY	Well # T-19
① over, cont. Sampling Truck	10.5'
② Rock, cont. Sampling Truck	16.5'
③ Temp. Casing Inst.	10.5'
④ 2" PVC Well INST.	26.0'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Charles C. Fry III DATE 8/28/04

WITNESS DATE

TITLE **PROJECT NO.**

8/29/04 Overcast & 70°F **BOOK**

Work continued from Page

0700 Arrive @ office BLDG. Terry reviews H&S for the day with everyone. Calibrate PID & Load Supplier.

0750 Arrive @ site 12. Begin Boring 12MWT32. This is a deep well w/ no sampling. Casing is to be set @ 40' bgs.

1100 Casing is set @ 40' bgs in 12MWT32.

1200 Drillers mob to decon pad & clean equipment

1300 Decide to set up on Boring 12MWT31. This is a deep well w/ no sampling. Casing is to be set @ 40' bgs

1415 Problem with Drill Rig.

1428 Repairs made. Restart Rig.

1550 Casing is set @ 39.5' bgs in 12MWT31.

TOTALS FOR THE DAY	Well # T32	Well # T31
① over, no sampling, Truck	10'	9.5'
② Rock, No sampling, Truck	29.5'	30.0'
③ Permanent Casing Inst.	40.0'	40.0'
④ Temp. Casing Inst.	10.0'	9.5'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Charles C. Fry III DATE 8/28/04

WITNESS DATE

TITLE **PROJECT NO.**

8/30/04 Partly Cloudy, 80°F **BOOK**

Work continued from Page

1500 Arrive @ Office. Calibrate PID. Discuss Tonights drilling schedule & HAS with driller. We have to meet w/ the Fire Marshall at the site to inspect lights at 1630 prior to doing any work.

1630 Meet with Fire Marshall & he issues the permits. My crew moves over to 12MWT31 to begin coring work.

2030 Coring ends on 12MWT31. Cored to 90' bgs.

2150 Begin Reaming 12MWT31.

2310 End Reaming 12MWT31.

2340 Well 12MWT31 Set.

Well Screen from 68'-88' bgs

Sand from 65'-89' bgs

Bentonite from 55-65' bgs

8/31/04 Grout from 0-55' bgs

0000 Begin drilling 12MWT14

Hole advanced without sampling. Reamed to 26' bgs

Well Screened from 15-25' bgs.

Sand from 12-26' bgs

Chips from 3-12' bgs.

0230 Well 12MWT14 set. All have site for the night.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE

DATE 8/31/04

WITNESS

DATE

TITLE **PROJECT NO.**

8/30/04 → 8/31/04 **BOOK**

Work continued from Page

TOTALS FOR THE DAY	12MWT31	12MWT14
1 Over, No Sampling, Truck	0	11.0'
2 Rock, No Sampling, Truck	50.0'	15.0'
3 Permanent Casing Inst.	0	0
4 Temp. Casing Inst.	0	11.0'
5 2" PVC Well Inst.	88.0'	25.0'
6 Rock, cont. Sampling, Truck	49.0'	0

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE

DATE

WITNESS

DATE

TITLE **PROJECT NO.**

8/31/04 - 9/1/04 Partly cloudy, 83°F **BOOK**

Work continued from Page

1430 Arrive @ office. Calibrate PID. Discuss tonight's drilling schedule & H&S with drillers.
Drillers are at Deer Park.
Today my crew will be on 12MWT33 (Deep) & 12MWT27 (Shallow)

1640 Arrive @ Site 12. Decision is made to set up on 12MWT33 (Deep)

1700 12MWT14 DTW = 22.7' - 2.3' = 20.4'

1703 12MWT31 DTW = DRY. No weephole & cap was on tight
Cut weephole in 12MWT31.

1846 12MWT33 @ 33½ feet cuttings were a dark black wet material.

1955 Casing set on 12MWT33.
Mob over & set up on 12MWT32.
Permanent Casing was set to 40' on this Boring on 8/29/04.

2030 Cable broke on rig. Rig under repair.

2200 Cable finished. Rig set up on 12MWT32

9/1 → 0030 Stop coring at 79' bgs to let tools sit for ½ hour to check & see if any water seeps into the hole.

0100 No water in hole. Begin coring 79'-89'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Charles C. Ly III DATE 9/1/04

WITNESS DATE

TITLE **PROJECT NO.**

9/1/04 **BOOK**

Work continued from Page

0130 End coring to 89' bgs. Decide to let this hole sit all night & check tomorrow to see if any water seeps in.

0200 All leave site for night.

TOTALS FOR DAY	12MWT33	12MWT32
① OVER, NO SAMPLING, TRUCK	10.5	—
② PERMANENT CASING INST.	35.5	—
③ TEMP. CASING INST.	10.5	—
④ ROCK, CONT. SAMPLING, TRUCK	0	~~48.5~~

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Charles C. Ly III DATE 9/1/04

WITNESS DATE

TITLE 9/1/04 Partly Cloudy, 87°F

PROJECT NO.

BOOK

Work continued from Page

1430 Arrive @ office. Calibrate PID. Discuss tonight's drilling schedule. H&S with drillers.

1600 Arrive @ site. Check water level in hole of 12MWT32. 6' of water is in the hole. Discuss w/ Stan Carto. We agree to drill 10 more feet & then set the well.

1640 Drillers begin to core 89-99' bgs.

1730 End Coring of 12MWT32. Begin Reaming.

1825 DTW = 86.7' FROM TOC } WELL
TD = 91.0' From TOC } 12MWT31

Hole 12MWT32 Reamed to 100'.

Well Screen: 79-99' bgs

SAND: 73' → 99' bgs

CHIPS: 60' → 73' bgs

GROUT: 0 → 60' bgs

2000 Well 12MWT32 set.

2115 Set up on 12MWT20. No Sampling. Ream to 26'. Set well @ 25' bgs

2300 Well 12MWT20 Set

Well Screen: 15-25'

SAND: 12-26'

CHIPS: 3-12'

Temp Casing - 11'

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Chuck C. Z III **DATE** 9/2/04

WITNESS **DATE**

TITLE 9/1/04 → 9/2/04

PROJECT NO.

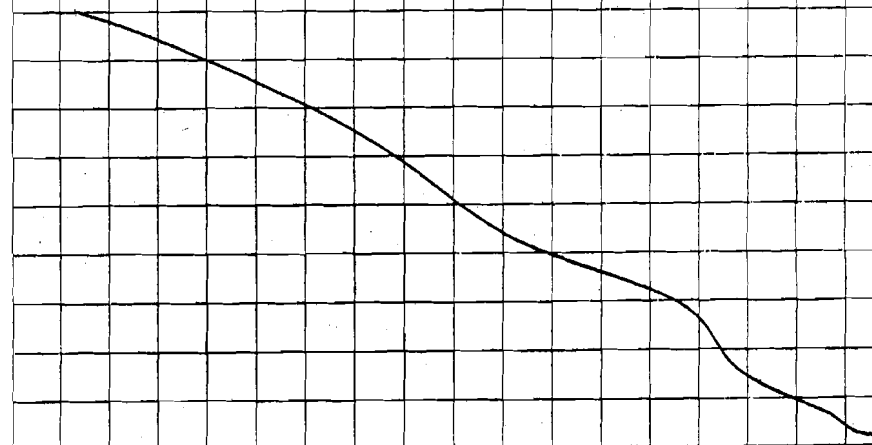
BOOK

Work continued from Page

2350 Set up on 12MWT33, & Begin Coring. Hole is cored to 94' bgs. No significant shale layer found. Hole will sit overnight & we will set well in the morning.

9/2/04 ↓

0300 Finish coring 12MWT33. All leave site for the AM.



TOTALS FOR DAY	12MWT32	12MWT20	12MWT33
(1) Over, no samp. Truck	—	11'	—
(2) Rock, No Samp. Truck	—	15'	—
(3) Rock, cont. Samp. Truck	59.5'	—	—
(4) Temp Casing	—	11'	—
(5) 2" PVC Well	99'	25'	—

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE Chuck C. Z III **DATE** 9/2/04

WITNESS **DATE**

TITLE **PROJECT NO.**

9/2/04 overcast & 82°F **BOOK**

Work continued from Page

1500 Arrive @ Office. Discuss today's drilling activities.
H&S with drillers.
1600 Arrive @ Site 12
1630 DTW = 81.75' from TOC in 12MWT31
1638 DTW = 75.60' from TOC in 12MWT32.
TOC = +0.60' ground surface - 12MWT32.
1645 DTW = 24.12' from TOC - 12MWT20.
TOC = +2.5' ground surface - 12MWT20.
Drillers begin reaming the hole (12MWT33) to 95' bgs.
1800 Reaming on 12MWT33 completed.
Begin to set well.
Screen: 74-94'
Sand: 69-95'
Bentonite: 60-69'
Grout: 0-60'
Permanent Casing was set to 35.5'. Drillers drilled down to 40' prior to coring by mistake.
2000 Begin setup on 12MWT27
Hole Reamed to 26'
Screen: 15-25'
Sand: 12-26'
Bentonite: 3-12'
Grout: 0-3'

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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TOTALS FOR DAY	12MWT 33	12MWT 27
1 over, No Sampling, Truck		4
2 Rock, No Sampling, Truck	5.5'	15
3 Temp Casing		11
4 2" PVC Well	94'	25'
5 Rock Cont Samp, Truck	53.5'	

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SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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Subject	Page

TITLE NSWC Crane

PROJECT NO. 6878

BOOK 2582

Work continued from Page — 8-13-04

1300 - Arrived at a Summit Chatham area. Set up for DPT soil sampling. See Chip Lamy (CH) log book regarding activities.

1630 - Finished drilling & head back to bldg. 3245.

1645 - Unloaded vehicle & packed samples for shipping

- Departed Crane

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page —

SIGNATURE [signature] DATE 8/13

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TITLE NSWC

PROJECT NO. 68

BOOK 2582

Work continued from Page - 8-15-04

0645 - Arrived at NSWC crane. Drove to my vehicle to try & start - was not able to. Contacted Avis who is sending tow truck & replacement vehicle around 1100.

0815 - Arrived @ SWMU 12 DPT soil sampling at 125B08 - 11

1010 - DPT soil sampling at 125B04 - 07.

1100 - Notified by security that Avis was on base w/ replacement vehicle. Loaded other vehicle.

1140 - Bldg 3245 to unload samples & lunch.

1230 - SWMU 12 to finish 125B05 & 06.

1340 - DPT sample @ 125B03.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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SIGNATURE

DATE 8/15/04

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TITLE NSWC

PRO. NO. 6878

BOOK 2582

Work continued from Page 2

1410 - DPT sampling @ 125B03

1715 - Back to Bldg 3245 to unload samples.

1815 - Left Bldg. 3245.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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PROJECT NO. 6878
BOOK 2582

Work continued from Page — 8-30-04

0705 - Arrived on base. Calibrated equipment & loaded vehicle.

0825 - Checked in @ Summ 12. Set up in well 12MWT08.

1223 - Began sampling well 12MWT08. ~~T.R. stopped by~~ as

1255 - T.R. stopped by & watched the well as I went to lunch.

1310 - I returned to the well.

1330 - Finished sampling 12MWT08.

1337 - Setting up at 12MWT13.

1715 - Finished sampling, return to bldg 3245. Pack samples.

1800 - Left base enroute to Fed Ex

1835 - Dropped to samples @ Fed Ex

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page —

SIGNATURE

DATE 8/30/04

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PROJECT NO. 6878
BOOK 2582

Work continued from Page — 8-31-04

0705 - Arrived on base. Calibrated equipment & loaded vehicle for well development @ Summ 12.

0843 - Stopped @ Public Work w/ T.R. to pick up permits.

0910 - At Summ 12 Developing wells 12MWT30 & 34.

1210 - Broke for lunch, returned to office to decon whale pump & empty purge water containers

1330 - Back @ Summ 12 developing 12MWT35.

1458 - Finished development at Summ 12. Stopped to empty purge water @ Returned to bldg 3245.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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BOOK 2582

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1520 - Returned to bldg 3245. Empty vehicle. Decon whale pumps. Clean office.

1745 - Departed the base.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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Work continued from Page 9-1-04

Travel day back to Pittsburgh.

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DATE 9-1-04

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PROJECT NO. 6848

BOOK 2582

Work continued from Page 9-21-07

0730 - 1130
Preparing to, & taking confirmation samples @ Sump 12 after Tolled removed a truckload of soil.

PM - Veg sampling @ Sump 13
See logbook 2575

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DATE 9-21-07

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TITLE NSWC

PROJECT NO. 687

BOOK 2582

Work continued from Page – 9-22-07

0710 - Arrived on Base. Calibrated equip., loaded vehicle, & planned days activities.

0855 - Left Bldg 3245.

0905 - Arrived @ 12MWT30 Setting up to purge/samp

0945 - 12MWT30 was dry Unable to purge any wate

0952 - Arrived @ 12MWT34 Setting up to purge/sample

1014 - 12MWT34 had very little water (700ml) & was purged dry w/ bailer.

1019 - Arrived @ 12MWT39 Setting up to purge/sampl

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DATE 9-22-07

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TITL. NSWC

PROJECT NO. 687

BOOK 2582

Work continued from Page 9

1050 - Purged 12MWT39 dry w/ bailer after removing 1.2 L. Water color was orangish/brown.

1100 - Breaking early for lunch before starting a well that would be 2 hrs to purge/sample.

1120 - Arrived @ 12MWT35 to set up for purge/sample.

1715 - Finished sampling 12MWT35. Heading to bldg 3245 to unload sampler/equip.

1755 - Leaving bldg 3245 & heading back to hotel.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

Work continued to Page

SIGNATURE

DATE 9-22-04

WITNESS

DATE

TITLE NSWC

PROJ NO. 6878

BOOK 2582

Work continued from Page — 9-23-04

0705 - Arrived on base. Calibrate equip. & load vehicle

0820 - At well 12MWT30 & try & collect sample. WL was 92.76 & I was unable to collect any water via bailer

0840 - At well 12MWT34 try & collect a sample. Only able to collect 1 L. [illegible]

0855 - At well 12MWT37. TD = 26.70' & WL is 24.33'. I spoke w/ T.R. asking if it would be better to bail rather than peristaltic. He said the peristaltic would do a better job & not disturb the water as much. Will drive out

0918 - At well 12MWT39 to collect samples. I was able to collect 1.5 L (Explosives), I

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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will either try & sample later today or tomorrow a.m. Dry.

0945 - At well 12MWT37 to purge & sample.

1055 - 12MWT37 went dry as I was purging it. Will sample tomorrow. Heading back to bldg 3245 to pick up air tanks & control box.

1140 - Stopped at cafe to pick up sandwich.

1205 - Talked to T.R. regarding sampling activities.

1230 - At well 12MWT24A to purge & sample.

1755 - Finished sampling & MWA at 12MWT24A

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PROJECT NO. 6878

BOOK 2582

Work continued from Page 12

1758 - At well 12MWT39 to try & collect additional sample. Collected another 1.5 L. Water clear at first but then turned brownish/orange. Well went dry.

1816 - At well 12MWT36. Going to set up so I can purge/sample in the morning.

1850 - Returned to bldg 3245 to drop off samples & equip.

1920 - Left the base to go to Radio Shack to purchase a conversion calculator for the field work.

2000 - Leaving Radio Shack for hotel. Unable to find conversion calculator.

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DATE 9/23/04

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TITLE NSWC

PROJECT NO. 6870

BOOK 2582

Work continued from Page - 9-24-04

0730 - Arrived on base. Loaded vehicle & calibrated equip.

0830 - Arrived at well 12MWT34 to try & collect more sample. Well is dry - no sample collected.

0846 - At well 12MWT39. Collected approx. 1 L - Enough to finish Nitrate bottle & beginning of filtered metals.

0915 - At well 12MWT37 to sample. Only able to collect about 500 ml (exp.)

0951 - At well 12MWT19 to purge. Well dried out after 54 minutes (4.75 L).

1106 - At well 12MWT19 to purge. Well dry after 73 minutes (5.65 L).

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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PROJECT NO. 6870

BOO. 2582

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1250 - Dropped off samples at bldg 3245. Spoke w/ T.R. regarding upcoming schedule. Stopped at Cafe to pick up lunch.

1319 - At well 12MWT36 to purge & sample.

1450 - Left well 12MWT36 & went to nearby well 12MWT to try & collect additional sample. Collected approx. 1 L. Will pump through peristaltic pump & filter for Diss. Metal

1500 - Returned to 12MWT36. Was able to collect all required samples.

1700 - Returned to bldg 3245. Dropped off samples, unloaded vehicle & caught up on required paperwork.

1800 - Left the base.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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PROJECT NO. 6878

BOOK 2582

Work continued from Page

9-25-04

0715 - Arrived on base. Calibrating equipment & loaded vehicle.

0828 - At well 12MW14 to bailer & sample, & collect MNA. Well produced 2L & I performed MNA on those analysis not requiring filtered sample.

0942 - At well 12MW37 to collect additional sample. Collected ≈750ml.

1006 - At well 12MW19 for sampling. Was able to collect all samples & also complete MNA analysis.

1135 - Heading back to bldg 3245 to drop off samples & then stopping at Subway.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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PROJECT NO. 6878

BOOK 2582

Work continued from Page 16

1205 - Setting up at well 12MW37 to purge/sample.

1805 - Finished sampling & MNA analysis at 12MW37. Returned to bldg 3245 to unload samples & equip.

1835 - Left the base.

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PROJECT NO. 6875
BOOK 2582

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9-26-04

0702 - Arrived at the Base.

0805 - Setting up to sample at 12MW737. Collected 500ml. Currently have 2 (1L) explosives bottles filled.

0825 - At well 12MW714. Collected metals & Nitrate sample.

0901 - At well 12MW733 to purge/sample.

1500 - Finished full sample & MS/D @ 12MW733 including duplicate.

1507 - At well 12MW740 to purge/sample.
Purged for 4 hrs & then the pump stopped producing w/ still ~3' of water in the well.

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BOOK 2582

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1920 - Was going to sample 12MW740. However pump lost its suction & was not able to pull up the water.

1930 - Returned to Bldg 3245 to unload samples & vehicle.

1950 - Left the Base.

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PROJECT NO. 6878
BOOK 2582

Work continued from Page 9-27-04

0715 - Arrived on Base. Loaded vehicle & planned

0855 - Arrived @ 12MWT14 to collect final filtered metals sample & finish MNA analysis that required filtered process.

1005 - At well 12MWT31 to purge/sample & MNA. Needed to filter metals & MNA.

C 1610 - At bldg 324 & to unload samples & vehicle & help T.R. pack samples for shipping. Decon bladder pumps.

1710 - Left the Base for Fed Ex.

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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DATE 9/27/04

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TITLE NSWC

PROJECT NO. 687
BOOK 2582

Work continued from Page - 9-28-04

0720 - Arrived on Base. Loaded vehicle & calibrated equip.

0820 - Arrived @ well 12MWT04 to purge/sample. While purging I also did MNA on 12MWT04 which the cont. was sampling. Then finished his well @ 1345 & proceeded to well 12MWT3 to install pump for me.

1428 - Arrived at well 12MW & was immediately able to begin purging. MNA

1945 - Returned to Bldg 324 to completely unload vehicle

2030 - Left the Base

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605

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PROJECT NO. 68

BOOK 2582

Work continued from Page 9-29-04

End of Shift. Travel Day from ~~Pit~~ to Pit.
End

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BOOK 2582

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10-5-04

AM - Travel Day from Pit to Crane.

PM - Going through paperwork & preparing for SW/Sed sampling.

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DATE 10-5-04

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PROJECT NO. 6878

BOOK 2582

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10-6-04

0705 - Arrived @ Crane. Calibrated equip., loaded vehicle, planned for days activities.

Day was spent sampling

Wrong book - see 2575 for daily log.

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DATE 10/6/04

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PROJECT NO. 6878

BOOK 2582

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10-9-04

0705 - Arrived @ Crane. Calibrated equipment. Unloaded/loaded vehicle for GW sampling.

0815 - Arrived @ well 12MW12 to begin purge, sample, & do MWT

1140 - Finished @ well 12MW12. Returned to Field Office to drop off supplies. Lunch.

1235 - Arrived @ well 12MW12. After 2 hours of purge time, we was not stabalizing & I decided to go ahead & dry the well out & sample the following morning.

PM - locating SW/SD locations @ SWMU 12. See Steve Cook logbook (2576) for days activities.

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DATE 10/9/04

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PROJECT NO. 687

BOOK 2582

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10-10-04

0710 - Arrived @ Grant. Calibrated equip & loaded vehicle.

0815 - Arrived @ well 12MW22 to sample & do MVA analysis.

1020 - Bldg 3245 to switch from GW to SW/Sed @ Swmu 16.

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BOOK 2582

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10-11-04

Day was spent collecting SW/SD samples at Swmu 12. See Star Contin. log (2576) for specific details.

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10-12-04

Day was spent collecting SW/SD samples @ SWMU 12. Refer to Stan Cantis logbook (2576) for specific details.

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10-13-04

Day was spent collecting SW/SD samples @ SWMU 12. Refer to Stan Cantis logbook (2576) for specific details.

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10-14-04

End of shift. Travel day from Crane back to Pitt office.

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APPENDIX D.3.1

SWMU 12

LAND SURVEY DATA ROUND 1

SWMU 12 SURVEY LOCATIONS- OCTOBER, 2004					
DATA COMPILED BY: BLEDSOE, TAPP, & RIGGERT, INC					
Location	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet amsl)	Top of Casing Elevation (feet amsl)	Top of PVC Elevation (feet amsl)
MONITORING WELL			Elevation	Elevation	Elevation
12MWT01	1312852.79	3026150.48	724.06	727.05	726.87
12MWT02	1312701.31	3026218.56	723.57	725.66	725.64
12MWT03	1312747.34	3026026.90	732.39	734.41	734.44
12MWT04	1312647.57	3026082.64	728.62	730.73	730.74
12MWT05	1312511.09	3026137.13	722.90	725.36	725.36
12MWT06	1311833.50	3026562.65	724.59	726.66	726.70
12MWT07	1311707.13	3026615.62	726.03	728.32	728.40
12MWT08	1311609.35	3026660.10	726.73	728.91	728.83
12MWT09	1311595.76	3026580.09	725.78	728.00	728.00
12MWT10	1311456.81	3026649.95	723.84	726.70	726.68
12MWT11	1313014.33	3026776.15	738.45	741.05	740.79
12MWT12	1312972.30	3026791.19	739.51	741.58	741.66
12MWT13	1313060.01	3026835.37	733.55	735.91	735.81
12MWT14	1312965.79	3026875.34	734.54	737.07	736.67
12MWT15	1312876.08	3026906.85	734.40	736.79	736.74
12MWT16	1312096.13	3027182.94	743.63	745.95	745.97
12MWT17	1312047.38	3027205.14	744.84	747.14	747.23
12MWT18	1312114.82	3027253.63	743.93	746.14	745.94
12MWT19	1312026.45	3027292.38	744.55	746.94	746.89
12MWT20	1311919.40	3027337.61	744.40	746.70	746.56
12MWT21	1312878.00	3026436.50	735.16	737.64	737.72
12MWT22	1311937.84	3026901.94	737.50	739.73	739.74
12MWT23	1311150.87	3027466.57	737.29	739.70	739.75
12MWT24	1310974.75	3027184.02	738.28	740.66	740.60
12MWT24A	1310968.91	3027192.97	737.99	740.49	740.53
12MWT25	1313924.59	3026269.42	746.55	748.84	748.66
12MWT26	1313638.57	3025981.12	741.64	743.68	743.72
12MWT27	1313736.63	3026477.23	738.42	740.92	740.52
12MWT28	1313506.96	3026352.09	743.27	745.54	745.53
12MWT29	1312653.54	3026079.78	729.13	731.30	731.23
12MWT30	1311604.34	3026576.32	725.67	727.98	727.59
12MWT31	1312970.99	3026872.87	734.55	736.85	736.75
12MWT32	1312015.49	3027297.24	744.51	747.43	747.44
12MWT33	1313725.86	3026481.26	738.32	740.90	740.49
12MWT34	1310967.35	3027183.73	738.02	740.61	740.52
12MWT35	1312711.38	3027111.95	732.17	734.74	734.64
12MWT36	1312466.54	3027186.16	736.51	738.87	738.63
12MWT37	1311630.57	3027496.41	736.35	738.99	738.77
12MWT38	1312353.89	3026531.17	726.05	728.10	728.03
12MWT39	1311015.63	3027662.97	735.33	737.55	737.64
12MWT40	1310616.56	3027037.67	725.37	727.55	727.50
12MWT41	1310642.00	3026376.75	621.30	623.09	622.97
12MWT42	1312364.70	3026127.28	717.93	720.22	720.22
12MWT43	1310955.52	3026125.55	677.03	679.08	679.01
12MWT44	1310276.64	3026617.87	624.81	626.67	626.69
12MWT45	1313384.30	3027614.01	688.37	691.16	691.07

12MWT46	1312828.63	3027864.12	673.31	675.62	675.67
12MWT47	1312455.99	3028025.00	660.79	663.13	663.12
12MWT48	1312052.61	3028122.50	647.84	650.15	650.05
12MWT49	1310956.27	3028138.17	616.96	619.37	619.25
12MWT50	1310582.27	3028100.87	606.85	608.98	609.01
SOIL BORINGS					
12SB01	1311032.42	3027155.52	739.33	N/A	N/A
12SB02	1311701.69	3026915.71	742.40	N/A	N/A
12SB03	1313185.14	3026402.15	741.35	N/A	N/A
12SB04	1313692.11	3026475.04	738.15	N/A	N/A
12SB05	1313719.43	3026442.00	739.89	N/A	N/A
12SB06	1313768.50	3026445.14	738.48	N/A	N/A
12SB07	1313740.37	3026475.53	737.69	N/A	N/A
12SB08	1312352.44	3026617.03	726.20	N/A	N/A
12SB09	1312448.97	3026645.54	728.31	N/A	N/A
12SB10	1312436.29	3026576.23	728.20	N/A	N/A
12SB11	1312345.82	3026527.08	725.22	N/A	N/A
12SB12	1310501.04	3027464.57	718.19	N/A	N/A
12SB13	1310582.74	3027460.00	719.01	N/A	N/A
12SB14	1310519.33	3027436.09	718.60	N/A	N/A
12SB15	1310543.62	3027435.51	719.20	N/A	N/A
12SB16	NOT SAMPLED			N/A	N/A
12SB17	NOT SAMPLED			N/A	N/A
12SB18	1310572.00	3027512.06	722.64	N/A	N/A
12SB19	1310515.78	3027510.27	721.76	N/A	N/A
12SB20	1310474.42	3027488.31	720.64	N/A	N/A
12SB21	1310543.08	3027414.43	724.66	N/A	N/A
12SB22	1310555.02	3027432.94	719.64	N/A	N/A
12SB23	1310565.07	3027424.00	723.85	N/A	N/A
12SB24	1310565.59	3027436.25	719.49	N/A	N/A
STAFF GUAGE					
12SG01	1313149.25	3026817.59	730.97	N/A	N/A
12SG02	1312731.07	3027125.37	731.64	N/A	N/A
12SG03	1312335.43	3027317.19	735.03	N/A	N/A
12SG04	1311657.15	3027481.28	736.72	N/A	N/A
12SG05	1310844.41	3026971.44	724.28	N/A	N/A
12SG06	1312141.14	3026445.52	713.38	N/A	N/A
12SG07	1312447.98	3026302.90	713.45	N/A	N/A
12SG08	1316378.17	3028951.05	668.56	N/A	N/A
12SG09	1308584.68	3028722.93	529.35	N/A	N/A
12SG10	1307698.34	3029600.29	517.21	N/A	N/A
12SG11	1305640.98	3027744.30	513.47	N/A	N/A
12SG12	1308475.83	3027438.49	538.45	N/A	N/A
SURFACE WATER/ SEDIMENT					
12SW/SD01	1312447.98	3026302.90	708.90	N/A	N/A.
12SW/SD02	1312141.14	3026445.52	709.28	N/A	N/A
12SW/SD03	1310844.69	3026971.64	721.75	N/A	N/A
12SW/SD04	1311781.01	3026168.40	666.67	N/A	N/A
12SW/SD05	1311798.03	3026222.72	668.27	N/A	N/A
12SW/SD06	1311048.61	3026339.55	638.80	N/A	N/A
12SW/SD07	1310581.24	3026370.50	612.31	N/A	N/A

12SW/SD08	1309931.91	3026317.49	588.88	N/A	N/A
12SW/SD09	1309919.29	3026464.03	583.46	N/A	N/A
12SW/SD10	1308494.52	3027425.86	532.72	N/A	N/A
12SW/SD11	1306152.75	3027966.65	495.03	N/A	N/A
12SW/SD12	1313710.13	3026822.66	693.17	N/A	N/A
12SW/SD13	1313658.03	3027884.12	605.56	N/A	N/A
12SW/SD14	1313148.91	3026817.14	727.88	N/A	N/A
12SWSD15	1312731.23	3027125.07	729.10	N/A	N/A
12SW/SD16	1312919.98	3028532.73	572.50	N/A	N/A
12SW/SD17	1312693.42	3028394.14	571.81	N/A	N/A
12SW/SD18	1312335.51	3027316.98	732.59	N/A	N/A
12SW/SD19	1312201.30	3028459.13	568.09	N/A	N/A
12SW/SD20	1311656.71	3027481.00	732.59	N/A	N/A
12SW/SD21	1311878.92	3028556.12	559.29	N/A	N/A
12SW/SD22	1311935.53	3028715.72	560.05	N/A	N/A
12SW/SD23	1310239.09	3028422.55	530.25	N/A	N/A
12SW/SD24	1307696.96	3029047.63	501.08	N/A	N/A
12SW/SD25	1307637.00	3029490.87	500.14	N/A	N/A
12SW/SD26	1307520.30	3029345.83	501.56	N/A	N/A
12SW/SD27	1305680.14	3027762.71	492.64	N/A	N/A
12SW/SD28	1314101.52	3026766.23	691.82	N/A	N/A
12SW/SD29	1313381.03	3026076.24	733.17	N/A	N/A
12SW/SD30	1313945.56	3026370.49	734.61	N/A	N/A
SB= Soil Boring SW = Surface Water SG = Staff Guage					
MW = Monitoring Well SD = Sediment SP = Seep					

APPENDIX D.3.2

SWMU 12

LAND SURVEY DATA ROUND 2

HIGHWAY 58 DUMP SITE "A" SURVEY LOCATIONS- FEBRUARY, 2004					
DATA COMPILED BY: BLEDSOE, TAPP, & RIGGERT, INC					
Location	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet amsl)	Top of Casing Elevation (feet amsl)	Top of PVC Elevation
			Elevation	Elevation	Elevation
WES-7-1-81	1309481.87	3026477.49	628.95	631.74	631.69
WES-7-2-81	1309501.85	3026589.93	601.72	NO CASING	604.37
WES-7-3-81	1309677.40	3026457.16	596.22	NO CASING	599.19
WES-7-4-81	1309586.54	3026531.10	595.22	NO CASING	597.64
WES-7-5-81	1309640.94	3026503.16	593.50	NO CASING	595.95
WES = Monitoring Well					

ADDITIONAL SWMU 12 SURVEY LOCATIONS- MARCH, 2005					
DATA COMPILED BY: BLEDSOE, TAPP, & RIGGERT, INC					
Location	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet amsl)	Top of Casing Elevation (feet amsl)	Top of PVC Elevation
SURFACE WATER/					
SEDIMENT					
12SW/SD31	1313640.32	3026716.23	707.92	N/A	N/A
12SW/SD32	1313610.22	3026758.78	702.06	N/A	N/A
12SW/SD33	1314802.20	3027176.64	703.28	N/A	N/A
12SW/SD34	1312130.31	3026460.97	710.60	N/A	N/A
12SW/SD35	1312246.87	3026481.69	718.28	N/A	N/A
12SW/SD36	1312237.88	3026490.84	717.22	N/A	N/A
SB= Soil Boring SW = Surface Water SG = Staff Guage					
MW = Monitoring Well SD = Sediment SP = Seep VG = Vegetation					

APPENDIX E

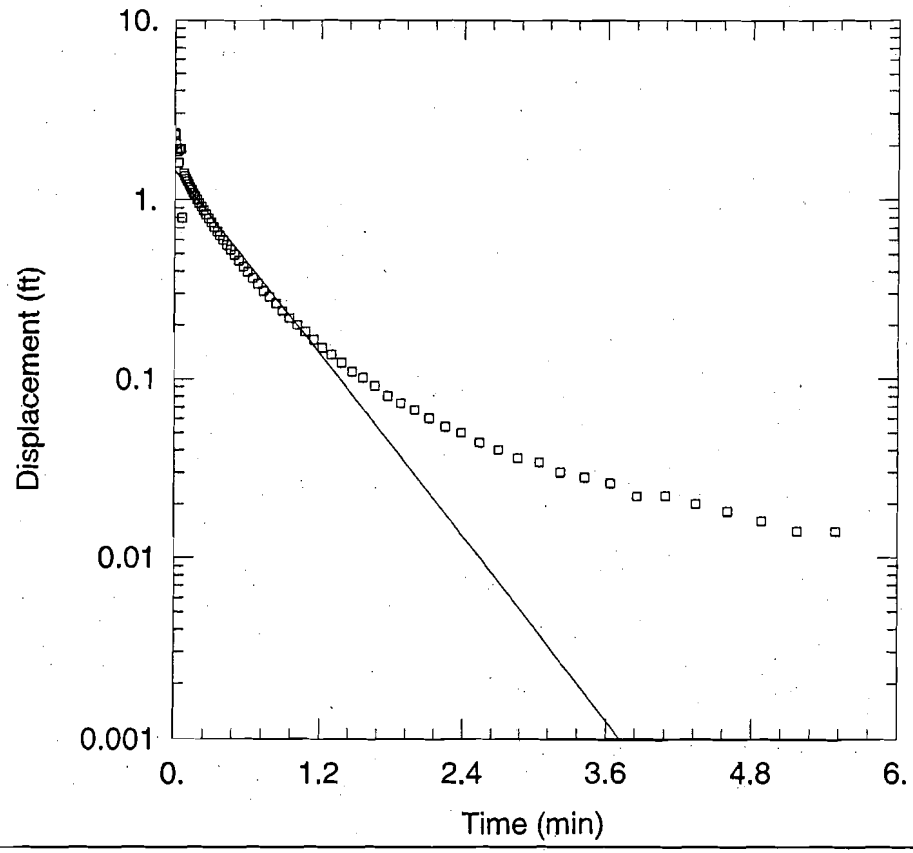
SWMU 12

AQUIFER CHARACTERISTICS, CALCULATIONS, AND RECORDS

APPENDIX E.1

SWMU 12

SLUG TEST DATA, CALCULATIONS, AND RESULTS



12MWT01 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT01-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:33:50

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT01
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 3.611 ft/day
y0 = 1.444 ft

AQUIFER DATA

Saturated Thickness: 29.48 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT01)

Initial Displacement: 2.321 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 29.48 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MW101

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 8.45 DATE: 1-6-05

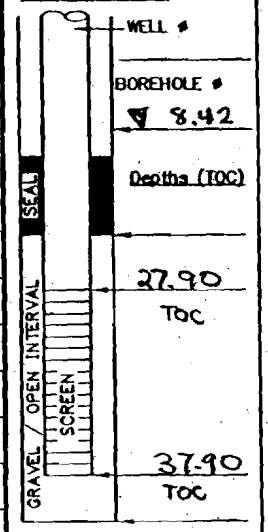
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG PAGE 1 OF 1

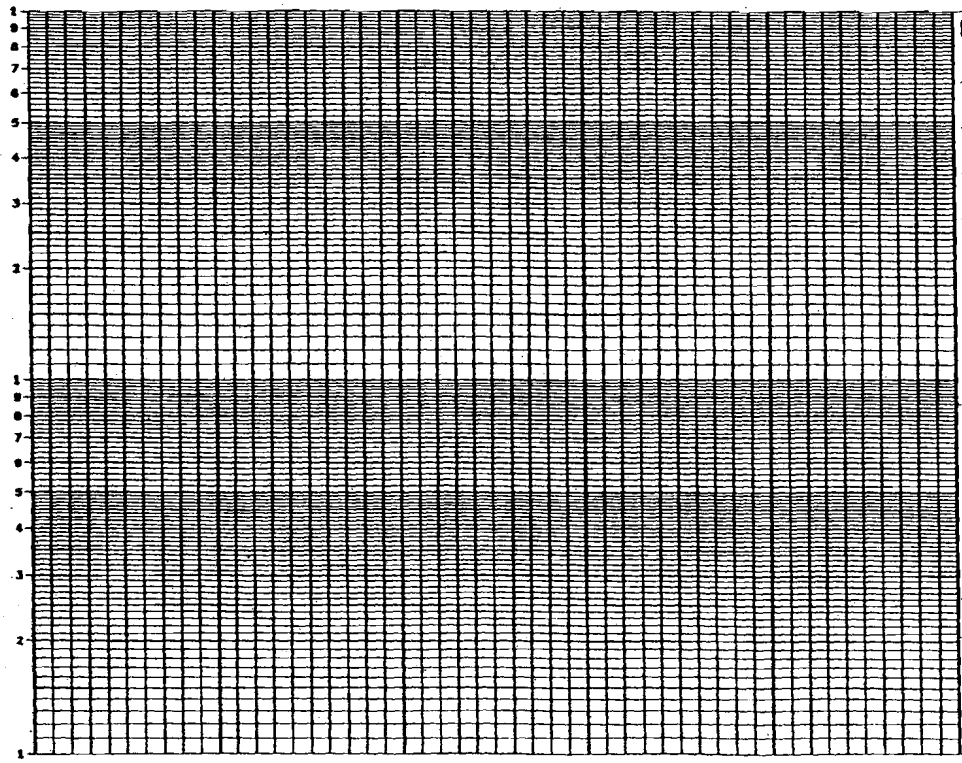
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.075	2.21				
.1	2.26				
.2	1.25				
.3	.95				
.4	.75				
.5	.60				
.75	.36				
1	.24			29.48	
2	.07				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph Good

CALCS, SKETCH MAPS, ETC.:

ACAD: FORM_HYDCONTST.dwg 07/08/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 9:21:06
Report fror ...\SN08927 2005-01-06 091500 12MWT01-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT01-F

Test define 1/6/2005 9:00:48
Test sched 1/6/2005 9:15:00
Test starte 1/6/2005 9:15:00
Test stopp 1/6/2005 9:20:45

Data gathered using Logarithmic testing
Maximun Minutes.
Number 91

TOTAL DA 91

Channel number [1]
Measurer Temperature
Channel name:

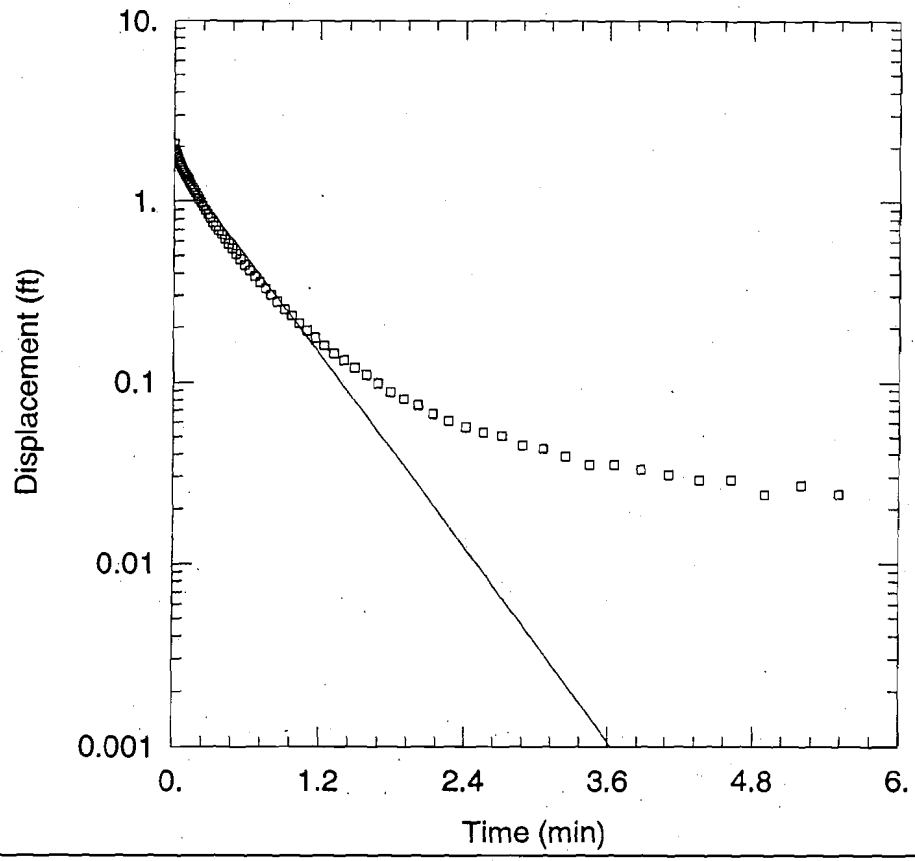
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 20.64 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	9:15:00	0	15.12	0
1/6/2005	9:15:00	0.005	15.14	0.006
1/6/2005	9:15:00	0.01	15.15	0.007
1/6/2005	9:15:00	0.015	15.15	0.009
1/6/2005	9:15:01	0.02	15.15	0.011
1/6/2005	9:15:01	0.025	15.15	0.011
1/6/2005	9:15:01	0.03	15.17	0.011
1/6/2005	9:15:02	0.035	15.17	0.013
1/6/2005	9:15:02	0.04	15.17	0.013

1/6/2005	9:15:02	0.045	15.17	0.013
1/6/2005	9:15:03	0.05	15.17	0.272
1/6/2005	9:15:03	0.055	15.17	0.938
1/6/2005	9:15:03	0.06	15.17	1.672
1/6/2005	9:15:03	0.065	15.17	1.225
1/6/2005	9:15:04	0.07	15.17	1.488
1/6/2005	9:15:04	0.075	15.17	2.212
1/6/2005	9:15:04	0.08	15.18	2.25
1/6/2005	9:15:05	0.085	15.18	1.629
1/6/2005	9:15:05	0.09	15.18	1.965
1/6/2005	9:15:05	0.095	15.18	2.321
1/6/2005	9:15:06	0.1	15.18	2.264
1/6/2005	9:15:06	0.1058	15.18	2.013
1/6/2005	9:15:06	0.112	15.18	1.904
1/6/2005	9:15:07	0.1185	15.18	1.831
1/6/2005	9:15:07	0.1255	15.18	1.591
1/6/2005	9:15:07	0.1328	15.18	1.89
1/6/2005	9:15:08	0.1407	15.18	1.888
1/6/2005	9:15:08	0.149	15.18	1.912
1/6/2005	9:15:09	0.1578	15.18	0.796
1/6/2005	9:15:10	0.1672	15.17	1.389
1/6/2005	9:15:10	0.177	15.17	1.336
1/6/2005	9:15:11	0.1875	15.17	1.294
1/6/2005	9:15:11	0.1985	15.15	1.253
1/6/2005	9:15:12	0.2102	15.15	1.211
1/6/2005	9:15:13	0.2227	15.15	1.168
1/6/2005	9:15:14	0.2358	15.15	1.126
1/6/2005	9:15:15	0.2498	15.15	1.083
1/6/2005	9:15:15	0.2647	15.15	1.041
1/6/2005	9:15:16	0.2803	15.15	0.996
1/6/2005	9:15:17	0.297	15.15	0.954
1/6/2005	9:15:18	0.3147	15.15	0.912
1/6/2005	9:15:20	0.3333	15.15	0.869
1/6/2005	9:15:21	0.3532	15.15	0.827
1/6/2005	9:15:22	0.3742	15.15	0.786
1/6/2005	9:15:23	0.3963	15.15	0.748
1/6/2005	9:15:25	0.4198	15.15	0.707
1/6/2005	9:15:26	0.4447	15.15	0.667
1/6/2005	9:15:28	0.4697	15.15	0.632
1/6/2005	9:15:29	0.4963	15.15	0.596
1/6/2005	9:15:31	0.5247	15.15	0.56
1/6/2005	9:15:33	0.5547	15.15	0.525
1/6/2005	9:15:35	0.5863	15.15	0.493
1/6/2005	9:15:37	0.6213	15.15	0.458
1/6/2005	9:15:39	0.658	15.15	0.424
1/6/2005	9:15:41	0.6963	15.15	0.396
1/6/2005	9:15:44	0.738	15.15	0.365
1/6/2005	9:15:46	0.7813	15.15	0.339
1/6/2005	9:15:49	0.828	15.15	0.309
1/6/2005	9:15:52	0.8763	15.14	0.287
1/6/2005	9:15:55	0.928	15.14	0.263
1/6/2005	9:15:58	0.983	15.14	0.24

ET (min)	Feet H2O
0	2.321
0.005	2.264
0.0108	2.013
0.017	1.904
0.0235	1.831
0.0305	1.591
0.0378	1.89
0.0457	1.888
0.054	1.912
0.0628	0.796
0.0722	1.389
0.082	1.336
0.0925	1.294
0.1035	1.253
0.1152	1.211
0.1277	1.168
0.1408	1.126
0.1548	1.083
0.1697	1.041
0.1853	0.996
0.202	0.954
0.2197	0.912
0.2383	0.869
0.2582	0.827
0.2792	0.786
0.3013	0.748
0.3248	0.707
0.3497	0.667
0.3747	0.632
0.4013	0.596
0.4297	0.56
0.4597	0.525
0.4913	0.493
0.5263	0.458
0.563	0.424
0.6013	0.396
0.643	0.365
0.6863	0.339
0.733	0.309
0.7813	0.287
0.833	0.263
0.888	0.24

1/6/2005	9:16:02	1.0413	15.14	0.218	0.9463	0.218
1/6/2005	9:16:06	1.103	15.14	0.2	1.008	0.2
1/6/2005	9:16:10	1.168	15.14	0.184	1.073	0.184
1/6/2005	9:16:14	1.238	15.14	0.165	1.143	0.165
1/6/2005	9:16:18	1.3113	15.14	0.149	1.2163	0.149
1/6/2005	9:16:23	1.3897	15.14	0.137	1.2947	0.137
1/6/2005	9:16:28	1.473	15.14	0.123	1.378	0.123
1/6/2005	9:16:33	1.5613	15.14	0.109	1.4663	0.109
1/6/2005	9:16:39	1.6547	15.13	0.101	1.5597	0.101
1/6/2005	9:16:45	1.753	15.14	0.091	1.658	0.091
1/6/2005	9:16:51	1.858	15.14	0.08	1.763	0.08
1/6/2005	9:16:58	1.968	15.13	0.073	1.873	0.073
1/6/2005	9:17:05	2.0847	15.13	0.067	1.9897	0.067
1/6/2005	9:17:12	2.2097	15.14	0.06	2.1147	0.06
1/6/2005	9:17:20	2.3413	15.14	0.054	2.2463	0.054
1/6/2005	9:17:28	2.4813	15.13	0.05	2.3863	0.05
1/6/2005	9:17:37	2.6297	15.13	0.044	2.5347	0.044
1/6/2005	9:17:47	2.7863	15.13	0.04	2.6913	0.04
1/6/2005	9:17:57	2.953	15.13	0.036	2.858	0.036
1/6/2005	9:18:07	3.1297	15.13	0.034	3.0347	0.034
1/6/2005	9:18:18	3.3163	15.13	0.03	3.2213	0.03
1/6/2005	9:18:30	3.5147	15.13	0.028	3.4197	0.028
1/6/2005	9:18:43	3.7247	15.13	0.026	3.6297	0.026
1/6/2005	9:18:56	3.9463	15.13	0.022	3.8513	0.022
1/6/2005	9:19:10	4.1813	15.13	0.022	4.0863	0.022
1/6/2005	9:19:25	4.4297	15.13	0.02	4.3347	0.02
1/6/2005	9:19:41	4.693	15.13	0.018	4.598	0.018
1/6/2005	9:19:58	4.973	15.13	0.016	4.878	0.016
1/6/2005	9:20:16	5.2697	15.13	0.014	5.1747	0.014
1/6/2005	9:20:34	5.583	15.13	0.014	5.488	0.014



12MWT01 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT01-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:33:57

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT01
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 3.767 ft/day
y0 = 1.661 ft

AQUIFER DATA

Saturated Thickness: 29.48 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT01)

Initial Displacement: 2.072 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 29.48 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT01-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/ TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 8.45 DATE: 1-6-05

TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

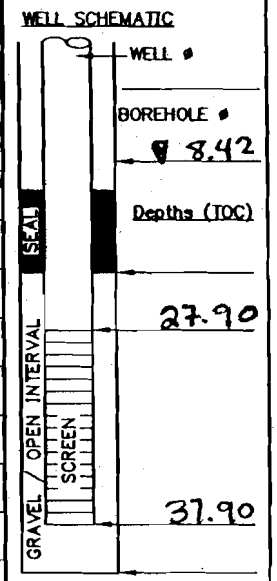
METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC.

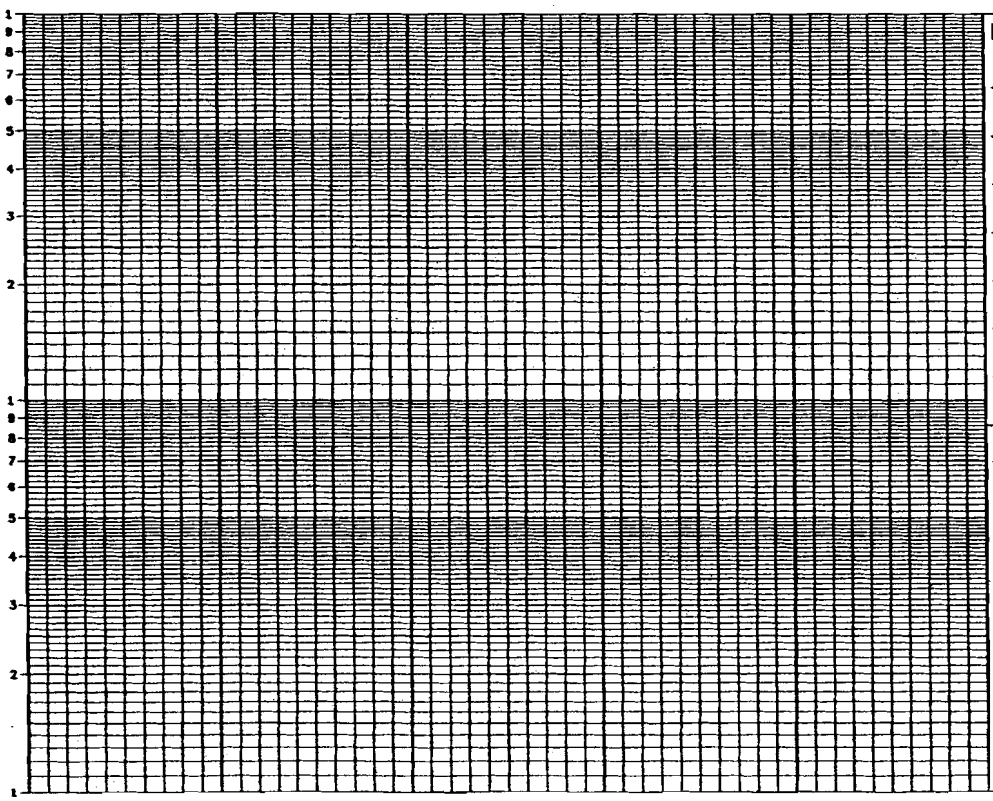
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	~~MEASURED WATER LEVEL~~ (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.075	-2.07				
.1	-1.72				
.2	-1.28				
.3	-.98				
.5	-.62				
.8	-.36				
1.0	-.25			29.48	
2.0	-.08				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

GRAPH GOOD

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 9:41:07
Report fror ...\SN08927 2005-01-06 093500 12MWTO1-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWTO1-R

Test define 1/6/2005 9:27:31
Test sched 1/6/2005 9:35:00
Test starte 1/6/2005 9:35:00
Test stopp 1/6/2005 9:40:53

Data gathered using Logarithmic testing
Maximun Minutes.
Number 91

TOTAL DA 91

Channel number [1]
Measurer Temperature
Channel name:

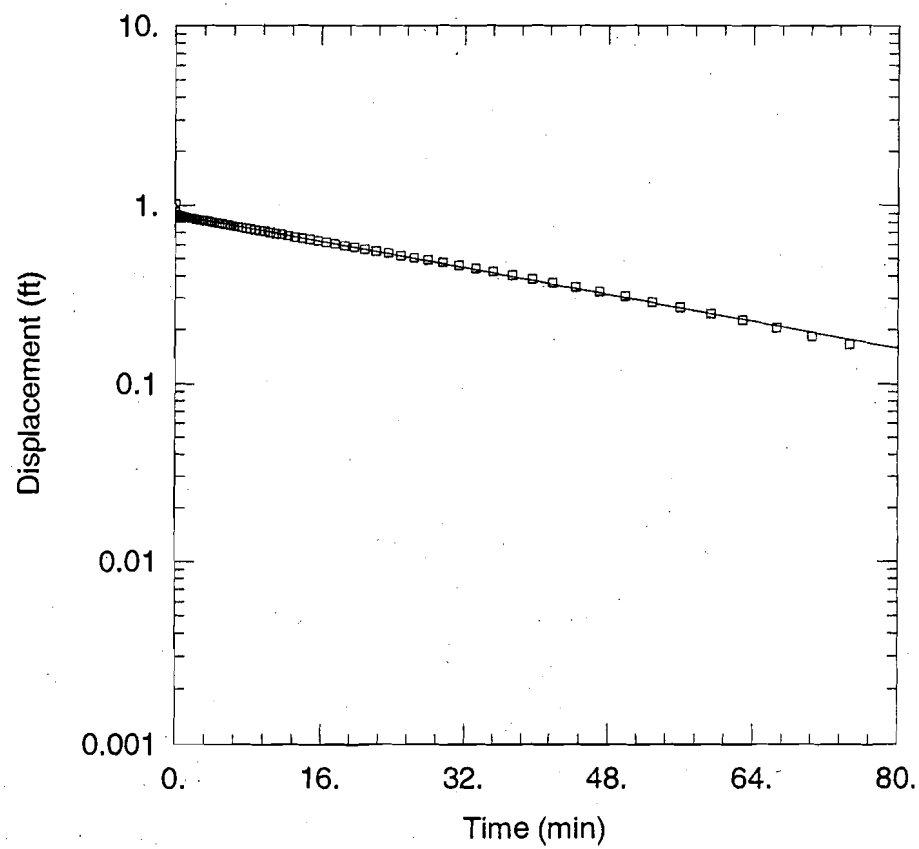
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 20.638 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	9:35:00	0	15.12	0
1/6/2005	9:35:00	0.005	15.14	0.008
1/6/2005	9:35:00	0.01	15.14	0.01
1/6/2005	9:35:00	0.015	15.15	0.011
1/6/2005	9:35:01	0.02	15.15	0.011
1/6/2005	9:35:01	0.025	15.15	0.011
1/6/2005	9:35:01	0.03	15.15	0.011
1/6/2005	9:35:02	0.035	15.17	0.013
1/6/2005	9:35:02	0.04	15.17	0.011

1/6/2005	9:35:02	0.045	15.17	0.013
1/6/2005	9:35:03	0.05	15.17	-1.285
1/6/2005	9:35:03	0.055	15.17	-2.659
1/6/2005	9:35:03	0.06	15.17	-2.402
1/6/2005	9:35:03	0.065	15.17	-1.028
1/6/2005	9:35:04	0.07	15.17	-1.629
1/6/2005	9:35:04	0.075	15.17	-2.072
1/6/2005	9:35:04	0.08	15.17	-1.937
1/6/2005	9:35:05	0.085	15.17	-1.892
1/6/2005	9:35:05	0.09	15.17	-1.846
1/6/2005	9:35:05	0.095	15.17	-1.807
1/6/2005	9:35:06	0.1	15.17	-1.767
1/6/2005	9:35:06	0.1058	15.17	-1.73
1/6/2005	9:35:06	0.112	15.17	-1.686
1/6/2005	9:35:07	0.1185	15.17	-1.641
1/6/2005	9:35:07	0.1255	15.17	-1.603
1/6/2005	9:35:07	0.1328	15.18	-1.563
1/6/2005	9:35:08	0.1407	15.18	-1.522
1/6/2005	9:35:08	0.149	15.18	-1.482
1/6/2005	9:35:09	0.1578	15.18	-1.441
1/6/2005	9:35:10	0.1672	15.17	-1.405
1/6/2005	9:35:10	0.177	15.17	-1.364
1/6/2005	9:35:11	0.1875	15.15	-1.322
1/6/2005	9:35:11	0.1985	15.15	-1.281
1/6/2005	9:35:12	0.2102	15.15	-1.239
1/6/2005	9:35:13	0.2227	15.15	-1.196
1/6/2005	9:35:14	0.2358	15.15	-1.154
1/6/2005	9:35:15	0.2498	15.15	-1.109
1/6/2005	9:35:15	0.2647	15.15	-1.067
1/6/2005	9:35:16	0.2803	15.15	-1.024
1/6/2005	9:35:17	0.297	15.15	-0.982
1/6/2005	9:35:18	0.3147	15.15	-0.939
1/6/2005	9:35:20	0.3333	15.15	-0.897
1/6/2005	9:35:21	0.3532	15.15	-0.854
1/6/2005	9:35:22	0.3742	15.15	-0.814
1/6/2005	9:35:23	0.3963	15.15	-0.771
1/6/2005	9:35:25	0.4198	15.15	-0.731
1/6/2005	9:35:26	0.4447	15.15	-0.692
1/6/2005	9:35:28	0.4697	15.15	-0.656
1/6/2005	9:35:29	0.4963	15.15	-0.618
1/6/2005	9:35:31	0.5247	15.15	-0.581
1/6/2005	9:35:33	0.5547	15.15	-0.547
1/6/2005	9:35:35	0.5863	15.15	-0.514
1/6/2005	9:35:37	0.6213	15.14	-0.48
1/6/2005	9:35:39	0.658	15.15	-0.446
1/6/2005	9:35:41	0.6963	15.15	-0.415
1/6/2005	9:35:44	0.738	15.15	-0.385
1/6/2005	9:35:46	0.7813	15.15	-0.357
1/6/2005	9:35:49	0.828	15.14	-0.328
1/6/2005	9:35:52	0.8763	15.14	-0.304
1/6/2005	9:35:55	0.928	15.14	-0.278
1/6/2005	9:35:58	0.983	15.14	-0.253

ET (min)	Feet H2O
0	2.072
0.005	1.937
0.01	1.892
0.015	1.846
0.02	1.807
0.025	1.767
0.0308	1.73
0.037	1.686
0.0435	1.641
0.0505	1.603
0.0578	1.563
0.0657	1.522
0.074	1.482
0.0828	1.441
0.0922	1.405
0.102	1.364
0.1125	1.322
0.1235	1.281
0.1352	1.239
0.1477	1.196
0.1608	1.154
0.1748	1.109
0.1897	1.067
0.2053	1.024
0.222	0.982
0.2397	0.939
0.2583	0.897
0.2782	0.854
0.2992	0.814
0.3213	0.771
0.3448	0.731
0.3697	0.692
0.3947	0.656
0.4213	0.618
0.4497	0.581
0.4797	0.547
0.5113	0.514
0.5463	0.48
0.583	0.446
0.6213	0.415
0.663	0.385
0.7063	0.357
0.753	0.328
0.8013	0.304
0.853	0.278
0.908	0.253

1/6/2005	9:36:02	1.0413	15.14	-0.233	0.9663	0.233
1/6/2005	9:36:06	1.103	15.14	-0.211	1.028	0.211
1/6/2005	9:36:10	1.168	15.14	-0.193	1.093	0.193
1/6/2005	9:36:14	1.238	15.14	-0.176	1.163	0.176
1/6/2005	9:36:18	1.3113	15.14	-0.16	1.2363	0.16
1/6/2005	9:36:23	1.3897	15.14	-0.144	1.3147	0.144
1/6/2005	9:36:28	1.473	15.14	-0.132	1.398	0.132
1/6/2005	9:36:33	1.5613	15.14	-0.12	1.4863	0.12
1/6/2005	9:36:39	1.6547	15.14	-0.11	1.5797	0.11
1/6/2005	9:36:45	1.753	15.13	-0.099	1.678	0.099
1/6/2005	9:36:51	1.858	15.13	-0.089	1.783	0.089
1/6/2005	9:36:58	1.968	15.14	-0.081	1.893	0.081
1/6/2005	9:37:05	2.0847	15.13	-0.075	2.0097	0.075
1/6/2005	9:37:12	2.2097	15.13	-0.067	2.1347	0.067
1/6/2005	9:37:20	2.3413	15.13	-0.061	2.2663	0.061
1/6/2005	9:37:28	2.4813	15.13	-0.057	2.4063	0.057
1/6/2005	9:37:37	2.6297	15.13	-0.053	2.5547	0.053
1/6/2005	9:37:47	2.7863	15.13	-0.051	2.7113	0.051
1/6/2005	9:37:57	2.953	15.13	-0.045	2.878	0.045
1/6/2005	9:38:07	3.1297	15.13	-0.043	3.0547	0.043
1/6/2005	9:38:18	3.3163	15.13	-0.039	3.2413	0.039
1/6/2005	9:38:30	3.5147	15.13	-0.035	3.4397	0.035
1/6/2005	9:38:43	3.7247	15.13	-0.035	3.6497	0.035
1/6/2005	9:38:56	3.9463	15.13	-0.033	3.8713	0.033
1/6/2005	9:39:10	4.1813	15.13	-0.031	4.1063	0.031
1/6/2005	9:39:25	4.4297	15.13	-0.029	4.3547	0.029
1/6/2005	9:39:41	4.693	15.13	-0.029	4.618	0.029
1/6/2005	9:39:58	4.973	15.13	-0.024	4.898	0.024
1/6/2005	9:40:16	5.2697	15.13	-0.027	5.1947	0.027
1/6/2005	9:40:34	5.583	15.13	-0.024	5.508	0.024



12MWT03 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT03-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:04

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT03
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.03958 ft/day
y0 = 0.8821 ft

AQUIFER DATA

Saturated Thickness: 12.57 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT03)

Initial Displacement: 1.022 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 12.57 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MW103F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/27.90 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 15.10 DATE: 1-6-05

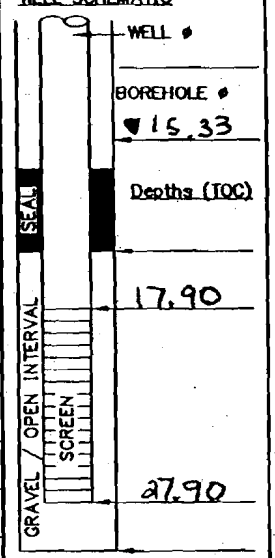
TEST TYPE (Rising/Falling/Constant Head): F CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

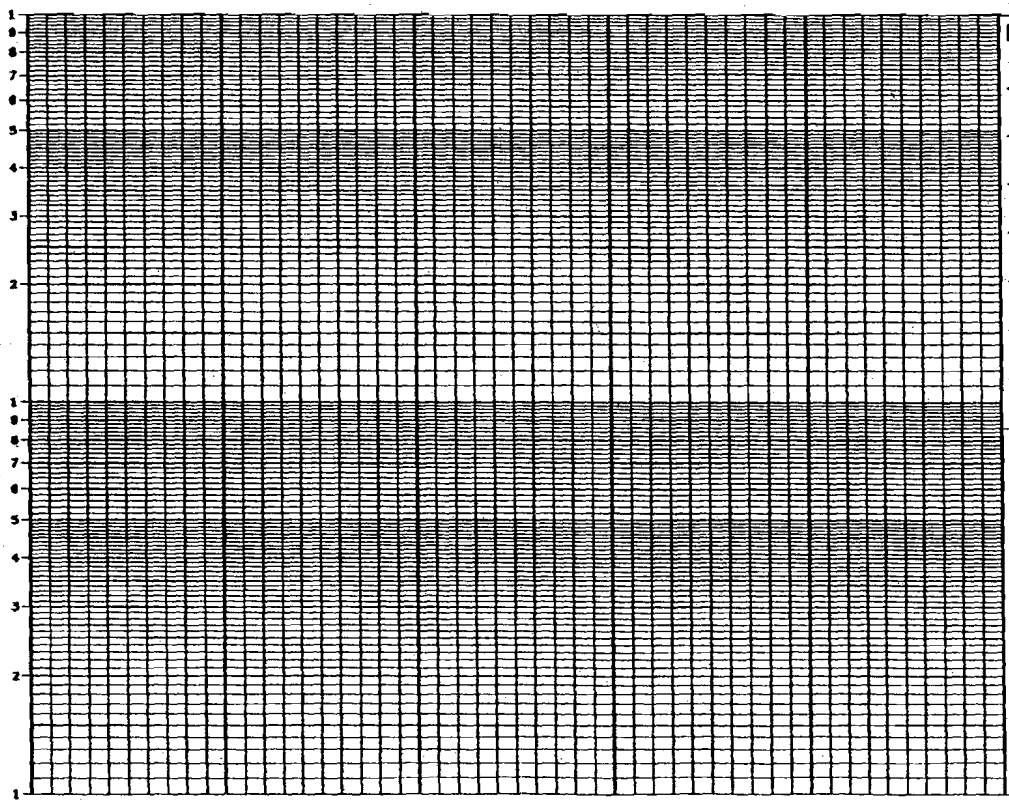
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	~~MEASURED WATER LEVEL~~ (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.08	1.27				
.2	.85				
1.0	.87				
5	.79				
10	.71				
15	.64				
20	.58		12.57		
25	.52				
30	.47				
40	.38				
50	.31				
60	.25				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph is good

No Rising Head performed due to slow rec during Falling Head

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 12:02:30
Report fror ...\SN08927 2005-01-06 104700 12MWT03-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT03-F

Test define 1/6/2005 10:41:53
Test sched 1/6/2005 10:47:00
Test starte 1/6/2005 10:47:00
Test stopp 1/6/2005 12:02:22

Data gathered using Logarithmic testing
Maximun Minutes.
Number 136

TOTAL DA 136

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 11.843 Feet H2O

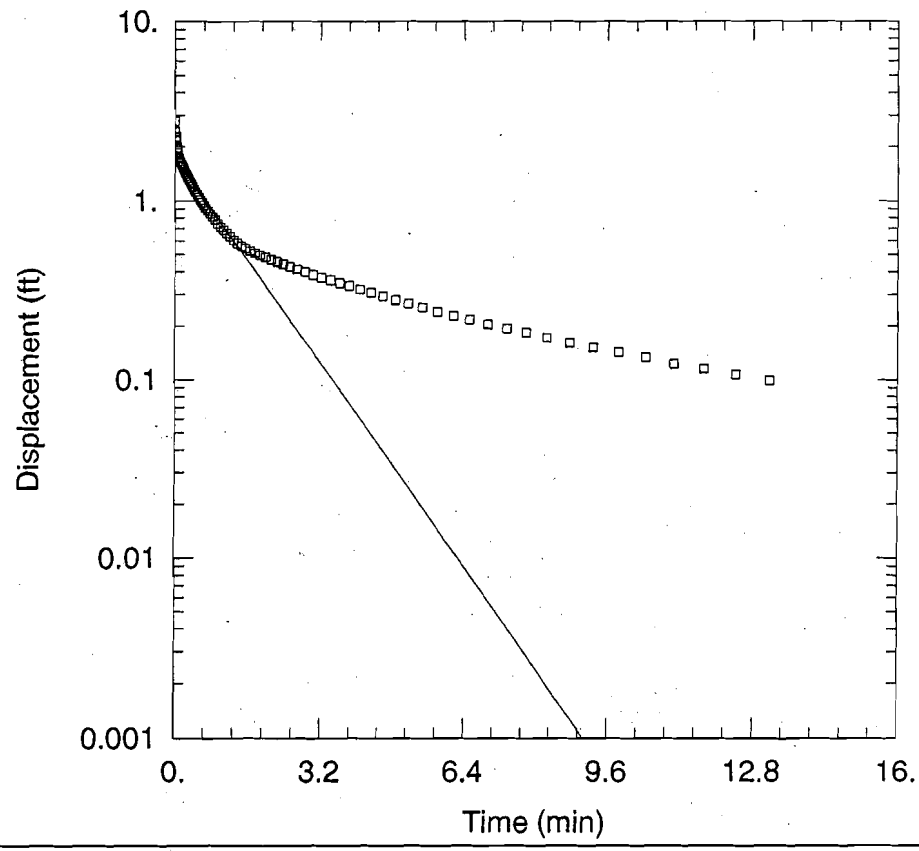
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	10:47:00	0	14.5	0
1/6/2005	10:47:00	0.005	14.51	0
1/6/2005	10:47:00	0.01	14.51	0.002
1/6/2005	10:47:00	0.015	14.52	0.002
1/6/2005	10:47:01	0.02	14.52	0.004
1/6/2005	10:47:01	0.025	14.52	0.004
1/6/2005	10:47:01	0.03	14.52	0.002
1/6/2005	10:47:02	0.035	14.54	0.003
1/6/2005	10:47:02	0.04	14.54	0.003

1/6/2005	10:47:02	0.045	14.54	0.003
1/6/2005	10:47:03	0.05	14.54	0.003
1/6/2005	10:47:03	0.055	14.54	0.005
1/6/2005	10:47:03	0.06	14.54	0.429
1/6/2005	10:47:03	0.065	14.54	1.21
1/6/2005	10:47:04	0.07	14.54	1.315
1/6/2005	10:47:04	0.075	14.54	1.143
1/6/2005	10:47:04	0.08	14.54	1.271
1/6/2005	10:47:05	0.085	14.54	1.022
1/6/2005	10:47:05	0.09	14.54	1.372
1/6/2005	10:47:05	0.095	14.54	0.961
1/6/2005	10:47:06	0.1	14.54	0.931
1/6/2005	10:47:06	0.1058	14.55	1.044
1/6/2005	10:47:06	0.112	14.55	0.906
1/6/2005	10:47:07	0.1185	14.55	1.026
1/6/2005	10:47:07	0.1255	14.55	0.961
1/6/2005	10:47:07	0.1328	14.55	0.959
1/6/2005	10:47:08	0.1407	14.55	0.9
1/6/2005	10:47:08	0.149	14.55	0.88
1/6/2005	10:47:09	0.1578	14.55	1.014
1/6/2005	10:47:10	0.1672	14.54	0.672
1/6/2005	10:47:10	0.177	14.54	1.022
1/6/2005	10:47:11	0.1875	14.54	0.868
1/6/2005	10:47:11	0.1985	14.54	0.852
1/6/2005	10:47:12	0.2102	14.54	0.931
1/6/2005	10:47:13	0.2227	14.54	0.909
1/6/2005	10:47:14	0.2358	14.54	0.884
1/6/2005	10:47:15	0.2498	14.52	0.882
1/6/2005	10:47:15	0.2647	14.54	0.886
1/6/2005	10:47:16	0.2803	14.52	0.888
1/6/2005	10:47:17	0.297	14.52	0.888
1/6/2005	10:47:18	0.3147	14.52	0.888
1/6/2005	10:47:20	0.3333	14.52	0.888
1/6/2005	10:47:21	0.3532	14.52	0.886
1/6/2005	10:47:22	0.3742	14.52	0.886
1/6/2005	10:47:23	0.3963	14.52	0.884
1/6/2005	10:47:25	0.4198	14.52	0.884
1/6/2005	10:47:26	0.4447	14.52	0.884
1/6/2005	10:47:28	0.4697	14.52	0.882
1/6/2005	10:47:29	0.4963	14.52	0.882
1/6/2005	10:47:31	0.5247	14.52	0.88
1/6/2005	10:47:33	0.5547	14.52	0.876
1/6/2005	10:47:35	0.5863	14.52	0.876
1/6/2005	10:47:37	0.6213	14.52	0.876
1/6/2005	10:47:39	0.658	14.52	0.876
1/6/2005	10:47:41	0.6963	14.52	0.876
1/6/2005	10:47:44	0.738	14.52	0.87
1/6/2005	10:47:46	0.7813	14.52	0.872
1/6/2005	10:47:49	0.828	14.52	0.87
1/6/2005	10:47:52	0.8763	14.52	0.87
1/6/2005	10:47:55	0.928	14.52	0.868
1/6/2005	10:47:58	0.983	14.52	0.868

ET (min)	Feet H2O
0	1.022
0.0105	0.868
0.0215	0.852
0.0332	0.931
0.0457	0.909
0.0588	0.884
0.0728	0.882
0.0877	0.886
0.1033	0.888
0.12	0.888
0.1377	0.888
0.1563	0.888
0.1762	0.886
0.1972	0.886
0.2193	0.884
0.2428	0.884
0.2677	0.884
0.2927	0.882
0.3193	0.882
0.3477	0.88
0.3777	0.876
0.4093	0.876
0.4443	0.876
0.481	0.876
0.5193	0.876
0.561	0.87
0.6043	0.872
0.651	0.87
0.6993	0.87
0.751	0.868
0.806	0.868

1/6/2005	10:48:02	1.0413	14.52	0.866	0.8643	0.866
1/6/2005	10:48:06	1.103	14.52	0.864	0.926	0.864
1/6/2005	10:48:10	1.168	14.52	0.864	0.991	0.864
1/6/2005	10:48:14	1.238	14.51	0.862	1.061	0.862
1/6/2005	10:48:18	1.3113	14.51	0.86	1.1343	0.86
1/6/2005	10:48:23	1.3897	14.51	0.858	1.2127	0.858
1/6/2005	10:48:28	1.473	14.51	0.856	1.296	0.856
1/6/2005	10:48:33	1.5613	14.51	0.854	1.3843	0.854
1/6/2005	10:48:39	1.6547	14.51	0.848	1.4777	0.848
1/6/2005	10:48:45	1.753	14.51	0.848	1.576	0.848
1/6/2005	10:48:51	1.858	14.51	0.848	1.681	0.848
1/6/2005	10:48:58	1.968	14.51	0.85	1.791	0.85
1/6/2005	10:49:05	2.0847	14.51	0.844	1.9077	0.844
1/6/2005	10:49:12	2.2097	14.51	0.84	2.0327	0.84
1/6/2005	10:49:20	2.3413	14.51	0.84	2.1643	0.84
1/6/2005	10:49:28	2.4813	14.51	0.836	2.3043	0.836
1/6/2005	10:49:37	2.6297	14.51	0.832	2.4527	0.832
1/6/2005	10:49:47	2.7863	14.51	0.83	2.6093	0.83
1/6/2005	10:49:57	2.953	14.51	0.826	2.776	0.826
1/6/2005	10:50:07	3.1297	14.5	0.824	2.9527	0.824
1/6/2005	10:50:18	3.3163	14.5	0.82	3.1393	0.82
1/6/2005	10:50:30	3.5147	14.5	0.816	3.3377	0.816
1/6/2005	10:50:43	3.7247	14.5	0.814	3.5477	0.814
1/6/2005	10:50:56	3.9463	14.5	0.808	3.7693	0.808
1/6/2005	10:51:10	4.1813	14.5	0.804	4.0043	0.804
1/6/2005	10:51:25	4.4297	14.5	0.798	4.2527	0.798
1/6/2005	10:51:41	4.693	14.5	0.796	4.516	0.796
1/6/2005	10:51:58	4.973	14.5	0.79	4.796	0.79
1/6/2005	10:52:16	5.2697	14.5	0.784	5.0927	0.784
1/6/2005	10:52:34	5.583	14.5	0.776	5.406	0.776
1/6/2005	10:52:54	5.9147	14.5	0.773	5.7377	0.773
1/6/2005	10:53:15	6.2663	14.5	0.767	6.0893	0.767
1/6/2005	10:53:38	6.6397	14.5	0.761	6.4627	0.761
1/6/2005	10:54:02	7.0347	14.5	0.755	6.8577	0.755
1/6/2005	10:54:27	7.453	14.5	0.747	7.276	0.747
1/6/2005	10:54:53	7.8963	14.5	0.741	7.7193	0.741
1/6/2005	10:55:21	8.3663	14.5	0.735	8.1893	0.735
1/6/2005	10:55:51	8.8647	14.5	0.727	8.6877	0.727
1/6/2005	10:56:23	9.3913	14.51	0.719	9.2143	0.719
1/6/2005	10:56:56	9.9497	14.51	0.711	9.7727	0.711
1/6/2005	10:57:32	10.5413	14.5	0.701	10.3643	0.701
1/6/2005	10:58:10	11.168	14.51	0.69	10.991	0.69
1/6/2005	10:58:49	11.8313	14.51	0.684	11.6543	0.684
1/6/2005	10:59:32	12.5347	14.5	0.672	12.3577	0.672
1/6/2005	11:00:16	13.2797	14.51	0.662	13.1027	0.662
1/6/2005	11:01:04	14.0697	14.5	0.652	13.8927	0.652
1/6/2005	11:01:54	14.9063	14.51	0.642	14.7293	0.642
1/6/2005	11:02:47	15.7913	14.51	0.63	15.6143	0.63
1/6/2005	11:03:43	16.7297	14.51	0.617	16.5527	0.617
1/6/2005	11:04:43	17.723	14.51	0.605	17.546	0.605
1/6/2005	11:05:46	18.7763	14.51	0.593	18.5993	0.593
1/6/2005	11:06:53	19.8913	14.51	0.581	19.7143	0.581

1/6/2005	11:08:04	21.073	14.51	0.565	20.896	0.565
1/6/2005	11:09:19	22.3247	14.51	0.551	22.1477	0.551
1/6/2005	11:10:38	23.6497	14.51	0.536	23.4727	0.536
1/6/2005	11:12:03	25.0547	14.51	0.52	24.8777	0.52
1/6/2005	11:13:32	26.543	14.51	0.504	26.366	0.504
1/6/2005	11:15:07	28.118	14.51	0.49	27.941	0.49
1/6/2005	11:16:47	29.7863	14.51	0.474	29.6093	0.474
1/6/2005	11:18:33	31.5547	14.51	0.457	31.3777	0.457
1/6/2005	11:20:25	33.428	14.52	0.439	33.251	0.439
1/6/2005	11:22:24	35.4113	14.52	0.421	35.2343	0.421
1/6/2005	11:24:30	37.513	14.52	0.403	37.336	0.403
1/6/2005	11:26:44	39.7397	14.52	0.384	39.5627	0.384
1/6/2005	11:29:05	42.098	14.52	0.366	41.921	0.366
1/6/2005	11:31:35	44.5963	14.52	0.346	44.4193	0.346
1/6/2005	11:34:14	47.243	14.52	0.326	47.066	0.326
1/6/2005	11:37:02	50.0463	14.52	0.307	49.8693	0.307
1/6/2005	11:40:00	53.0147	14.52	0.285	52.8377	0.285
1/6/2005	11:43:09	56.1597	14.52	0.267	55.9827	0.267
1/6/2005	11:46:29	59.4913	14.52	0.247	59.3143	0.247
1/6/2005	11:50:01	63.0197	14.52	0.226	62.8427	0.226
1/6/2005	11:53:45	66.758	14.52	0.206	66.581	0.206
1/6/2005	11:57:43	70.718	14.52	0.184	70.541	0.184
1/6/2005	12:01:54	74.9113	14.52	0.166	74.7343	0.166



12MWT06 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT06-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:10

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT06
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 1.512 ft/day
y0 = 1.717 ft

AQUIFER DATA

Saturated Thickness: 15.85 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT06)

Initial Displacement: 2.77 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 15.85 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT06-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/25.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 10.10 DATE: 11/6/05

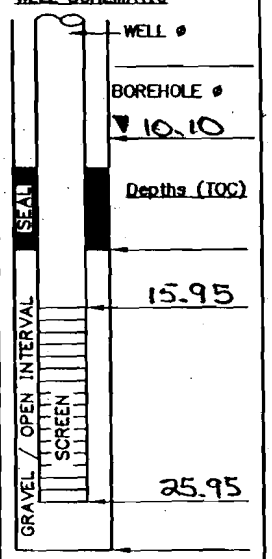
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG. PAGE 1 OF 1

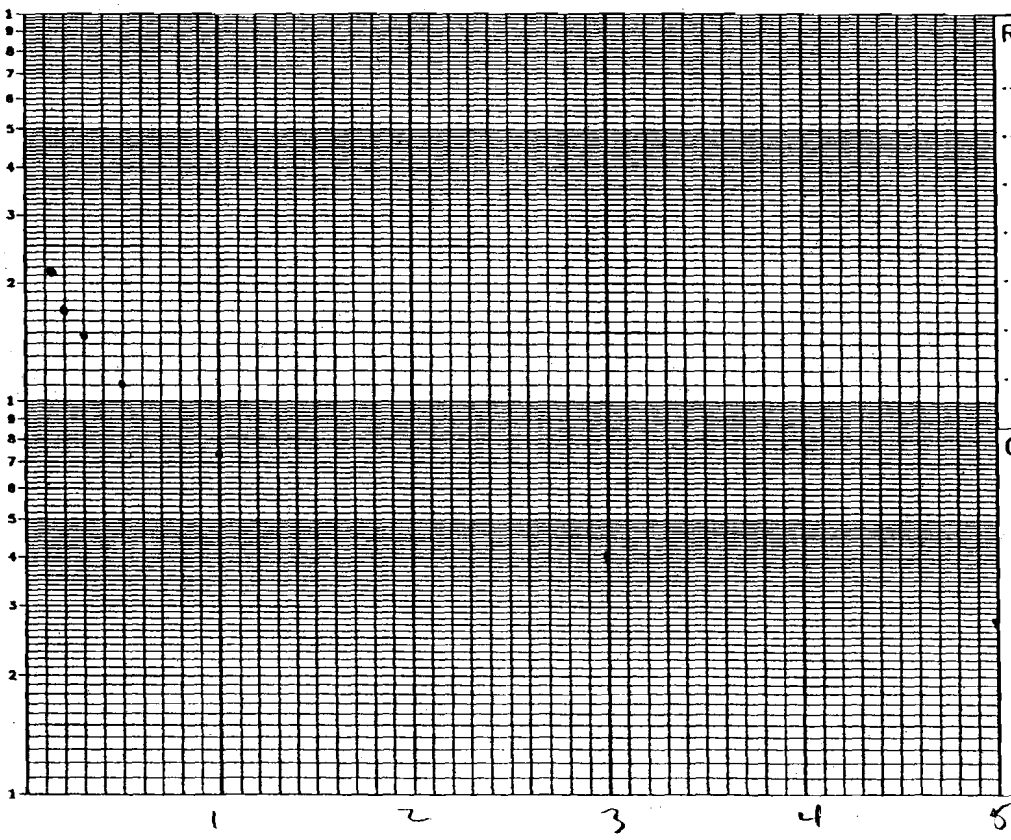
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	~~MEASURED~~ WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.14	2.15				
.2	1.70				
.3	1.49				
.5	1.19				
1.0	.74				
2.0			15.85		
3	.40				
5	.28				
10	.14				
13.2	.10				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph is Good.

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 13:43:46
Report fror ...\SN08927 2005-01-06 133000 12MWT06-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT06-F

Test define 1/6/2005 13:19:33
Test sched 1/6/2005 13:30:00
Test starte 1/6/2005 13:30:00
Test stopp 1/6/2005 13:43:34

Data gathered using Logarithmic testing
Maximun Minutes.
Number 106

TOTAL DA 106

Channel number [1]
Measurer Temperature
Channel name:

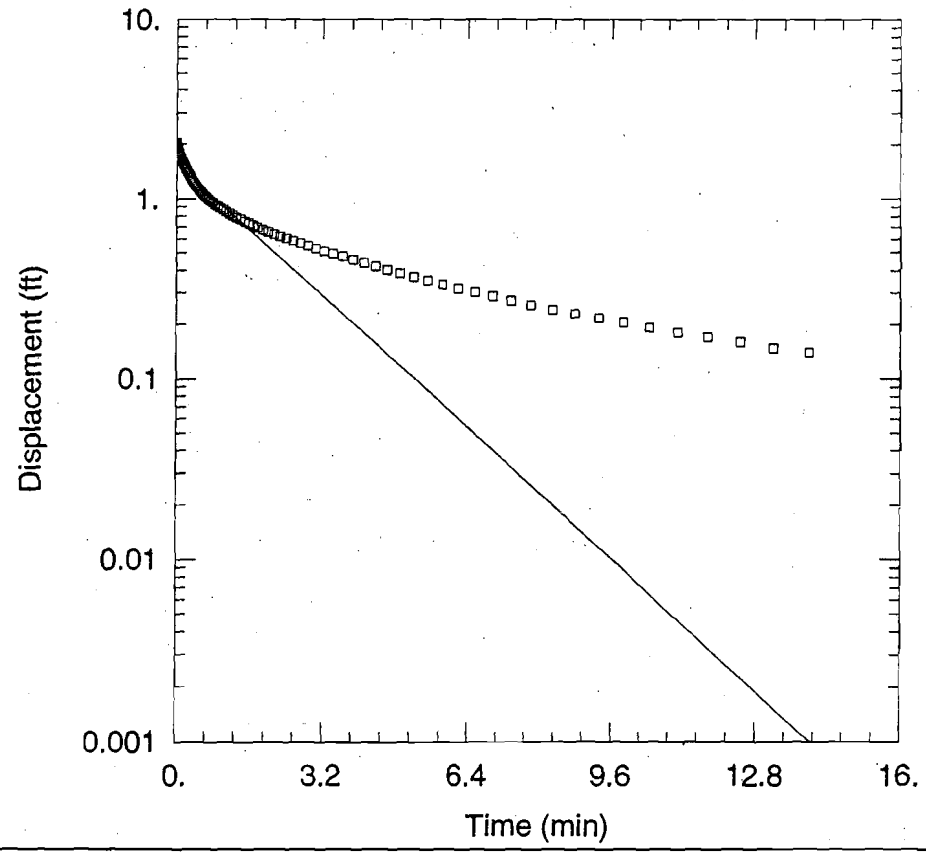
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 14.75 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	13:30:00	0	14.84	0
1/6/2005	13:30:00	0.005	14.85	0.004
1/6/2005	13:30:00	0.01	14.85	0.006
1/6/2005	13:30:00	0.015	14.86	0.008
1/6/2005	13:30:01	0.02	14.86	0.008
1/6/2005	13:30:01	0.025	14.86	0.008
1/6/2005	13:30:01	0.03	14.86	0.008
1/6/2005	13:30:02	0.035	14.88	0.009
1/6/2005	13:30:02	0.04	14.88	0.009

1/6/2005	13:30:02	0.045	14.88	0.009
1/6/2005	13:30:03	0.05	14.88	0.009
1/6/2005	13:30:03	0.055	14.88	0.009
1/6/2005	13:30:03	0.06	14.88	0.009
1/6/2005	13:30:03	0.065	14.88	0.009
1/6/2005	13:30:04	0.07	14.88	0.022
1/6/2005	13:30:04	0.075	14.88	0.222
1/6/2005	13:30:04	0.08	14.88	0.945
1/6/2005	13:30:05	0.085	14.88	1.928
1/6/2005	13:30:05	0.09	14.89	2.509
1/6/2005	13:30:05	0.095	14.89	2.529
1/6/2005	13:30:06	0.1	14.89	2.77
1/6/2005	13:30:06	0.1058	14.89	2.438
1/6/2005	13:30:06	0.112	14.89	2.409
1/6/2005	13:30:07	0.1185	14.89	2.272
1/6/2005	13:30:07	0.1255	14.89	2.25
1/6/2005	13:30:07	0.1328	14.89	2.28
1/6/2005	13:30:08	0.1407	14.89	2.146
1/6/2005	13:30:08	0.149	14.89	1.985
1/6/2005	13:30:09	0.1578	14.89	1.94
1/6/2005	13:30:10	0.1672	14.88	1.843
1/6/2005	13:30:10	0.177	14.88	1.75
1/6/2005	13:30:11	0.1875	14.88	1.724
1/6/2005	13:30:11	0.1985	14.88	1.697
1/6/2005	13:30:12	0.2102	14.88	1.669
1/6/2005	13:30:13	0.2227	14.88	1.641
1/6/2005	13:30:14	0.2358	14.88	1.612
1/6/2005	13:30:15	0.2498	14.86	1.584
1/6/2005	13:30:15	0.2647	14.86	1.554
1/6/2005	13:30:16	0.2803	14.88	1.523
1/6/2005	13:30:17	0.297	14.86	1.491
1/6/2005	13:30:18	0.3147	14.86	1.459
1/6/2005	13:30:20	0.3333	14.86	1.428
1/6/2005	13:30:21	0.3532	14.86	1.394
1/6/2005	13:30:22	0.3742	14.86	1.36
1/6/2005	13:30:23	0.3963	14.86	1.327
1/6/2005	13:30:25	0.4198	14.86	1.291
1/6/2005	13:30:26	0.4447	14.86	1.256
1/6/2005	13:30:28	0.4697	14.86	1.222
1/6/2005	13:30:29	0.4963	14.86	1.188
1/6/2005	13:30:31	0.5247	14.86	1.153
1/6/2005	13:30:33	0.5547	14.86	1.119
1/6/2005	13:30:35	0.5863	14.86	1.082
1/6/2005	13:30:37	0.6213	14.86	1.048
1/6/2005	13:30:39	0.658	14.86	1.01
1/6/2005	13:30:41	0.6963	14.86	0.975
1/6/2005	13:30:44	0.738	14.86	0.939
1/6/2005	13:30:46	0.7813	14.86	0.904
1/6/2005	13:30:49	0.828	14.86	0.872
1/6/2005	13:30:52	0.8763	14.86	0.84
1/6/2005	13:30:55	0.928	14.86	0.807
1/6/2005	13:30:58	0.983	14.86	0.775

ET (min)	Feet H2O
0	2.77
0.0058	2.438
0.012	2.409
0.0185	2.272
0.0255	2.25
0.0328	2.28
0.0407	2.146
0.049	1.985
0.0578	1.94
0.0672	1.843
0.077	1.75
0.0875	1.724
0.0985	1.697
0.1102	1.669
0.1227	1.641
0.1358	1.612
0.1498	1.584
0.1647	1.554
0.1803	1.523
0.197	1.491
0.2147	1.459
0.2333	1.428
0.2532	1.394
0.2742	1.36
0.2963	1.327
0.3198	1.291
0.3447	1.256
0.3697	1.222
0.3963	1.188
0.4247	1.153
0.4547	1.119
0.4863	1.082
0.5213	1.048
0.558	1.01
0.5963	0.975
0.638	0.939
0.6813	0.904
0.728	0.872
0.7763	0.84
0.828	0.807
0.883	0.775

1/6/2005	13:31:02	1.0413	14.86	0.74	0.9413	0.74
1/6/2005	13:31:06	1.103	14.86	0.71	1.003	0.71
1/6/2005	13:31:10	1.168	14.85	0.684	1.068	0.684
1/6/2005	13:31:14	1.238	14.86	0.655	1.138	0.655
1/6/2005	13:31:18	1.3113	14.85	0.629	1.2113	0.629
1/6/2005	13:31:23	1.3897	14.85	0.603	1.2897	0.603
1/6/2005	13:31:28	1.473	14.85	0.581	1.373	0.581
1/6/2005	13:31:33	1.5613	14.85	0.56	1.4613	0.56
1/6/2005	13:31:39	1.6547	14.85	0.544	1.5547	0.544
1/6/2005	13:31:45	1.753	14.85	0.526	1.653	0.526
1/6/2005	13:31:51	1.858	14.85	0.512	1.758	0.512
1/6/2005	13:31:58	1.968	14.85	0.496	1.868	0.496
1/6/2005	13:32:05	2.0847	14.85	0.482	1.9847	0.482
1/6/2005	13:32:12	2.2097	14.85	0.467	2.1097	0.467
1/6/2005	13:32:20	2.3413	14.85	0.453	2.2413	0.453
1/6/2005	13:32:28	2.4813	14.85	0.439	2.3813	0.439
1/6/2005	13:32:37	2.6297	14.85	0.425	2.5297	0.425
1/6/2005	13:32:47	2.7863	14.85	0.413	2.6863	0.413
1/6/2005	13:32:57	2.953	14.85	0.399	2.853	0.399
1/6/2005	13:33:07	3.1297	14.85	0.386	3.0297	0.386
1/6/2005	13:33:18	3.3163	14.85	0.372	3.2163	0.372
1/6/2005	13:33:30	3.5147	14.85	0.36	3.4147	0.36
1/6/2005	13:33:43	3.7247	14.85	0.346	3.6247	0.346
1/6/2005	13:33:56	3.9463	14.85	0.334	3.8463	0.334
1/6/2005	13:34:10	4.1813	14.85	0.32	4.0813	0.32
1/6/2005	13:34:25	4.4297	14.85	0.307	4.3297	0.307
1/6/2005	13:34:41	4.693	14.85	0.293	4.593	0.293
1/6/2005	13:34:58	4.973	14.85	0.279	4.873	0.279
1/6/2005	13:35:16	5.2697	14.85	0.267	5.1697	0.267
1/6/2005	13:35:34	5.583	14.85	0.253	5.483	0.253
1/6/2005	13:35:54	5.9147	14.86	0.24	5.8147	0.24
1/6/2005	13:36:15	6.2663	14.86	0.228	6.1663	0.228
1/6/2005	13:36:38	6.6397	14.86	0.216	6.5397	0.216
1/6/2005	13:37:02	7.0347	14.86	0.204	6.9347	0.204
1/6/2005	13:37:27	7.453	14.86	0.194	7.353	0.194
1/6/2005	13:37:53	7.8963	14.86	0.184	7.7963	0.184
1/6/2005	13:38:21	8.3663	14.86	0.172	8.2663	0.172
1/6/2005	13:38:51	8.8647	14.86	0.161	8.7647	0.161
1/6/2005	13:39:23	9.3913	14.86	0.151	9.2913	0.151
1/6/2005	13:39:56	9.9497	14.88	0.143	9.8497	0.143
1/6/2005	13:40:32	10.5413	14.88	0.133	10.4413	0.133
1/6/2005	13:41:10	11.168	14.88	0.123	11.068	0.123
1/6/2005	13:41:49	11.8313	14.88	0.115	11.7313	0.115
1/6/2005	13:42:32	12.5347	14.88	0.107	12.4347	0.107
1/6/2005	13:43:16	13.2797	14.88	0.099	13.1797	0.099



12MWT06 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT06-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:15

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT06
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.9665 ft/day
y0 = 1.553 ft

AQUIFER DATA

Saturated Thickness: 15.85 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT06)

Initial Displacement: 2.037 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 15.85 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT06-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/25.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 10.10 DATE: 1/6/05

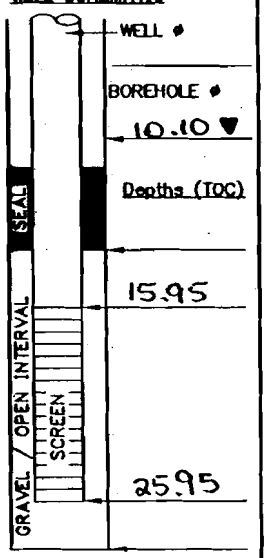
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SECT SLUG PAGE 1 OF 1

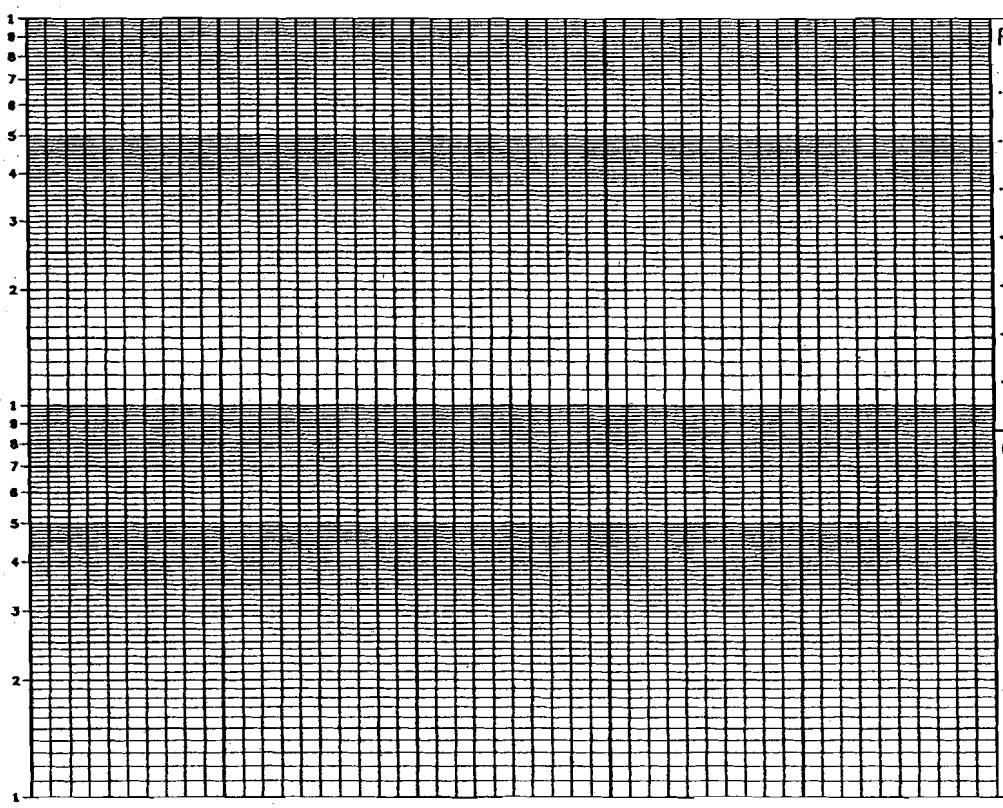
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	~~MEASURED~~ WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.08	-2.001				
.10	-1.906				
.2	-1.619				
.3	-1.434				
.5	-1.191				
1.04	-.885		15.85		
2.08	-.658				
3.12	-.531				
5	-.385				
10	-.205				
14	-.14				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph - Good

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 14:09:26
Report fror ...\SN08927 2005-01-06 135500 12MWT06-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT06-R

Test define 1/6/2005 13:47:05
Test sched 1/6/2005 13:55:00
Test starte 1/6/2005 13:55:00
Test stopp 1/6/2005 14:09:17

Data gathered using Logarithmic testing
Maximun Minutes.
Number 107

TOTAL DA 107

Channel number [1]
Measurer Temperature
Channel name:

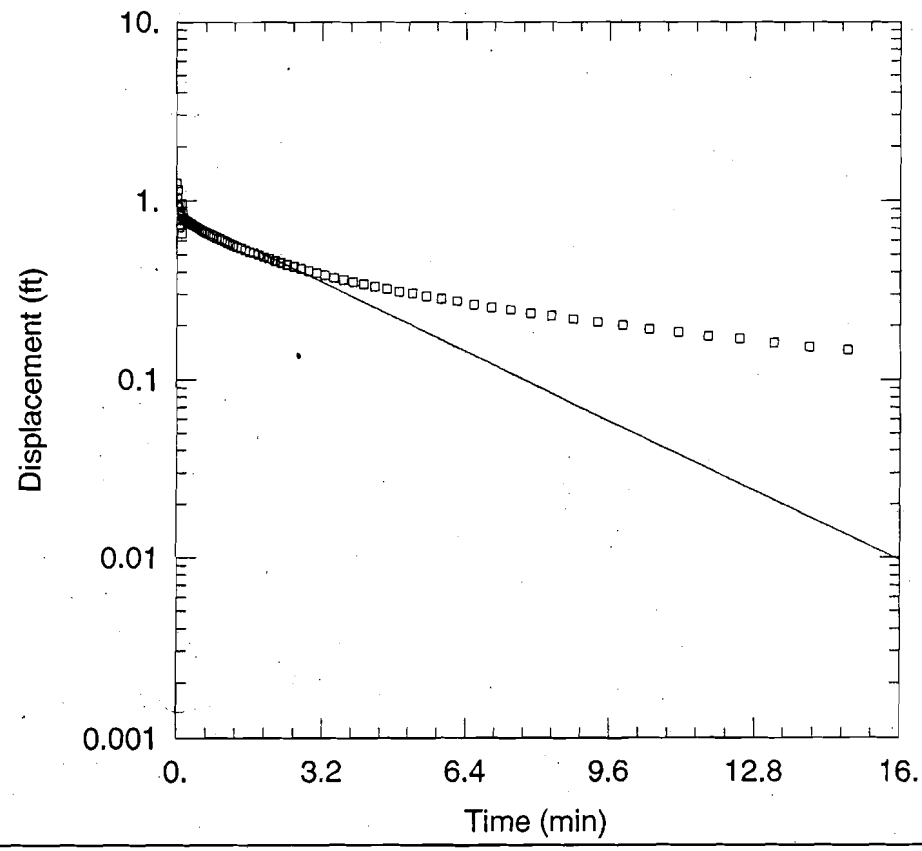
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 14.81 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	13:55:00	0	14.89	0
1/6/2005	13:55:00	0.005	14.9	0.006
1/6/2005	13:55:00	0.01	14.91	0.008
1/6/2005	13:55:00	0.015	14.91	0.008
1/6/2005	13:55:01	0.02	14.91	0.008
1/6/2005	13:55:01	0.025	14.93	0.007
1/6/2005	13:55:01	0.03	14.93	0.009
1/6/2005	13:55:02	0.035	14.93	0.009
1/6/2005	13:55:02	0.04	14.93	0.009

1/6/2005	13:55:02	0.045	14.93	-1.503
1/6/2005	13:55:03	0.05	14.93	-1.786
1/6/2005	13:55:03	0.055	14.94	-1.147
1/6/2005	13:55:03	0.06	14.94	-1.187
1/6/2005	13:55:03	0.065	14.94	-1.979
1/6/2005	13:55:04	0.07	14.94	-1.991
1/6/2005	13:55:04	0.075	14.94	-2.037
1/6/2005	13:55:04	0.08	14.94	-2.001
1/6/2005	13:55:05	0.085	14.94	-1.973
1/6/2005	13:55:05	0.09	14.94	-1.946
1/6/2005	13:55:05	0.095	14.94	-1.924
1/6/2005	13:55:06	0.1	14.94	-1.906
1/6/2005	13:55:06	0.1058	14.94	-1.877
1/6/2005	13:55:06	0.112	14.94	-1.859
1/6/2005	13:55:07	0.1185	14.94	-1.833
1/6/2005	13:55:07	0.1255	14.94	-1.809
1/6/2005	13:55:07	0.1328	14.94	-1.784
1/6/2005	13:55:08	0.1407	14.94	-1.758
1/6/2005	13:55:08	0.149	14.94	-1.738
1/6/2005	13:55:09	0.1578	14.94	-1.711
1/6/2005	13:55:10	0.1672	14.94	-1.687
1/6/2005	13:55:10	0.177	14.94	-1.665
1/6/2005	13:55:11	0.1875	14.93	-1.64
1/6/2005	13:55:11	0.1985	14.93	-1.614
1/6/2005	13:55:12	0.2102	14.93	-1.592
1/6/2005	13:55:13	0.2227	14.93	-1.569
1/6/2005	13:55:14	0.2358	14.93	-1.541
1/6/2005	13:55:15	0.2498	14.93	-1.515
1/6/2005	13:55:15	0.2647	14.93	-1.488
1/6/2005	13:55:16	0.2803	14.93	-1.46
1/6/2005	13:55:17	0.297	14.93	-1.434
1/6/2005	13:55:18	0.3147	14.93	-1.405
1/6/2005	13:55:20	0.3333	14.93	-1.379
1/6/2005	13:55:21	0.3532	14.93	-1.353
1/6/2005	13:55:22	0.3742	14.93	-1.324
1/6/2005	13:55:23	0.3963	14.93	-1.296
1/6/2005	13:55:25	0.4198	14.93	-1.27
1/6/2005	13:55:26	0.4447	14.93	-1.243
1/6/2005	13:55:28	0.4697	14.93	-1.217
1/6/2005	13:55:29	0.4963	14.93	-1.191
1/6/2005	13:55:31	0.5247	14.93	-1.167
1/6/2005	13:55:33	0.5547	14.93	-1.142
1/6/2005	13:55:35	0.5863	14.93	-1.118
1/6/2005	13:55:37	0.6213	14.93	-1.092
1/6/2005	13:55:39	0.658	14.93	-1.067
1/6/2005	13:55:41	0.6963	14.93	-1.043
1/6/2005	13:55:44	0.738	14.93	-1.019
1/6/2005	13:55:46	0.7813	14.93	-0.995
1/6/2005	13:55:49	0.828	14.91	-0.972
1/6/2005	13:55:52	0.8763	14.91	-0.952
1/6/2005	13:55:55	0.928	14.91	-0.927
1/6/2005	13:55:58	0.983	14.91	-0.907

ET (min)	Feet H2O
0	2.037
0.005	2.001
0.01	1.973
0.015	1.946
0.02	1.924
0.025	1.906
0.0308	1.877
0.037	1.859
0.0435	1.833
0.0505	1.809
0.0578	1.784
0.0657	1.758
0.074	1.738
0.0828	1.711
0.0922	1.687
0.102	1.665
0.1125	1.64
0.1235	1.614
0.1352	1.592
0.1477	1.569
0.1608	1.541
0.1748	1.515
0.1897	1.488
0.2053	1.46
0.222	1.434
0.2397	1.405
0.2583	1.379
0.2782	1.353
0.2992	1.324
0.3213	1.296
0.3448	1.27
0.3697	1.243
0.3947	1.217
0.4213	1.191
0.4497	1.167
0.4797	1.142
0.5113	1.118
0.5463	1.092
0.583	1.067
0.6213	1.043
0.663	1.019
0.7063	0.995
0.753	0.972
0.8013	0.952
0.853	0.927
0.908	0.907

1/6/2005	13:56:02	1.0413	14.91	-0.885	0.9663	0.885
1/6/2005	13:56:06	1.103	14.91	-0.865	1.028	0.865
1/6/2005	13:56:10	1.168	14.91	-0.844	1.093	0.844
1/6/2005	13:56:14	1.238	14.91	-0.826	1.163	0.826
1/6/2005	13:56:18	1.3113	14.91	-0.806	1.2363	0.806
1/6/2005	13:56:23	1.3897	14.91	-0.786	1.3147	0.786
1/6/2005	13:56:28	1.473	14.91	-0.768	1.398	0.768
1/6/2005	13:56:33	1.5613	14.91	-0.749	1.4863	0.749
1/6/2005	13:56:39	1.6547	14.9	-0.731	1.5797	0.731
1/6/2005	13:56:45	1.753	14.91	-0.713	1.678	0.713
1/6/2005	13:56:51	1.858	14.9	-0.694	1.783	0.694
1/6/2005	13:56:58	1.968	14.9	-0.676	1.893	0.676
1/6/2005	13:57:05	2.0847	14.9	-0.658	2.0097	0.658
1/6/2005	13:57:12	2.2097	14.9	-0.64	2.1347	0.64
1/6/2005	13:57:20	2.3413	14.9	-0.622	2.2663	0.622
1/6/2005	13:57:28	2.4813	14.9	-0.605	2.4063	0.605
1/6/2005	13:57:37	2.6297	14.9	-0.585	2.5547	0.585
1/6/2005	13:57:47	2.7863	14.9	-0.569	2.7113	0.569
1/6/2005	13:57:57	2.953	14.9	-0.549	2.878	0.549
1/6/2005	13:58:07	3.1297	14.9	-0.531	3.0547	0.531
1/6/2005	13:58:18	3.3163	14.9	-0.512	3.2413	0.512
1/6/2005	13:58:30	3.5147	14.9	-0.494	3.4397	0.494
1/6/2005	13:58:43	3.7247	14.9	-0.478	3.6497	0.478
1/6/2005	13:58:56	3.9463	14.89	-0.457	3.8713	0.457
1/6/2005	13:59:10	4.1813	14.9	-0.439	4.1063	0.439
1/6/2005	13:59:25	4.4297	14.9	-0.421	4.3547	0.421
1/6/2005	13:59:41	4.693	14.9	-0.403	4.618	0.403
1/6/2005	13:59:58	4.973	14.9	-0.385	4.898	0.385
1/6/2005	14:00:16	5.2697	14.9	-0.369	5.1947	0.369
1/6/2005	14:00:34	5.583	14.9	-0.352	5.508	0.352
1/6/2005	14:00:54	5.9147	14.9	-0.334	5.8397	0.334
1/6/2005	14:01:15	6.2663	14.9	-0.318	6.1913	0.318
1/6/2005	14:01:38	6.6397	14.9	-0.304	6.5647	0.304
1/6/2005	14:02:02	7.0347	14.9	-0.288	6.9597	0.288
1/6/2005	14:02:27	7.453	14.9	-0.271	7.378	0.271
1/6/2005	14:02:53	7.8963	14.9	-0.257	7.8213	0.257
1/6/2005	14:03:21	8.3663	14.9	-0.243	8.2913	0.243
1/6/2005	14:03:51	8.8647	14.89	-0.229	8.7897	0.229
1/6/2005	14:04:23	9.3913	14.89	-0.217	9.3163	0.217
1/6/2005	14:04:56	9.9497	14.9	-0.205	9.8747	0.205
1/6/2005	14:05:32	10.5413	14.9	-0.192	10.4663	0.192
1/6/2005	14:06:10	11.168	14.9	-0.18	11.093	0.18
1/6/2005	14:06:49	11.8313	14.9	-0.17	11.7563	0.17
1/6/2005	14:07:32	12.5347	14.9	-0.16	12.4597	0.16
1/6/2005	14:08:16	13.2797	14.9	-0.148	13.2047	0.148
1/6/2005	14:09:04	14.0697	14.89	-0.14	13.9947	0.14



12MWT08 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT08-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:20

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT08
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.5167 ft/day
y0 = 0.8607 ft

AQUIFER DATA

Saturated Thickness: 13.45 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT08)

Initial Displacement: 1.252 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 13.45 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MW108F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10 / 25.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 12.50 DATE: 1/6/05

TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

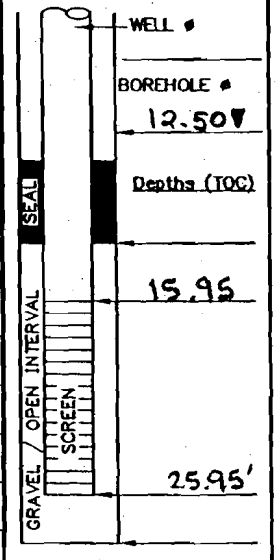
METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG. PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

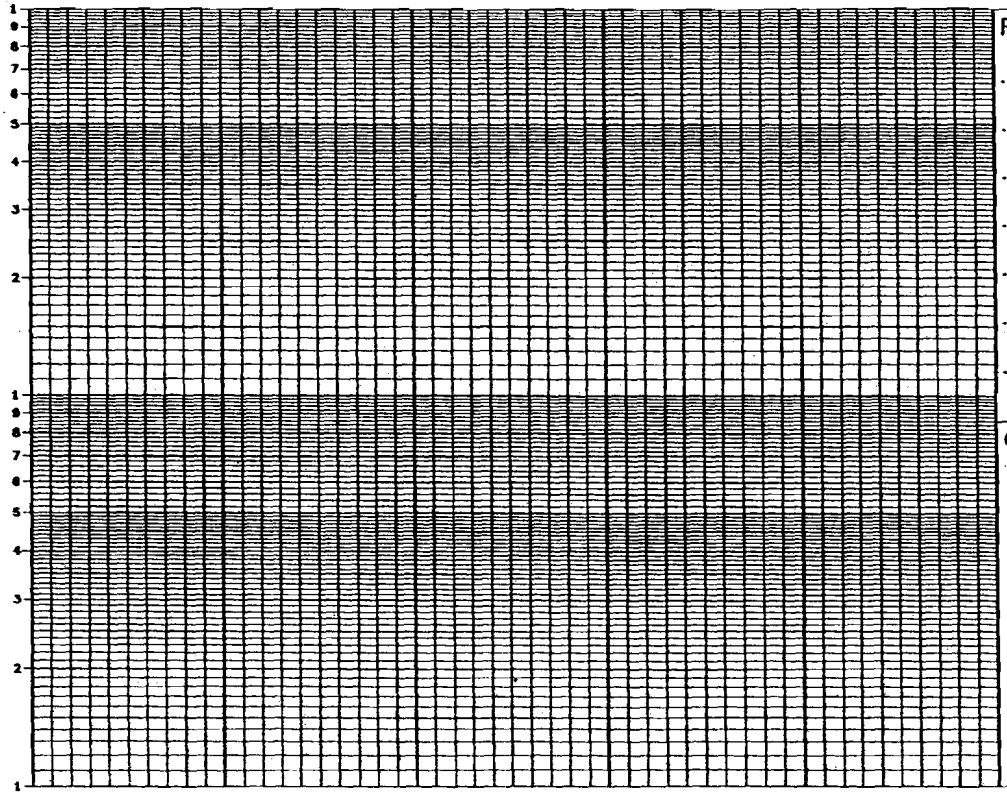
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.06	1.252				
.10	.924				
.15	.841				
.21	.789				
.31	.76				
.50	.712				
1.04	.605		13.45		
2.08	.476				
3.1	.393				
5	.31				
10	.20				
14	.152				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph Good.

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 14:55:34
Report fror ...\SN08927 2005-01-06 144000 12MWT08-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT08-F

Test define 1/6/2005 14:33:27
Test sched 1/6/2005 14:40:00
Test starte 1/6/2005 14:40:00
Test stopp 1/6/2005 14:55:15

Data gathered using Logarithmic testing
Maximun Minutes.
Number 108

TOTAL DA 108

Channel number [1]
Measurer Temperature
Channel name:

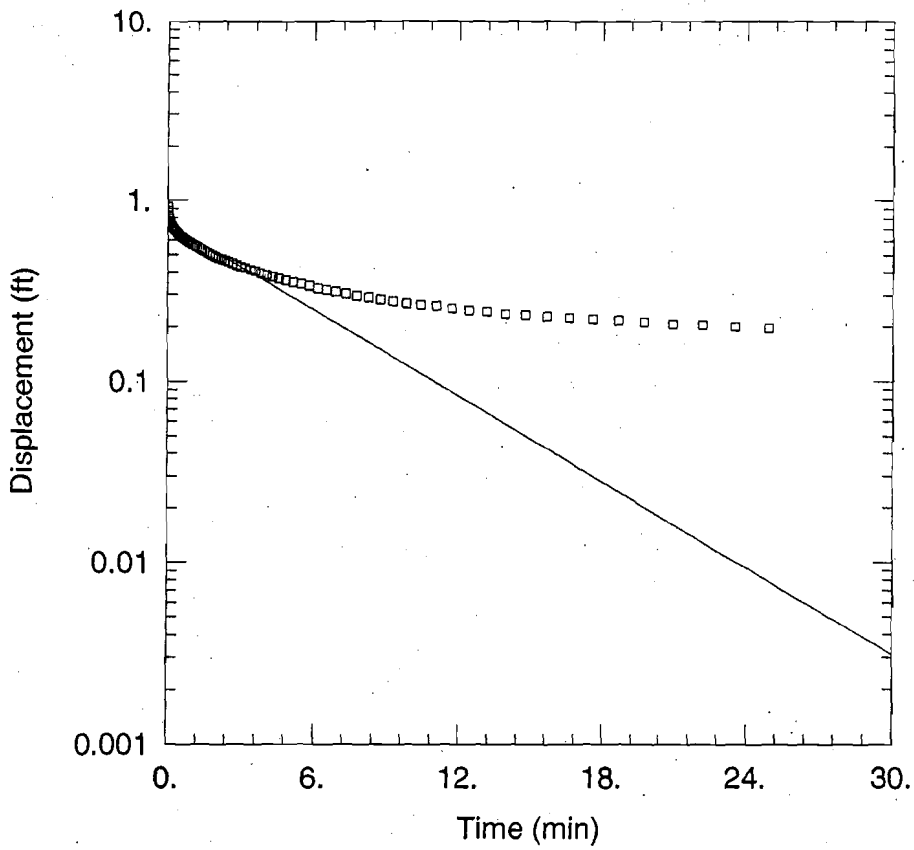
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 12.947 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	14:40:00	0	15.57	0
1/6/2005	14:40:00	0.005	15.58	0.002
1/6/2005	14:40:00	0.01	15.6	0.004
1/6/2005	14:40:00	0.015	15.6	0.004
1/6/2005	14:40:01	0.02	15.6	0.004
1/6/2005	14:40:01	0.025	15.61	0.005
1/6/2005	14:40:01	0.03	15.61	0.005
1/6/2005	14:40:02	0.035	15.61	0.005
1/6/2005	14:40:02	0.04	15.61	0.005

1/6/2005	14:40:02	0.045	15.61	0.016
1/6/2005	14:40:03	0.05	15.61	0.724
1/6/2005	14:40:03	0.055	15.62	1.119
1/6/2005	14:40:03	0.06	15.62	1.252
1/6/2005	14:40:03	0.065	15.62	0.922
1/6/2005	14:40:04	0.07	15.62	0.957
1/6/2005	14:40:04	0.075	15.62	1.038
1/6/2005	14:40:04	0.08	15.62	1.023
1/6/2005	14:40:05	0.085	15.62	0.965
1/6/2005	14:40:05	0.09	15.62	1.159
1/6/2005	14:40:05	0.095	15.62	0.835
1/6/2005	14:40:06	0.1	15.62	0.924
1/6/2005	14:40:06	0.1058	15.62	0.849
1/6/2005	14:40:06	0.112	15.62	0.827
1/6/2005	14:40:07	0.1185	15.62	0.71
1/6/2005	14:40:07	0.1255	15.62	0.959
1/6/2005	14:40:07	0.1328	15.62	0.778
1/6/2005	14:40:08	0.1407	15.62	0.823
1/6/2005	14:40:08	0.149	15.62	0.841
1/6/2005	14:40:09	0.1578	15.62	0.795
1/6/2005	14:40:10	0.1672	15.62	0.963
1/6/2005	14:40:10	0.177	15.62	0.655
1/6/2005	14:40:11	0.1875	15.62	0.872
1/6/2005	14:40:11	0.1985	15.61	0.775
1/6/2005	14:40:12	0.2102	15.61	0.789
1/6/2005	14:40:13	0.2227	15.61	0.805
1/6/2005	14:40:14	0.2358	15.61	0.777
1/6/2005	14:40:15	0.2498	15.61	0.777
1/6/2005	14:40:15	0.2647	15.61	0.777
1/6/2005	14:40:16	0.2803	15.61	0.771
1/6/2005	14:40:17	0.297	15.61	0.765
1/6/2005	14:40:18	0.3147	15.61	0.76
1/6/2005	14:40:20	0.3333	15.61	0.754
1/6/2005	14:40:21	0.3532	15.61	0.75
1/6/2005	14:40:22	0.3742	15.61	0.744
1/6/2005	14:40:23	0.3963	15.61	0.736
1/6/2005	14:40:25	0.4198	15.61	0.73
1/6/2005	14:40:26	0.4447	15.61	0.726
1/6/2005	14:40:28	0.4697	15.61	0.72
1/6/2005	14:40:29	0.4963	15.61	0.712
1/6/2005	14:40:31	0.5247	15.6	0.706
1/6/2005	14:40:33	0.5547	15.6	0.698
1/6/2005	14:40:35	0.5863	15.6	0.69
1/6/2005	14:40:37	0.6213	15.6	0.682
1/6/2005	14:40:39	0.658	15.6	0.674
1/6/2005	14:40:41	0.6963	15.6	0.668
1/6/2005	14:40:44	0.738	15.6	0.657
1/6/2005	14:40:46	0.7813	15.6	0.651
1/6/2005	14:40:49	0.828	15.6	0.639
1/6/2005	14:40:52	0.8763	15.6	0.631
1/6/2005	14:40:55	0.928	15.6	0.623
1/6/2005	14:40:58	0.983	15.58	0.615

ET (min)	Feet H2O
0	1.252
0.005	0.922
0.01	0.957
0.015	1.038
0.02	1.023
0.025	0.965
0.03	1.159
0.035	0.835
0.04	0.924
0.0458	0.849
0.052	0.827
0.0585	0.71
0.0655	0.959
0.0728	0.778
0.0807	0.823
0.089	0.841
0.0978	0.795
0.1072	0.963
0.117	0.655
0.1275	0.872
0.1385	0.775
0.1502	0.789
0.1627	0.805
0.1758	0.777
0.1898	0.777
0.2047	0.777
0.2203	0.771
0.237	0.765
0.2547	0.76
0.2733	0.754
0.2932	0.75
0.3142	0.744
0.3363	0.736
0.3598	0.73
0.3847	0.726
0.4097	0.72
0.4363	0.712
0.4647	0.706
0.4947	0.698
0.5263	0.69
0.5613	0.682
0.598	0.674
0.6363	0.668
0.678	0.657
0.7213	0.651
0.768	0.639
0.8163	0.631
0.868	0.623
0.923	0.615

1/6/2005	14:41:02	1.0413	15.58	0.605	0.9813	0.605
1/6/2005	14:41:06	1.103	15.58	0.595	1.043	0.595
1/6/2005	14:41:10	1.168	15.58	0.585	1.108	0.585
1/6/2005	14:41:14	1.238	15.58	0.575	1.178	0.575
1/6/2005	14:41:18	1.3113	15.58	0.563	1.2513	0.563
1/6/2005	14:41:23	1.3897	15.58	0.552	1.3297	0.552
1/6/2005	14:41:28	1.473	15.57	0.543	1.413	0.543
1/6/2005	14:41:33	1.5613	15.57	0.53	1.5013	0.53
1/6/2005	14:41:39	1.6547	15.57	0.52	1.5947	0.52
1/6/2005	14:41:45	1.753	15.57	0.51	1.693	0.51
1/6/2005	14:41:51	1.858	15.57	0.498	1.798	0.498
1/6/2005	14:41:58	1.968	15.57	0.486	1.908	0.486
1/6/2005	14:42:05	2.0847	15.56	0.476	2.0247	0.476
1/6/2005	14:42:12	2.2097	15.56	0.464	2.1497	0.464
1/6/2005	14:42:20	2.3413	15.56	0.452	2.2813	0.452
1/6/2005	14:42:28	2.4813	15.56	0.439	2.4213	0.439
1/6/2005	14:42:37	2.6297	15.56	0.429	2.5697	0.429
1/6/2005	14:42:47	2.7863	15.56	0.417	2.7263	0.417
1/6/2005	14:42:57	2.953	15.56	0.405	2.893	0.405
1/6/2005	14:43:07	3.1297	15.55	0.393	3.0697	0.393
1/6/2005	14:43:18	3.3163	15.55	0.383	3.2563	0.383
1/6/2005	14:43:30	3.5147	15.55	0.371	3.4547	0.371
1/6/2005	14:43:43	3.7247	15.55	0.361	3.6647	0.361
1/6/2005	14:43:56	3.9463	15.55	0.351	3.8863	0.351
1/6/2005	14:44:10	4.1813	15.55	0.341	4.1213	0.341
1/6/2005	14:44:25	4.4297	15.55	0.33	4.3697	0.33
1/6/2005	14:44:41	4.693	15.55	0.32	4.633	0.32
1/6/2005	14:44:58	4.973	15.55	0.31	4.913	0.31
1/6/2005	14:45:16	5.2697	15.55	0.302	5.2097	0.302
1/6/2005	14:45:34	5.583	15.55	0.292	5.523	0.292
1/6/2005	14:45:54	5.9147	15.55	0.282	5.8547	0.282
1/6/2005	14:46:15	6.2663	15.55	0.274	6.2063	0.274
1/6/2005	14:46:38	6.6397	15.55	0.262	6.5797	0.262
1/6/2005	14:47:02	7.0347	15.55	0.253	6.9747	0.253
1/6/2005	14:47:27	7.453	15.55	0.245	7.393	0.245
1/6/2005	14:47:53	7.8963	15.55	0.235	7.8363	0.235
1/6/2005	14:48:21	8.3663	15.55	0.227	8.3063	0.227
1/6/2005	14:48:51	8.8647	15.55	0.217	8.8047	0.217
1/6/2005	14:49:23	9.3913	15.55	0.209	9.3313	0.209
1/6/2005	14:49:56	9.9497	15.55	0.201	9.8897	0.201
1/6/2005	14:50:32	10.5413	15.55	0.191	10.4813	0.191
1/6/2005	14:51:10	11.168	15.55	0.183	11.108	0.183
1/6/2005	14:51:49	11.8313	15.55	0.175	11.7713	0.175
1/6/2005	14:52:32	12.5347	15.55	0.168	12.4747	0.168
1/6/2005	14:53:16	13.2797	15.55	0.16	13.2197	0.16
1/6/2005	14:54:04	14.0697	15.55	0.152	14.0097	0.152
1/6/2005	14:54:54	14.9063	15.55	0.146	14.8463	0.146



12MWT08 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT08-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:25

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT08
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.3363 ft/day
y0 = 0.7406 ft

AQUIFER DATA

Saturated Thickness: 13.45 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT08)

Initial Displacement: 0.916 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 13.45 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT08-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"ϕ SCREEN LENGTH/DEPTH: 10/25.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 12.50 DATE: 1/6/05

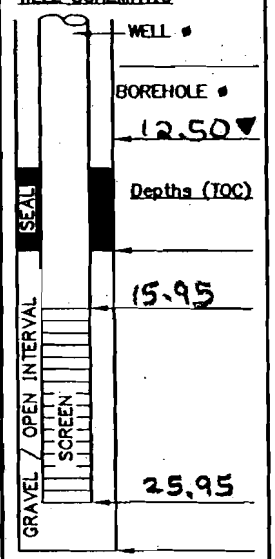
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

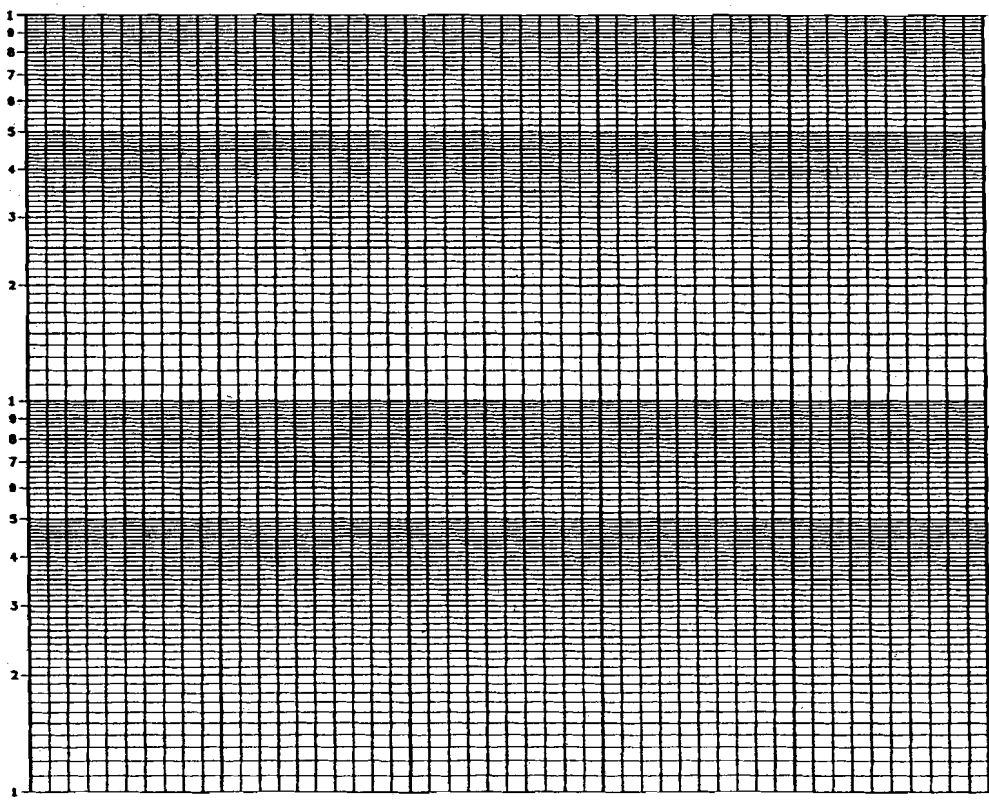
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.085	-1.26				
.1	-1.02				
.2	-.77				
.3	-.725				
.5	-.665				
1.04	-.58		13.45		
2.08	-.487				
3.1	-.428				
5.2	-.351				
10	-.27				
21	-.207				
25	-.197				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph - Good

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/6/2005 15:28:41
Report fror ...\SN08927 2005-01-06 150300 12MWT08-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT08-R

Test define 1/6/2005 14:57:09
Test sched 1/6/2005 15:03:00
Test starte 1/6/2005 15:03:00
Test stopp 1/6/2005 15:28:21

Data gathered using Logarithmic testing
Maximun Minutes.
Number 117

TOTAL DA 117

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 13.048 Feet H2O

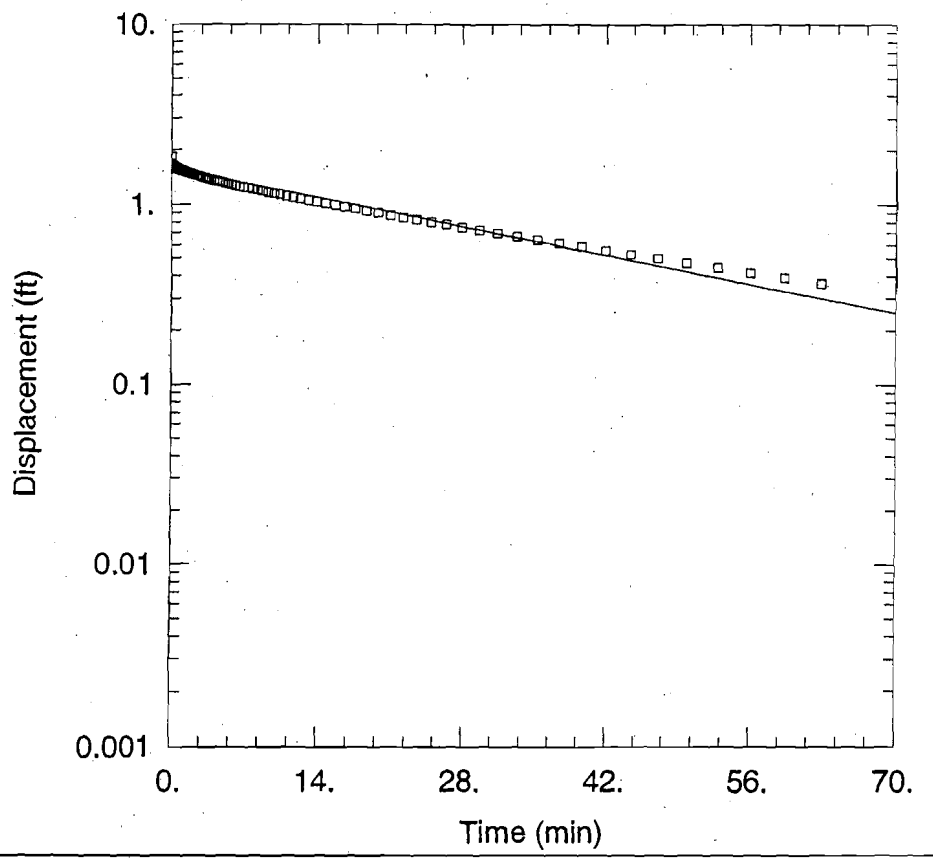
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/6/2005	15:03:00	0	15.56	0
1/6/2005	15:03:00	0.005	15.57	0.004
1/6/2005	15:03:00	0.01	15.58	0.004
1/6/2005	15:03:00	0.015	15.58	0.006
1/6/2005	15:03:01	0.02	15.58	0.006
1/6/2005	15:03:01	0.025	15.6	0.005
1/6/2005	15:03:01	0.03	15.6	0.007
1/6/2005	15:03:02	0.035	15.6	0.007
1/6/2005	15:03:02	0.04	15.6	0.005

1/6/2005	15:03:02	0.045	15.6	-0.001
1/6/2005	15:03:03	0.05	15.6	-0.017
1/6/2005	15:03:03	0.055	15.6	-0.019
1/6/2005	15:03:03	0.06	15.6	-0.179
1/6/2005	15:03:03	0.065	15.6	-1.521
1/6/2005	15:03:04	0.07	15.6	-0.885
1/6/2005	15:03:04	0.075	15.6	-0.764
1/6/2005	15:03:04	0.08	15.61	-1.015
1/6/2005	15:03:05	0.085	15.61	-1.26
1/6/2005	15:03:05	0.09	15.61	-0.616
1/6/2005	15:03:05	0.095	15.61	-0.956
1/6/2005	15:03:06	0.1	15.61	-1.023
1/6/2005	15:03:06	0.1058	15.61	-0.685
1/6/2005	15:03:06	0.112	15.61	-0.997
1/6/2005	15:03:07	0.1185	15.61	-0.734
1/6/2005	15:03:07	0.1255	15.61	-0.916
1/6/2005	15:03:07	0.1328	15.61	-0.762
1/6/2005	15:03:08	0.1407	15.61	-0.873
1/6/2005	15:03:08	0.149	15.61	-0.766
1/6/2005	15:03:09	0.1578	15.61	-0.823
1/6/2005	15:03:10	0.1672	15.61	-0.805
1/6/2005	15:03:10	0.177	15.61	-0.77
1/6/2005	15:03:11	0.1875	15.6	-0.786
1/6/2005	15:03:11	0.1985	15.6	-0.788
1/6/2005	15:03:12	0.2102	15.6	-0.77
1/6/2005	15:03:13	0.2227	15.6	-0.76
1/6/2005	15:03:14	0.2358	15.6	-0.754
1/6/2005	15:03:15	0.2498	15.6	-0.748
1/6/2005	15:03:15	0.2647	15.6	-0.74
1/6/2005	15:03:16	0.2803	15.6	-0.731
1/6/2005	15:03:17	0.297	15.6	-0.725
1/6/2005	15:03:18	0.3147	15.6	-0.719
1/6/2005	15:03:20	0.3333	15.6	-0.711
1/6/2005	15:03:21	0.3532	15.6	-0.703
1/6/2005	15:03:22	0.3742	15.6	-0.697
1/6/2005	15:03:23	0.3963	15.6	-0.689
1/6/2005	15:03:25	0.4198	15.6	-0.681
1/6/2005	15:03:26	0.4447	15.6	-0.677
1/6/2005	15:03:28	0.4697	15.6	-0.671
1/6/2005	15:03:29	0.4963	15.6	-0.665
1/6/2005	15:03:31	0.5247	15.6	-0.657
1/6/2005	15:03:33	0.5547	15.6	-0.65
1/6/2005	15:03:35	0.5863	15.6	-0.644
1/6/2005	15:03:37	0.6213	15.6	-0.634
1/6/2005	15:03:39	0.658	15.6	-0.628
1/6/2005	15:03:41	0.6963	15.6	-0.624
1/6/2005	15:03:44	0.738	15.6	-0.618
1/6/2005	15:03:46	0.7813	15.6	-0.61
1/6/2005	15:03:49	0.828	15.6	-0.604
1/6/2005	15:03:52	0.8763	15.6	-0.598
1/6/2005	15:03:55	0.928	15.6	-0.592
1/6/2005	15:03:58	0.983	15.61	-0.586

ET (min)	Feet H2O
0	0.916
0.0073	0.762
0.0152	0.873
0.0235	0.766
0.0323	0.823
0.0417	0.805
0.0515	0.77
0.062	0.786
0.073	0.788
0.0847	0.77
0.0972	0.76
0.1103	0.754
0.1243	0.748
0.1392	0.74
0.1548	0.731
0.1715	0.725
0.1892	0.719
0.2078	0.711
0.2277	0.703
0.2487	0.697
0.2708	0.689
0.2943	0.681
0.3192	0.677
0.3442	0.671
0.3708	0.665
0.3992	0.657
0.4292	0.65
0.4608	0.644
0.4958	0.634
0.5325	0.628
0.5708	0.624
0.6125	0.618
0.6558	0.61
0.7025	0.604
0.7508	0.598
0.8025	0.592
0.8575	0.586

1/6/2005	15:04:02	1.0413	15.61	-0.58	0.9158	0.58
1/6/2005	15:04:06	1.103	15.61	-0.572	0.9775	0.572
1/6/2005	15:04:10	1.168	15.61	-0.564	1.0425	0.564
1/6/2005	15:04:14	1.238	15.61	-0.558	1.1125	0.558
1/6/2005	15:04:18	1.3113	15.61	-0.549	1.1858	0.549
1/6/2005	15:04:23	1.3897	15.61	-0.543	1.2642	0.543
1/6/2005	15:04:28	1.473	15.61	-0.535	1.3475	0.535
1/6/2005	15:04:33	1.5613	15.62	-0.527	1.4358	0.527
1/6/2005	15:04:39	1.6547	15.61	-0.519	1.5292	0.519
1/6/2005	15:04:45	1.753	15.62	-0.511	1.6275	0.511
1/6/2005	15:04:51	1.858	15.62	-0.505	1.7325	0.505
1/6/2005	15:04:58	1.968	15.62	-0.495	1.8425	0.495
1/6/2005	15:05:05	2.0847	15.62	-0.487	1.9592	0.487
1/6/2005	15:05:12	2.2097	15.62	-0.479	2.0842	0.479
1/6/2005	15:05:20	2.3413	15.62	-0.471	2.2158	0.471
1/6/2005	15:05:28	2.4813	15.62	-0.463	2.3558	0.463
1/6/2005	15:05:37	2.6297	15.62	-0.455	2.5042	0.455
1/6/2005	15:05:47	2.7863	15.62	-0.446	2.6608	0.446
1/6/2005	15:05:57	2.953	15.62	-0.438	2.8275	0.438
1/6/2005	15:06:07	3.1297	15.62	-0.428	3.0042	0.428
1/6/2005	15:06:18	3.3163	15.62	-0.42	3.1908	0.42
1/6/2005	15:06:30	3.5147	15.62	-0.412	3.3892	0.412
1/6/2005	15:06:43	3.7247	15.62	-0.404	3.5992	0.404
1/6/2005	15:06:56	3.9463	15.62	-0.394	3.8208	0.394
1/6/2005	15:07:10	4.1813	15.62	-0.386	4.0558	0.386
1/6/2005	15:07:25	4.4297	15.62	-0.376	4.3042	0.376
1/6/2005	15:07:41	4.693	15.62	-0.367	4.5675	0.367
1/6/2005	15:07:58	4.973	15.62	-0.359	4.8475	0.359
1/6/2005	15:08:16	5.2697	15.62	-0.351	5.1442	0.351
1/6/2005	15:08:34	5.583	15.62	-0.343	5.4575	0.343
1/6/2005	15:08:54	5.9147	15.62	-0.335	5.7892	0.335
1/6/2005	15:09:15	6.2663	15.62	-0.325	6.1408	0.325
1/6/2005	15:09:38	6.6397	15.62	-0.319	6.5142	0.319
1/6/2005	15:10:02	7.0347	15.62	-0.311	6.9092	0.311
1/6/2005	15:10:27	7.453	15.62	-0.305	7.3275	0.305
1/6/2005	15:10:53	7.8963	15.62	-0.297	7.7708	0.297
1/6/2005	15:11:21	8.3663	15.62	-0.291	8.2408	0.291
1/6/2005	15:11:51	8.8647	15.62	-0.284	8.7392	0.284
1/6/2005	15:12:23	9.3913	15.62	-0.278	9.2658	0.278
1/6/2005	15:12:56	9.9497	15.62	-0.27	9.8242	0.27
1/6/2005	15:13:32	10.5413	15.61	-0.266	10.4158	0.266
1/6/2005	15:14:10	11.168	15.61	-0.262	11.0425	0.262
1/6/2005	15:14:49	11.8313	15.61	-0.254	11.7058	0.254
1/6/2005	15:15:32	12.5347	15.61	-0.248	12.4092	0.248
1/6/2005	15:16:16	13.2797	15.6	-0.244	13.1542	0.244
1/6/2005	15:17:04	14.0697	15.6	-0.237	13.9442	0.237
1/6/2005	15:17:54	14.9063	15.58	-0.233	14.7808	0.233
1/6/2005	15:18:47	15.7913	15.58	-0.229	15.6658	0.229
1/6/2005	15:19:43	16.7297	15.58	-0.225	16.6042	0.225
1/6/2005	15:20:43	17.723	15.58	-0.221	17.5975	0.221
1/6/2005	15:21:46	18.7763	15.58	-0.217	18.6508	0.217
1/6/2005	15:22:53	19.8913	15.57	-0.213	19.7658	0.213

1/6/2005	15:24:04	21.073	15.57	-0.207	20.9475	0.207
1/6/2005	15:25:19	22.3247	15.57	-0.205	22.1992	0.205
1/6/2005	15:26:38	23.6497	15.57	-0.201	23.5242	0.201
1/6/2005	15:28:03	25.0547	15.57	-0.197	24.9292	0.197



12MWT10 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT10-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:30

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT10
Test Date: 1-6-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.04871 ft/day
y0 = 1.586 ft

AQUIFER DATA

Saturated Thickness: 12.7 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT10)

Initial Displacement: 1.835 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 12.7 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT10-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10'/26.85 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 14.15 DATE: 1/8/05

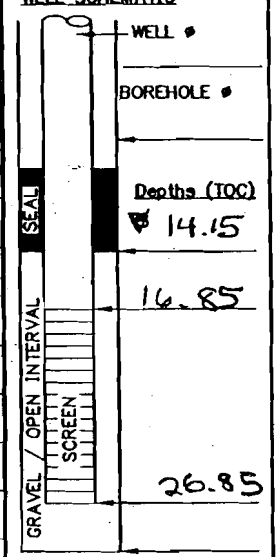
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SECTION SLUG. PAGE 1 OF 1

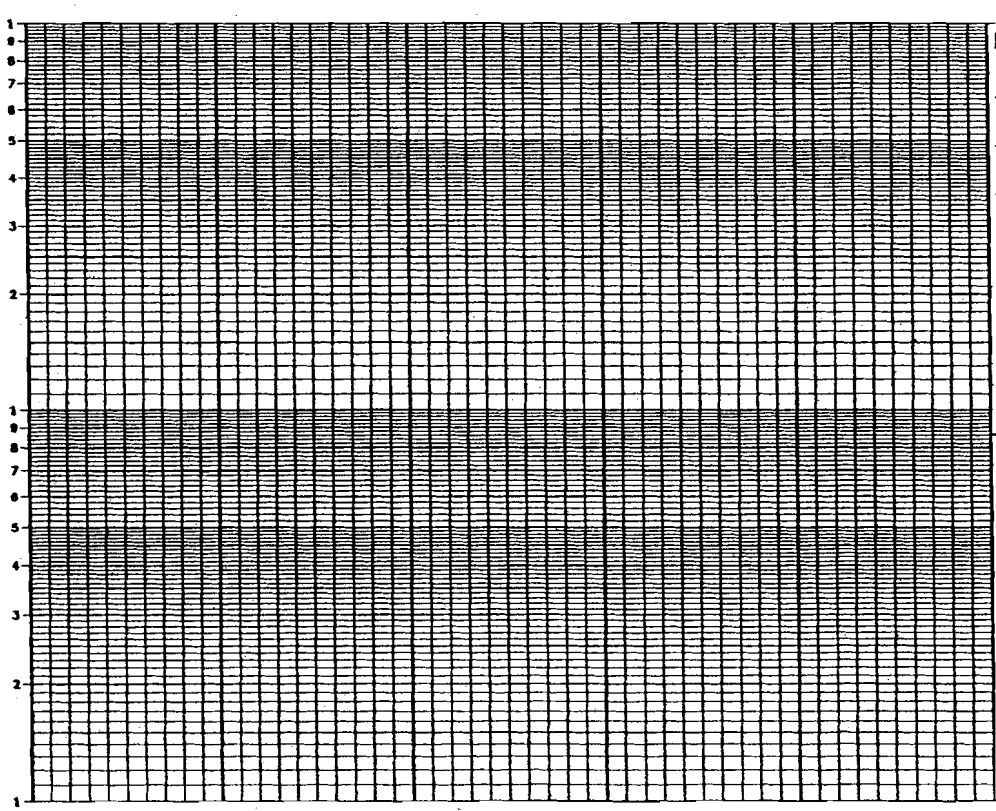
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.08		2.17		50	.47
.13		1.84		63	.37
.3		1.63			
.5		1.60			
1		1.55			
3		1.43			
5		1.33		12.7	
10		1.15			
15		1.01			
20		.90			
30		.72			
40		.59			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:
Graph Good.

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/08/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/8/2005 14:30:50
Report fror ...\SN08927 2005-01-08 132416 12MWT10-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT10-F

Test define 1/8/2005 13:18:52
Test starte 1/8/2005 13:24:16
Test stopp 1/8/2005 14:29:55

Data gathered using Logarithmic testing
Maximun Minutes.
Number 133

TOTAL DA 133

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 12.125 Feet H2O

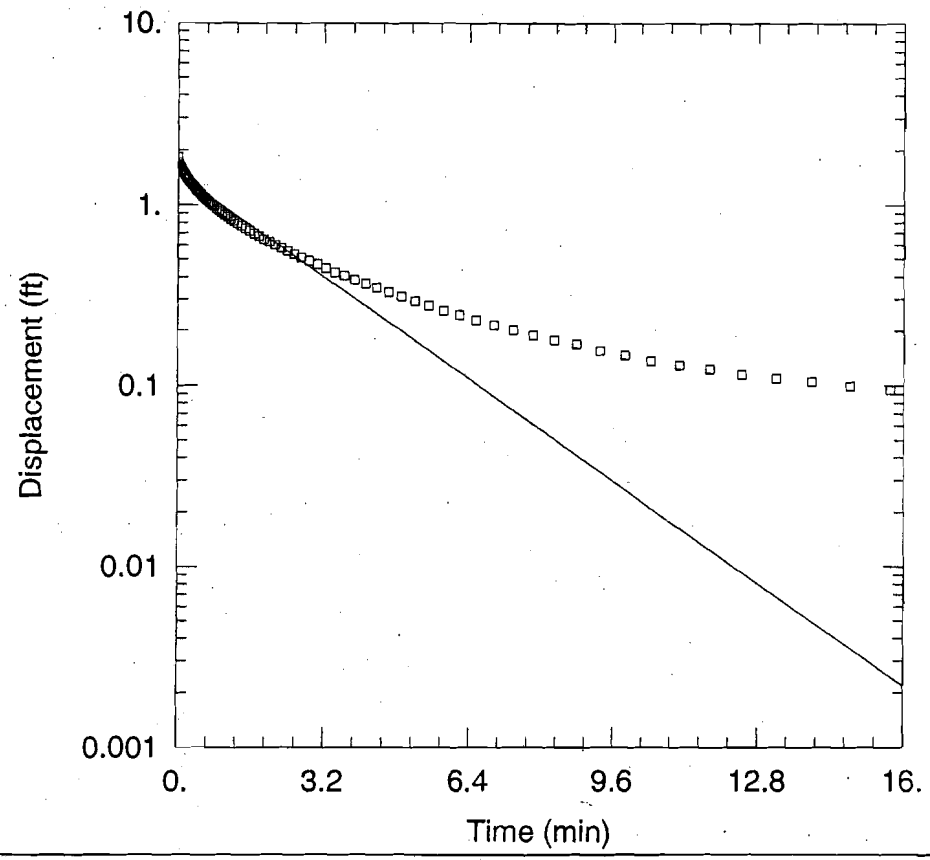
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/8/2005	13:24:16	0	14.42	0
1/8/2005	13:24:17	0.005	14.43	0.008
1/8/2005	13:24:17	0.01	14.45	0.03
1/8/2005	13:24:17	0.015	14.46	0.649
1/8/2005	13:24:17	0.02	14.46	1.447
1/8/2005	13:24:18	0.025	14.46	2.139
1/8/2005	13:24:18	0.03	14.46	2.147
1/8/2005	13:24:18	0.035	14.46	2.028
1/8/2005	13:24:19	0.04	14.47	2.252
1/8/2005	13:24:19	0.045	14.47	2.281

1/8/2005	13:24:19	0.05	14.47	2.321
1/8/2005	13:24:20	0.055	14.47	2.086
1/8/2005	13:24:20	0.06	14.47	1.829
1/8/2005	13:24:20	0.065	14.47	2.194
1/8/2005	13:24:20	0.07	14.47	2.273
1/8/2005	13:24:21	0.075	14.47	1.783
1/8/2005	13:24:21	0.08	14.47	2.174
1/8/2005	13:24:21	0.085	14.47	1.686
1/8/2005	13:24:22	0.09	14.47	1.748
1/8/2005	13:24:22	0.095	14.48	2.398
1/8/2005	13:24:22	0.1	14.47	1.222
1/8/2005	13:24:23	0.1058	14.47	1.212
1/8/2005	13:24:23	0.112	14.48	1.995
1/8/2005	13:24:23	0.1185	14.48	1.673
1/8/2005	13:24:24	0.1255	14.47	1.469
1/8/2005	13:24:24	0.1328	14.48	1.835
1/8/2005	13:24:25	0.1407	14.48	1.57
1/8/2005	13:24:25	0.149	14.48	1.683
1/8/2005	13:24:26	0.1578	14.48	1.659
1/8/2005	13:24:26	0.1672	14.47	1.643
1/8/2005	13:24:27	0.177	14.47	1.655
1/8/2005	13:24:28	0.1875	14.47	1.651
1/8/2005	13:24:28	0.1985	14.47	1.639
1/8/2005	13:24:29	0.2102	14.47	1.651
1/8/2005	13:24:30	0.2227	14.47	1.635
1/8/2005	13:24:30	0.2358	14.47	1.639
1/8/2005	13:24:31	0.2498	14.47	1.639
1/8/2005	13:24:32	0.2647	14.46	1.633
1/8/2005	13:24:33	0.2803	14.46	1.631
1/8/2005	13:24:34	0.297	14.46	1.629
1/8/2005	13:24:35	0.3147	14.46	1.625
1/8/2005	13:24:36	0.3333	14.46	1.623
1/8/2005	13:24:37	0.3532	14.46	1.621
1/8/2005	13:24:39	0.3742	14.46	1.617
1/8/2005	13:24:40	0.3963	14.46	1.615
1/8/2005	13:24:41	0.4198	14.46	1.613
1/8/2005	13:24:43	0.4447	14.46	1.609
1/8/2005	13:24:44	0.4697	14.46	1.605
1/8/2005	13:24:46	0.4963	14.46	1.603
1/8/2005	13:24:48	0.5247	14.46	1.601
1/8/2005	13:24:50	0.5547	14.46	1.597
1/8/2005	13:24:51	0.5863	14.46	1.593
1/8/2005	13:24:54	0.6213	14.46	1.589
1/8/2005	13:24:56	0.658	14.46	1.587
1/8/2005	13:24:58	0.6963	14.46	1.581
1/8/2005	13:25:01	0.738	14.46	1.579
1/8/2005	13:25:03	0.7813	14.46	1.573
1/8/2005	13:25:06	0.828	14.46	1.568
1/8/2005	13:25:09	0.8763	14.46	1.564
1/8/2005	13:25:12	0.928	14.46	1.56
1/8/2005	13:25:15	0.983	14.46	1.554
1/8/2005	13:25:19	1.0413	14.46	1.552

ET (min)	Feet H2O
0	1.835
0.0079	1.57
0.0162	1.683
0.025	1.659
0.0344	1.643
0.0442	1.655
0.0547	1.651
0.0657	1.639
0.0774	1.651
0.0899	1.635
0.103	1.639
0.117	1.639
0.1319	1.633
0.1475	1.631
0.1642	1.629
0.1819	1.625
0.2005	1.623
0.2204	1.621
0.2414	1.617
0.2635	1.615
0.287	1.613
0.3119	1.609
0.3369	1.605
0.3635	1.603
0.3919	1.601
0.4219	1.597
0.4535	1.593
0.4885	1.589
0.5252	1.587
0.5635	1.581
0.6052	1.579
0.6485	1.573
0.6952	1.568
0.7435	1.564
0.7952	1.56
0.8502	1.554
0.9085	1.552

1/8/2005	13:25:22	1.103	14.46	1.546	0.9702	1.546
1/8/2005	13:25:26	1.168	14.46	1.542	1.0352	1.542
1/8/2005	13:25:31	1.238	14.46	1.534	1.1052	1.534
1/8/2005	13:25:35	1.3113	14.45	1.53	1.1785	1.53
1/8/2005	13:25:40	1.3897	14.45	1.524	1.2569	1.524
1/8/2005	13:25:45	1.473	14.45	1.518	1.3402	1.518
1/8/2005	13:25:50	1.5613	14.45	1.512	1.4285	1.512
1/8/2005	13:25:56	1.6547	14.45	1.506	1.5219	1.506
1/8/2005	13:26:01	1.753	14.45	1.5	1.6202	1.5
1/8/2005	13:26:08	1.858	14.45	1.492	1.7252	1.492
1/8/2005	13:26:14	1.968	14.45	1.486	1.8352	1.486
1/8/2005	13:26:21	2.0847	14.43	1.478	1.9519	1.478
1/8/2005	13:26:29	2.2097	14.43	1.47	2.0769	1.47
1/8/2005	13:26:37	2.3413	14.43	1.462	2.2085	1.462
1/8/2005	13:26:45	2.4813	14.43	1.453	2.3485	1.453
1/8/2005	13:26:54	2.6297	14.43	1.445	2.4969	1.445
1/8/2005	13:27:03	2.7863	14.43	1.437	2.6535	1.437
1/8/2005	13:27:13	2.953	14.43	1.429	2.8202	1.429
1/8/2005	13:27:24	3.1297	14.43	1.419	2.9969	1.419
1/8/2005	13:27:35	3.3163	14.43	1.409	3.1835	1.409
1/8/2005	13:27:47	3.5147	14.43	1.399	3.3819	1.399
1/8/2005	13:28:00	3.7247	14.43	1.389	3.5919	1.389
1/8/2005	13:28:13	3.9463	14.43	1.377	3.8135	1.377
1/8/2005	13:28:27	4.1813	14.43	1.366	4.0485	1.366
1/8/2005	13:28:42	4.4297	14.43	1.354	4.2969	1.354
1/8/2005	13:28:58	4.693	14.43	1.342	4.5602	1.342
1/8/2005	13:29:15	4.973	14.43	1.332	4.8402	1.332
1/8/2005	13:29:32	5.2697	14.43	1.318	5.1369	1.318
1/8/2005	13:29:51	5.583	14.43	1.306	5.4502	1.306
1/8/2005	13:30:11	5.9147	14.43	1.292	5.7819	1.292
1/8/2005	13:30:32	6.2663	14.43	1.277	6.1335	1.277
1/8/2005	13:30:55	6.6397	14.43	1.263	6.5069	1.263
1/8/2005	13:31:18	7.0347	14.43	1.249	6.9019	1.249
1/8/2005	13:31:43	7.453	14.43	1.235	7.3202	1.235
1/8/2005	13:32:10	7.8963	14.43	1.219	7.7635	1.219
1/8/2005	13:32:38	8.3663	14.43	1.202	8.2335	1.202
1/8/2005	13:33:08	8.8647	14.45	1.186	8.7319	1.186
1/8/2005	13:33:40	9.3913	14.45	1.17	9.2585	1.17
1/8/2005	13:34:13	9.9497	14.45	1.152	9.8169	1.152
1/8/2005	13:34:49	10.5413	14.45	1.133	10.4085	1.133
1/8/2005	13:35:26	11.168	14.45	1.113	11.0352	1.113
1/8/2005	13:36:06	11.8313	14.45	1.095	11.6985	1.095
1/8/2005	13:36:48	12.5347	14.45	1.077	12.4019	1.077
1/8/2005	13:37:33	13.2797	14.45	1.054	13.1469	1.054
1/8/2005	13:38:20	14.0697	14.45	1.034	13.9369	1.034
1/8/2005	13:39:11	14.9063	14.45	1.012	14.7735	1.012
1/8/2005	13:40:04	15.7913	14.45	0.992	15.6585	0.992
1/8/2005	13:41:00	16.7297	14.46	0.969	16.5969	0.969
1/8/2005	13:42:00	17.723	14.46	0.947	17.5902	0.947
1/8/2005	13:43:03	18.7763	14.46	0.923	18.6435	0.923
1/8/2005	13:44:10	19.8913	14.46	0.898	19.7585	0.898
1/8/2005	13:45:21	21.073	14.46	0.874	20.9402	0.874

1/8/2005	13:46:36	22.3247	14.46	0.85	22.1919	0.85
1/8/2005	13:47:55	23.6497	14.46	0.825	23.5169	0.825
1/8/2005	13:49:20	25.0547	14.47	0.801	24.9219	0.801
1/8/2005	13:50:49	26.543	14.47	0.775	26.4102	0.775
1/8/2005	13:52:23	28.118	14.47	0.748	27.9852	0.748
1/8/2005	13:54:03	29.7863	14.47	0.722	29.6535	0.722
1/8/2005	13:55:50	31.5547	14.47	0.694	31.4219	0.694
1/8/2005	13:57:42	33.428	14.47	0.667	33.2952	0.667
1/8/2005	13:59:41	35.4113	14.47	0.641	35.2785	0.641
1/8/2005	14:01:47	37.513	14.47	0.613	37.3802	0.613
1/8/2005	14:04:01	39.7397	14.47	0.586	39.6069	0.586
1/8/2005	14:06:22	42.098	14.47	0.558	41.9652	0.558
1/8/2005	14:08:52	44.5963	14.47	0.53	44.4635	0.53
1/8/2005	14:11:31	47.243	14.47	0.503	47.1102	0.503
1/8/2005	14:14:19	50.0463	14.47	0.473	49.9135	0.473
1/8/2005	14:17:17	53.0147	14.46	0.447	52.8819	0.447
1/8/2005	14:20:26	56.1597	14.47	0.418	56.0269	0.418
1/8/2005	14:23:46	59.4913	14.46	0.392	59.3585	0.392
1/8/2005	14:27:17	63.0197	14.46	0.366	62.8869	0.366



12MWT13 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT13-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:36

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT13
Test Date: 1-8-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.7497 ft/day
y0 = 1.463 ft

AQUIFER DATA

Saturated Thickness: 18.86 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT13)

Initial Displacement: 1.826 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 18.86 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: RMWT13 F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" Φ SCREEN LENGTH/DEPTH: 10'/23 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 4.14 DATE: 1/8/05

TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

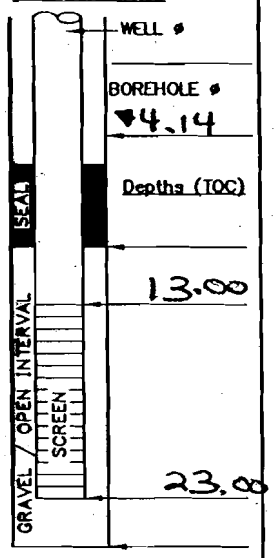
METHOD OF INDUCING WATER LEVEL CHANGE: 2 SECT SLUG. PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

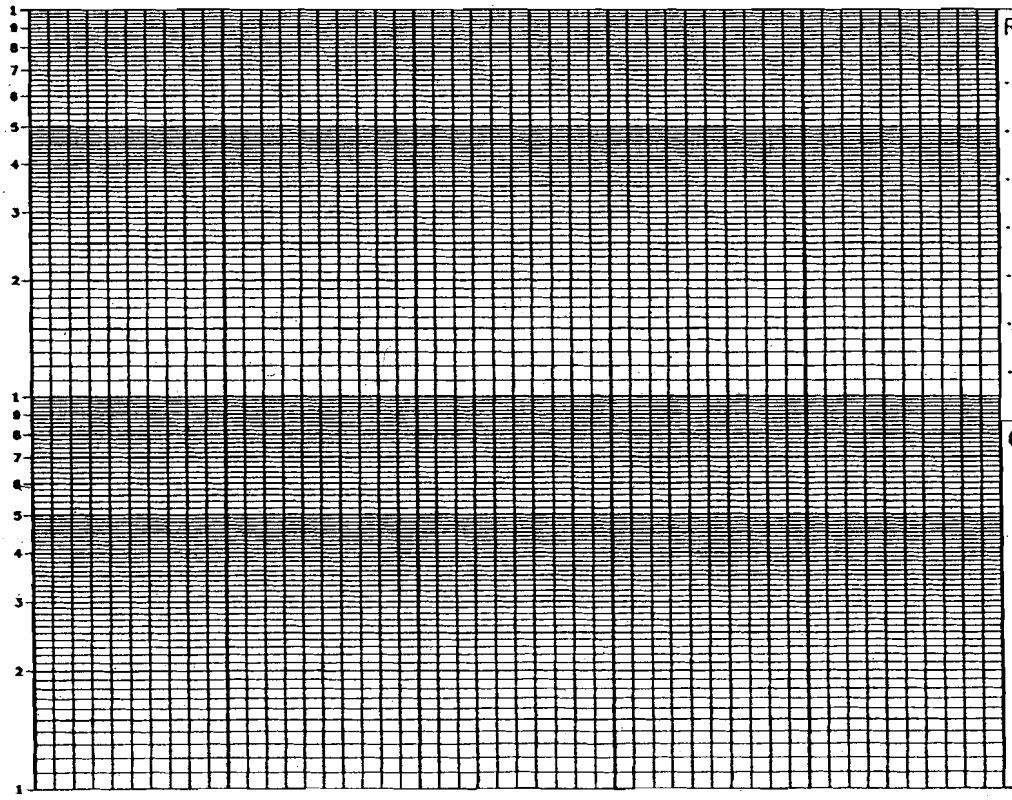
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.06		2.12			
.1		1.68			
.2		1.52			
.3		1.39			
.5		1.20			
1.0		.90			
2		.62			
3		.49			
5		.31			
10		.15			
15.8		.10			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

GOOD GRAPH

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/8/2005 15:12:35
Report fror ...\SN08927 2005-01-08 145612 12MWT13-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT13-F

Test define 1/8/2005 14:55:34
Test starte 1/8/2005 14:56:12
Test stopp 1/8/2005 15:12:22

Data gathered using Logarithmic testing
Maximun Minutes.
Number 109

TOTAL DA 109

Channel number [1]
Measurer Temperature
Channel name:

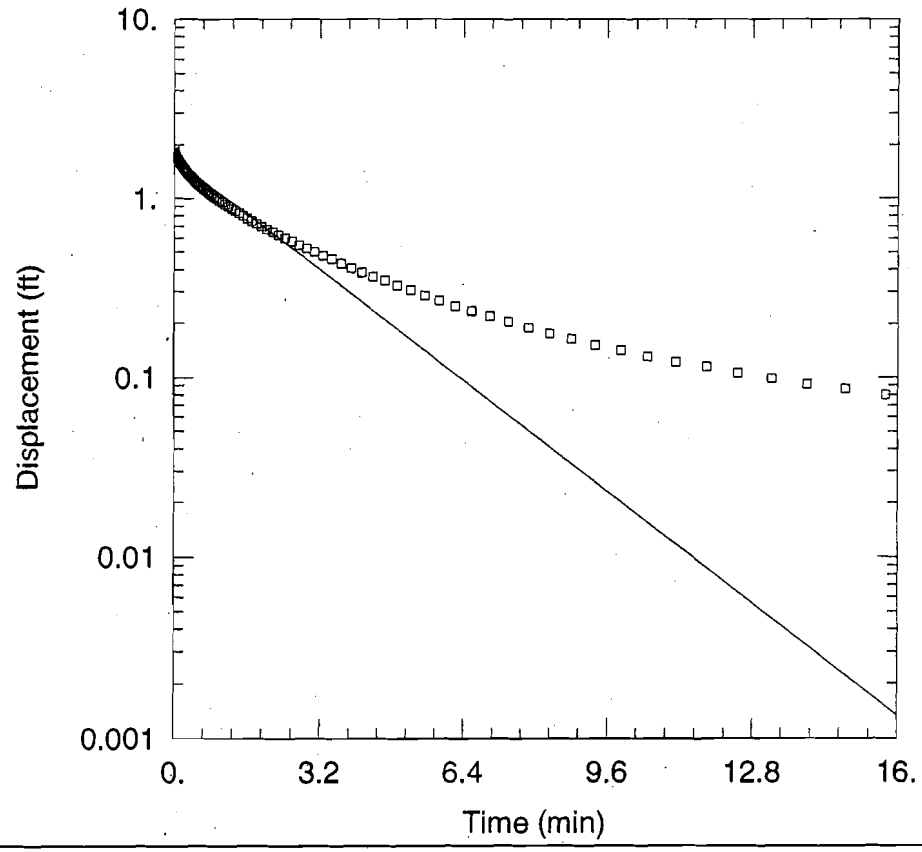
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 16.995 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/8/2005	14:56:12	0	14.33	0
1/8/2005	14:56:13	0.005	14.36	0.008
1/8/2005	14:56:13	0.01	14.36	0.39
1/8/2005	14:56:13	0.015	14.37	1.286
1/8/2005	14:56:14	0.02	14.37	2.049
1/8/2005	14:56:14	0.025	14.38	2.393
1/8/2005	14:56:14	0.03	14.38	2.607
1/8/2005	14:56:14	0.035	14.38	2.154
1/8/2005	14:56:15	0.04	14.38	1.984
1/8/2005	14:56:15	0.045	14.38	2.282

1/8/2005	14:56:15	0.05	14.38	2.13
1/8/2005	14:56:16	0.055	14.38	2.342
1/8/2005	14:56:16	0.06	14.38	2.12
1/8/2005	14:56:16	0.065	14.38	1.82
1/8/2005	14:56:17	0.07	14.4	1.737
1/8/2005	14:56:17	0.075	14.4	1.725
1/8/2005	14:56:17	0.08	14.4	1.373
1/8/2005	14:56:17	0.085	14.4	1.826
1/8/2005	14:56:18	0.09	14.4	1.822
1/8/2005	14:56:18	0.095	14.4	1.66
1/8/2005	14:56:18	0.1	14.4	1.678
1/8/2005	14:56:19	0.1058	14.4	1.707
1/8/2005	14:56:19	0.112	14.4	1.67
1/8/2005	14:56:19	0.1185	14.4	1.658
1/8/2005	14:56:20	0.1255	14.4	1.65
1/8/2005	14:56:20	0.1328	14.4	1.63
1/8/2005	14:56:21	0.1407	14.4	1.618
1/8/2005	14:56:21	0.149	14.4	1.604
1/8/2005	14:56:22	0.1578	14.4	1.589
1/8/2005	14:56:22	0.1672	14.38	1.569
1/8/2005	14:56:23	0.177	14.38	1.549
1/8/2005	14:56:24	0.1875	14.38	1.535
1/8/2005	14:56:24	0.1985	14.38	1.519
1/8/2005	14:56:25	0.2102	14.38	1.501
1/8/2005	14:56:26	0.2227	14.38	1.482
1/8/2005	14:56:26	0.2358	14.38	1.464
1/8/2005	14:56:27	0.2498	14.38	1.446
1/8/2005	14:56:28	0.2647	14.38	1.428
1/8/2005	14:56:29	0.2803	14.38	1.407
1/8/2005	14:56:30	0.297	14.38	1.389
1/8/2005	14:56:31	0.3147	14.38	1.369
1/8/2005	14:56:32	0.3333	14.38	1.349
1/8/2005	14:56:34	0.3532	14.38	1.329
1/8/2005	14:56:35	0.3742	14.38	1.308
1/8/2005	14:56:36	0.3963	14.38	1.288
1/8/2005	14:56:38	0.4198	14.38	1.266
1/8/2005	14:56:39	0.4447	14.38	1.246
1/8/2005	14:56:41	0.4697	14.38	1.223
1/8/2005	14:56:42	0.4963	14.38	1.203
1/8/2005	14:56:44	0.5247	14.38	1.181
1/8/2005	14:56:46	0.5547	14.38	1.161
1/8/2005	14:56:48	0.5863	14.38	1.138
1/8/2005	14:56:50	0.6213	14.38	1.114
1/8/2005	14:56:52	0.658	14.38	1.092
1/8/2005	14:56:54	0.6963	14.38	1.07
1/8/2005	14:56:57	0.738	14.38	1.045
1/8/2005	14:56:59	0.7813	14.38	1.021
1/8/2005	14:57:02	0.828	14.38	0.997
1/8/2005	14:57:05	0.8763	14.38	0.974
1/8/2005	14:57:08	0.928	14.38	0.95
1/8/2005	14:57:11	0.983	14.38	0.926
1/8/2005	14:57:15	1.0413	14.38	0.904

ET (min)	Feet H2O
0	1.826
0.005	1.822
0.01	1.66
0.015	1.678
0.0208	1.707
0.027	1.67
0.0335	1.658
0.0405	1.65
0.0478	1.63
0.0557	1.618
0.064	1.604
0.0728	1.589
0.0822	1.569
0.092	1.549
0.1025	1.535
0.1135	1.519
0.1252	1.501
0.1377	1.482
0.1508	1.464
0.1648	1.446
0.1797	1.428
0.1953	1.407
0.212	1.389
0.2297	1.369
0.2483	1.349
0.2682	1.329
0.2892	1.308
0.3113	1.288
0.3348	1.266
0.3597	1.246
0.3847	1.223
0.4113	1.203
0.4397	1.181
0.4697	1.161
0.5013	1.138
0.5363	1.114
0.573	1.092
0.6113	1.07
0.653	1.045
0.6963	1.021
0.743	0.997
0.7913	0.974
0.843	0.95
0.898	0.926
0.9563	0.904

1/8/2005	14:57:19	1.103	14.38	0.879	1.018	0.879
1/8/2005	14:57:22	1.168	14.38	0.857	1.083	0.857
1/8/2005	14:57:27	1.238	14.38	0.833	1.153	0.833
1/8/2005	14:57:31	1.3113	14.38	0.811	1.2263	0.811
1/8/2005	14:57:36	1.3897	14.38	0.786	1.3047	0.786
1/8/2005	14:57:41	1.473	14.38	0.762	1.388	0.762
1/8/2005	14:57:46	1.5613	14.38	0.74	1.4763	0.74
1/8/2005	14:57:52	1.6547	14.38	0.718	1.5697	0.718
1/8/2005	14:57:58	1.753	14.4	0.693	1.668	0.693
1/8/2005	14:58:04	1.858	14.4	0.671	1.773	0.671
1/8/2005	14:58:10	1.968	14.4	0.646	1.883	0.646
1/8/2005	14:58:17	2.0847	14.4	0.624	1.9997	0.624
1/8/2005	14:58:25	2.2097	14.4	0.6	2.1247	0.6
1/8/2005	14:58:33	2.3413	14.4	0.578	2.2563	0.578
1/8/2005	14:58:41	2.4813	14.4	0.555	2.3963	0.555
1/8/2005	14:58:50	2.6297	14.4	0.533	2.5447	0.533
1/8/2005	14:59:00	2.7863	14.4	0.511	2.7013	0.511
1/8/2005	14:59:10	2.953	14.4	0.489	2.868	0.489
1/8/2005	14:59:20	3.1297	14.4	0.468	3.0447	0.468
1/8/2005	14:59:31	3.3163	14.4	0.446	3.2313	0.446
1/8/2005	14:59:43	3.5147	14.4	0.424	3.4297	0.424
1/8/2005	14:59:56	3.7247	14.4	0.404	3.6397	0.404
1/8/2005	15:00:09	3.9463	14.41	0.385	3.8613	0.385
1/8/2005	15:00:23	4.1813	14.41	0.365	4.0963	0.365
1/8/2005	15:00:38	4.4297	14.41	0.347	4.3447	0.347
1/8/2005	15:00:54	4.693	14.41	0.329	4.608	0.329
1/8/2005	15:01:11	4.973	14.42	0.31	4.888	0.31
1/8/2005	15:01:29	5.2697	14.43	0.292	5.1847	0.292
1/8/2005	15:01:47	5.583	14.43	0.276	5.498	0.276
1/8/2005	15:02:07	5.9147	14.43	0.259	5.8297	0.259
1/8/2005	15:02:28	6.2663	14.43	0.245	6.1813	0.245
1/8/2005	15:02:51	6.6397	14.43	0.229	6.5547	0.229
1/8/2005	15:03:14	7.0347	14.43	0.215	6.9497	0.215
1/8/2005	15:03:40	7.453	14.45	0.202	7.368	0.202
1/8/2005	15:04:06	7.8963	14.45	0.188	7.8113	0.188
1/8/2005	15:04:34	8.3663	14.45	0.178	8.2813	0.178
1/8/2005	15:05:04	8.8647	14.46	0.168	8.7797	0.168
1/8/2005	15:05:36	9.3913	14.47	0.155	9.3063	0.155
1/8/2005	15:06:09	9.9497	14.47	0.147	9.8647	0.147
1/8/2005	15:06:45	10.5413	14.48	0.137	10.4563	0.137
1/8/2005	15:07:22	11.168	14.5	0.129	11.083	0.129
1/8/2005	15:08:02	11.8313	14.48	0.123	11.7463	0.123
1/8/2005	15:08:44	12.5347	14.47	0.115	12.4497	0.115
1/8/2005	15:09:29	13.2797	14.46	0.109	13.1947	0.109
1/8/2005	15:10:17	14.0697	14.45	0.105	13.9847	0.105
1/8/2005	15:11:07	14.9063	14.45	0.099	14.8213	0.099
1/8/2005	15:12:00	15.7913	14.43	0.095	15.7063	0.095



12MWT13 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT13-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:43

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT13
Test Date: 1-8-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.8206 ft/day
y0 = 1.657 ft

AQUIFER DATA

Saturated Thickness: 18.86 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT13)

Initial Displacement: 1.893 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 18.86 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT13

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/23 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 4.14 DATE: 1/8/05

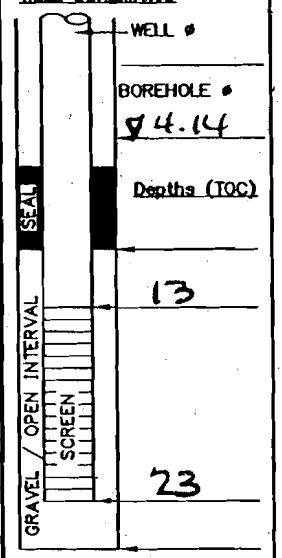
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SECT SLUG PAGE 1 OF 1

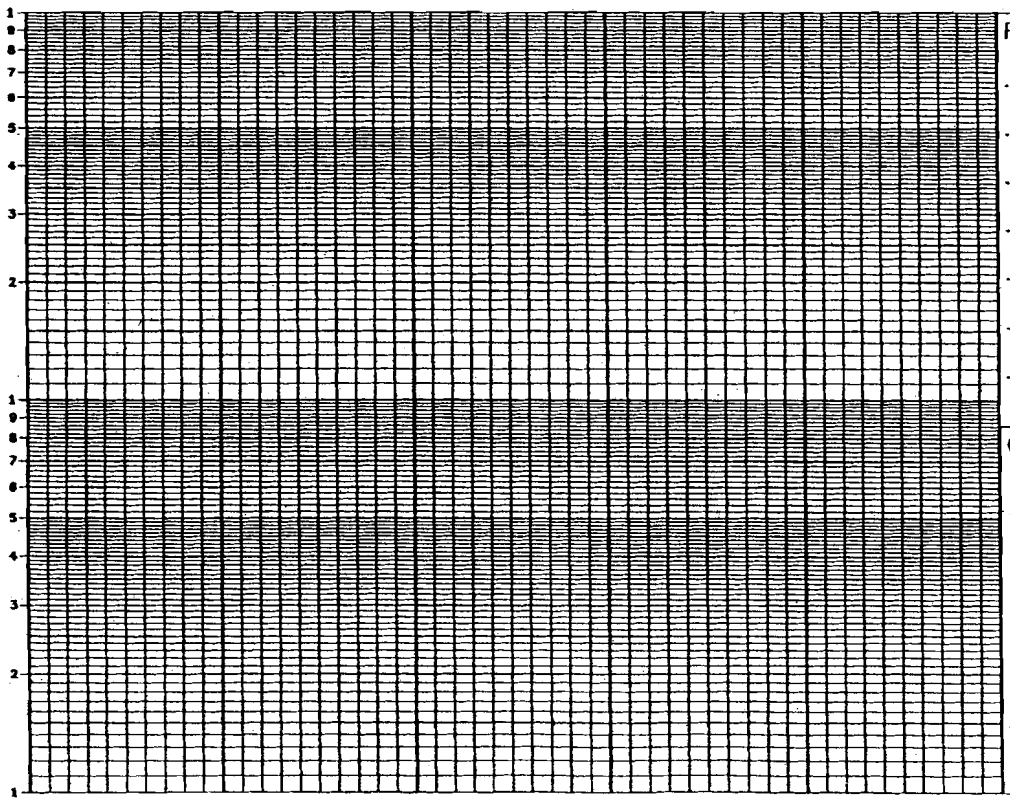
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.04		-1.95			
.1		-1.74			
.2		-1.56			
.3		-1.44			
.5		-1.26			
.78		-1.08		18.86	
1		-.97			
2		-.70			
3		-.52			
5		-.32			
10		-.14			
15.8		-.08			

WELL SCHEMATIC



Indicate SWL Depth on Drawing



REMARKS:

GOOD GRAPH

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/8/2005 15:31:42
Report fror ...\SN08927 2005-01-08 151513 12MWT13-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT13-R

Test define 1/8/2005 15:14:49
Test starte 1/8/2005 15:15:13
Test stopp 1/8/2005 15:31:31

Data gathered using Logarithmic testing
Maximun Minutes.
Number 109

TOTAL DA 109

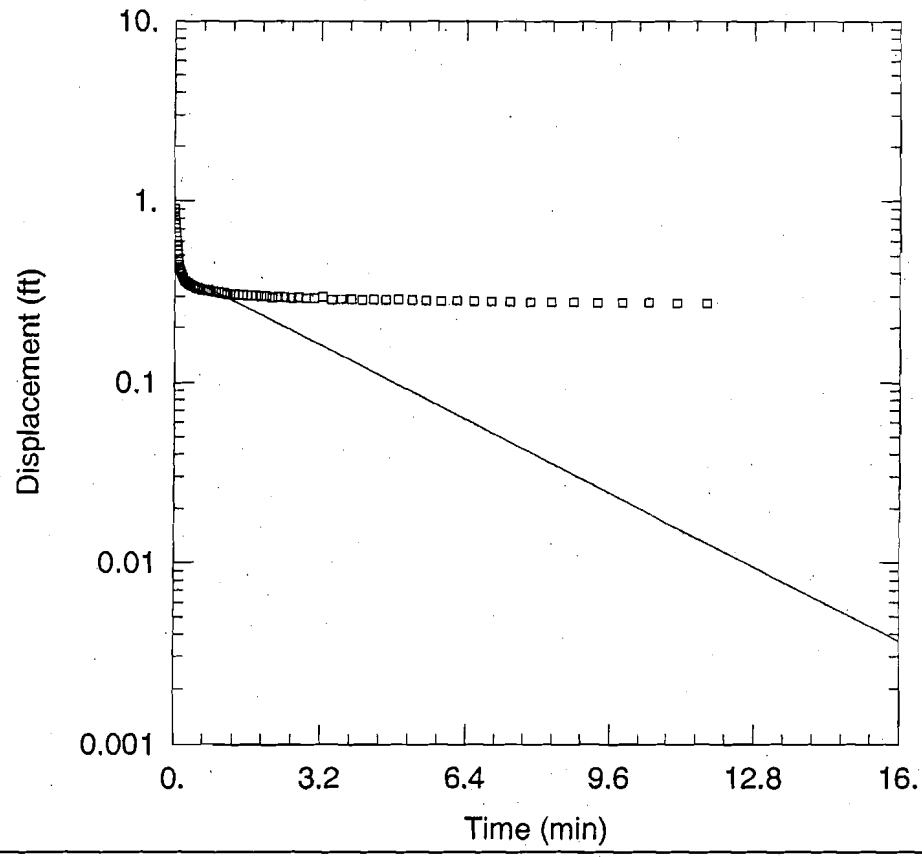
Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 17.078 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/8/2005	15:15:13	0	14.36	0
1/8/2005	15:15:14	0.005	14.38	0.004
1/8/2005	15:15:14	0.01	14.38	-0.025
1/8/2005	15:15:14	0.015	14.4	-2.8
1/8/2005	15:15:15	0.02	14.4	-2.29
1/8/2005	15:15:15	0.025	14.4	-1.134
1/8/2005	15:15:15	0.03	14.4	-2.529
1/8/2005	15:15:16	0.035	14.4	-1.67
1/8/2005	15:15:16	0.04	14.4	-1.95
1/8/2005	15:15:16	0.045	14.4	-1.937

1/8/2005	15:15:16	0.05	14.41	-1.792	ET (min)	Feet H2O
1/8/2005	15:15:17	0.055	14.41	-1.893	0	1.893
1/8/2005	15:15:17	0.06	14.41	-1.808	0.005	1.808
1/8/2005	15:15:17	0.065	14.41	-1.828	0.01	1.828
1/8/2005	15:15:18	0.07	14.41	-1.808	0.015	1.808
1/8/2005	15:15:18	0.075	14.41	-1.79	0.02	1.79
1/8/2005	15:15:18	0.08	14.41	-1.786	0.025	1.786
1/8/2005	15:15:19	0.085	14.41	-1.768	0.03	1.768
1/8/2005	15:15:19	0.09	14.41	-1.76	0.035	1.76
1/8/2005	15:15:19	0.095	14.41	-1.747	0.04	1.747
1/8/2005	15:15:19	0.1	14.41	-1.735	0.045	1.735
1/8/2005	15:15:20	0.1058	14.41	-1.727	0.0508	1.727
1/8/2005	15:15:20	0.112	14.41	-1.711	0.057	1.711
1/8/2005	15:15:21	0.1185	14.41	-1.699	0.0635	1.699
1/8/2005	15:15:21	0.1255	14.41	-1.685	0.0705	1.685
1/8/2005	15:15:21	0.1328	14.41	-1.671	0.0778	1.671
1/8/2005	15:15:22	0.1407	14.41	-1.656	0.0857	1.656
1/8/2005	15:15:22	0.149	14.41	-1.64	0.094	1.64
1/8/2005	15:15:23	0.1578	14.41	-1.626	0.1028	1.626
1/8/2005	15:15:23	0.1672	14.41	-1.612	0.1122	1.612
1/8/2005	15:15:24	0.177	14.4	-1.597	0.122	1.597
1/8/2005	15:15:25	0.1875	14.4	-1.579	0.1325	1.579
1/8/2005	15:15:25	0.1985	14.4	-1.563	0.1435	1.563
1/8/2005	15:15:26	0.2102	14.4	-1.547	0.1552	1.547
1/8/2005	15:15:27	0.2227	14.4	-1.531	0.1677	1.531
1/8/2005	15:15:28	0.2358	14.4	-1.512	0.1808	1.512
1/8/2005	15:15:28	0.2498	14.38	-1.494	0.1948	1.494
1/8/2005	15:15:29	0.2647	14.38	-1.474	0.2097	1.474
1/8/2005	15:15:30	0.2803	14.38	-1.456	0.2253	1.456
1/8/2005	15:15:31	0.297	14.38	-1.437	0.242	1.437
1/8/2005	15:15:32	0.3147	14.38	-1.417	0.2597	1.417
1/8/2005	15:15:33	0.3333	14.38	-1.399	0.2783	1.399
1/8/2005	15:15:35	0.3532	14.38	-1.379	0.2982	1.379
1/8/2005	15:15:36	0.3742	14.38	-1.36	0.3192	1.36
1/8/2005	15:15:37	0.3963	14.38	-1.34	0.3413	1.34
1/8/2005	15:15:39	0.4198	14.38	-1.32	0.3648	1.32
1/8/2005	15:15:40	0.4447	14.37	-1.297	0.3897	1.297
1/8/2005	15:15:42	0.4697	14.38	-1.279	0.4147	1.279
1/8/2005	15:15:43	0.4963	14.37	-1.259	0.4413	1.259
1/8/2005	15:15:45	0.5247	14.37	-1.237	0.4697	1.237
1/8/2005	15:15:47	0.5547	14.37	-1.216	0.4997	1.216
1/8/2005	15:15:49	0.5863	14.37	-1.194	0.5313	1.194
1/8/2005	15:15:51	0.6213	14.37	-1.174	0.5663	1.174
1/8/2005	15:15:53	0.658	14.37	-1.15	0.603	1.15
1/8/2005	15:15:55	0.6963	14.37	-1.127	0.6413	1.127
1/8/2005	15:15:58	0.738	14.37	-1.105	0.683	1.105
1/8/2005	15:16:00	0.7813	14.37	-1.083	0.7263	1.083
1/8/2005	15:16:03	0.828	14.37	-1.059	0.773	1.059
1/8/2005	15:16:06	0.8763	14.37	-1.036	0.8213	1.036
1/8/2005	15:16:09	0.928	14.36	-1.012	0.873	1.012
1/8/2005	15:16:12	0.983	14.36	-0.99	0.928	0.99
1/8/2005	15:16:16	1.0413	14.36	-0.965	0.9863	0.965

1/8/2005	15:16:20	1.103	14.36	-0.943	1.048	0.943
1/8/2005	15:16:24	1.168	14.36	-0.917	1.113	0.917
1/8/2005	15:16:28	1.238	14.36	-0.892	1.183	0.892
1/8/2005	15:16:32	1.3113	14.36	-0.868	1.2563	0.868
1/8/2005	15:16:37	1.3897	14.36	-0.844	1.3347	0.844
1/8/2005	15:16:42	1.473	14.36	-0.82	1.418	0.82
1/8/2005	15:16:47	1.5613	14.36	-0.795	1.5063	0.795
1/8/2005	15:16:53	1.6547	14.36	-0.769	1.5997	0.769
1/8/2005	15:16:59	1.753	14.36	-0.745	1.698	0.745
1/8/2005	15:17:05	1.858	14.36	-0.72	1.803	0.72
1/8/2005	15:17:12	1.968	14.36	-0.696	1.913	0.696
1/8/2005	15:17:19	2.0847	14.36	-0.67	2.0297	0.67
1/8/2005	15:17:26	2.2097	14.36	-0.648	2.1547	0.648
1/8/2005	15:17:34	2.3413	14.36	-0.621	2.2863	0.621
1/8/2005	15:17:42	2.4813	14.36	-0.597	2.4263	0.597
1/8/2005	15:17:51	2.6297	14.36	-0.573	2.5747	0.573
1/8/2005	15:18:01	2.7863	14.36	-0.546	2.7313	0.546
1/8/2005	15:18:11	2.953	14.35	-0.524	2.898	0.524
1/8/2005	15:18:21	3.1297	14.35	-0.5	3.0747	0.5
1/8/2005	15:18:32	3.3163	14.35	-0.475	3.2613	0.475
1/8/2005	15:18:44	3.5147	14.35	-0.453	3.4597	0.453
1/8/2005	15:18:57	3.7247	14.35	-0.429	3.6697	0.429
1/8/2005	15:19:10	3.9463	14.35	-0.407	3.8913	0.407
1/8/2005	15:19:24	4.1813	14.35	-0.386	4.1263	0.386
1/8/2005	15:19:39	4.4297	14.35	-0.364	4.3747	0.364
1/8/2005	15:19:55	4.693	14.33	-0.346	4.638	0.346
1/8/2005	15:20:12	4.973	14.33	-0.323	4.918	0.323
1/8/2005	15:20:30	5.2697	14.32	-0.305	5.2147	0.305
1/8/2005	15:20:48	5.583	14.31	-0.286	5.528	0.286
1/8/2005	15:21:08	5.9147	14.31	-0.268	5.8597	0.268
1/8/2005	15:21:29	6.2663	14.3	-0.25	6.2113	0.25
1/8/2005	15:21:52	6.6397	14.3	-0.234	6.5847	0.234
1/8/2005	15:22:16	7.0347	14.31	-0.22	6.9797	0.22
1/8/2005	15:22:41	7.453	14.31	-0.204	7.398	0.204
1/8/2005	15:23:07	7.8963	14.31	-0.189	7.8413	0.189
1/8/2005	15:23:35	8.3663	14.31	-0.175	8.3113	0.175
1/8/2005	15:24:05	8.8647	14.31	-0.163	8.8097	0.163
1/8/2005	15:24:37	9.3913	14.31	-0.151	9.3363	0.151
1/8/2005	15:25:10	9.9497	14.3	-0.141	9.8947	0.141
1/8/2005	15:25:46	10.5413	14.3	-0.13	10.4863	0.13
1/8/2005	15:26:24	11.168	14.3	-0.122	11.113	0.122
1/8/2005	15:27:03	11.8313	14.3	-0.114	11.7763	0.114
1/8/2005	15:27:46	12.5347	14.3	-0.106	12.4797	0.106
1/8/2005	15:28:30	13.2797	14.31	-0.098	13.2247	0.098
1/8/2005	15:29:18	14.0697	14.31	-0.092	14.0147	0.092
1/8/2005	15:30:08	14.9063	14.31	-0.086	14.8513	0.086
1/8/2005	15:31:01	15.7913	14.32	-0.08	15.7363	0.08



12MWT15 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT15-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:48

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT15
Test Date: 1-8-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.545 ft/day
y0 = 0.4144 ft

AQUIFER DATA

Saturated Thickness: 8.4 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT15)

Initial Displacement: 0.902 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 8.4 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT15-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10'/ 26.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 18.55 DATE: 1/9/05

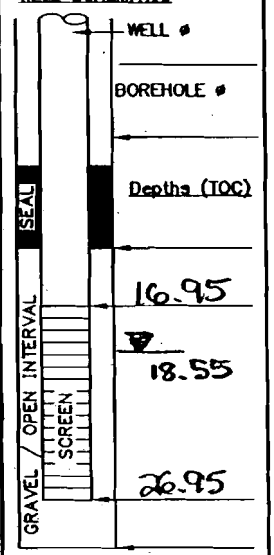
TEST TYPE (Rising/Falling/Constant Head): RISING ONLY CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1-SECTION SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.055		-1.10			
.075		-.90			
.09		-.82			
.095		-.79			
.1		-.75			
.15		-.51		8.4	
.2		-.42			
.3		-.36			
.5		-.34			
1.0		-.32			
5		-.29			
10		-.28			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

REMARKS:

7.77 XD 0843

8.047 XD 0852

8.01 XD 0905

7.99 XD 0912

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/9/2005 9:31:01
Report fror ...\SN08927 2005-01-09 091500 12MWT15-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT15-R

Test define 1/9/2005 9:06:19
Test sched 1/9/2005 9:15:00
Test starte 1/9/2005 9:15:00
Test stopp 1/9/2005 9:27:10

Data gathered using Logarithmic testing
Maximun Minutes.
Number 104

TOTAL DA 104

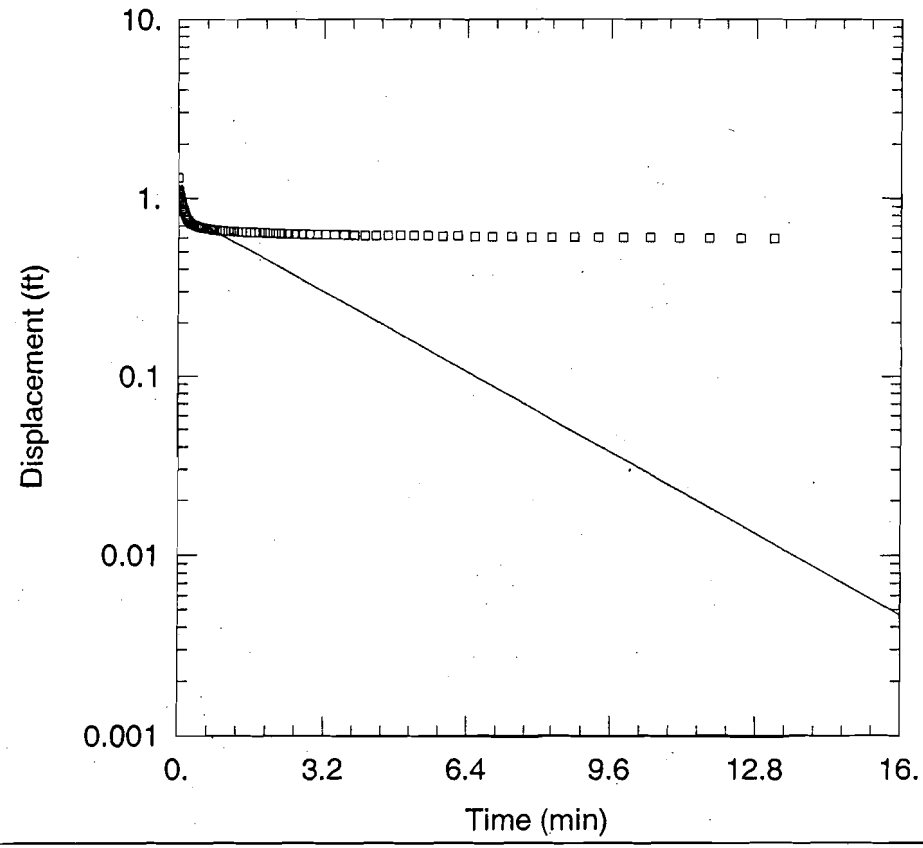
Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 7.991 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/9/2005	9:15:00	0	15.74	0
1/9/2005	9:15:00	0.005	15.75	0
1/9/2005	9:15:00	0.01	15.76	0
1/9/2005	9:15:00	0.015	15.76	0.002
1/9/2005	9:15:01	0.02	15.76	0.002
1/9/2005	9:15:01	0.025	15.77	0.001
1/9/2005	9:15:01	0.03	15.77	0.001
1/9/2005	9:15:02	0.035	15.77	-0.001
1/9/2005	9:15:02	0.04	15.77	0.001

1/9/2005	9:15:02	0.045	15.77	-1.058		
1/9/2005	9:15:03	0.05	15.77	-0.971		
1/9/2005	9:15:03	0.055	15.77	-1.099		
1/9/2005	9:15:03	0.06	15.77	-0.491		
1/9/2005	9:15:03	0.065	15.77	-0.831		
1/9/2005	9:15:04	0.07	15.77	-0.874	ET (min)	Feet H2O
1/9/2005	9:15:04	0.075	15.79	-0.902	0	0.902
1/9/2005	9:15:04	0.08	15.77	-0.894	0.005	0.894
1/9/2005	9:15:05	0.085	15.77	-0.862	0.01	0.862
1/9/2005	9:15:05	0.09	15.79	-0.823	0.015	0.823
1/9/2005	9:15:05	0.095	15.79	-0.785	0.02	0.785
1/9/2005	9:15:06	0.1	15.79	-0.748	0.025	0.748
1/9/2005	9:15:06	0.1058	15.79	-0.71	0.0308	0.71
1/9/2005	9:15:06	0.112	15.79	-0.673	0.037	0.673
1/9/2005	9:15:07	0.1185	15.79	-0.637	0.0435	0.637
1/9/2005	9:15:07	0.1255	15.79	-0.602	0.0505	0.602
1/9/2005	9:15:07	0.1328	15.79	-0.566	0.0578	0.566
1/9/2005	9:15:08	0.1407	15.79	-0.534	0.0657	0.534
1/9/2005	9:15:08	0.149	15.79	-0.513	0.074	0.513
1/9/2005	9:15:09	0.1578	15.79	-0.481	0.0828	0.481
1/9/2005	9:15:10	0.1672	15.79	-0.461	0.0922	0.461
1/9/2005	9:15:10	0.177	15.79	-0.442	0.102	0.442
1/9/2005	9:15:11	0.1875	15.79	-0.426	0.1125	0.426
1/9/2005	9:15:11	0.1985	15.79	-0.418	0.1235	0.418
1/9/2005	9:15:12	0.2102	15.79	-0.408	0.1352	0.408
1/9/2005	9:15:13	0.2227	15.77	-0.402	0.1477	0.402
1/9/2005	9:15:14	0.2358	15.77	-0.394	0.1608	0.394
1/9/2005	9:15:15	0.2498	15.77	-0.386	0.1748	0.386
1/9/2005	9:15:15	0.2647	15.77	-0.381	0.1897	0.381
1/9/2005	9:15:16	0.2803	15.77	-0.371	0.2053	0.371
1/9/2005	9:15:17	0.297	15.77	-0.361	0.222	0.361
1/9/2005	9:15:18	0.3147	15.77	-0.363	0.2397	0.363
1/9/2005	9:15:20	0.3333	15.77	-0.359	0.2583	0.359
1/9/2005	9:15:21	0.3532	15.77	-0.355	0.2782	0.355
1/9/2005	9:15:22	0.3742	15.77	-0.351	0.2992	0.351
1/9/2005	9:15:23	0.3963	15.77	-0.349	0.3213	0.349
1/9/2005	9:15:25	0.4198	15.77	-0.345	0.3448	0.345
1/9/2005	9:15:26	0.4447	15.77	-0.343	0.3697	0.343
1/9/2005	9:15:28	0.4697	15.77	-0.341	0.3947	0.341
1/9/2005	9:15:29	0.4963	15.77	-0.339	0.4213	0.339
1/9/2005	9:15:31	0.5247	15.77	-0.335	0.4497	0.335
1/9/2005	9:15:33	0.5547	15.77	-0.333	0.4797	0.333
1/9/2005	9:15:35	0.5863	15.77	-0.333	0.5113	0.333
1/9/2005	9:15:37	0.6213	15.77	-0.329	0.5463	0.329
1/9/2005	9:15:39	0.658	15.77	-0.327	0.583	0.327
1/9/2005	9:15:41	0.6963	15.77	-0.325	0.6213	0.325
1/9/2005	9:15:44	0.738	15.77	-0.325	0.663	0.325
1/9/2005	9:15:46	0.7813	15.77	-0.323	0.7063	0.323
1/9/2005	9:15:49	0.828	15.77	-0.325	0.753	0.325
1/9/2005	9:15:52	0.8763	15.77	-0.319	0.8013	0.319
1/9/2005	9:15:55	0.928	15.77	-0.319	0.853	0.319
1/9/2005	9:15:58	0.983	15.77	-0.317	0.908	0.317

1/9/2005	9:16:02	1.0413	15.77	-0.317	0.9663	0.317
1/9/2005	9:16:06	1.103	15.77	-0.313	1.028	0.313
1/9/2005	9:16:10	1.168	15.77	-0.313	1.093	0.313
1/9/2005	9:16:14	1.238	15.76	-0.308	1.163	0.308
1/9/2005	9:16:18	1.3113	15.76	-0.306	1.2363	0.306
1/9/2005	9:16:23	1.3897	15.76	-0.308	1.3147	0.308
1/9/2005	9:16:28	1.473	15.76	-0.304	1.398	0.304
1/9/2005	9:16:33	1.5613	15.76	-0.304	1.4863	0.304
1/9/2005	9:16:39	1.6547	15.76	-0.302	1.5797	0.302
1/9/2005	9:16:45	1.753	15.76	-0.302	1.678	0.302
1/9/2005	9:16:51	1.858	15.76	-0.302	1.783	0.302
1/9/2005	9:16:58	1.968	15.76	-0.3	1.893	0.3
1/9/2005	9:17:05	2.0847	15.76	-0.3	2.0097	0.3
1/9/2005	9:17:12	2.2097	15.76	-0.294	2.1347	0.294
1/9/2005	9:17:20	2.3413	15.76	-0.298	2.2663	0.298
1/9/2005	9:17:28	2.4813	15.76	-0.296	2.4063	0.296
1/9/2005	9:17:37	2.6297	15.76	-0.294	2.5547	0.294
1/9/2005	9:17:47	2.7863	15.76	-0.296	2.7113	0.296
1/9/2005	9:17:57	2.953	15.76	-0.292	2.878	0.292
1/9/2005	9:18:07	3.1297	15.76	-0.292	3.0547	0.292
1/9/2005	9:18:18	3.3163	15.76	-0.298	3.2413	0.298
1/9/2005	9:18:30	3.5147	15.76	-0.288	3.4397	0.288
1/9/2005	9:18:43	3.7247	15.76	-0.29	3.6497	0.29
1/9/2005	9:18:56	3.9463	15.76	-0.288	3.8713	0.288
1/9/2005	9:19:10	4.1813	15.76	-0.286	4.1063	0.286
1/9/2005	9:19:25	4.4297	15.76	-0.288	4.3547	0.288
1/9/2005	9:19:41	4.693	15.76	-0.286	4.618	0.286
1/9/2005	9:19:58	4.973	15.76	-0.288	4.898	0.288
1/9/2005	9:20:16	5.2697	15.76	-0.286	5.1947	0.286
1/9/2005	9:20:34	5.583	15.76	-0.284	5.508	0.284
1/9/2005	9:20:54	5.9147	15.76	-0.282	5.8397	0.282
1/9/2005	9:21:15	6.2663	15.76	-0.282	6.1913	0.282
1/9/2005	9:21:38	6.6397	15.77	-0.282	6.5647	0.282
1/9/2005	9:22:02	7.0347	15.76	-0.28	6.9597	0.28
1/9/2005	9:22:27	7.453	15.77	-0.28	7.378	0.28
1/9/2005	9:22:53	7.8963	15.77	-0.278	7.8213	0.278
1/9/2005	9:23:21	8.3663	15.77	-0.278	8.2913	0.278
1/9/2005	9:23:51	8.8647	15.77	-0.276	8.7897	0.276
1/9/2005	9:24:23	9.3913	15.77	-0.276	9.3163	0.276
1/9/2005	9:24:56	9.9497	15.77	-0.276	9.8747	0.276
1/9/2005	9:25:32	10.5413	15.77	-0.276	10.4663	0.276
1/9/2005	9:26:10	11.168	15.77	-0.274	11.093	0.274
1/9/2005	9:26:49	11.8313	15.77	-0.274	11.7563	0.274



12MWT17 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT17-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:34:56

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT17
Test Date: 1-9-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.6003 ft/day
y0 = 0.852 ft

AQUIFER DATA

Saturated Thickness: 3.82 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT17)

Initial Displacement: 1.302 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 3.82 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT-17P

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/27.90 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 24.08 DATE: 11/9/05

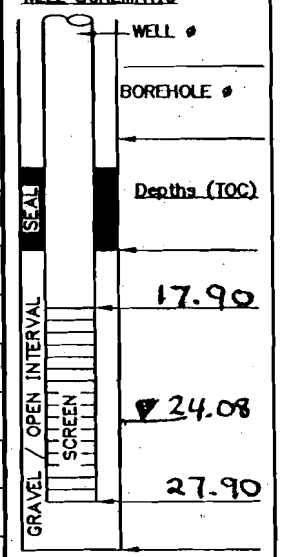
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.08		-1.11			
.13		- .98			
.177		- .88			
.25		- .78			
.62		- .68			
5		- .62			
10		- .60			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

REMARKS:

3.715 xD 0951
4.323 xD 1000
4.265 xD 1015
4.224 " 1034
4.212 " 1042
DID NOT REC TO STATIC - DECIDE TO RUN TEST - WILL

CALCS, SKETCH MAPS, ETC.:

LOOK AT DATA LATER.

ACAD: FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/9/2005 11:00:39
Report fror ...\SN08927 2005-01-09 104500 12MWT17-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT17-R

Test define 1/9/2005 10:35:37
Test sched 1/9/2005 10:45:00
Test starte 1/9/2005 10:45:00
Test stopp 1/9/2005 10:58:44

Data gathered using Logarithmic testing
Maximun Minutes.
Number 106

TOTAL DA 106

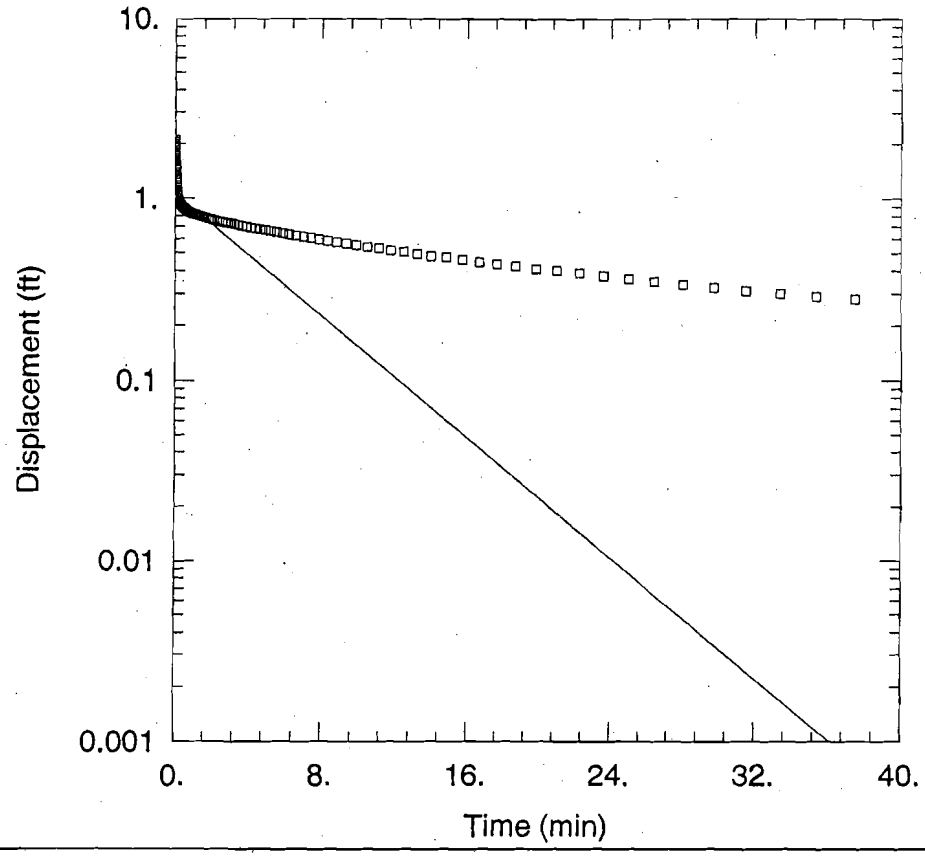
Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 4.205 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/9/2005	10:45:00	0	14.57	0
1/9/2005	10:45:00	0.005	14.59	0
1/9/2005	10:45:00	0.01	14.59	0
1/9/2005	10:45:00	0.015	14.6	0
1/9/2005	10:45:01	0.02	14.6	0
1/9/2005	10:45:01	0.025	14.6	0
1/9/2005	10:45:01	0.03	14.6	0
1/9/2005	10:45:02	0.035	14.61	-0.001
1/9/2005	10:45:02	0.04	14.61	-0.001

1/9/2005	10:45:02	0.045	14.61	-0.001		
1/9/2005	10:45:03	0.05	14.61	-0.003		
1/9/2005	10:45:03	0.055	14.61	-0.001		
1/9/2005	10:45:03	0.06	14.61	-0.09		
1/9/2005	10:45:03	0.065	14.61	-0.542		
1/9/2005	10:45:04	0.07	14.61	-0.919	ET (min)	Feet H2O
1/9/2005	10:45:04	0.075	14.61	-1.302	0	1.302
1/9/2005	10:45:04	0.08	14.61	-1.116	0.005	1.116
1/9/2005	10:45:05	0.085	14.61	-1.104	0.01	1.104
1/9/2005	10:45:05	0.09	14.61	-1.093	0.015	1.093
1/9/2005	10:45:05	0.095	14.62	-1.077	0.02	1.077
1/9/2005	10:45:06	0.1	14.61	-1.063	0.025	1.063
1/9/2005	10:45:06	0.1058	14.62	-1.047	0.0308	1.047
1/9/2005	10:45:06	0.112	14.62	-1.025	0.037	1.025
1/9/2005	10:45:07	0.1185	14.62	-1.021	0.0435	1.021
1/9/2005	10:45:07	0.1255	14.62	-1.006	0.0505	1.006
1/9/2005	10:45:07	0.1328	14.62	-0.982	0.0578	0.982
1/9/2005	10:45:08	0.1407	14.62	-0.964	0.0657	0.964
1/9/2005	10:45:08	0.149	14.62	-0.948	0.074	0.948
1/9/2005	10:45:09	0.1578	14.62	-0.925	0.0828	0.925
1/9/2005	10:45:10	0.1672	14.62	-0.903	0.0922	0.903
1/9/2005	10:45:10	0.177	14.62	-0.883	0.102	0.883
1/9/2005	10:45:11	0.1875	14.62	-0.869	0.1125	0.869
1/9/2005	10:45:11	0.1985	14.62	-0.85	0.1235	0.85
1/9/2005	10:45:12	0.2102	14.61	-0.832	0.1352	0.832
1/9/2005	10:45:13	0.2227	14.61	-0.816	0.1477	0.816
1/9/2005	10:45:14	0.2358	14.61	-0.799	0.1608	0.799
1/9/2005	10:45:15	0.2498	14.61	-0.783	0.1748	0.783
1/9/2005	10:45:15	0.2647	14.61	-0.767	0.1897	0.767
1/9/2005	10:45:16	0.2803	14.61	-0.755	0.2053	0.755
1/9/2005	10:45:17	0.297	14.61	-0.747	0.222	0.747
1/9/2005	10:45:18	0.3147	14.61	-0.737	0.2397	0.737
1/9/2005	10:45:20	0.3333	14.61	-0.73	0.2583	0.73
1/9/2005	10:45:21	0.3532	14.61	-0.722	0.2782	0.722
1/9/2005	10:45:22	0.3742	14.61	-0.716	0.2992	0.716
1/9/2005	10:45:23	0.3963	14.61	-0.712	0.3213	0.712
1/9/2005	10:45:25	0.4198	14.61	-0.708	0.3448	0.708
1/9/2005	10:45:26	0.4447	14.61	-0.702	0.3697	0.702
1/9/2005	10:45:28	0.4697	14.61	-0.7	0.3947	0.7
1/9/2005	10:45:29	0.4963	14.61	-0.696	0.4213	0.696
1/9/2005	10:45:31	0.5247	14.61	-0.692	0.4497	0.692
1/9/2005	10:45:33	0.5547	14.61	-0.69	0.4797	0.69
1/9/2005	10:45:35	0.5863	14.61	-0.686	0.5113	0.686
1/9/2005	10:45:37	0.6213	14.61	-0.682	0.5463	0.682
1/9/2005	10:45:39	0.658	14.61	-0.68	0.583	0.68
1/9/2005	10:45:41	0.6963	14.61	-0.678	0.6213	0.678
1/9/2005	10:45:44	0.738	14.61	-0.674	0.663	0.674
1/9/2005	10:45:46	0.7813	14.61	-0.674	0.7063	0.674
1/9/2005	10:45:49	0.828	14.61	-0.668	0.753	0.668
1/9/2005	10:45:52	0.8763	14.6	-0.665	0.8013	0.665
1/9/2005	10:45:55	0.928	14.61	-0.668	0.853	0.668
1/9/2005	10:45:58	0.983	14.6	-0.661	0.908	0.661

1/9/2005	10:46:02	1.0413	14.6	-0.659	0.9663	0.659
1/9/2005	10:46:06	1.103	14.6	-0.659	1.028	0.659
1/9/2005	10:46:10	1.168	14.6	-0.655	1.093	0.655
1/9/2005	10:46:14	1.238	14.6	-0.655	1.163	0.655
1/9/2005	10:46:18	1.3113	14.6	-0.653	1.2363	0.653
1/9/2005	10:46:23	1.3897	14.6	-0.651	1.3147	0.651
1/9/2005	10:46:28	1.473	14.6	-0.649	1.398	0.649
1/9/2005	10:46:33	1.5613	14.6	-0.649	1.4863	0.649
1/9/2005	10:46:39	1.6547	14.6	-0.643	1.5797	0.643
1/9/2005	10:46:45	1.753	14.6	-0.643	1.678	0.643
1/9/2005	10:46:51	1.858	14.6	-0.645	1.783	0.645
1/9/2005	10:46:58	1.968	14.6	-0.639	1.893	0.639
1/9/2005	10:47:05	2.0847	14.6	-0.639	2.0097	0.639
1/9/2005	10:47:12	2.2097	14.59	-0.637	2.1347	0.637
1/9/2005	10:47:20	2.3413	14.59	-0.637	2.2663	0.637
1/9/2005	10:47:28	2.4813	14.6	-0.635	2.4063	0.635
1/9/2005	10:47:37	2.6297	14.59	-0.633	2.5547	0.633
1/9/2005	10:47:47	2.7863	14.59	-0.633	2.7113	0.633
1/9/2005	10:47:57	2.953	14.59	-0.629	2.878	0.629
1/9/2005	10:48:07	3.1297	14.59	-0.629	3.0547	0.629
1/9/2005	10:48:18	3.3163	14.59	-0.627	3.2413	0.627
1/9/2005	10:48:30	3.5147	14.59	-0.625	3.4397	0.625
1/9/2005	10:48:43	3.7247	14.59	-0.623	3.6497	0.623
1/9/2005	10:48:56	3.9463	14.59	-0.623	3.8713	0.623
1/9/2005	10:49:10	4.1813	14.59	-0.621	4.1063	0.621
1/9/2005	10:49:25	4.4297	14.59	-0.621	4.3547	0.621
1/9/2005	10:49:41	4.693	14.59	-0.621	4.618	0.621
1/9/2005	10:49:58	4.973	14.59	-0.621	4.898	0.621
1/9/2005	10:50:16	5.2697	14.59	-0.617	5.1947	0.617
1/9/2005	10:50:34	5.583	14.59	-0.617	5.508	0.617
1/9/2005	10:50:54	5.9147	14.59	-0.614	5.8397	0.614
1/9/2005	10:51:15	6.2663	14.59	-0.619	6.1913	0.619
1/9/2005	10:51:38	6.6397	14.59	-0.612	6.5647	0.612
1/9/2005	10:52:02	7.0347	14.59	-0.61	6.9597	0.61
1/9/2005	10:52:27	7.453	14.59	-0.61	7.378	0.61
1/9/2005	10:52:53	7.8963	14.59	-0.608	7.8213	0.608
1/9/2005	10:53:21	8.3663	14.57	-0.606	8.2913	0.606
1/9/2005	10:53:51	8.8647	14.57	-0.608	8.7897	0.608
1/9/2005	10:54:23	9.3913	14.57	-0.606	9.3163	0.606
1/9/2005	10:54:56	9.9497	14.57	-0.604	9.8747	0.604
1/9/2005	10:55:32	10.5413	14.57	-0.604	10.4663	0.604
1/9/2005	10:56:10	11.168	14.57	-0.602	11.093	0.602
1/9/2005	10:56:49	11.8313	14.57	-0.6	11.7563	0.6
1/9/2005	10:57:32	12.5347	14.57	-0.598	12.4597	0.598
1/9/2005	10:58:16	13.2797	14.57	-0.598	13.2047	0.598



12MWT21 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT21-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:02

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT21
Test Date: 1-9-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.3555 ft/day
y0 = 1.062 ft

AQUIFER DATA

Saturated Thickness: 7.56 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT21)

Initial Displacement: 2.1 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 7.56 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT21- R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10'/26.75 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 19.19 DATE: 1/8/05

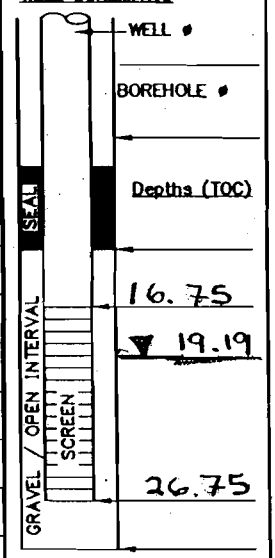
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG PAGE 1 OF 1

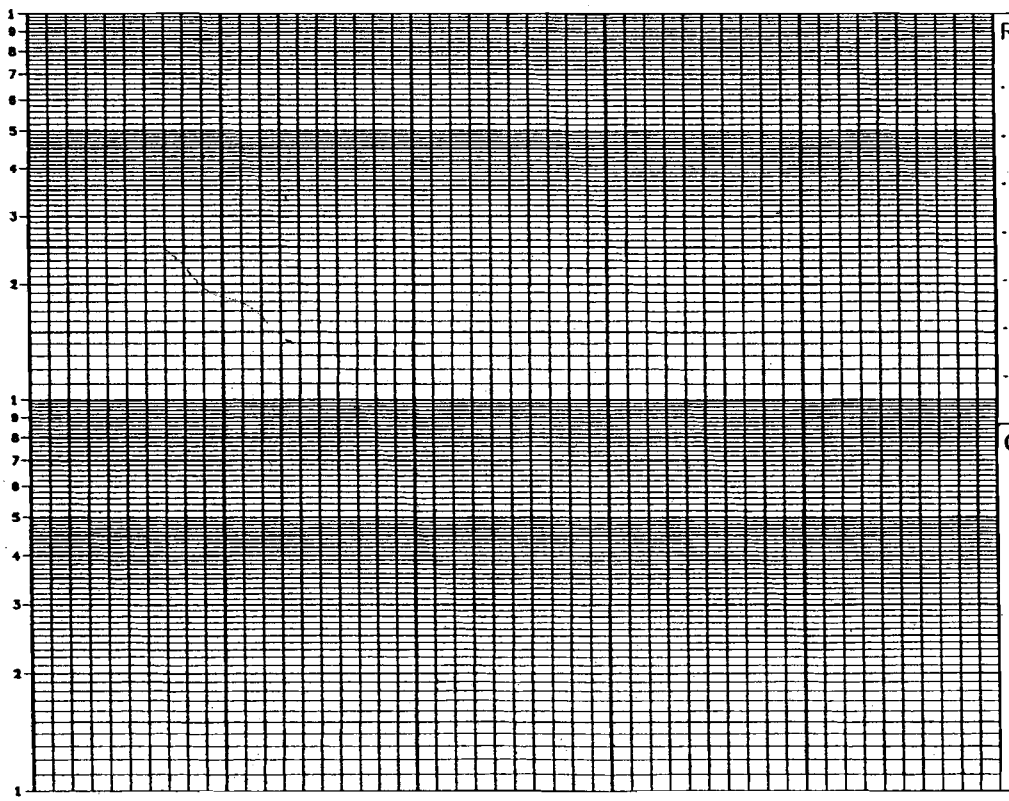
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.03		-2.10		15	-.47
.05		-1.90		20	-.41
.08		-1.62		25	-.36
.1		-1.47		28.1	-.34
.2		-1.04			
.3		-.95			
.5		-.88			
.78		-.84		7.56	
1		-.82			
3		-.73			
5		-.67			
10		-.55			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

XD = 7.017

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/8/2005 17:08:43
Report fror ...\SN08927 2005-01-08 163026 12MWT21-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT21-R

Test define 1/8/2005 16:12:26
Test starte 1/8/2005 16:30:26
Test stopp 1/8/2005 17:08:24

Data gathered using Logarithmic testing
Maximun Minutes.
Number 124

TOTAL DA 124

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 7.11 Feet H2O

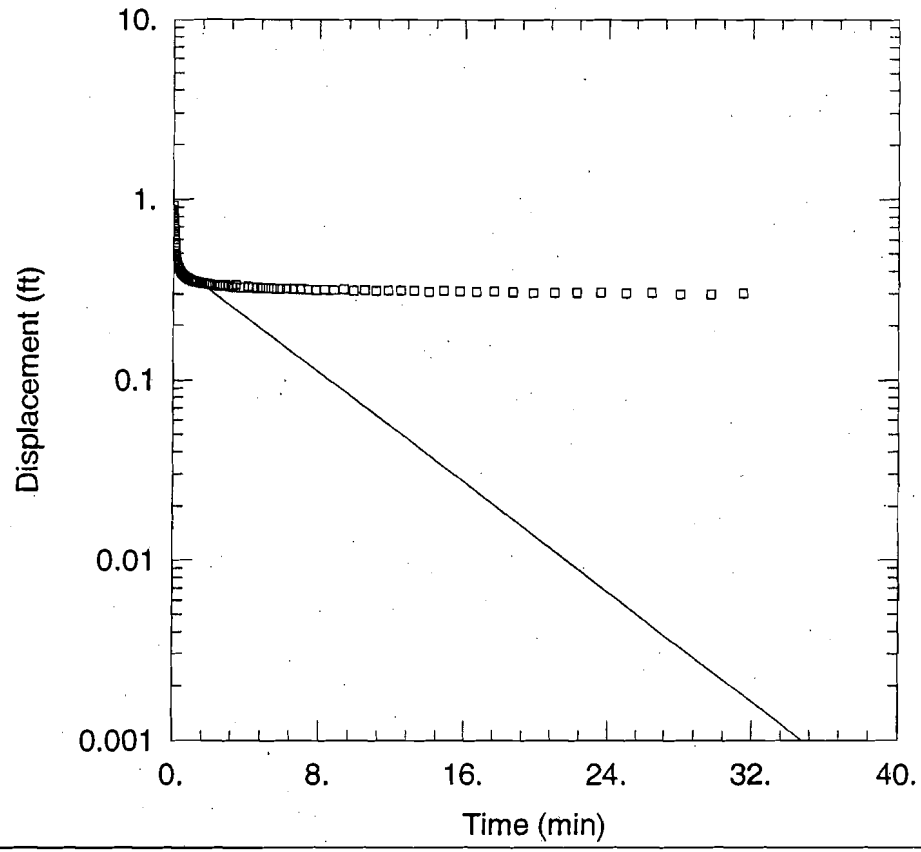
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/8/2005	16:30:26	0	14.81	0
1/8/2005	16:30:27	0.005	14.83	0
1/8/2005	16:30:27	0.01	14.83	-1.654
1/8/2005	16:30:27	0.015	14.83	-1.723
1/8/2005	16:30:28	0.02	14.84	-1.052
1/8/2005	16:30:28	0.025	14.84	-1.577
1/8/2005	16:30:28	0.03	14.84	-2.1
1/8/2005	16:30:29	0.035	14.84	-2.041
1/8/2005	16:30:29	0.04	14.84	-1.984
1/8/2005	16:30:29	0.045	14.85	-1.934

ET (min)	Feet H2O
0	2.1
0.005	2.041
0.01	1.984
0.015	1.934

1/8/2005	16:30:29	0.05	14.85	-1.901	0.02	1.901
1/8/2005	16:30:30	0.055	14.85	-1.835	0.025	1.835
1/8/2005	16:30:30	0.06	14.85	-1.79	0.03	1.79
1/8/2005	16:30:30	0.065	14.85	-1.747	0.035	1.747
1/8/2005	16:30:31	0.07	14.85	-1.705	0.04	1.705
1/8/2005	16:30:31	0.075	14.85	-1.662	0.045	1.662
1/8/2005	16:30:31	0.08	14.85	-1.624	0.05	1.624
1/8/2005	16:30:32	0.085	14.85	-1.593	0.055	1.593
1/8/2005	16:30:32	0.09	14.85	-1.545	0.06	1.545
1/8/2005	16:30:32	0.095	14.85	-1.506	0.065	1.506
1/8/2005	16:30:32	0.1	14.85	-1.468	0.07	1.468
1/8/2005	16:30:33	0.1058	14.85	-1.431	0.0758	1.431
1/8/2005	16:30:33	0.112	14.85	-1.389	0.082	1.389
1/8/2005	16:30:34	0.1185	14.85	-1.342	0.0885	1.342
1/8/2005	16:30:34	0.1255	14.85	-1.302	0.0955	1.302
1/8/2005	16:30:34	0.1328	14.86	-1.261	0.1028	1.261
1/8/2005	16:30:35	0.1407	14.86	-1.219	0.1107	1.219
1/8/2005	16:30:35	0.149	14.86	-1.178	0.119	1.178
1/8/2005	16:30:36	0.1578	14.86	-1.144	0.1278	1.144
1/8/2005	16:30:36	0.1672	14.85	-1.109	0.1372	1.109
1/8/2005	16:30:37	0.177	14.85	-1.083	0.147	1.083
1/8/2005	16:30:38	0.1875	14.85	-1.06	0.1575	1.06
1/8/2005	16:30:38	0.1985	14.85	-1.04	0.1685	1.04
1/8/2005	16:30:39	0.2102	14.85	-1.022	0.1802	1.022
1/8/2005	16:30:40	0.2227	14.85	-1.004	0.1927	1.004
1/8/2005	16:30:41	0.2358	14.85	-0.989	0.2058	0.989
1/8/2005	16:30:41	0.2498	14.85	-0.977	0.2198	0.977
1/8/2005	16:30:42	0.2647	14.85	-0.965	0.2347	0.965
1/8/2005	16:30:43	0.2803	14.85	-0.955	0.2503	0.955
1/8/2005	16:30:44	0.297	14.85	-0.945	0.267	0.945
1/8/2005	16:30:45	0.3147	14.84	-0.937	0.2847	0.937
1/8/2005	16:30:46	0.3333	14.84	-0.926	0.3033	0.926
1/8/2005	16:30:48	0.3532	14.84	-0.92	0.3232	0.92
1/8/2005	16:30:49	0.3742	14.85	-0.912	0.3442	0.912
1/8/2005	16:30:50	0.3963	14.84	-0.906	0.3663	0.906
1/8/2005	16:30:52	0.4198	14.84	-0.898	0.3898	0.898
1/8/2005	16:30:53	0.4447	14.84	-0.892	0.4147	0.892
1/8/2005	16:30:55	0.4697	14.84	-0.888	0.4397	0.888
1/8/2005	16:30:56	0.4963	14.84	-0.882	0.4663	0.882
1/8/2005	16:30:58	0.5247	14.84	-0.876	0.4947	0.876
1/8/2005	16:31:00	0.5547	14.84	-0.872	0.5247	0.872
1/8/2005	16:31:02	0.5863	14.84	-0.866	0.5563	0.866
1/8/2005	16:31:04	0.6213	14.84	-0.862	0.5913	0.862
1/8/2005	16:31:06	0.658	14.84	-0.858	0.628	0.858
1/8/2005	16:31:08	0.6963	14.84	-0.851	0.6663	0.851
1/8/2005	16:31:11	0.738	14.84	-0.847	0.708	0.847
1/8/2005	16:31:13	0.7813	14.84	-0.843	0.7513	0.843
1/8/2005	16:31:16	0.828	14.84	-0.837	0.798	0.837
1/8/2005	16:31:19	0.8763	14.84	-0.835	0.8463	0.835
1/8/2005	16:31:22	0.928	14.84	-0.829	0.898	0.829
1/8/2005	16:31:25	0.983	14.84	-0.825	0.953	0.825
1/8/2005	16:31:29	1.0413	14.83	-0.821	1.0113	0.821

1/8/2005	16:31:33	1.103	14.83	-0.817	1.073	0.817
1/8/2005	16:31:37	1.168	14.83	-0.813	1.138	0.813
1/8/2005	16:31:41	1.238	14.83	-0.807	1.208	0.807
1/8/2005	16:31:45	1.3113	14.83	-0.803	1.2813	0.803
1/8/2005	16:31:50	1.3897	14.83	-0.799	1.3597	0.799
1/8/2005	16:31:55	1.473	14.81	-0.792	1.443	0.792
1/8/2005	16:32:00	1.5613	14.81	-0.788	1.5313	0.788
1/8/2005	16:32:06	1.6547	14.81	-0.784	1.6247	0.784
1/8/2005	16:32:12	1.753	14.81	-0.778	1.723	0.778
1/8/2005	16:32:18	1.858	14.81	-0.774	1.828	0.774
1/8/2005	16:32:25	1.968	14.81	-0.768	1.938	0.768
1/8/2005	16:32:32	2.0847	14.81	-0.762	2.0547	0.762
1/8/2005	16:32:39	2.2097	14.81	-0.758	2.1797	0.758
1/8/2005	16:32:47	2.3413	14.81	-0.752	2.3113	0.752
1/8/2005	16:32:55	2.4813	14.81	-0.748	2.4513	0.748
1/8/2005	16:33:04	2.6297	14.81	-0.742	2.5997	0.742
1/8/2005	16:33:14	2.7863	14.8	-0.735	2.7563	0.735
1/8/2005	16:33:24	2.953	14.8	-0.729	2.923	0.729
1/8/2005	16:33:34	3.1297	14.81	-0.723	3.0997	0.723
1/8/2005	16:33:45	3.3163	14.81	-0.715	3.2863	0.715
1/8/2005	16:33:57	3.5147	14.81	-0.709	3.4847	0.709
1/8/2005	16:34:10	3.7247	14.81	-0.701	3.6947	0.701
1/8/2005	16:34:23	3.9463	14.83	-0.695	3.9163	0.695
1/8/2005	16:34:37	4.1813	14.83	-0.687	4.1513	0.687
1/8/2005	16:34:52	4.4297	14.83	-0.681	4.3997	0.681
1/8/2005	16:35:08	4.693	14.83	-0.673	4.663	0.673
1/8/2005	16:35:25	4.973	14.84	-0.665	4.943	0.665
1/8/2005	16:35:43	5.2697	14.84	-0.657	5.2397	0.657
1/8/2005	16:36:01	5.583	14.84	-0.649	5.553	0.649
1/8/2005	16:36:21	5.9147	14.84	-0.641	5.8847	0.641
1/8/2005	16:36:42	6.2663	14.84	-0.631	6.2363	0.631
1/8/2005	16:37:05	6.6397	14.85	-0.623	6.6097	0.623
1/8/2005	16:37:29	7.0347	14.85	-0.613	7.0047	0.613
1/8/2005	16:37:54	7.453	14.85	-0.604	7.423	0.604
1/8/2005	16:38:20	7.8963	14.85	-0.594	7.8663	0.594
1/8/2005	16:38:48	8.3663	14.86	-0.584	8.3363	0.584
1/8/2005	16:39:18	8.8647	14.86	-0.574	8.8347	0.574
1/8/2005	16:39:50	9.3913	14.86	-0.564	9.3613	0.564
1/8/2005	16:40:23	9.9497	14.88	-0.554	9.9197	0.554
1/8/2005	16:40:59	10.5413	14.88	-0.542	10.5113	0.542
1/8/2005	16:41:37	11.168	14.88	-0.532	11.138	0.532
1/8/2005	16:42:16	11.8313	14.88	-0.52	11.8013	0.52
1/8/2005	16:42:59	12.5347	14.88	-0.51	12.5047	0.51
1/8/2005	16:43:43	13.2797	14.88	-0.497	13.2497	0.497
1/8/2005	16:44:31	14.0697	14.89	-0.483	14.0397	0.483
1/8/2005	16:45:21	14.9063	14.88	-0.473	14.8763	0.473
1/8/2005	16:46:14	15.7913	14.89	-0.461	15.7613	0.461
1/8/2005	16:47:10	16.7297	14.9	-0.447	16.6997	0.447
1/8/2005	16:48:10	17.723	14.91	-0.435	17.693	0.435
1/8/2005	16:49:13	18.7763	14.91	-0.423	18.7463	0.423
1/8/2005	16:50:20	19.8913	14.93	-0.409	19.8613	0.409
1/8/2005	16:51:31	21.073	14.93	-0.399	21.043	0.399

1/8/2005	16:52:46	22.3247	14.93	-0.385	22.2947	0.385
1/8/2005	16:54:05	23.6497	14.93	-0.373	23.6197	0.373
1/8/2005	16:55:30	25.0547	14.93	-0.36	25.0247	0.36
1/8/2005	16:56:59	26.543	14.93	-0.348	26.513	0.348
1/8/2005	16:58:34	28.118	14.93	-0.336	28.088	0.336
1/8/2005	17:00:14	29.7863	14.93	-0.324	29.7563	0.324
1/8/2005	17:02:00	31.5547	14.91	-0.312	31.5247	0.312
1/8/2005	17:03:52	33.428	14.91	-0.301	33.398	0.301
1/8/2005	17:05:51	35.4113	14.9	-0.291	35.3813	0.291
1/8/2005	17:07:57	37.513	14.9	-0.281	37.483	0.281



12MWT23 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT23-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:13

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT23
Test Date: 1-11-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.3237 ft/day
y0 = 0.4489 ft

AQUIFER DATA

Saturated Thickness: 4.96 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT23)

Initial Displacement: 0.923 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 4.96 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MW123-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10/32.60 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 27.64 DATE: 1/11/05

TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

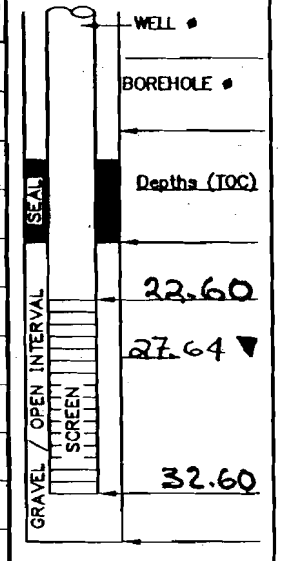
METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.075		-.923			
.09		-.842			
.12		-.79			
.15		-.68			
.188		-.58			
.25		-.48		4.96	
.58		-.38			
1.0		-.36			
2		-.34			
5		-.32			
10		-.31			
20		-.30			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

REMARKS:

4.893 XD 1040
5.22 XD 1045
5.19 XD 1105
WILL START TEST
TROLL
NOT CONNECTING
MAY COME BACK TO
THIS ONE.

CALCS, SKETCH MAPS, ETC.:

BACK @
1300 WILL TRY SHORTER
Troll 8927
XD @ 4.777

In-Situ Inc. MiniTroll Pro

Report gen 1/11/2005 14:17:35
Report fror ...\SN08927 2005-01-11 134500 12MWT23-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT23-R

Test define 1/11/2005 13:36:56
Test sched 1/11/2005 13:45:00
Test starte 1/11/2005 13:45:00
Test stopp 1/11/2005 14:17:26

Data gathered using Logarithmic testing
Maximun Minutes.
Number 121

TOTAL DA 121

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 5.081 Feet H2O

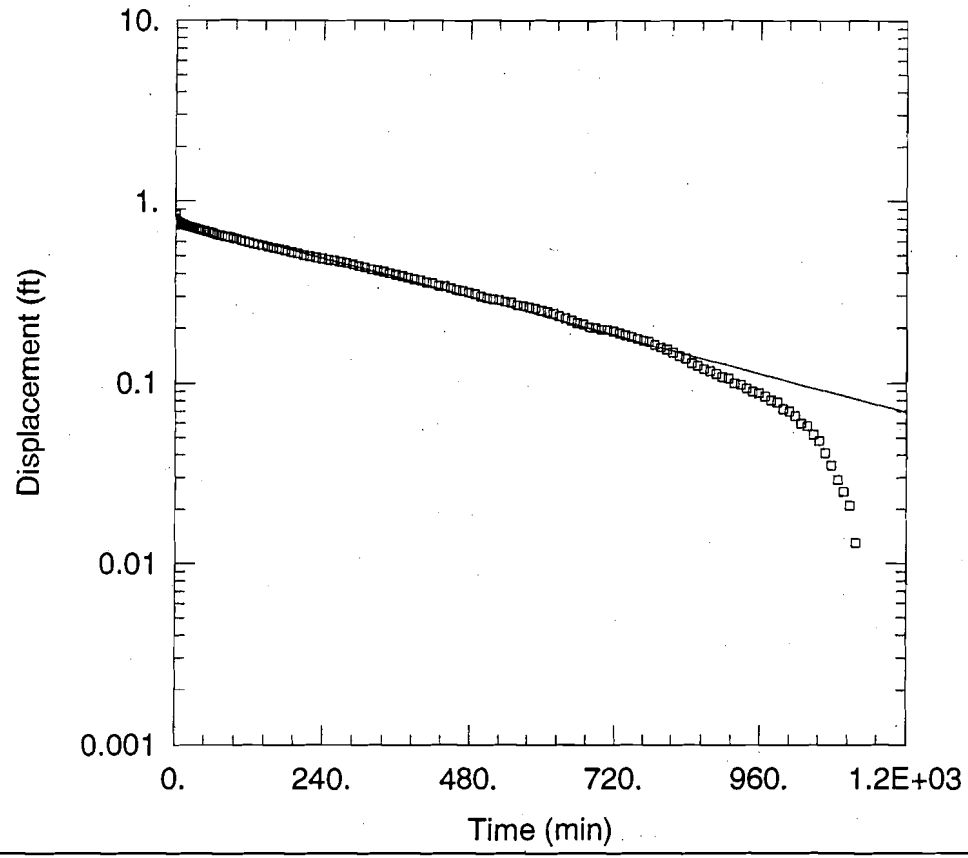
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/11/2005	13:45:00	0	15.36	0
1/11/2005	13:45:00	0.005	15.36	-0.002
1/11/2005	13:45:00	0.01	15.37	0
1/11/2005	13:45:00	0.015	15.37	-0.002
1/11/2005	13:45:01	0.02	15.38	0
1/11/2005	13:45:01	0.025	15.38	0
1/11/2005	13:45:01	0.03	15.38	0
1/11/2005	13:45:02	0.035	15.38	0
1/11/2005	13:45:02	0.04	15.38	0

1/11/2005	13:45:02	0.045	15.39	-0.001
1/11/2005	13:45:03	0.05	15.38	0
1/11/2005	13:45:03	0.055	15.39	-0.931
1/11/2005	13:45:03	0.06	15.39	-1.586
1/11/2005	13:45:03	0.065	15.39	-1.924
1/11/2005	13:45:04	0.07	15.39	-1.584
1/11/2005	13:45:04	0.075	15.39	-0.923
1/11/2005	13:45:04	0.08	15.39	-0.785
1/11/2005	13:45:05	0.085	15.39	-0.795
1/11/2005	13:45:05	0.09	15.39	-0.842
1/11/2005	13:45:05	0.095	15.39	-0.87
1/11/2005	13:45:06	0.1	15.39	-0.868
1/11/2005	13:45:06	0.1058	15.39	-0.84
1/11/2005	13:45:06	0.112	15.39	-0.811
1/11/2005	13:45:07	0.1185	15.39	-0.785
1/11/2005	13:45:07	0.1255	15.39	-0.761
1/11/2005	13:45:07	0.1328	15.39	-0.736
1/11/2005	13:45:08	0.1407	15.39	-0.712
1/11/2005	13:45:08	0.149	15.41	-0.682
1/11/2005	13:45:09	0.1578	15.39	-0.655
1/11/2005	13:45:10	0.1672	15.41	-0.629
1/11/2005	13:45:10	0.177	15.39	-0.599
1/11/2005	13:45:11	0.1875	15.39	-0.576
1/11/2005	13:45:11	0.1985	15.39	-0.556
1/11/2005	13:45:12	0.2102	15.39	-0.536
1/11/2005	13:45:13	0.2227	15.39	-0.515
1/11/2005	13:45:14	0.2358	15.39	-0.493
1/11/2005	13:45:15	0.2498	15.39	-0.483
1/11/2005	13:45:15	0.2647	15.39	-0.465
1/11/2005	13:45:16	0.2803	15.39	-0.455
1/11/2005	13:45:17	0.297	15.39	-0.449
1/11/2005	13:45:18	0.3147	15.39	-0.44
1/11/2005	13:45:20	0.3333	15.39	-0.434
1/11/2005	13:45:21	0.3532	15.38	-0.43
1/11/2005	13:45:22	0.3742	15.38	-0.42
1/11/2005	13:45:23	0.3963	15.39	-0.416
1/11/2005	13:45:25	0.4198	15.39	-0.41
1/11/2005	13:45:26	0.4447	15.38	-0.4
1/11/2005	13:45:28	0.4697	15.38	-0.398
1/11/2005	13:45:29	0.4963	15.38	-0.392
1/11/2005	13:45:31	0.5247	15.38	-0.39
1/11/2005	13:45:33	0.5547	15.38	-0.385
1/11/2005	13:45:35	0.5863	15.38	-0.383
1/11/2005	13:45:37	0.6213	15.38	-0.379
1/11/2005	13:45:39	0.658	15.38	-0.377
1/11/2005	13:45:41	0.6963	15.38	-0.375
1/11/2005	13:45:44	0.738	15.38	-0.371
1/11/2005	13:45:46	0.7813	15.38	-0.369
1/11/2005	13:45:49	0.828	15.38	-0.367
1/11/2005	13:45:52	0.8763	15.38	-0.365
1/11/2005	13:45:55	0.928	15.38	-0.361
1/11/2005	13:45:58	0.983	15.38	-0.361

ET (min)	Feet H2O
0	0.923
0.005	0.785
0.01	0.795
0.015	0.842
0.02	0.87
0.025	0.868
0.0308	0.84
0.037	0.811
0.0435	0.785
0.0505	0.761
0.0578	0.736
0.0657	0.712
0.074	0.682
0.0828	0.655
0.0922	0.629
0.102	0.599
0.1125	0.576
0.1235	0.556
0.1352	0.536
0.1477	0.515
0.1608	0.493
0.1748	0.483
0.1897	0.465
0.2053	0.455
0.222	0.449
0.2397	0.44
0.2583	0.434
0.2782	0.43
0.2992	0.42
0.3213	0.416
0.3448	0.41
0.3697	0.4
0.3947	0.398
0.4213	0.392
0.4497	0.39
0.4797	0.385
0.5113	0.383
0.5463	0.379
0.583	0.377
0.6213	0.375
0.663	0.371
0.7063	0.369
0.753	0.367
0.8013	0.365
0.853	0.361
0.908	0.361

1/11/2005	13:46:02	1.0413	15.38	-0.357	0.9663	0.357
1/11/2005	13:46:06	1.103	15.38	-0.355	1.028	0.355
1/11/2005	13:46:10	1.168	15.38	-0.351	1.093	0.351
1/11/2005	13:46:14	1.238	15.38	-0.353	1.163	0.353
1/11/2005	13:46:18	1.3113	15.38	-0.349	1.2363	0.349
1/11/2005	13:46:23	1.3897	15.38	-0.349	1.3147	0.349
1/11/2005	13:46:28	1.473	15.38	-0.347	1.398	0.347
1/11/2005	13:46:33	1.5613	15.37	-0.345	1.4863	0.345
1/11/2005	13:46:39	1.6547	15.37	-0.345	1.5797	0.345
1/11/2005	13:46:45	1.753	15.37	-0.343	1.678	0.343
1/11/2005	13:46:51	1.858	15.37	-0.341	1.783	0.341
1/11/2005	13:46:58	1.968	15.37	-0.341	1.893	0.341
1/11/2005	13:47:05	2.0847	15.37	-0.339	2.0097	0.339
1/11/2005	13:47:12	2.2097	15.37	-0.337	2.1347	0.337
1/11/2005	13:47:20	2.3413	15.37	-0.337	2.2663	0.337
1/11/2005	13:47:28	2.4813	15.37	-0.335	2.4063	0.335
1/11/2005	13:47:37	2.6297	15.37	-0.333	2.5547	0.333
1/11/2005	13:47:47	2.7863	15.37	-0.333	2.7113	0.333
1/11/2005	13:47:57	2.953	15.37	-0.337	2.878	0.337
1/11/2005	13:48:07	3.1297	15.37	-0.331	3.0547	0.331
1/11/2005	13:48:18	3.3163	15.37	-0.327	3.2413	0.327
1/11/2005	13:48:30	3.5147	15.37	-0.337	3.4397	0.337
1/11/2005	13:48:43	3.7247	15.37	-0.324	3.6497	0.324
1/11/2005	13:48:56	3.9463	15.37	-0.324	3.8713	0.324
1/11/2005	13:49:10	4.1813	15.37	-0.329	4.1063	0.329
1/11/2005	13:49:25	4.4297	15.36	-0.324	4.3547	0.324
1/11/2005	13:49:41	4.693	15.37	-0.324	4.618	0.324
1/11/2005	13:49:58	4.973	15.37	-0.322	4.898	0.322
1/11/2005	13:50:16	5.2697	15.37	-0.322	5.1947	0.322
1/11/2005	13:50:34	5.583	15.36	-0.32	5.508	0.32
1/11/2005	13:50:54	5.9147	15.36	-0.32	5.8397	0.32
1/11/2005	13:51:15	6.2663	15.36	-0.32	6.1913	0.32
1/11/2005	13:51:38	6.6397	15.36	-0.318	6.5647	0.318
1/11/2005	13:52:02	7.0347	15.36	-0.318	6.9597	0.318
1/11/2005	13:52:27	7.453	15.36	-0.316	7.378	0.316
1/11/2005	13:52:53	7.8963	15.36	-0.314	7.8213	0.314
1/11/2005	13:53:21	8.3663	15.36	-0.316	8.2913	0.316
1/11/2005	13:53:51	8.8647	15.36	-0.314	8.7897	0.314
1/11/2005	13:54:23	9.3913	15.36	-0.316	9.3163	0.316
1/11/2005	13:54:56	9.9497	15.36	-0.312	9.8747	0.312
1/11/2005	13:55:32	10.5413	15.36	-0.314	10.4663	0.314
1/11/2005	13:56:10	11.168	15.36	-0.312	11.093	0.312
1/11/2005	13:56:49	11.8313	15.37	-0.312	11.7563	0.312
1/11/2005	13:57:32	12.5347	15.37	-0.312	12.4597	0.312
1/11/2005	13:58:16	13.2797	15.38	-0.31	13.2047	0.31
1/11/2005	13:59:04	14.0697	15.38	-0.308	13.9947	0.308
1/11/2005	13:59:54	14.9063	15.38	-0.31	14.8313	0.31
1/11/2005	14:00:47	15.7913	15.38	-0.308	15.7163	0.308
1/11/2005	14:01:43	16.7297	15.38	-0.306	16.6547	0.306
1/11/2005	14:02:43	17.723	15.38	-0.308	17.648	0.308
1/11/2005	14:03:46	18.7763	15.38	-0.306	18.7013	0.306
1/11/2005	14:04:53	19.8913	15.38	-0.304	19.8163	0.304

1/11/2005	14:06:04	21.073	15.38	-0.304	20.998	0.304
1/11/2005	14:07:19	22.3247	15.38	-0.304	22.2497	0.304
1/11/2005	14:08:38	23.6497	15.38	-0.302	23.5747	0.302
1/11/2005	14:10:03	25.0547	15.38	-0.302	24.9797	0.302
1/11/2005	14:11:32	26.543	15.38	-0.302	26.468	0.302
1/11/2005	14:13:07	28.118	15.38	-0.298	28.043	0.298
1/11/2005	14:14:47	29.7863	15.38	-0.298	29.7113	0.298
1/11/2005	14:16:33	31.5547	15.38	-0.3	31.4797	0.3



12MWT25 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT25-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:20

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT25
Test Date: 1-9-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.003748 ft/day
y0 = 0.7906 ft

AQUIFER DATA

Saturated Thickness: 11.1 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT25)

Initial Displacement: 0.834 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 11.1 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT25-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10'/27.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 16.85 DATE: 1/9/05

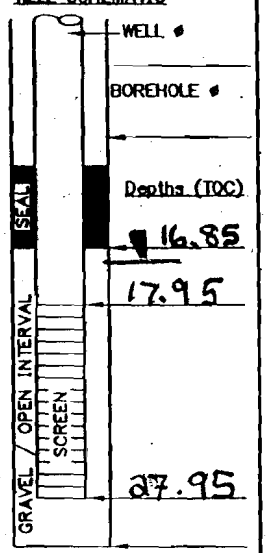
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1-SEC SLUG. PAGE 1 OF 1

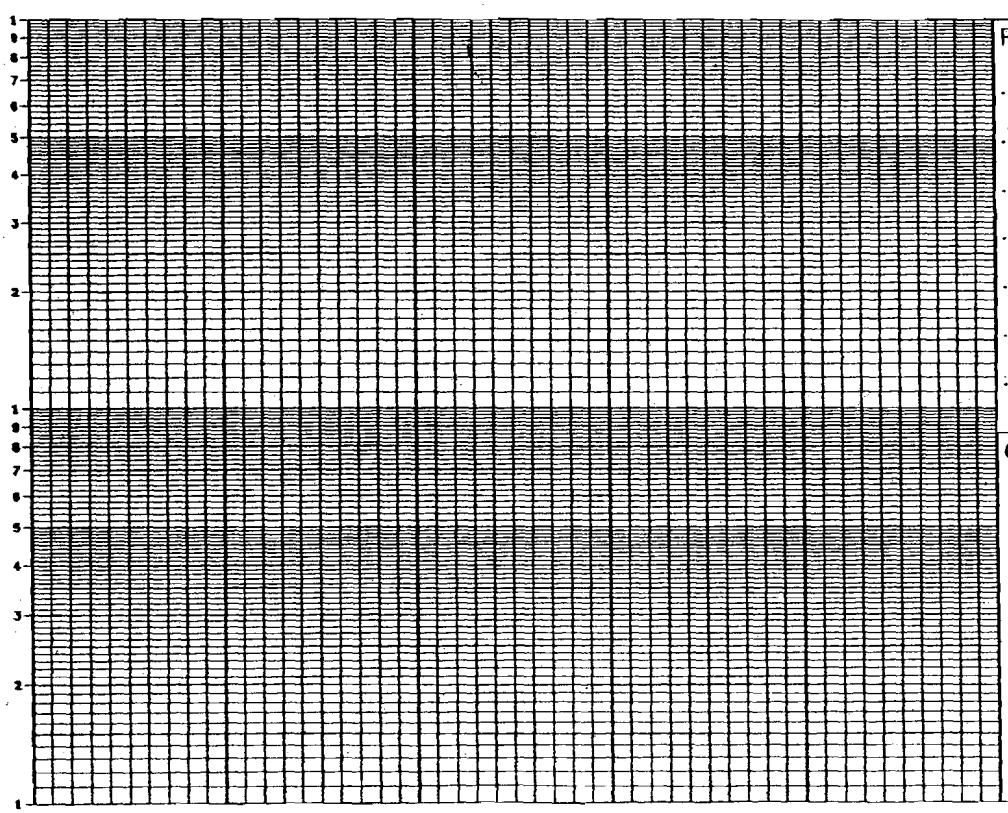
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.10		1.052	70		.65
.12		1.953	100		.62
.2		.773	197		.52
.3		.79	317		.42
.5		.79	467		.32
1		.78	647		.22
3		.77	867		.12
5		–	1007		.07
20		.73			
30		.71			
40		.69		11.1	
50		.68			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 8:09:19
Report fror ...\SN08927 2005-01-09 132500 12MWT25-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT25-F

Test define 1/9/2005 13:15:59
Test sched 1/9/2005 13:25:00
Test starte 1/9/2005 13:25:00
Test stopp 1/10/2005 8:09:07

Data gathered using Logarithmic testing
Maximun Minutes.
Number 245

TOTAL DA 245

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 10.737 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/9/2005	13:25:00	0	15.6	0
1/9/2005	13:25:00	0.005	15.61	0.002
1/9/2005	13:25:00	0.01	15.61	0.004
1/9/2005	13:25:00	0.015	15.62	0.002
1/9/2005	13:25:01	0.02	15.62	0.004
1/9/2005	13:25:01	0.025	15.62	0.004
1/9/2005	13:25:01	0.03	15.62	0.004
1/9/2005	13:25:02	0.035	15.62	0.004
1/9/2005	13:25:02	0.04	15.62	0.004

1/9/2005	13:25:02	0.045	15.63	0.003
1/9/2005	13:25:03	0.05	15.63	0.003
1/9/2005	13:25:03	0.055	15.63	0.003
1/9/2005	13:25:03	0.06	15.63	0.003
1/9/2005	13:25:03	0.065	15.63	0.005
1/9/2005	13:25:04	0.07	15.63	0.005
1/9/2005	13:25:04	0.075	15.63	0.005
1/9/2005	13:25:04	0.08	15.63	0.688
1/9/2005	13:25:05	0.085	15.63	0.712
1/9/2005	13:25:05	0.09	15.63	0.953
1/9/2005	13:25:05	0.095	15.63	0.888
1/9/2005	13:25:06	0.1	15.63	1.139
1/9/2005	13:25:06	0.1058	15.63	1.052
1/9/2005	13:25:06	0.112	15.63	0.994
1/9/2005	13:25:07	0.1185	15.63	0.953
1/9/2005	13:25:07	0.1255	15.65	0.716
1/9/2005	13:25:07	0.1328	15.65	0.912
1/9/2005	13:25:08	0.1407	15.65	0.89
1/9/2005	13:25:08	0.149	15.65	0.678
1/9/2005	13:25:09	0.1578	15.65	0.981
1/9/2005	13:25:10	0.1672	15.63	0.641
1/9/2005	13:25:10	0.177	15.63	0.929
1/9/2005	13:25:11	0.1875	15.63	0.751
1/9/2005	13:25:11	0.1985	15.63	0.773
1/9/2005	13:25:12	0.2102	15.63	0.834
1/9/2005	13:25:13	0.2227	15.63	0.803
1/9/2005	13:25:14	0.2358	15.63	0.785
1/9/2005	13:25:15	0.2498	15.63	0.789
1/9/2005	13:25:15	0.2647	15.62	0.791
1/9/2005	13:25:16	0.2803	15.63	0.793
1/9/2005	13:25:17	0.297	15.62	0.793
1/9/2005	13:25:18	0.3147	15.62	0.793
1/9/2005	13:25:20	0.3333	15.62	0.793
1/9/2005	13:25:21	0.3532	15.62	0.791
1/9/2005	13:25:22	0.3742	15.62	0.791
1/9/2005	13:25:23	0.3963	15.62	0.791
1/9/2005	13:25:25	0.4198	15.62	0.791
1/9/2005	13:25:26	0.4447	15.62	0.791
1/9/2005	13:25:28	0.4697	15.62	0.789
1/9/2005	13:25:29	0.4963	15.62	0.789
1/9/2005	13:25:31	0.5247	15.62	0.789
1/9/2005	13:25:33	0.5547	15.62	0.789
1/9/2005	13:25:35	0.5863	15.62	0.787
1/9/2005	13:25:37	0.6213	15.62	0.787
1/9/2005	13:25:39	0.658	15.62	0.787
1/9/2005	13:25:41	0.6963	15.62	0.785
1/9/2005	13:25:44	0.738	15.62	0.785
1/9/2005	13:25:46	0.7813	15.62	0.787
1/9/2005	13:25:49	0.828	15.62	0.785
1/9/2005	13:25:52	0.8763	15.62	0.785
1/9/2005	13:25:55	0.928	15.62	0.785
1/9/2005	13:25:58	0.983	15.62	0.781

ET (min)	Feet H2O
0	0.834
0.0125	0.803
0.0256	0.785
0.0396	0.789
0.0545	0.791
0.0701	0.793
0.0868	0.793
0.1045	0.793
0.1231	0.793
0.143	0.791
0.164	0.791
0.1861	0.791
0.2096	0.791
0.2345	0.791
0.2595	0.789
0.2861	0.789
0.3145	0.789
0.3445	0.789
0.3761	0.787
0.4111	0.787
0.4478	0.787
0.4861	0.785
0.5278	0.785
0.5711	0.787
0.6178	0.785
0.6661	0.785
0.7178	0.785
0.7728	0.781

1/9/2005	13:26:02	1.0413	15.62	0.783	0.8311	0.783
1/9/2005	13:26:06	1.103	15.62	0.783	0.8928	0.783
1/9/2005	13:26:10	1.168	15.62	0.783	0.9578	0.783
1/9/2005	13:26:14	1.238	15.62	0.783	1.0278	0.783
1/9/2005	13:26:18	1.3113	15.62	0.781	1.1011	0.781
1/9/2005	13:26:23	1.3897	15.62	0.781	1.1795	0.781
1/9/2005	13:26:28	1.473	15.62	0.781	1.2628	0.781
1/9/2005	13:26:33	1.5613	15.62	0.779	1.3511	0.779
1/9/2005	13:26:39	1.6547	15.62	0.781	1.4445	0.781
1/9/2005	13:26:45	1.753	15.62	0.779	1.5428	0.779
1/9/2005	13:26:51	1.858	15.62	0.777	1.6478	0.777
1/9/2005	13:26:58	1.968	15.62	0.779	1.7578	0.779
1/9/2005	13:27:05	2.0847	15.61	0.777	1.8745	0.777
1/9/2005	13:27:12	2.2097	15.61	0.777	1.9995	0.777
1/9/2005	13:27:20	2.3413	15.61	0.775	2.1311	0.775
1/9/2005	13:27:28	2.4813	15.61	0.775	2.2711	0.775
1/9/2005	13:27:37	2.6297	15.61	0.775	2.4195	0.775
1/9/2005	13:27:47	2.7863	15.61	0.773	2.5761	0.773
1/9/2005	13:27:57	2.953	15.61	0.773	2.7428	0.773
1/9/2005	13:28:07	3.1297	15.61	0.771	2.9195	0.771
1/9/2005	13:28:18	3.3163	15.61	0.771	3.1061	0.771
1/9/2005	13:28:30	3.5147	15.61	0.771	3.3045	0.771
1/9/2005	13:28:43	3.7247	15.61	0.769	3.5145	0.769
1/9/2005	13:28:56	3.9463	15.61	0.769	3.7361	0.769
1/9/2005	13:29:10	4.1813	15.61	0.769	3.9711	0.769
1/9/2005	13:29:25	4.4297	15.61	0.767	4.2195	0.767
1/9/2005	13:29:41	4.693	15.61	0.767	4.4828	0.767
1/9/2005	13:29:58	4.973	15.61	0.765	4.7628	0.765
1/9/2005	13:30:16	5.2697	15.62	0.765	5.0595	0.765
1/9/2005	13:30:34	5.583	15.62	0.763	5.3728	0.763
1/9/2005	13:30:54	5.9147	15.62	0.763	5.7045	0.763
1/9/2005	13:31:15	6.2663	15.61	0.761	6.0561	0.761
1/9/2005	13:31:38	6.6397	15.61	0.761	6.4295	0.761
1/9/2005	13:32:02	7.0347	15.62	0.759	6.8245	0.759
1/9/2005	13:32:27	7.453	15.62	0.757	7.2428	0.757
1/9/2005	13:32:53	7.8963	15.62	0.757	7.6861	0.757
1/9/2005	13:33:21	8.3663	15.62	0.755	8.1561	0.755
1/9/2005	13:33:51	8.8647	15.62	0.755	8.6545	0.755
1/9/2005	13:34:23	9.3913	15.62	0.753	9.1811	0.753
1/9/2005	13:34:56	9.9497	15.62	0.753	9.7395	0.753
1/9/2005	13:35:32	10.5413	15.62	0.749	10.3311	0.749
1/9/2005	13:36:10	11.168	15.62	0.751	10.9578	0.751
1/9/2005	13:36:49	11.8313	15.62	0.747	11.6211	0.747
1/9/2005	13:37:32	12.5347	15.62	0.747	12.3245	0.747
1/9/2005	13:38:16	13.2797	15.62	0.745	13.0695	0.745
1/9/2005	13:39:04	14.0697	15.62	0.743	13.8595	0.743
1/9/2005	13:39:54	14.9063	15.63	0.74	14.6961	0.74
1/9/2005	13:40:47	15.7913	15.62	0.739	15.5811	0.739
1/9/2005	13:41:43	16.7297	15.63	0.736	16.5195	0.736
1/9/2005	13:42:43	17.723	15.63	0.734	17.5128	0.734
1/9/2005	13:43:46	18.7763	15.63	0.732	18.5661	0.732
1/9/2005	13:44:53	19.8913	15.63	0.73	19.6811	0.73

1/9/2005	13:46:04	21.073	15.63	0.728	20.8628	0.728
1/9/2005	13:47:19	22.3247	15.63	0.726	22.1145	0.726
1/9/2005	13:48:38	23.6497	15.63	0.724	23.4395	0.724
1/9/2005	13:50:03	25.0547	15.63	0.722	24.8445	0.722
1/9/2005	13:51:32	26.543	15.63	0.72	26.3328	0.72
1/9/2005	13:53:07	28.118	15.63	0.718	27.9078	0.718
1/9/2005	13:54:47	29.7863	15.63	0.714	29.5761	0.714
1/9/2005	13:56:33	31.5547	15.63	0.712	31.3445	0.712
1/9/2005	13:58:25	33.428	15.65	0.708	33.2178	0.708
1/9/2005	14:00:24	35.4113	15.65	0.704	35.2011	0.704
1/9/2005	14:02:30	37.513	15.65	0.702	37.3028	0.702
1/9/2005	14:04:44	39.7397	15.65	0.698	39.5295	0.698
1/9/2005	14:07:05	42.098	15.65	0.696	41.8878	0.696
1/9/2005	14:09:35	44.5963	15.65	0.694	44.3861	0.694
1/9/2005	14:12:14	47.243	15.65	0.69	47.0328	0.69
1/9/2005	14:15:02	50.0463	15.65	0.684	49.8361	0.684
1/9/2005	14:18:00	53.0147	15.65	0.68	52.8045	0.68
1/9/2005	14:21:09	56.1597	15.65	0.675	55.9495	0.675
1/9/2005	14:24:29	59.4913	15.65	0.671	59.2811	0.671
1/9/2005	14:28:01	63.0197	15.65	0.665	62.8095	0.665
1/9/2005	14:31:45	66.758	15.65	0.657	66.5478	0.657
1/9/2005	14:35:43	70.718	15.66	0.653	70.5078	0.653
1/9/2005	14:39:54	74.9113	15.66	0.647	74.7011	0.647
1/9/2005	14:44:21	79.3547	15.66	0.641	79.1445	0.641
1/9/2005	14:49:03	84.0613	15.66	0.637	83.8511	0.637
1/9/2005	14:54:02	89.0463	15.66	0.631	88.8361	0.631
1/9/2005	14:59:19	94.3263	15.66	0.625	94.1161	0.625
1/9/2005	15:04:55	99.9197	15.66	0.619	99.7095	0.619
1/9/2005	15:10:50	105.8447	15.66	0.61	105.6345	0.61
1/9/2005	15:17:07	112.1197	15.66	0.602	111.9095	0.602
1/9/2005	15:23:46	118.768	15.66	0.594	118.5578	0.594
1/9/2005	15:30:48	125.8097	15.66	0.586	125.5995	0.586
1/9/2005	15:38:16	133.268	15.66	0.578	133.0578	0.578
1/9/2005	15:46:10	141.168	15.66	0.572	140.9578	0.572
1/9/2005	15:54:32	149.5363	15.67	0.564	149.3261	0.564
1/9/2005	16:03:24	158.4013	15.67	0.554	158.1911	0.554
1/9/2005	16:12:47	167.7913	15.66	0.544	167.5811	0.544
1/9/2005	16:22:44	177.738	15.66	0.534	177.5278	0.534
1/9/2005	16:32:44	187.738	15.66	0.523	187.5278	0.523
1/9/2005	16:42:44	197.738	15.67	0.515	197.5278	0.515
1/9/2005	16:52:44	207.738	15.67	0.505	207.5278	0.505
1/9/2005	17:02:44	217.738	15.67	0.499	217.5278	0.499
1/9/2005	17:12:44	227.738	15.66	0.491	227.5278	0.491
1/9/2005	17:22:44	237.738	15.67	0.485	237.5278	0.485
1/9/2005	17:32:44	247.738	15.67	0.477	247.5278	0.477
1/9/2005	17:42:44	257.738	15.66	0.471	257.5278	0.471
1/9/2005	17:52:44	267.738	15.67	0.464	267.5278	0.464
1/9/2005	18:02:44	277.738	15.66	0.457	277.5278	0.457
1/9/2005	18:12:44	287.738	15.66	0.448	287.5278	0.448
1/9/2005	18:22:44	297.738	15.66	0.44	297.5278	0.44
1/9/2005	18:32:44	307.738	15.66	0.432	307.5278	0.432
1/9/2005	18:42:44	317.738	15.66	0.422	317.5278	0.422

1/9/2005	18:52:44	327.738	15.66	0.416	327.5278	0.416
1/9/2005	19:02:44	337.738	15.67	0.41	337.5278	0.41
1/9/2005	19:12:44	347.738	15.66	0.4	347.5278	0.4
1/9/2005	19:22:44	357.738	15.67	0.392	357.5278	0.392
1/9/2005	19:32:44	367.738	15.66	0.386	367.5278	0.386
1/9/2005	19:42:44	377.738	15.66	0.378	377.5278	0.378
1/9/2005	19:52:44	387.738	15.66	0.37	387.5278	0.37
1/9/2005	20:02:44	397.738	15.66	0.365	397.5278	0.365
1/9/2005	20:12:44	407.738	15.66	0.357	407.5278	0.357
1/9/2005	20:22:44	417.738	15.66	0.353	417.5278	0.353
1/9/2005	20:32:44	427.738	15.67	0.343	427.5278	0.343
1/9/2005	20:42:44	437.738	15.66	0.339	437.5278	0.339
1/9/2005	20:52:44	447.738	15.66	0.331	447.5278	0.331
1/9/2005	21:02:44	457.738	15.67	0.323	457.5278	0.323
1/9/2005	21:12:44	467.738	15.66	0.319	467.5278	0.319
1/9/2005	21:22:44	477.738	15.66	0.313	477.5278	0.313
1/9/2005	21:32:44	487.738	15.66	0.307	487.5278	0.307
1/9/2005	21:42:44	497.738	15.66	0.299	497.5278	0.299
1/9/2005	21:52:44	507.738	15.66	0.293	507.5278	0.293
1/9/2005	22:02:44	517.738	15.66	0.289	517.5278	0.289
1/9/2005	22:12:44	527.738	15.66	0.287	527.5278	0.287
1/9/2005	22:22:44	537.738	15.66	0.28	537.5278	0.28
1/9/2005	22:32:44	547.738	15.66	0.276	547.5278	0.276
1/9/2005	22:42:44	557.738	15.66	0.268	557.5278	0.268
1/9/2005	22:52:44	567.738	15.66	0.264	567.5278	0.264
1/9/2005	23:02:44	577.738	15.66	0.26	577.5278	0.26
1/9/2005	23:12:44	587.738	15.66	0.256	587.5278	0.256
1/9/2005	23:22:44	597.738	15.66	0.25	597.5278	0.25
1/9/2005	23:32:44	607.738	15.66	0.246	607.5278	0.246
1/9/2005	23:42:44	617.738	15.66	0.24	617.5278	0.24
1/9/2005	23:52:44	627.738	15.66	0.232	627.5278	0.232
1/10/2005	0:02:44	637.738	15.66	0.226	637.5278	0.226
1/10/2005	0:12:44	647.738	15.66	0.22	647.5278	0.22
1/10/2005	0:22:44	657.738	15.66	0.214	657.5278	0.214
1/10/2005	0:32:44	667.738	15.66	0.21	667.5278	0.21
1/10/2005	0:42:44	677.738	15.66	0.203	677.5278	0.203
1/10/2005	0:52:44	687.738	15.66	0.201	687.5278	0.201
1/10/2005	1:02:44	697.738	15.66	0.197	697.5278	0.197
1/10/2005	1:12:44	707.738	15.66	0.195	707.5278	0.195
1/10/2005	1:22:44	717.738	15.66	0.191	717.5278	0.191
1/10/2005	1:32:44	727.738	15.66	0.187	727.5278	0.187
1/10/2005	1:42:44	737.738	15.66	0.183	737.5278	0.183
1/10/2005	1:52:44	747.738	15.67	0.179	747.5278	0.179
1/10/2005	2:02:44	757.738	15.66	0.175	757.5278	0.175
1/10/2005	2:12:44	767.738	15.66	0.171	767.5278	0.171
1/10/2005	2:22:44	777.738	15.66	0.169	777.5278	0.169
1/10/2005	2:32:44	787.738	15.66	0.163	787.5278	0.163
1/10/2005	2:42:44	797.738	15.66	0.157	797.5278	0.157
1/10/2005	2:52:44	807.738	15.66	0.153	807.5278	0.153
1/10/2005	3:02:44	817.738	15.66	0.147	817.5278	0.147
1/10/2005	3:12:44	827.738	15.66	0.141	827.5278	0.141
1/10/2005	3:22:44	837.738	15.66	0.137	837.5278	0.137

1/10/2005	3:32:44	847.738	15.66	0.129	847.5278	0.129
1/10/2005	3:42:44	857.738	15.66	0.125	857.5278	0.125
1/10/2005	3:52:44	867.738	15.67	0.12	867.5278	0.12
1/10/2005	4:02:44	877.738	15.67	0.116	877.5278	0.116
1/10/2005	4:12:44	887.738	15.66	0.112	887.5278	0.112
1/10/2005	4:22:44	897.738	15.66	0.108	897.5278	0.108
1/10/2005	4:32:44	907.738	15.67	0.106	907.5278	0.106
1/10/2005	4:42:44	917.738	15.66	0.1	917.5278	0.1
1/10/2005	4:52:44	927.738	15.66	0.098	927.5278	0.098
1/10/2005	5:02:44	937.738	15.67	0.094	937.5278	0.094
1/10/2005	5:12:44	947.738	15.67	0.09	947.5278	0.09
1/10/2005	5:22:44	957.738	15.66	0.088	957.5278	0.088
1/10/2005	5:32:44	967.738	15.66	0.084	967.5278	0.084
1/10/2005	5:42:44	977.738	15.67	0.08	977.5278	0.08
1/10/2005	5:52:44	987.738	15.66	0.078	987.5278	0.078
1/10/2005	6:02:44	997.738	15.66	0.072	997.5278	0.072
1/10/2005	6:12:44	1007.738	15.66	0.07	1007.528	0.07
1/10/2005	6:22:44	1017.738	15.66	0.066	1017.528	0.066
1/10/2005	6:32:44	1027.738	15.66	0.06	1027.528	0.06
1/10/2005	6:42:44	1037.738	15.66	0.058	1037.528	0.058
1/10/2005	6:52:44	1047.738	15.66	0.052	1047.528	0.052
1/10/2005	7:02:44	1057.738	15.66	0.048	1057.528	0.048
1/10/2005	7:12:44	1067.738	15.66	0.041	1067.528	0.041
1/10/2005	7:22:44	1077.738	15.67	0.035	1077.528	0.035
1/10/2005	7:32:44	1087.738	15.66	0.029	1087.528	0.029
1/10/2005	7:42:44	1097.738	15.66	0.025	1097.528	0.025
1/10/2005	7:52:44	1107.738	15.66	0.021	1107.528	0.021
1/10/2005	8:02:44	1117.738	15.66	0.013	1117.528	0.013

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT25-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/27.95 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 16.85 DATE: 1/9/05

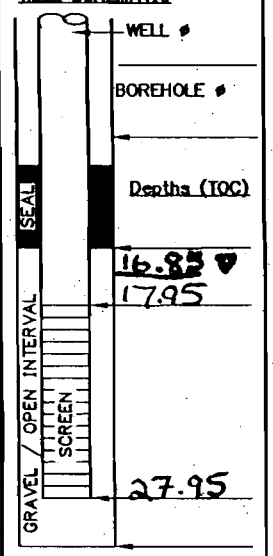
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1-SECT SLUG PAGE 1 OF 1

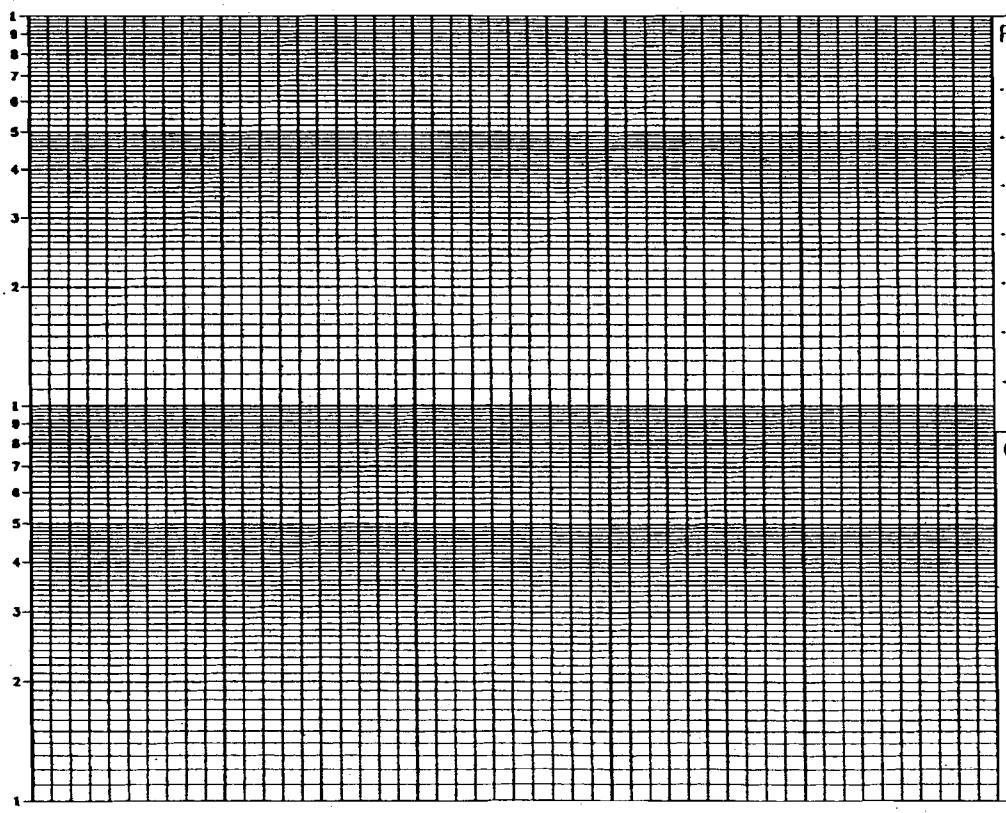
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

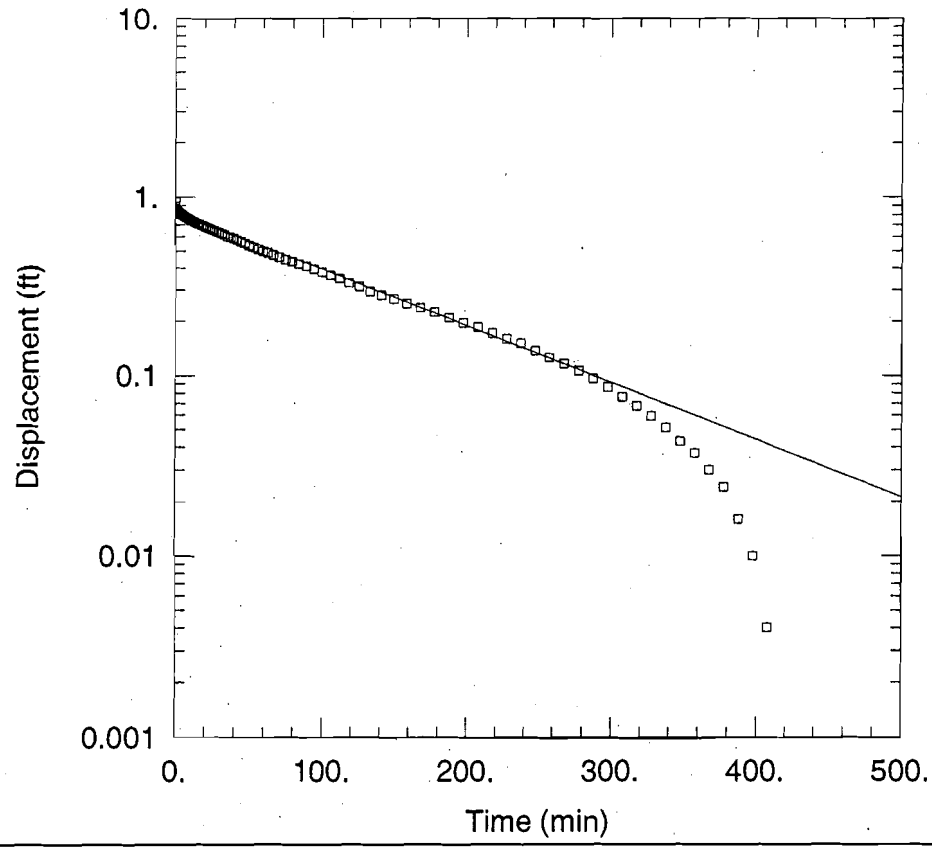


REMARKS:

NO RISING - FALLING HEAD IS TAKING TOO LONG.

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL



12MWT28 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT28-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:26

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT28
Test Date: 1-9-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.01347 ft/day
y0 = 0.8185 ft

AQUIFER DATA

Saturated Thickness: 15.61 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT28)

Initial Displacement: 0.94 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 15.61 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT28-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10/28 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 12.39 DATE: 1/9/05

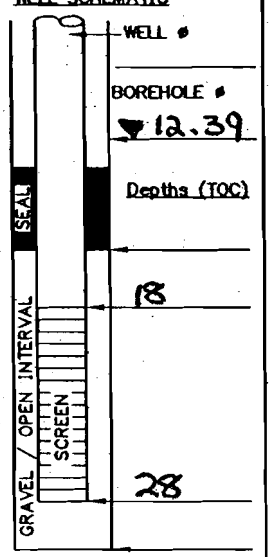
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

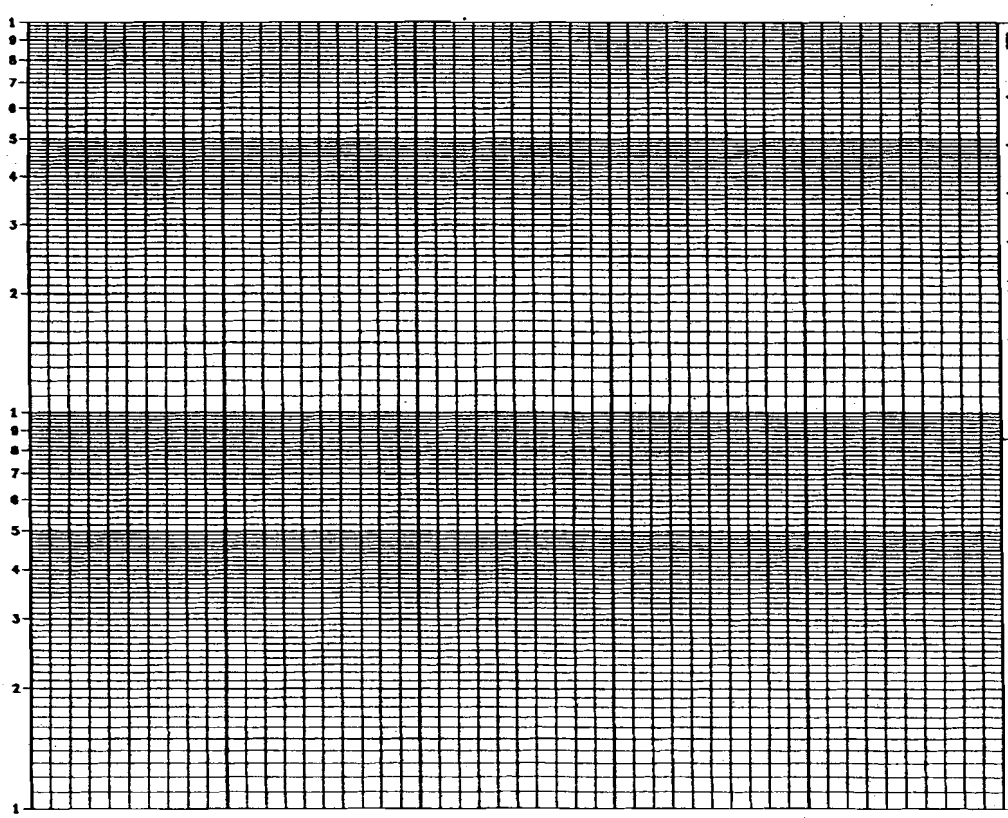
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.08	1.05		257		.125
.13	.97		367		.030
.20	.87				
.5	.86				
1	.84				
3	.82				
10	.75		15.61		
30	.63				
60	.50				
100	.38				
150	.27				
200	.20				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

15.843 XD 1420 HRS

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 8:21:45
Report fror ...\SN04880 2005-01-09 143000 12MWT28-F.bin
Win-Situ V 4.51

Serial num 4880
Firmware \ 3.09
Unit name:

Test name: 12MWT28-F

Test define 1/9/2005 14:21:29
Test sched 1/9/2005 14:30:00
Test starte 1/9/2005 14:30:00
Test stopp 1/10/2005 8:21:36

Data gathered using Logarithmic testing
Maximun Minutes.
Number 240

TOTAL DA 240

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 15.823 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/9/2005	14:30:00	0	14.53	0
1/9/2005	14:30:00	0.005	14.55	0.009
1/9/2005	14:30:00	0.01	14.55	0.011
1/9/2005	14:30:00	0.015	14.57	0.013
1/9/2005	14:30:01	0.02	14.57	0.013
1/9/2005	14:30:01	0.025	14.57	0.015
1/9/2005	14:30:01	0.03	14.57	0.015
1/9/2005	14:30:02	0.035	14.57	0.017
1/9/2005	14:30:02	0.04	14.57	0.017

1/9/2005	14:30:02	0.045	14.58	0.016
1/9/2005	14:30:03	0.05	14.58	0.016
1/9/2005	14:30:03	0.055	14.58	0.016
1/9/2005	14:30:03	0.06	14.58	0.016
1/9/2005	14:30:03	0.065	14.58	0.194
1/9/2005	14:30:04	0.07	14.58	0.96
1/9/2005	14:30:04	0.075	14.58	1.034
1/9/2005	14:30:04	0.08	14.58	1.055
1/9/2005	14:30:05	0.085	14.58	1.079
1/9/2005	14:30:05	0.09	14.58	0.864
1/9/2005	14:30:05	0.095	14.58	1.092
1/9/2005	14:30:06	0.1	14.58	1.465
1/9/2005	14:30:06	0.1058	14.58	0.917
1/9/2005	14:30:06	0.112	14.58	1.102
1/9/2005	14:30:07	0.1185	14.59	0.664
1/9/2005	14:30:07	0.1255	14.59	0.889
1/9/2005	14:30:07	0.1328	14.59	0.969
1/9/2005	14:30:08	0.1407	14.59	0.799
1/9/2005	14:30:08	0.149	14.59	0.94
1/9/2005	14:30:09	0.1578	14.59	0.844
1/9/2005	14:30:10	0.1672	14.58	0.893
1/9/2005	14:30:10	0.177	14.57	0.862
1/9/2005	14:30:11	0.1875	14.57	0.872
1/9/2005	14:30:11	0.1985	14.57	0.872
1/9/2005	14:30:12	0.2102	14.57	0.864
1/9/2005	14:30:13	0.2227	14.57	0.866
1/9/2005	14:30:14	0.2358	14.57	0.866
1/9/2005	14:30:15	0.2498	14.57	0.864
1/9/2005	14:30:15	0.2647	14.57	0.864
1/9/2005	14:30:16	0.2803	14.55	0.863
1/9/2005	14:30:17	0.297	14.55	0.863
1/9/2005	14:30:18	0.3147	14.55	0.861
1/9/2005	14:30:20	0.3333	14.55	0.859
1/9/2005	14:30:21	0.3532	14.55	0.859
1/9/2005	14:30:22	0.3742	14.55	0.859
1/9/2005	14:30:23	0.3963	14.55	0.859
1/9/2005	14:30:25	0.4198	14.55	0.857
1/9/2005	14:30:26	0.4447	14.55	0.857
1/9/2005	14:30:28	0.4697	14.55	0.855
1/9/2005	14:30:29	0.4963	14.55	0.857
1/9/2005	14:30:31	0.5247	14.55	0.855
1/9/2005	14:30:33	0.5547	14.55	0.853
1/9/2005	14:30:35	0.5863	14.55	0.853
1/9/2005	14:30:37	0.6213	14.55	0.853
1/9/2005	14:30:39	0.658	14.55	0.851
1/9/2005	14:30:41	0.6963	14.55	0.851
1/9/2005	14:30:44	0.738	14.55	0.849
1/9/2005	14:30:46	0.7813	14.55	0.849
1/9/2005	14:30:49	0.828	14.54	0.847
1/9/2005	14:30:52	0.8763	14.55	0.847
1/9/2005	14:30:55	0.928	14.54	0.845
1/9/2005	14:30:58	0.983	14.55	0.845

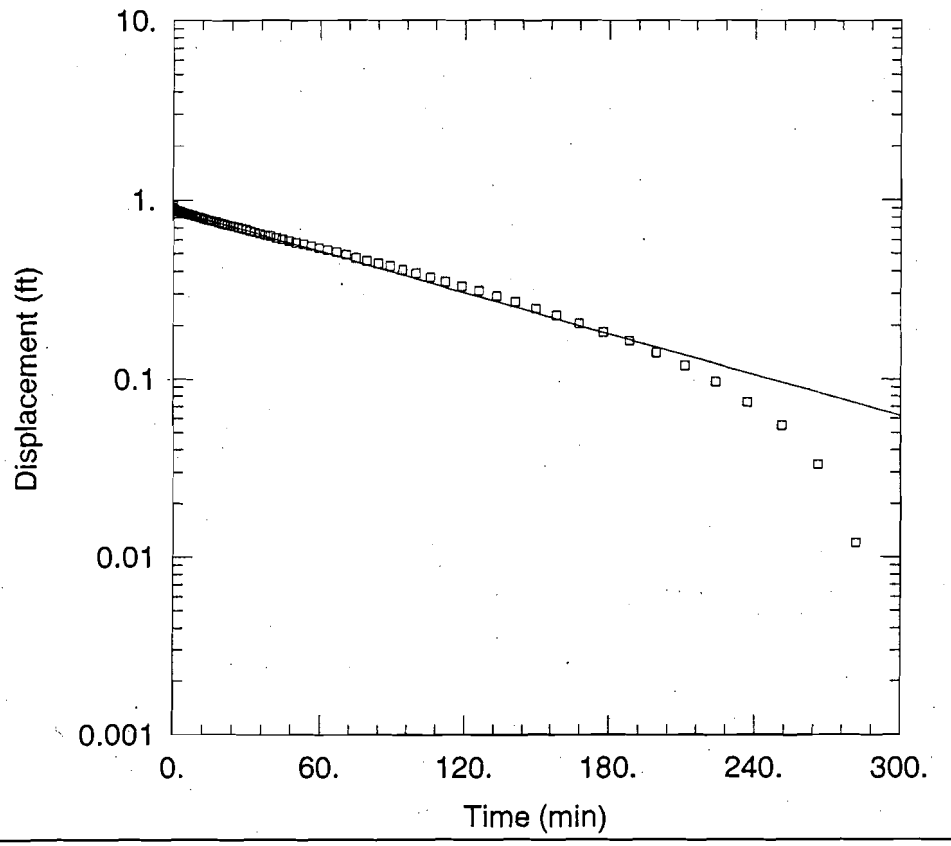
ET (min)	Feet H2O
0	0.94
0.0088	0.844
0.0182	0.893
0.028	0.862
0.0385	0.872
0.0495	0.872
0.0612	0.864
0.0737	0.866
0.0868	0.866
0.1008	0.864
0.1157	0.864
0.1313	0.863
0.148	0.863
0.1657	0.861
0.1843	0.859
0.2042	0.859
0.2252	0.859
0.2473	0.859
0.2708	0.857
0.2957	0.857
0.3207	0.855
0.3473	0.857
0.3757	0.855
0.4057	0.853
0.4373	0.853
0.4723	0.853
0.509	0.851
0.5473	0.851
0.589	0.849
0.6323	0.849
0.679	0.847
0.7273	0.847
0.779	0.845
0.834	0.845

1/9/2005	14:31:02	1.0413	14.54	0.843	0.8923	0.843
1/9/2005	14:31:06	1.103	14.54	0.843	0.954	0.843
1/9/2005	14:31:10	1.168	14.54	0.841	1.019	0.841
1/9/2005	14:31:14	1.238	14.54	0.839	1.089	0.839
1/9/2005	14:31:18	1.3113	14.54	0.837	1.1623	0.837
1/9/2005	14:31:23	1.3897	14.54	0.839	1.2407	0.839
1/9/2005	14:31:28	1.473	14.54	0.837	1.324	0.837
1/9/2005	14:31:33	1.5613	14.54	0.834	1.4123	0.834
1/9/2005	14:31:39	1.6547	14.54	0.834	1.5057	0.834
1/9/2005	14:31:45	1.753	14.54	0.832	1.604	0.832
1/9/2005	14:31:51	1.858	14.54	0.83	1.709	0.83
1/9/2005	14:31:58	1.968	14.54	0.828	1.819	0.828
1/9/2005	14:32:05	2.0847	14.53	0.828	1.9357	0.828
1/9/2005	14:32:12	2.2097	14.53	0.826	2.0607	0.826
1/9/2005	14:32:20	2.3413	14.53	0.824	2.1923	0.824
1/9/2005	14:32:28	2.4813	14.53	0.822	2.3323	0.822
1/9/2005	14:32:37	2.6297	14.53	0.82	2.4807	0.82
1/9/2005	14:32:47	2.7863	14.53	0.818	2.6373	0.818
1/9/2005	14:32:57	2.953	14.53	0.816	2.804	0.816
1/9/2005	14:33:07	3.1297	14.53	0.814	2.9807	0.814
1/9/2005	14:33:18	3.3163	14.53	0.812	3.1673	0.812
1/9/2005	14:33:30	3.5147	14.53	0.81	3.3657	0.81
1/9/2005	14:33:43	3.7247	14.53	0.807	3.5757	0.807
1/9/2005	14:33:56	3.9463	14.53	0.805	3.7973	0.805
1/9/2005	14:34:10	4.1813	14.53	0.801	4.0323	0.801
1/9/2005	14:34:25	4.4297	14.53	0.801	4.2807	0.801
1/9/2005	14:34:41	4.693	14.52	0.799	4.544	0.799
1/9/2005	14:34:58	4.973	14.53	0.795	4.824	0.795
1/9/2005	14:35:16	5.2697	14.53	0.791	5.1207	0.791
1/9/2005	14:35:34	5.583	14.53	0.789	5.434	0.789
1/9/2005	14:35:54	5.9147	14.53	0.787	5.7657	0.787
1/9/2005	14:36:15	6.2663	14.53	0.783	6.1173	0.783
1/9/2005	14:36:38	6.6397	14.53	0.779	6.4907	0.779
1/9/2005	14:37:02	7.0347	14.53	0.777	6.8857	0.777
1/9/2005	14:37:27	7.453	14.52	0.772	7.304	0.772
1/9/2005	14:37:53	7.8963	14.52	0.77	7.7473	0.77
1/9/2005	14:38:21	8.3663	14.52	0.766	8.2173	0.766
1/9/2005	14:38:51	8.8647	14.53	0.76	8.7157	0.76
1/9/2005	14:39:23	9.3913	14.52	0.756	9.2423	0.756
1/9/2005	14:39:56	9.9497	14.52	0.752	9.8007	0.752
1/9/2005	14:40:32	10.5413	14.52	0.746	10.3923	0.746
1/9/2005	14:41:10	11.168	14.52	0.74	11.019	0.74
1/9/2005	14:41:49	11.8313	14.52	0.737	11.6823	0.737
1/9/2005	14:42:32	12.5347	14.52	0.733	12.3857	0.733
1/9/2005	14:43:16	13.2797	14.53	0.726	13.1307	0.726
1/9/2005	14:44:04	14.0697	14.52	0.719	13.9207	0.719
1/9/2005	14:44:54	14.9063	14.52	0.715	14.7573	0.715
1/9/2005	14:45:47	15.7913	14.52	0.707	15.6423	0.707
1/9/2005	14:46:43	16.7297	14.52	0.705	16.5807	0.705
1/9/2005	14:47:43	17.723	14.52	0.697	17.574	0.697
1/9/2005	14:48:46	18.7763	14.52	0.692	18.6273	0.692
1/9/2005	14:49:53	19.8913	14.52	0.684	19.7423	0.684

1/9/2005	14:51:04	21.073	14.52	0.678	20.924	0.678
1/9/2005	14:52:19	22.3247	14.52	0.67	22.1757	0.67
1/9/2005	14:53:38	23.6497	14.52	0.664	23.5007	0.664
1/9/2005	14:55:03	25.0547	14.52	0.654	24.9057	0.654
1/9/2005	14:56:32	26.543	14.52	0.647	26.394	0.647
1/9/2005	14:58:07	28.118	14.52	0.637	27.969	0.637
1/9/2005	14:59:47	29.7863	14.52	0.629	29.6373	0.629
1/9/2005	15:01:33	31.5547	14.52	0.621	31.4057	0.621
1/9/2005	15:03:25	33.428	14.52	0.612	33.279	0.612
1/9/2005	15:05:24	35.4113	14.52	0.598	35.2623	0.598
1/9/2005	15:07:30	37.513	14.52	0.592	37.364	0.592
1/9/2005	15:09:44	39.7397	14.52	0.582	39.5907	0.582
1/9/2005	15:12:05	42.098	14.52	0.572	41.949	0.572
1/9/2005	15:14:35	44.5963	14.52	0.561	44.4473	0.561
1/9/2005	15:17:14	47.243	14.52	0.549	47.094	0.549
1/9/2005	15:20:02	50.0463	14.52	0.535	49.8973	0.535
1/9/2005	15:23:00	53.0147	14.52	0.524	52.8657	0.524
1/9/2005	15:26:09	56.1597	14.52	0.512	56.0107	0.512
1/9/2005	15:29:29	59.4913	14.52	0.498	59.3423	0.498
1/9/2005	15:33:01	63.0197	14.52	0.488	62.8707	0.488
1/9/2005	15:36:45	66.758	14.52	0.475	66.609	0.475
1/9/2005	15:40:43	70.718	14.52	0.461	70.569	0.461
1/9/2005	15:44:54	74.9113	14.52	0.447	74.7623	0.447
1/9/2005	15:49:21	79.3547	14.52	0.436	79.2057	0.436
1/9/2005	15:54:03	84.0613	14.52	0.422	83.9123	0.422
1/9/2005	15:59:02	89.0463	14.52	0.408	88.8973	0.408
1/9/2005	16:04:19	94.3263	14.52	0.393	94.1773	0.393
1/9/2005	16:09:55	99.9197	14.52	0.377	99.7707	0.377
1/9/2005	16:15:50	105.8447	14.52	0.362	105.6957	0.362
1/9/2005	16:22:07	112.1197	14.52	0.348	111.9707	0.348
1/9/2005	16:28:46	118.768	14.52	0.33	118.619	0.33
1/9/2005	16:35:48	125.8097	14.52	0.315	125.6607	0.315
1/9/2005	16:43:16	133.268	14.52	0.295	133.119	0.295
1/9/2005	16:51:10	141.168	14.52	0.281	141.019	0.281
1/9/2005	16:59:32	149.5363	14.52	0.268	149.3873	0.268
1/9/2005	17:08:24	158.4013	14.52	0.252	158.2523	0.252
1/9/2005	17:17:47	167.7913	14.52	0.239	167.6423	0.239
1/9/2005	17:27:44	177.738	14.52	0.225	177.589	0.225
1/9/2005	17:37:44	187.738	14.52	0.209	187.589	0.209
1/9/2005	17:47:44	197.738	14.52	0.196	197.589	0.196
1/9/2005	17:57:44	207.738	14.52	0.186	207.589	0.186
1/9/2005	18:07:44	217.738	14.52	0.172	217.589	0.172
1/9/2005	18:17:44	227.738	14.52	0.16	227.589	0.16
1/9/2005	18:27:44	237.738	14.52	0.151	237.589	0.151
1/9/2005	18:37:44	247.738	14.52	0.137	247.589	0.137
1/9/2005	18:47:44	257.738	14.52	0.125	257.589	0.125
1/9/2005	18:57:44	267.738	14.52	0.116	267.589	0.116
1/9/2005	19:07:44	277.738	14.52	0.106	277.589	0.106
1/9/2005	19:17:44	287.738	14.52	0.096	287.589	0.096
1/9/2005	19:27:44	297.738	14.52	0.086	297.589	0.086
1/9/2005	19:37:44	307.738	14.52	0.076	307.589	0.076
1/9/2005	19:47:44	317.738	14.52	0.067	317.589	0.067

1/9/2005	19:57:44	327.738	14.52	0.059	327.589	0.059
1/9/2005	20:07:44	337.738	14.52	0.051	337.589	0.051
1/9/2005	20:17:44	347.738	14.52	0.043	347.589	0.043
1/9/2005	20:27:44	357.738	14.52	0.037	357.589	0.037
1/9/2005	20:37:44	367.738	14.52	0.03	367.589	0.03
1/9/2005	20:47:44	377.738	14.52	0.024	377.589	0.024
1/9/2005	20:57:44	387.738	14.52	0.016	387.589	0.016
1/9/2005	21:07:44	397.738	14.52	0.01	397.589	0.01
1/9/2005	21:17:44	407.738	14.52	0.004	407.589	0.004
1/9/2005	21:27:44	417.738	14.52	-0.004		
1/9/2005	21:37:44	427.738	14.52	-0.009		
1/9/2005	21:47:44	437.738	14.52	-0.015		
1/9/2005	21:57:44	447.738	14.52	-0.021		
1/9/2005	22:07:44	457.738	14.52	-0.023		
1/9/2005	22:17:44	467.738	14.52	-0.027		
1/9/2005	22:27:44	477.738	14.52	-0.033		
1/9/2005	22:37:44	487.738	14.52	-0.039		
1/9/2005	22:47:44	497.738	14.53	-0.041		
1/9/2005	22:57:44	507.738	14.52	-0.045		
1/9/2005	23:07:44	517.738	14.52	-0.049		
1/9/2005	23:17:44	527.738	14.52	-0.052		
1/9/2005	23:27:44	537.738	14.52	-0.056		
1/9/2005	23:37:44	547.738	14.52	-0.062		
1/9/2005	23:47:44	557.738	14.52	-0.066		
1/9/2005	23:57:44	567.738	14.52	-0.074		
1/10/2005	0:07:44	577.738	14.52	-0.078		
1/10/2005	0:17:44	587.738	14.52	-0.082		
1/10/2005	0:27:44	597.738	14.52	-0.088		
1/10/2005	0:37:44	607.738	14.52	-0.092		
1/10/2005	0:47:44	617.738	14.52	-0.095		
1/10/2005	0:57:44	627.738	14.52	-0.097		
1/10/2005	1:07:44	637.738	14.52	-0.101		
1/10/2005	1:17:44	647.738	14.52	-0.101		
1/10/2005	1:27:44	657.738	14.52	-0.105		
1/10/2005	1:37:44	667.738	14.52	-0.109		
1/10/2005	1:47:44	677.738	14.52	-0.111		
1/10/2005	1:57:44	687.738	14.52	-0.115		
1/10/2005	2:07:44	697.738	14.52	-0.119		
1/10/2005	2:17:44	707.738	14.52	-0.119		
1/10/2005	2:27:44	717.738	14.52	-0.121		
1/10/2005	2:37:44	727.738	14.52	-0.127		
1/10/2005	2:47:44	737.738	14.52	-0.129		
1/10/2005	2:57:44	747.738	14.52	-0.133		
1/10/2005	3:07:44	757.738	14.53	-0.139		
1/10/2005	3:17:44	767.738	14.52	-0.142		
1/10/2005	3:27:44	777.738	14.52	-0.148		
1/10/2005	3:37:44	787.738	14.52	-0.15		
1/10/2005	3:47:44	797.738	14.52	-0.154		
1/10/2005	3:57:44	807.738	14.53	-0.158		
1/10/2005	4:07:44	817.738	14.52	-0.16		
1/10/2005	4:17:44	827.738	14.52	-0.162		
1/10/2005	4:27:44	837.738	14.52	-0.166		

1/10/2005	4:37:44	847.738	14.52	-0.168
1/10/2005	4:47:44	857.738	14.52	-0.17
1/10/2005	4:57:44	867.738	14.52	-0.174
1/10/2005	5:07:44	877.738	14.52	-0.175
1/10/2005	5:17:44	887.738	14.52	-0.177
1/10/2005	5:27:44	897.738	14.52	-0.181
1/10/2005	5:37:44	907.738	14.52	-0.183
1/10/2005	5:47:44	917.738	14.52	-0.185
1/10/2005	5:57:44	927.738	14.52	-0.187
1/10/2005	6:07:44	937.738	14.52	-0.191
1/10/2005	6:17:44	947.738	14.52	-0.195
1/10/2005	6:27:44	957.738	14.52	-0.195
1/10/2005	6:37:44	967.738	14.52	-0.199
1/10/2005	6:47:44	977.738	14.52	-0.205
1/10/2005	6:57:44	987.738	14.52	-0.207
1/10/2005	7:07:44	997.738	14.52	-0.213
1/10/2005	7:17:44	1007.738	14.52	-0.216
1/10/2005	7:27:44	1017.738	14.52	-0.222
1/10/2005	7:37:44	1027.738	14.52	-0.226
1/10/2005	7:47:44	1037.738	14.52	-0.23
1/10/2005	7:57:44	1047.738	14.52	-0.234
1/10/2005	8:07:44	1057.738	14.52	-0.24
1/10/2005	8:17:44	1067.738	14.52	-0.246



12MWT29 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT29-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:30

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT29
Test Date: 1-11-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.01045 ft/day
y0 = 0.8742 ft

AQUIFER DATA

Saturated Thickness: 29.9 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT29)

Initial Displacement: 0.957 ft
Wellbore Radius: 0.25 ft
Screen Length: 18. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 29.9 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT29- F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 18'/90.93 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 61.03 DATE: 1/11/05

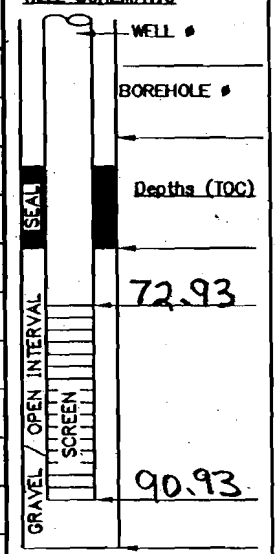
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SECTION SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

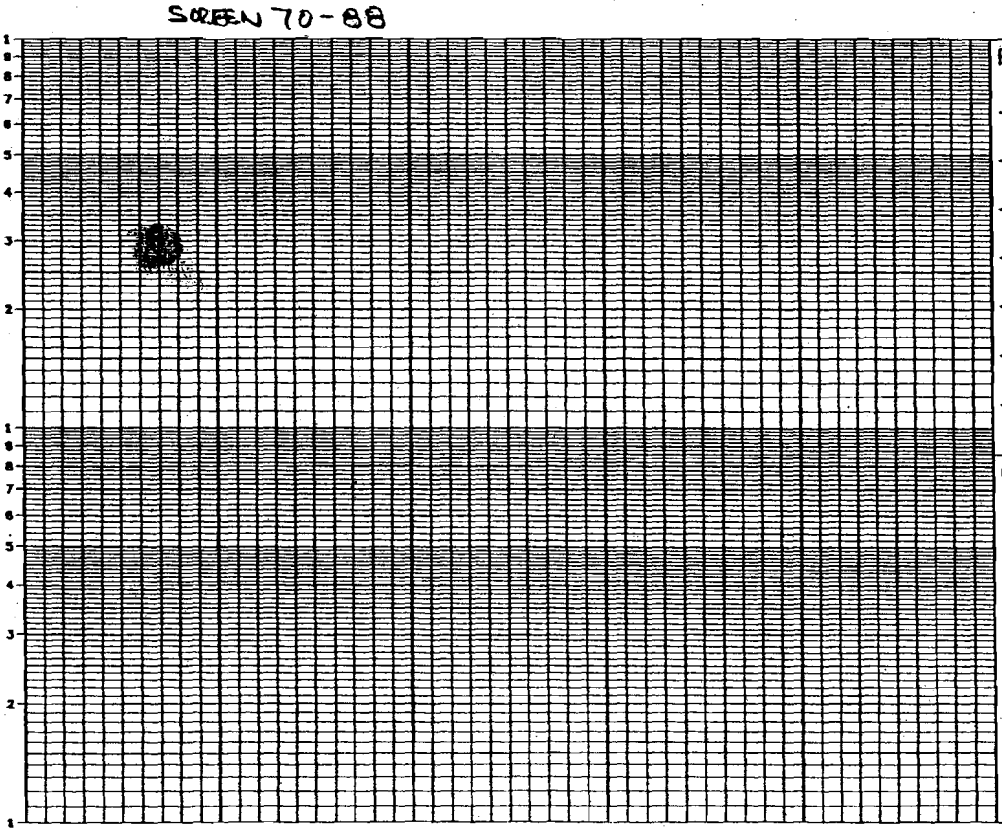
ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.05		1.033	60		.54
.06		.98	100		.39
.1		.88	150		.25
.2		.91	200		.14
.3		.90	281		.01
.5		.89			
1		.88			
3		.87			
5		.85		29.9	
10		.81			
20		.74			
30		.68			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

SCREEN 70-88



REMARKS:

20.715 XD 1155 HRS
20.685 XD 1207 "
WILL LET RUN OVERNITE -
STOPPED TEST ON 1/12/05 - WILL NOT RUN RISING HEAD TEST HERE.

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/12/2005 7:46:37
Report fror ...\SN04880 2005-01-11 121500 12MWT29-F.bin
Win-Situ V 4.51

Serial num 4880
Firmware \ 3.09
Unit name:

Test name: 12MWT29-F

Test define 1/11/2005 12:09:32
Test sched 1/11/2005 12:15:00
Test starte 1/11/2005 12:15:00
Test stopp 1/12/2005 7:46:02

Data gathered using Logarithmic testing
Maximun Minutes.
Number 203

TOTAL DA 203

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 20.659 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/11/2005	12:15:00	0	13.69	0
1/11/2005	12:15:00	0.005	13.72	0.013
1/11/2005	12:15:00	0.01	13.72	0.015
1/11/2005	12:15:00	0.015	13.74	0.016
1/11/2005	12:15:01	0.02	13.74	0.018
1/11/2005	12:15:01	0.025	13.74	0.02
1/11/2005	12:15:01	0.03	13.74	0.02
1/11/2005	12:15:02	0.035	13.74	0.02
1/11/2005	12:15:02	0.04	13.74	0.024

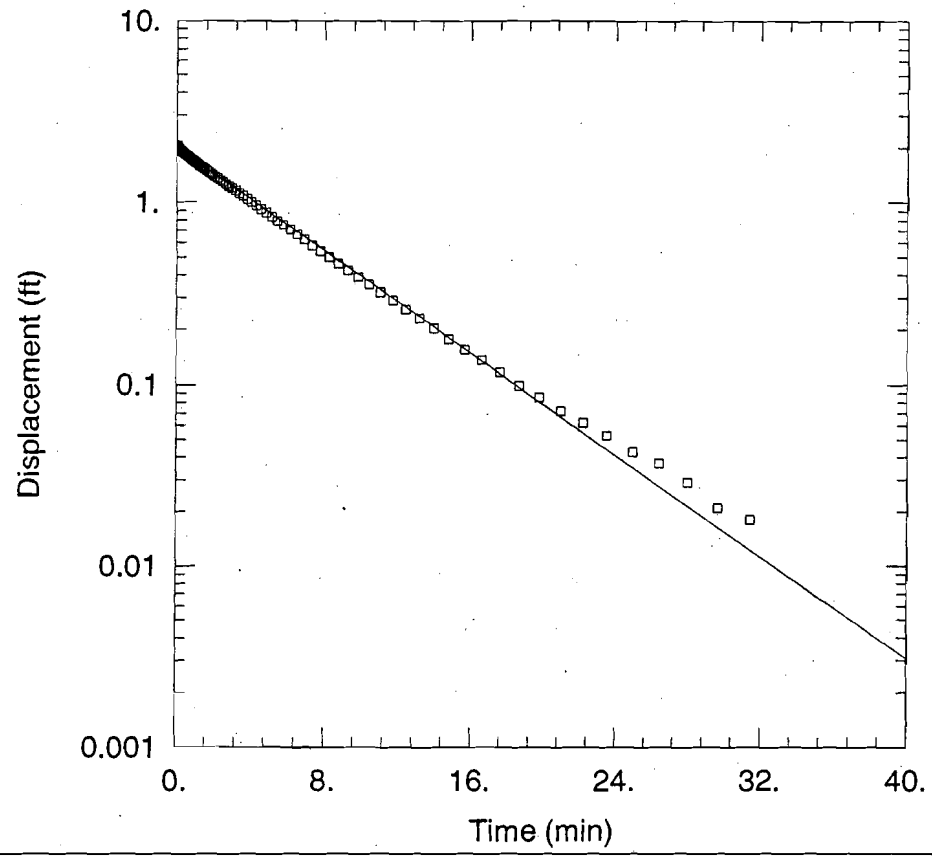
1/11/2005	12:15:02	0.045	13.75	0.557
1/11/2005	12:15:03	0.05	13.75	1.033
1/11/2005	12:15:03	0.055	13.75	1.373
1/11/2005	12:15:03	0.06	13.75	0.977
1/11/2005	12:15:03	0.065	13.75	1.062
1/11/2005	12:15:04	0.07	13.75	1.344
1/11/2005	12:15:04	0.075	13.75	1.236
1/11/2005	12:15:04	0.08	13.75	1.283
1/11/2005	12:15:05	0.085	13.75	1.4
1/11/2005	12:15:05	0.09	13.75	1.285
1/11/2005	12:15:05	0.095	13.75	1.295
1/11/2005	12:15:06	0.1	13.75	1.283
1/11/2005	12:15:06	0.1058	13.75	1.08
1/11/2005	12:15:06	0.112	13.75	0.883
1/11/2005	12:15:07	0.1185	13.75	0.588
1/11/2005	12:15:07	0.1255	13.75	1.117
1/11/2005	12:15:07	0.1328	13.76	0.83
1/11/2005	12:15:08	0.1407	13.76	0.957
1/11/2005	12:15:08	0.149	13.76	0.9
1/11/2005	12:15:09	0.1578	13.76	0.928
1/11/2005	12:15:10	0.1672	13.74	0.905
1/11/2005	12:15:10	0.177	13.74	0.911
1/11/2005	12:15:11	0.1875	13.74	0.905
1/11/2005	12:15:11	0.1985	13.74	0.905
1/11/2005	12:15:12	0.2102	13.72	0.903
1/11/2005	12:15:13	0.2227	13.74	0.903
1/11/2005	12:15:14	0.2358	13.72	0.903
1/11/2005	12:15:15	0.2498	13.72	0.901
1/11/2005	12:15:15	0.2647	13.72	0.901
1/11/2005	12:15:16	0.2803	13.72	0.899
1/11/2005	12:15:17	0.297	13.72	0.897
1/11/2005	12:15:18	0.3147	13.72	0.899
1/11/2005	12:15:20	0.3333	13.72	0.897
1/11/2005	12:15:21	0.3532	13.72	0.897
1/11/2005	12:15:22	0.3742	13.72	0.895
1/11/2005	12:15:23	0.3963	13.72	0.893
1/11/2005	12:15:25	0.4198	13.72	0.895
1/11/2005	12:15:26	0.4447	13.72	0.893
1/11/2005	12:15:28	0.4697	13.72	0.893
1/11/2005	12:15:29	0.4963	13.72	0.891
1/11/2005	12:15:31	0.5247	13.72	0.891
1/11/2005	12:15:33	0.5547	13.72	0.889
1/11/2005	12:15:35	0.5863	13.72	0.889
1/11/2005	12:15:37	0.6213	13.71	0.89
1/11/2005	12:15:39	0.658	13.71	0.888
1/11/2005	12:15:41	0.6963	13.71	0.89
1/11/2005	12:15:44	0.738	13.71	0.888
1/11/2005	12:15:46	0.7813	13.71	0.888
1/11/2005	12:15:49	0.828	13.71	0.886
1/11/2005	12:15:52	0.8763	13.71	0.886
1/11/2005	12:15:55	0.928	13.71	0.884
1/11/2005	12:15:58	0.983	13.71	0.884

ET (min)	Feet H2O
0	0.957
0.0083	0.9
0.0171	0.928
0.0265	0.905
0.0363	0.911
0.0468	0.905
0.0578	0.905
0.0695	0.903
0.082	0.903
0.0951	0.903
0.1091	0.901
0.124	0.901
0.1396	0.899
0.1563	0.897
0.174	0.899
0.1926	0.897
0.2125	0.897
0.2335	0.895
0.2556	0.893
0.2791	0.895
0.304	0.893
0.329	0.893
0.3556	0.891
0.384	0.891
0.414	0.889
0.4456	0.889
0.4806	0.89
0.5173	0.888
0.5556	0.89
0.5973	0.888
0.6406	0.888
0.6873	0.886
0.7356	0.886
0.7873	0.884
0.8423	0.884

1/11/2005	12:16:02	1.0413	13.71	0.884	0.9006	0.884
1/11/2005	12:16:06	1.103	13.71	0.884	0.9623	0.884
1/11/2005	12:16:10	1.168	13.71	0.882	1.0273	0.882
1/11/2005	12:16:14	1.238	13.71	0.882	1.0973	0.882
1/11/2005	12:16:18	1.3113	13.71	0.882	1.1706	0.882
1/11/2005	12:16:23	1.3897	13.71	0.878	1.249	0.878
1/11/2005	12:16:28	1.473	13.7	0.878	1.3323	0.878
1/11/2005	12:16:33	1.5613	13.7	0.878	1.4206	0.878
1/11/2005	12:16:39	1.6547	13.7	0.876	1.514	0.876
1/11/2005	12:16:45	1.753	13.7	0.874	1.6123	0.874
1/11/2005	12:16:51	1.858	13.7	0.874	1.7173	0.874
1/11/2005	12:16:58	1.968	13.7	0.872	1.8273	0.872
1/11/2005	12:17:05	2.0847	13.7	0.872	1.944	0.872
1/11/2005	12:17:12	2.2097	13.7	0.87	2.069	0.87
1/11/2005	12:17:20	2.3413	13.7	0.87	2.2006	0.87
1/11/2005	12:17:28	2.4813	13.7	0.868	2.3406	0.868
1/11/2005	12:17:37	2.6297	13.7	0.866	2.489	0.866
1/11/2005	12:17:47	2.7863	13.7	0.866	2.6456	0.866
1/11/2005	12:17:57	2.953	13.7	0.865	2.8123	0.865
1/11/2005	12:18:07	3.1297	13.7	0.863	2.989	0.863
1/11/2005	12:18:18	3.3163	13.7	0.861	3.1756	0.861
1/11/2005	12:18:30	3.5147	13.7	0.859	3.374	0.859
1/11/2005	12:18:43	3.7247	13.7	0.857	3.584	0.857
1/11/2005	12:18:56	3.9463	13.69	0.857	3.8056	0.857
1/11/2005	12:19:10	4.1813	13.69	0.855	4.0406	0.855
1/11/2005	12:19:25	4.4297	13.69	0.851	4.289	0.851
1/11/2005	12:19:41	4.693	13.69	0.849	4.5523	0.849
1/11/2005	12:19:58	4.973	13.69	0.847	4.8323	0.847
1/11/2005	12:20:16	5.2697	13.69	0.845	5.129	0.845
1/11/2005	12:20:34	5.583	13.69	0.843	5.4423	0.843
1/11/2005	12:20:54	5.9147	13.69	0.841	5.774	0.841
1/11/2005	12:21:15	6.2663	13.69	0.836	6.1256	0.836
1/11/2005	12:21:38	6.6397	13.69	0.834	6.499	0.834
1/11/2005	12:22:02	7.0347	13.69	0.83	6.894	0.83
1/11/2005	12:22:27	7.453	13.69	0.828	7.3123	0.828
1/11/2005	12:22:53	7.8963	13.69	0.824	7.7556	0.824
1/11/2005	12:23:21	8.3663	13.69	0.822	8.2256	0.822
1/11/2005	12:23:51	8.8647	13.69	0.816	8.724	0.816
1/11/2005	12:24:23	9.3913	13.69	0.81	9.2506	0.81
1/11/2005	12:24:56	9.9497	13.69	0.808	9.809	0.808
1/11/2005	12:25:32	10.5413	13.69	0.804	10.4006	0.804
1/11/2005	12:26:10	11.168	13.69	0.798	11.0273	0.798
1/11/2005	12:26:49	11.8313	13.67	0.795	11.6906	0.795
1/11/2005	12:27:32	12.5347	13.67	0.789	12.394	0.789
1/11/2005	12:28:16	13.2797	13.67	0.783	13.139	0.783
1/11/2005	12:29:04	14.0697	13.67	0.777	13.929	0.777
1/11/2005	12:29:54	14.9063	13.67	0.771	14.7656	0.771
1/11/2005	12:30:47	15.7913	13.67	0.766	15.6506	0.766
1/11/2005	12:31:43	16.7297	13.67	0.76	16.589	0.76
1/11/2005	12:32:43	17.723	13.67	0.756	17.5823	0.756
1/11/2005	12:33:46	18.7763	13.67	0.748	18.6356	0.748
1/11/2005	12:34:53	19.8913	13.67	0.74	19.7506	0.74

1/11/2005	12:36:04	21.073	13.67	0.732	20.9323	0.732
1/11/2005	12:37:19	22.3247	13.67	0.725	22.184	0.725
1/11/2005	12:38:38	23.6497	13.67	0.717	23.509	0.717
1/11/2005	12:40:03	25.0547	13.67	0.709	24.914	0.709
1/11/2005	12:41:32	26.543	13.67	0.699	26.4023	0.699
1/11/2005	12:43:07	28.118	13.67	0.691	27.9773	0.691
1/11/2005	12:44:47	29.7863	13.67	0.682	29.6456	0.682
1/11/2005	12:46:33	31.5547	13.67	0.67	31.414	0.67
1/11/2005	12:48:25	33.428	13.67	0.662	33.2873	0.662
1/11/2005	12:50:24	35.4113	13.67	0.65	35.2706	0.65
1/11/2005	12:52:30	37.513	13.67	0.641	37.3723	0.641
1/11/2005	12:54:44	39.7397	13.67	0.631	39.599	0.631
1/11/2005	12:57:05	42.098	13.67	0.617	41.9573	0.617
1/11/2005	12:59:35	44.5963	13.67	0.605	44.4556	0.605
1/11/2005	13:02:14	47.243	13.67	0.592	47.1023	0.592
1/11/2005	13:05:02	50.0463	13.67	0.578	49.9056	0.578
1/11/2005	13:08:00	53.0147	13.67	0.566	52.874	0.566
1/11/2005	13:11:09	56.1597	13.67	0.553	56.019	0.553
1/11/2005	13:14:29	59.4913	13.67	0.537	59.3506	0.537
1/11/2005	13:18:01	63.0197	13.67	0.523	62.879	0.523
1/11/2005	13:21:45	66.758	13.67	0.508	66.6173	0.508
1/11/2005	13:25:43	70.718	13.67	0.492	70.5773	0.492
1/11/2005	13:29:54	74.9113	13.67	0.475	74.7706	0.475
1/11/2005	13:34:21	79.3547	13.67	0.457	79.214	0.457
1/11/2005	13:39:03	84.0613	13.67	0.441	83.9206	0.441
1/11/2005	13:44:02	89.0463	13.67	0.426	88.9056	0.426
1/11/2005	13:49:19	94.3263	13.67	0.406	94.1856	0.406
1/11/2005	13:54:55	99.9197	13.67	0.389	99.779	0.389
1/11/2005	14:00:50	105.8447	13.67	0.369	105.704	0.369
1/11/2005	14:07:07	112.1197	13.67	0.35	111.979	0.35
1/11/2005	14:13:46	118.768	13.67	0.33	118.6273	0.33
1/11/2005	14:20:48	125.8097	13.67	0.311	125.669	0.311
1/11/2005	14:28:16	133.268	13.67	0.291	133.1273	0.291
1/11/2005	14:36:10	141.168	13.67	0.27	141.0273	0.27
1/11/2005	14:44:32	149.5363	13.67	0.248	149.3956	0.248
1/11/2005	14:53:24	158.4013	13.67	0.227	158.2606	0.227
1/11/2005	15:02:47	167.7913	13.67	0.205	167.6506	0.205
1/11/2005	15:12:44	177.738	13.67	0.184	177.5973	0.184
1/11/2005	15:23:16	188.2747	13.67	0.164	188.134	0.164
1/11/2005	15:34:26	199.4347	13.67	0.141	199.294	0.141
1/11/2005	15:46:15	211.2563	13.67	0.119	211.1156	0.119
1/11/2005	15:58:46	223.778	13.67	0.096	223.6373	0.096
1/11/2005	16:12:02	237.043	13.67	0.074	236.9023	0.074
1/11/2005	16:26:05	251.093	13.67	0.055	250.9523	0.055
1/11/2005	16:40:58	265.9763	13.67	0.033	265.8356	0.033
1/11/2005	16:56:44	281.7413	13.67	0.012	281.6006	0.012
1/11/2005	17:13:26	298.4397	13.67	-0.008		
1/11/2005	17:31:07	316.128	13.67	-0.025		
1/11/2005	17:49:51	334.8647	13.67	-0.045		
1/11/2005	18:09:42	354.7113	13.67	-0.06		
1/11/2005	18:29:42	374.7113	13.67	-0.078		
1/11/2005	18:49:42	394.7113	13.67	-0.093		

1/11/2005	19:09:42	414.7113	13.67	-0.105
1/11/2005	19:29:42	434.7113	13.67	-0.117
1/11/2005	19:49:42	454.7113	13.67	-0.127
1/11/2005	20:09:42	474.7113	13.67	-0.136
1/11/2005	20:29:42	494.7113	13.67	-0.144
1/11/2005	20:49:42	514.7113	13.67	-0.15
1/11/2005	21:09:42	534.7113	13.67	-0.158
1/11/2005	21:29:42	554.7113	13.67	-0.166
1/11/2005	21:49:42	574.7113	13.67	-0.172
1/11/2005	22:09:42	594.7113	13.67	-0.175
1/11/2005	22:29:42	614.7113	13.67	-0.181
1/11/2005	22:49:42	634.7113	13.67	-0.187
1/11/2005	23:09:42	654.7113	13.67	-0.191
1/11/2005	23:29:42	674.7113	13.67	-0.195
1/11/2005	23:49:42	694.7113	13.67	-0.199
1/12/2005	0:09:42	714.7113	13.67	-0.203
1/12/2005	0:29:42	734.7113	13.67	-0.207
1/12/2005	0:49:42	754.7113	13.67	-0.211
1/12/2005	1:09:42	774.7113	13.67	-0.211
1/12/2005	1:29:42	794.7113	13.67	-0.213
1/12/2005	1:49:42	814.7113	13.67	-0.213
1/12/2005	2:09:42	834.7113	13.67	-0.216
1/12/2005	2:29:42	854.7113	13.66	-0.214
1/12/2005	2:49:42	874.7113	13.67	-0.218
1/12/2005	3:09:42	894.7113	13.67	-0.218
1/12/2005	3:29:42	914.7113	13.67	-0.218
1/12/2005	3:49:42	934.7113	13.67	-0.22
1/12/2005	4:09:42	954.7113	13.67	-0.216
1/12/2005	4:29:42	974.7113	13.67	-0.214
1/12/2005	4:49:42	994.7113	13.67	-0.213
1/12/2005	5:09:42	1014.711	13.67	-0.211
1/12/2005	5:29:42	1034.711	13.67	-0.209
1/12/2005	5:49:42	1054.711	13.67	-0.209
1/12/2005	6:09:42	1074.711	13.67	-0.207
1/12/2005	6:29:42	1094.711	13.67	-0.203
1/12/2005	6:49:42	1114.711	13.67	-0.201
1/12/2005	7:09:42	1134.711	13.67	-0.205
1/12/2005	7:29:42	1154.711	13.67	-0.216



12MWT33 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT33-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:38

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT33
Test Date: 1-11-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.1771 ft/day
y0 = 1.989 ft

AQUIFER DATA

Saturated Thickness: 52.9 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT33)

Initial Displacement: 2.041 ft
Wellbore Radius: 0.25 ft
Screen Length: 20. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 52.9 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT33-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 20'/97.30 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 44.40 DATE: 1/11/05

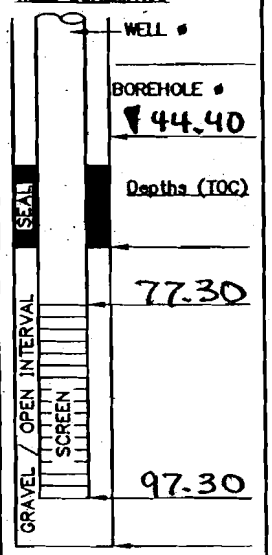
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG. PAGE 1 OF 1

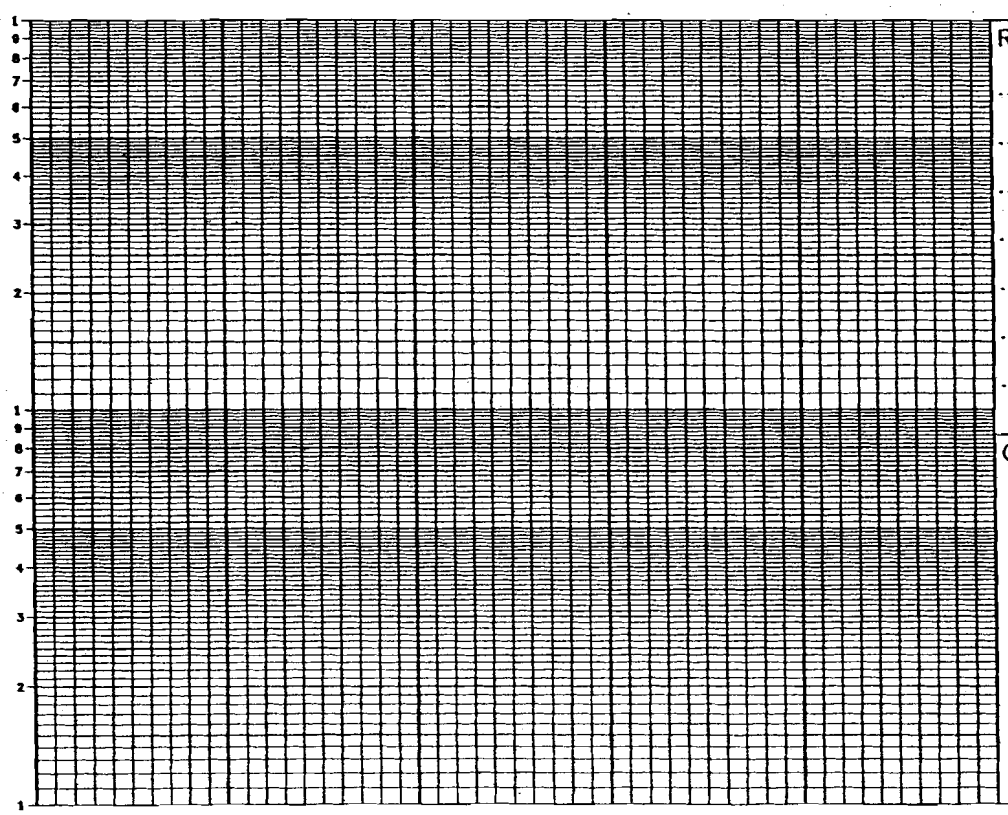
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.11		2.04	20		.09
.16		1.99	26.5		.04
.3		1.92	30		.02
.5		1.85			
.8		1.76			
1		1.68			
2		1.44			
3		1.21		52.9	
5		.88			
7		.62			
10		.39			
15		.18			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

XD @ 39.685

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/08/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/11/2005 8:57:23
Report fror ...\SN04880 2005-01-11 082500 12MWT33-F.bin
Win-Situ V 4.51

Serial num 4880
Firmware \ 3.09
Unit name:

Test name: 12MWT33-F

Test define 1/11/2005 8:17:06
Test sched 1/11/2005 8:25:00
Test starte 1/11/2005 8:25:00
Test stopp 1/11/2005 8:57:12

Data gathered using Logarithmic testing
Maximun Minutes.
Number 121

TOTAL DA 121

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 39.57 Feet H2O

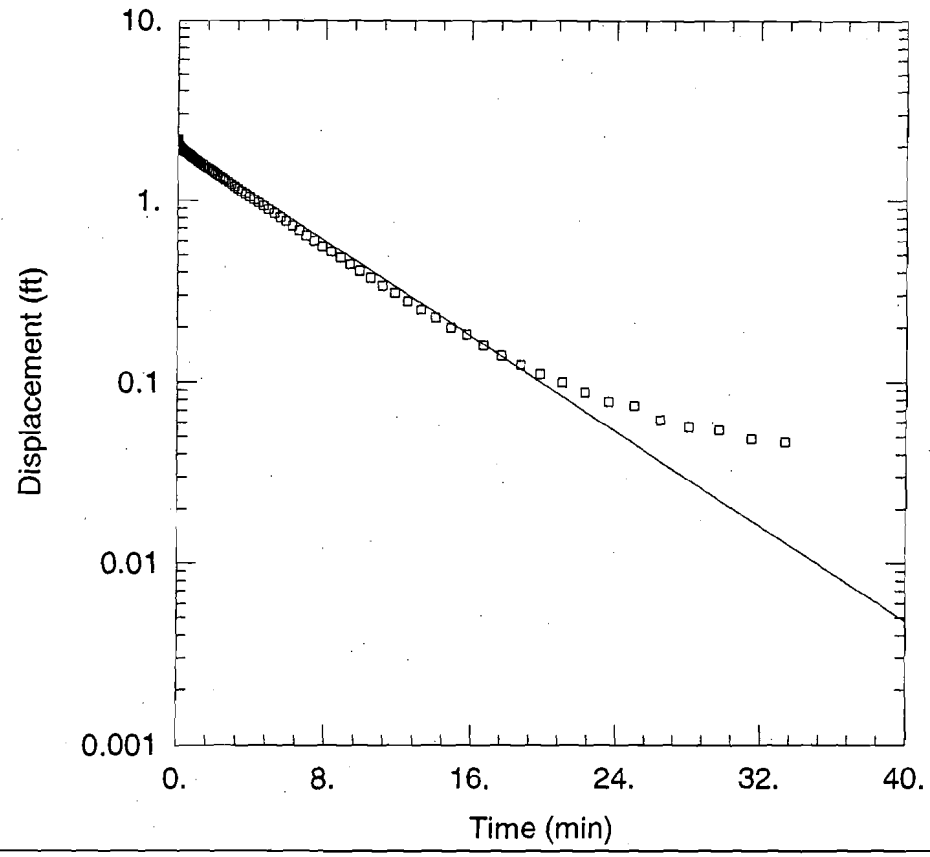
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/11/2005	8:25:00	0	14.19	0
1/11/2005	8:25:00	0.005	14.23	0.023
1/11/2005	8:25:00	0.01	14.24	0.028
1/11/2005	8:25:00	0.015	14.25	0.032
1/11/2005	8:25:01	0.02	14.25	0.034
1/11/2005	8:25:01	0.025	14.25	0.034
1/11/2005	8:25:01	0.03	14.25	0.036
1/11/2005	8:25:02	0.035	14.25	0.036
1/11/2005	8:25:02	0.04	14.25	0.038

1/11/2005	8:25:02	0.045	14.25	0.038
1/11/2005	8:25:03	0.05	14.27	0.463
1/11/2005	8:25:03	0.055	14.25	1.706
1/11/2005	8:25:03	0.06	14.27	2.345
1/11/2005	8:25:03	0.065	14.27	2.706
1/11/2005	8:25:04	0.07	14.27	2.866
1/11/2005	8:25:04	0.075	14.27	2.917
1/11/2005	8:25:04	0.08	14.27	2.591
1/11/2005	8:25:05	0.085	14.27	2.708
1/11/2005	8:25:05	0.09	14.27	2.578
1/11/2005	8:25:05	0.095	14.27	2.603
1/11/2005	8:25:06	0.1	14.27	2.324
1/11/2005	8:25:06	0.1058	14.27	1.743
1/11/2005	8:25:06	0.112	14.27	2.041
1/11/2005	8:25:07	0.1185	14.27	2.041
1/11/2005	8:25:07	0.1255	14.27	2.037
1/11/2005	8:25:07	0.1328	14.28	2.033
1/11/2005	8:25:08	0.1407	14.27	2.029
1/11/2005	8:25:08	0.149	14.28	2.023
1/11/2005	8:25:09	0.1578	14.28	2.019
1/11/2005	8:25:10	0.1672	14.24	1.999
1/11/2005	8:25:10	0.177	14.24	1.993
1/11/2005	8:25:11	0.1875	14.23	1.985
1/11/2005	8:25:11	0.1985	14.23	1.977
1/11/2005	8:25:12	0.2102	14.23	1.97
1/11/2005	8:25:13	0.2227	14.23	1.964
1/11/2005	8:25:14	0.2358	14.23	1.958
1/11/2005	8:25:15	0.2498	14.23	1.952
1/11/2005	8:25:15	0.2647	14.23	1.944
1/11/2005	8:25:16	0.2803	14.23	1.936
1/11/2005	8:25:17	0.297	14.23	1.929
1/11/2005	8:25:18	0.3147	14.23	1.921
1/11/2005	8:25:20	0.3333	14.21	1.911
1/11/2005	8:25:21	0.3532	14.21	1.904
1/11/2005	8:25:22	0.3742	14.21	1.896
1/11/2005	8:25:23	0.3963	14.23	1.888
1/11/2005	8:25:25	0.4198	14.21	1.878
1/11/2005	8:25:26	0.4447	14.21	1.868
1/11/2005	8:25:28	0.4697	14.21	1.859
1/11/2005	8:25:29	0.4963	14.21	1.849
1/11/2005	8:25:31	0.5247	14.21	1.841
1/11/2005	8:25:33	0.5547	14.21	1.831
1/11/2005	8:25:35	0.5863	14.21	1.82
1/11/2005	8:25:37	0.6213	14.21	1.808
1/11/2005	8:25:39	0.658	14.21	1.796
1/11/2005	8:25:41	0.6963	14.21	1.785
1/11/2005	8:25:44	0.738	14.21	1.771
1/11/2005	8:25:46	0.7813	14.21	1.757
1/11/2005	8:25:49	0.828	14.21	1.742
1/11/2005	8:25:52	0.8763	14.21	1.728
1/11/2005	8:25:55	0.928	14.21	1.712
1/11/2005	8:25:58	0.983	14.21	1.697

ET (min)	Feet H2O
0	2.041
0.0065	2.041
0.0135	2.037
0.0208	2.033
0.0287	2.029
0.037	2.023
0.0458	2.019
0.0552	1.999
0.065	1.993
0.0755	1.985
0.0865	1.977
0.0982	1.97
0.1107	1.964
0.1238	1.958
0.1378	1.952
0.1527	1.944
0.1683	1.936
0.185	1.929
0.2027	1.921
0.2213	1.911
0.2412	1.904
0.2622	1.896
0.2843	1.888
0.3078	1.878
0.3327	1.868
0.3577	1.859
0.3843	1.849
0.4127	1.841
0.4427	1.831
0.4743	1.82
0.5093	1.808
0.546	1.796
0.5843	1.785
0.626	1.771
0.6693	1.757
0.716	1.742
0.7643	1.728
0.816	1.712
0.871	1.697

1/11/2005	8:26:02	1.0413	14.21	1.681	0.9293	1.681
1/11/2005	8:26:06	1.103	14.2	1.66	0.991	1.66
1/11/2005	8:26:10	1.168	14.2	1.644	1.056	1.644
1/11/2005	8:26:14	1.238	14.2	1.623	1.126	1.623
1/11/2005	8:26:18	1.3113	14.21	1.603	1.1993	1.603
1/11/2005	8:26:23	1.3897	14.2	1.584	1.2777	1.584
1/11/2005	8:26:28	1.473	14.2	1.562	1.361	1.562
1/11/2005	8:26:33	1.5613	14.2	1.539	1.4493	1.539
1/11/2005	8:26:39	1.6547	14.2	1.516	1.5427	1.516
1/11/2005	8:26:45	1.753	14.2	1.49	1.641	1.49
1/11/2005	8:26:51	1.858	14.2	1.465	1.746	1.465
1/11/2005	8:26:58	1.968	14.2	1.438	1.856	1.438
1/11/2005	8:27:05	2.0847	14.2	1.41	1.9727	1.41
1/11/2005	8:27:12	2.2097	14.2	1.383	2.0977	1.383
1/11/2005	8:27:20	2.3413	14.2	1.352	2.2293	1.352
1/11/2005	8:27:28	2.4813	14.2	1.321	2.3693	1.321
1/11/2005	8:27:37	2.6297	14.2	1.289	2.5177	1.289
1/11/2005	8:27:47	2.7863	14.2	1.254	2.6743	1.254
1/11/2005	8:27:57	2.953	14.2	1.217	2.841	1.217
1/11/2005	8:28:07	3.1297	14.19	1.188	3.0177	1.188
1/11/2005	8:28:18	3.3163	14.19	1.151	3.2043	1.151
1/11/2005	8:28:30	3.5147	14.19	1.114	3.4027	1.114
1/11/2005	8:28:43	3.7247	14.19	1.079	3.6127	1.079
1/11/2005	8:28:56	3.9463	14.19	1.038	3.8343	1.038
1/11/2005	8:29:10	4.1813	14.19	0.999	4.0693	0.999
1/11/2005	8:29:25	4.4297	14.19	0.96	4.3177	0.96
1/11/2005	8:29:41	4.693	14.19	0.919	4.581	0.919
1/11/2005	8:29:58	4.973	14.19	0.878	4.861	0.878
1/11/2005	8:30:16	5.2697	14.19	0.833	5.1577	0.833
1/11/2005	8:30:34	5.583	14.19	0.79	5.471	0.79
1/11/2005	8:30:54	5.9147	14.19	0.751	5.8027	0.751
1/11/2005	8:31:15	6.2663	14.19	0.708	6.1543	0.708
1/11/2005	8:31:38	6.6397	14.19	0.665	6.5277	0.665
1/11/2005	8:32:02	7.0347	14.19	0.624	6.9227	0.624
1/11/2005	8:32:27	7.453	14.19	0.581	7.341	0.581
1/11/2005	8:32:53	7.8963	14.19	0.542	7.7843	0.542
1/11/2005	8:33:21	8.3663	14.19	0.501	8.2543	0.501
1/11/2005	8:33:51	8.8647	14.19	0.462	8.7527	0.462
1/11/2005	8:34:23	9.3913	14.19	0.423	9.2793	0.423
1/11/2005	8:34:56	9.9497	14.19	0.388	9.8377	0.388
1/11/2005	8:35:32	10.5413	14.19	0.353	10.4293	0.353
1/11/2005	8:36:10	11.168	14.19	0.32	11.056	0.32
1/11/2005	8:36:49	11.8313	14.19	0.289	11.7193	0.289
1/11/2005	8:37:32	12.5347	14.19	0.258	12.4227	0.258
1/11/2005	8:38:16	13.2797	14.18	0.23	13.1677	0.23
1/11/2005	8:39:04	14.0697	14.19	0.203	13.9577	0.203
1/11/2005	8:39:54	14.9063	14.19	0.178	14.7943	0.178
1/11/2005	8:40:47	15.7913	14.19	0.156	15.6793	0.156
1/11/2005	8:41:43	16.7297	14.19	0.137	16.6177	0.137
1/11/2005	8:42:43	17.723	14.19	0.117	17.611	0.117
1/11/2005	8:43:46	18.7763	14.19	0.099	18.6643	0.099
1/11/2005	8:44:53	19.8913	14.19	0.086	19.7793	0.086

1/11/2005	8:46:04	21.073	14.19	0.072	20.961	0.072
1/11/2005	8:47:19	22.3247	14.19	0.062	22.2127	0.062
1/11/2005	8:48:38	23.6497	14.19	0.053	23.5377	0.053
1/11/2005	8:50:03	25.0547	14.19	0.043	24.9427	0.043
1/11/2005	8:51:32	26.543	14.18	0.037	26.431	0.037
1/11/2005	8:53:07	28.118	14.19	0.029	28.006	0.029
1/11/2005	8:54:47	29.7863	14.19	0.021	29.6743	0.021
1/11/2005	8:56:33	31.5547	14.19	0.018	31.4427	0.018



12MWT33 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT33-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:42

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT33
Test Date: 1-11-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.1653 ft/day
y0 = 2. ft

AQUIFER DATA

Saturated Thickness: 55.9 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT33)

Initial Displacement: 2.179 ft
Wellbore Radius: 0.25 ft
Screen Length: 20. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 55.9 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT33-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 20'/97.30 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 41.40 DATE: 1/11/05

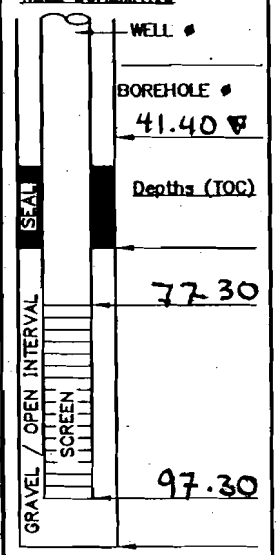
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SECT SLUG PAGE 1 OF 1

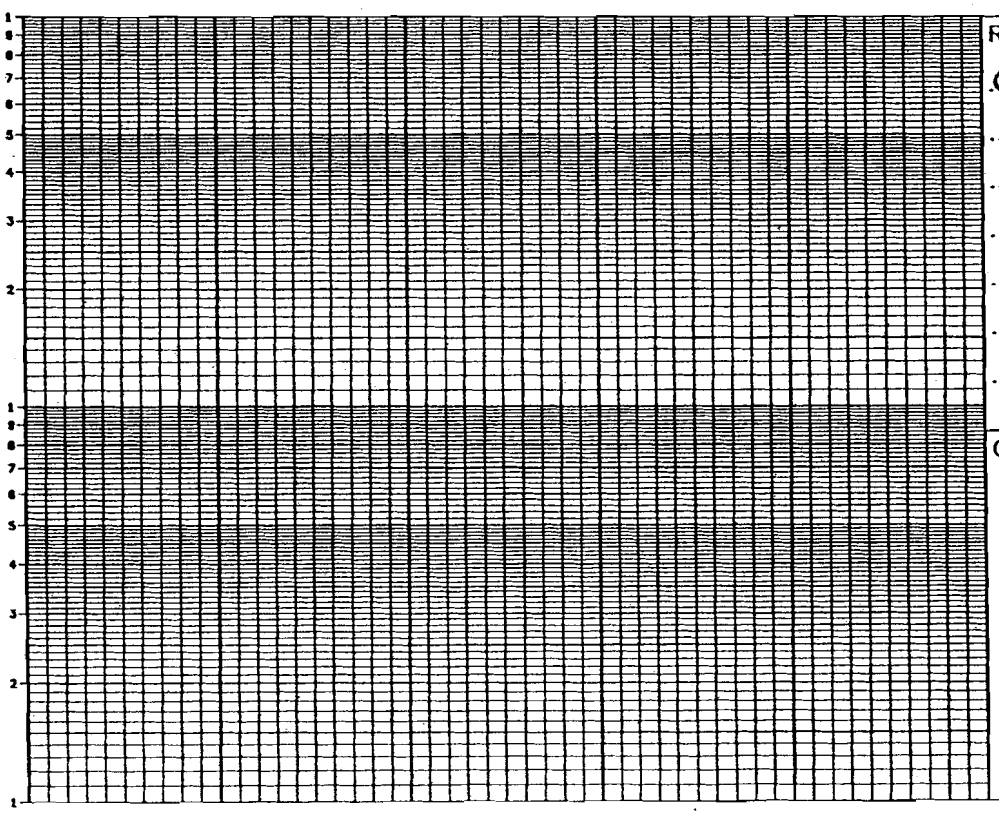
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.055		-2.09	15		.20
.1		-2.05	20		.11
.13		-2.00	25		.07
.2		-1.96	30		.05
.3		-1.91	33.4		.05
.5		-1.84			
.78		-1.75			
1.04		-1.68		55.9	
2		-1.44			
3		-1.23			
5		-.89	<7.5	.60	
10		-.41			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:
Graph Good

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/11/2005 9:39:26
Report fror ...\SN04880 2005-01-11 090500 12MWT33-R.bin
Win-Situ V 4.51

Serial num 4880
Firmware \ 3.09
Unit name:

Test name: 12MWT33-R

Test define 1/11/2005 8:59:45
Test sched 1/11/2005 9:05:00
Test starte 1/11/2005 9:05:00
Test stopp 1/11/2005 9:39:13

Data gathered using Logarithmic testing
Maximun Minutes.
Number 122

TOTAL DA 122

Channel number [1]
Measurer Temperature
Channel name:

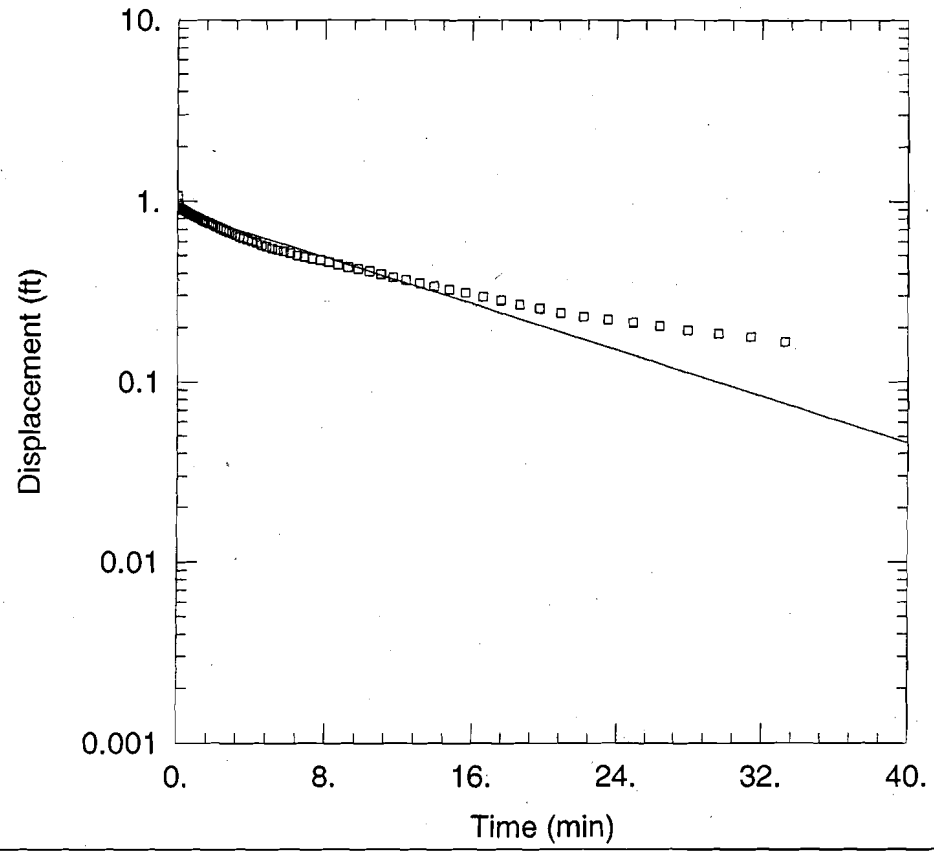
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 39.576 Feet H2O

Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/11/2005	9:05:00	0	14.18	0
1/11/2005	9:05:00	0.005	14.23	0.02
1/11/2005	9:05:00	0.01	14.24	0.028
1/11/2005	9:05:00	0.015	14.24	0.03
1/11/2005	9:05:01	0.02	14.24	0.032
1/11/2005	9:05:01	0.025	14.24	0.034
1/11/2005	9:05:01	0.03	14.25	0.033
1/11/2005	9:05:02	0.035	14.25	0.033
1/11/2005	9:05:02	0.04	14.25	0.035

1/11/2005	9:05:02	0.045	14.25	0.035		
1/11/2005	9:05:03	0.05	14.25	-1.644		
1/11/2005	9:05:03	0.055	14.25	-2.093		
1/11/2005	9:05:03	0.06	14.25	-1.2		
1/11/2005	9:05:03	0.065	14.25	-1.839	ET (min)	Feet H2O
1/11/2005	9:05:04	0.07	14.25	-2.179	0	2.179
1/11/2005	9:05:04	0.075	14.27	-2.148	0.005	2.148
1/11/2005	9:05:04	0.08	14.27	-2.123	0.01	2.123
1/11/2005	9:05:05	0.085	14.25	-2.101	0.015	2.101
1/11/2005	9:05:05	0.09	14.25	-2.079	0.02	2.079
1/11/2005	9:05:05	0.095	14.25	-2.066	0.025	2.066
1/11/2005	9:05:06	0.1	14.27	-2.052	0.03	2.052
1/11/2005	9:05:06	0.1058	14.27	-2.039	0.0358	2.039
1/11/2005	9:05:06	0.112	14.27	-2.031	0.042	2.031
1/11/2005	9:05:07	0.1185	14.27	-2.019	0.0485	2.019
1/11/2005	9:05:07	0.1255	14.27	-2.008	0.0555	2.008
1/11/2005	9:05:07	0.1328	14.27	-2	0.0628	2
1/11/2005	9:05:08	0.1407	14.27	-1.988	0.0707	1.988
1/11/2005	9:05:08	0.149	14.27	-1.978	0.079	1.978
1/11/2005	9:05:09	0.1578	14.27	-1.97	0.0878	1.97
1/11/2005	9:05:10	0.1672	14.23	-1.977	0.0972	1.977
1/11/2005	9:05:10	0.177	14.23	-1.972	0.107	1.972
1/11/2005	9:05:11	0.1875	14.23	-1.962	0.1175	1.962
1/11/2005	9:05:11	0.1985	14.23	-1.962	0.1285	1.962
1/11/2005	9:05:12	0.2102	14.23	-1.958	0.1402	1.958
1/11/2005	9:05:13	0.2227	14.23	-1.948	0.1527	1.948
1/11/2005	9:05:14	0.2358	14.21	-1.94	0.1658	1.94
1/11/2005	9:05:15	0.2498	14.21	-1.932	0.1798	1.932
1/11/2005	9:05:15	0.2647	14.21	-1.926	0.1947	1.926
1/11/2005	9:05:16	0.2803	14.21	-1.921	0.2103	1.921
1/11/2005	9:05:17	0.297	14.21	-1.911	0.227	1.911
1/11/2005	9:05:18	0.3147	14.21	-1.905	0.2447	1.905
1/11/2005	9:05:20	0.3333	14.21	-1.895	0.2633	1.895
1/11/2005	9:05:21	0.3532	14.21	-1.887	0.2832	1.887
1/11/2005	9:05:22	0.3742	14.21	-1.88	0.3042	1.88
1/11/2005	9:05:23	0.3963	14.21	-1.872	0.3263	1.872
1/11/2005	9:05:25	0.4198	14.21	-1.864	0.3498	1.864
1/11/2005	9:05:26	0.4447	14.21	-1.856	0.3747	1.856
1/11/2005	9:05:28	0.4697	14.21	-1.845	0.3997	1.845
1/11/2005	9:05:29	0.4963	14.21	-1.835	0.4263	1.835
1/11/2005	9:05:31	0.5247	14.21	-1.825	0.4547	1.825
1/11/2005	9:05:33	0.5547	14.21	-1.817	0.4847	1.817
1/11/2005	9:05:35	0.5863	14.21	-1.809	0.5163	1.809
1/11/2005	9:05:37	0.6213	14.21	-1.798	0.5513	1.798
1/11/2005	9:05:39	0.658	14.21	-1.786	0.588	1.786
1/11/2005	9:05:41	0.6963	14.21	-1.772	0.6263	1.772
1/11/2005	9:05:44	0.738	14.21	-1.763	0.668	1.763
1/11/2005	9:05:46	0.7813	14.2	-1.751	0.7113	1.751
1/11/2005	9:05:49	0.828	14.2	-1.737	0.758	1.737
1/11/2005	9:05:52	0.8763	14.2	-1.719	0.8063	1.719
1/11/2005	9:05:55	0.928	14.2	-1.706	0.858	1.706
1/11/2005	9:05:58	0.983	14.2	-1.69	0.913	1.69

1/11/2005	9:06:02	1.0413	14.2	-1.675	0.9713	1.675
1/11/2005	9:06:06	1.103	14.2	-1.657	1.033	1.657
1/11/2005	9:06:10	1.168	14.2	-1.637	1.098	1.637
1/11/2005	9:06:14	1.238	14.2	-1.62	1.168	1.62
1/11/2005	9:06:18	1.3113	14.2	-1.6	1.2413	1.6
1/11/2005	9:06:23	1.3897	14.2	-1.581	1.3197	1.581
1/11/2005	9:06:28	1.473	14.2	-1.557	1.403	1.557
1/11/2005	9:06:33	1.5613	14.2	-1.536	1.4913	1.536
1/11/2005	9:06:39	1.6547	14.2	-1.515	1.5847	1.515
1/11/2005	9:06:45	1.753	14.2	-1.491	1.683	1.491
1/11/2005	9:06:51	1.858	14.2	-1.464	1.788	1.464
1/11/2005	9:06:58	1.968	14.2	-1.438	1.898	1.438
1/11/2005	9:07:05	2.0847	14.2	-1.411	2.0147	1.411
1/11/2005	9:07:12	2.2097	14.19	-1.384	2.1397	1.384
1/11/2005	9:07:20	2.3413	14.19	-1.352	2.2713	1.352
1/11/2005	9:07:28	2.4813	14.19	-1.327	2.4113	1.327
1/11/2005	9:07:37	2.6297	14.19	-1.294	2.5597	1.294
1/11/2005	9:07:47	2.7863	14.19	-1.261	2.7163	1.261
1/11/2005	9:07:57	2.953	14.19	-1.229	2.883	1.229
1/11/2005	9:08:07	3.1297	14.19	-1.192	3.0597	1.192
1/11/2005	9:08:18	3.3163	14.19	-1.159	3.2463	1.159
1/11/2005	9:08:30	3.5147	14.19	-1.122	3.4447	1.122
1/11/2005	9:08:43	3.7247	14.19	-1.085	3.6547	1.085
1/11/2005	9:08:56	3.9463	14.19	-1.048	3.8763	1.048
1/11/2005	9:09:10	4.1813	14.19	-1.009	4.1113	1.009
1/11/2005	9:09:25	4.4297	14.19	-0.97	4.3597	0.97
1/11/2005	9:09:41	4.693	14.19	-0.931	4.623	0.931
1/11/2005	9:09:58	4.973	14.19	-0.89	4.903	0.89
1/11/2005	9:10:16	5.2697	14.19	-0.849	5.1997	0.849
1/11/2005	9:10:34	5.583	14.19	-0.806	5.513	0.806
1/11/2005	9:10:54	5.9147	14.19	-0.765	5.8447	0.765
1/11/2005	9:11:15	6.2663	14.19	-0.724	6.1963	0.724
1/11/2005	9:11:38	6.6397	14.19	-0.683	6.5697	0.683
1/11/2005	9:12:02	7.0347	14.18	-0.642	6.9647	0.642
1/11/2005	9:12:27	7.453	14.19	-0.601	7.383	0.601
1/11/2005	9:12:53	7.8963	14.18	-0.56	7.8263	0.56
1/11/2005	9:13:21	8.3663	14.18	-0.523	8.2963	0.523
1/11/2005	9:13:51	8.8647	14.18	-0.484	8.7947	0.484
1/11/2005	9:14:23	9.3913	14.18	-0.445	9.3213	0.445
1/11/2005	9:14:56	9.9497	14.18	-0.408	9.8797	0.408
1/11/2005	9:15:32	10.5413	14.18	-0.375	10.4713	0.375
1/11/2005	9:16:10	11.168	14.18	-0.339	11.098	0.339
1/11/2005	9:16:49	11.8313	14.18	-0.31	11.7613	0.31
1/11/2005	9:17:32	12.5347	14.19	-0.279	12.4647	0.279
1/11/2005	9:18:16	13.2797	14.19	-0.25	13.2097	0.25
1/11/2005	9:19:04	14.0697	14.18	-0.226	13.9997	0.226
1/11/2005	9:19:54	14.9063	14.18	-0.199	14.8363	0.199
1/11/2005	9:20:47	15.7913	14.18	-0.183	15.7213	0.183
1/11/2005	9:21:43	16.7297	14.18	-0.16	16.6597	0.16
1/11/2005	9:22:43	17.723	14.18	-0.14	17.653	0.14
1/11/2005	9:23:46	18.7763	14.18	-0.125	18.7063	0.125
1/11/2005	9:24:53	19.8913	14.18	-0.111	19.8213	0.111

1/11/2005	9:26:04	21.073	14.18	-0.1	21.003	0.1
1/11/2005	9:27:19	22.3247	14.18	-0.088	22.2547	0.088
1/11/2005	9:28:38	23.6497	14.18	-0.078	23.5797	0.078
1/11/2005	9:30:03	25.0547	14.18	-0.074	24.9847	0.074
1/11/2005	9:31:32	26.543	14.18	-0.062	26.473	0.062
1/11/2005	9:33:07	28.118	14.18	-0.057	28.048	0.057
1/11/2005	9:34:47	29.7863	14.18	-0.055	29.7163	0.055
1/11/2005	9:36:33	31.5547	14.18	-0.049	31.4847	0.049
1/11/2005	9:38:25	33.428	14.19	-0.047	33.358	0.047



12MWT36 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT36-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:46

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT36
Test Date: 1-9-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.1362 ft/day
y0 = 0.8871 ft

AQUIFER DATA

Saturated Thickness: 13.48 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT36)

Initial Displacement: 1.076 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 13.48 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT36-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/27.75 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 14.27 DATE: 1/9/05

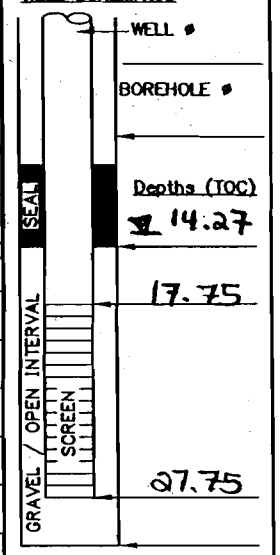
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

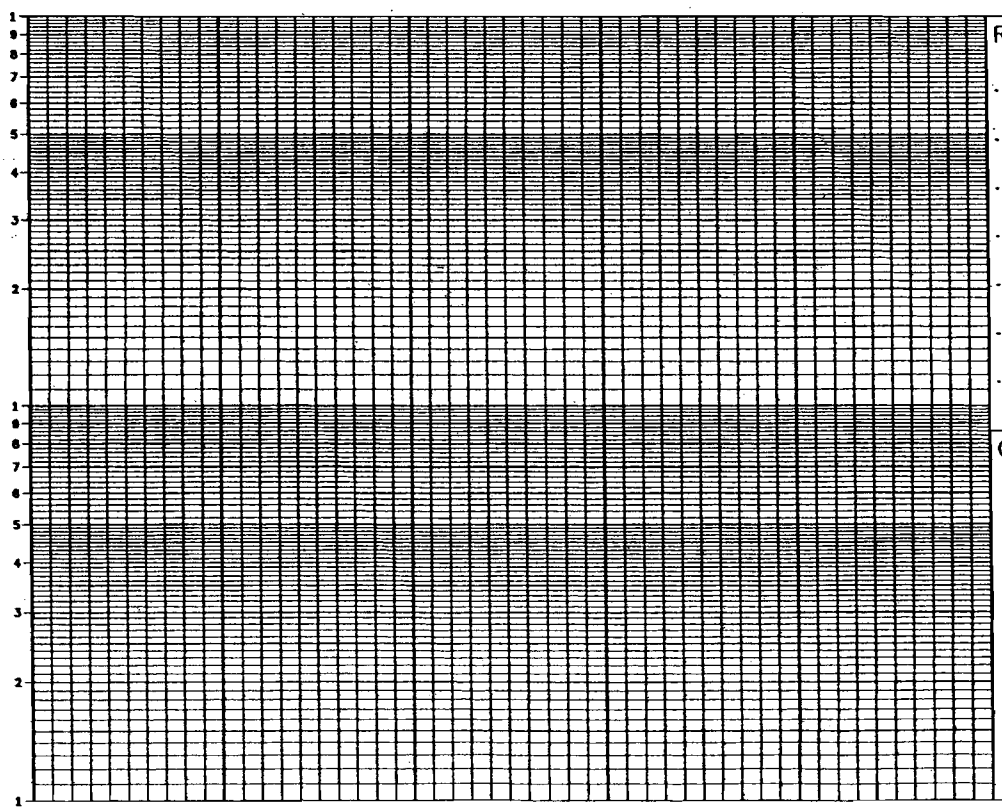
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.095		1.098	21		.24
.187		.975	25		.21
.2		.89	31.6		.18
.3		.92			
.5		.89			
1		.83			
2		.75			
3		.68		13.48	
5		.56			
7		.49			
10		.42			
15		.33			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

XD @ 13.24 @ 1120

13.20 @ 1125

Graph Good

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/9/2005 12:02:03
Report fror ...\SN08927 2005-01-09 112800 12MWT36-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT36-F

Test define 1/9/2005 11:20:57
Test sched 1/9/2005 11:28:00
Test starte 1/9/2005 11:28:00
Test stopp 1/9/2005 12:01:54

Data gathered using Logarithmic testing
Maximun Minutes.
Number 122

TOTAL DA 122

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 13.189 Feet H2O

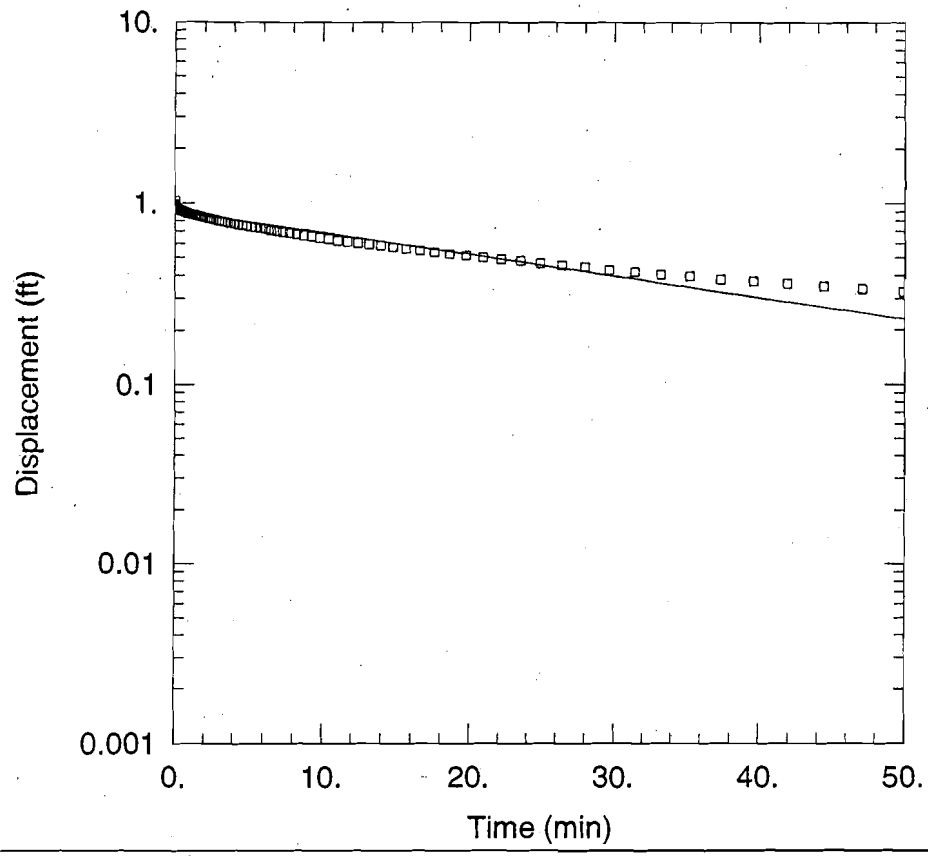
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/9/2005	11:28:00	0	15.63	0
1/9/2005	11:28:00	0.005	15.65	0.002
1/9/2005	11:28:00	0.01	15.66	0.004
1/9/2005	11:28:00	0.015	15.66	0.004
1/9/2005	11:28:01	0.02	15.66	0.006
1/9/2005	11:28:01	0.025	15.67	0.005
1/9/2005	11:28:01	0.03	15.67	0.005
1/9/2005	11:28:02	0.035	15.67	0.005
1/9/2005	11:28:02	0.04	15.67	0.005

1/9/2005	11:28:02	0.045	15.67	0.005
1/9/2005	11:28:03	0.05	15.68	0.005
1/9/2005	11:28:03	0.055	15.68	0.005
1/9/2005	11:28:03	0.06	15.68	0.005
1/9/2005	11:28:03	0.065	15.68	0.007
1/9/2005	11:28:04	0.07	15.68	0.007
1/9/2005	11:28:04	0.075	15.68	0.534
1/9/2005	11:28:04	0.08	15.68	1.309
1/9/2005	11:28:05	0.085	15.68	1.301
1/9/2005	11:28:05	0.09	15.68	1.201
1/9/2005	11:28:05	0.095	15.68	1.098
1/9/2005	11:28:06	0.1	15.68	1.289
1/9/2005	11:28:06	0.1058	15.68	1.036
1/9/2005	11:28:06	0.112	15.68	1.173
1/9/2005	11:28:07	0.1185	15.68	1.151
1/9/2005	11:28:07	0.1255	15.68	0.805
1/9/2005	11:28:07	0.1328	15.68	1.031
1/9/2005	11:28:08	0.1407	15.68	1.082
1/9/2005	11:28:08	0.149	15.68	0.768
1/9/2005	11:28:09	0.1578	15.68	1.076
1/9/2005	11:28:10	0.1672	15.68	0.884
1/9/2005	11:28:10	0.177	15.68	0.94
1/9/2005	11:28:11	0.1875	15.67	0.975
1/9/2005	11:28:11	0.1985	15.67	0.894
1/9/2005	11:28:12	0.2102	15.67	0.945
1/9/2005	11:28:13	0.2227	15.67	0.943
1/9/2005	11:28:14	0.2358	15.67	0.922
1/9/2005	11:28:15	0.2498	15.67	0.918
1/9/2005	11:28:15	0.2647	15.67	0.92
1/9/2005	11:28:16	0.2803	15.67	0.918
1/9/2005	11:28:17	0.297	15.67	0.916
1/9/2005	11:28:18	0.3147	15.67	0.914
1/9/2005	11:28:20	0.3333	15.67	0.91
1/9/2005	11:28:21	0.3532	15.67	0.908
1/9/2005	11:28:22	0.3742	15.67	0.904
1/9/2005	11:28:23	0.3963	15.67	0.9
1/9/2005	11:28:25	0.4198	15.67	0.9
1/9/2005	11:28:26	0.4447	15.67	0.894
1/9/2005	11:28:28	0.4697	15.67	0.892
1/9/2005	11:28:29	0.4963	15.67	0.888
1/9/2005	11:28:31	0.5247	15.67	0.884
1/9/2005	11:28:33	0.5547	15.67	0.882
1/9/2005	11:28:35	0.5863	15.67	0.878
1/9/2005	11:28:37	0.6213	15.67	0.872
1/9/2005	11:28:39	0.658	15.67	0.868
1/9/2005	11:28:41	0.6963	15.67	0.864
1/9/2005	11:28:44	0.738	15.67	0.86
1/9/2005	11:28:46	0.7813	15.67	0.854
1/9/2005	11:28:49	0.828	15.67	0.85
1/9/2005	11:28:52	0.8763	15.67	0.845
1/9/2005	11:28:55	0.928	15.67	0.839
1/9/2005	11:28:58	0.983	15.67	0.833

ET (min)	Feet H2O
0	1.076
0.0094	0.884
0.0192	0.94
0.0297	0.975
0.0407	0.894
0.0524	0.945
0.0649	0.943
0.078	0.922
0.092	0.918
0.1069	0.92
0.1225	0.918
0.1392	0.916
0.1569	0.914
0.1755	0.91
0.1954	0.908
0.2164	0.904
0.2385	0.9
0.262	0.9
0.2869	0.894
0.3119	0.892
0.3385	0.888
0.3669	0.884
0.3969	0.882
0.4285	0.878
0.4635	0.872
0.5002	0.868
0.5385	0.864
0.5802	0.86
0.6235	0.854
0.6702	0.85
0.7185	0.845
0.7702	0.839
0.8252	0.833

1/9/2005	11:29:02	1.0413	15.67	0.829	0.8835	0.829
1/9/2005	11:29:06	1.103	15.67	0.823	0.9452	0.823
1/9/2005	11:29:10	1.168	15.67	0.817	1.0102	0.817
1/9/2005	11:29:14	1.238	15.67	0.811	1.0802	0.811
1/9/2005	11:29:18	1.3113	15.66	0.805	1.1535	0.805
1/9/2005	11:29:23	1.3897	15.66	0.797	1.2319	0.797
1/9/2005	11:29:28	1.473	15.67	0.789	1.3152	0.789
1/9/2005	11:29:33	1.5613	15.66	0.781	1.4035	0.781
1/9/2005	11:29:39	1.6547	15.66	0.773	1.4969	0.773
1/9/2005	11:29:45	1.753	15.66	0.765	1.5952	0.765
1/9/2005	11:29:51	1.858	15.66	0.759	1.7002	0.759
1/9/2005	11:29:58	1.968	15.66	0.749	1.8102	0.749
1/9/2005	11:30:05	2.0847	15.66	0.738	1.9269	0.738
1/9/2005	11:30:12	2.2097	15.66	0.728	2.0519	0.728
1/9/2005	11:30:20	2.3413	15.66	0.72	2.1835	0.72
1/9/2005	11:30:28	2.4813	15.66	0.71	2.3235	0.71
1/9/2005	11:30:37	2.6297	15.66	0.698	2.4719	0.698
1/9/2005	11:30:47	2.7863	15.66	0.688	2.6285	0.688
1/9/2005	11:30:57	2.953	15.66	0.678	2.7952	0.678
1/9/2005	11:31:07	3.1297	15.66	0.666	2.9719	0.666
1/9/2005	11:31:18	3.3163	15.66	0.653	3.1585	0.653
1/9/2005	11:31:30	3.5147	15.66	0.641	3.3569	0.641
1/9/2005	11:31:43	3.7247	15.66	0.627	3.5669	0.627
1/9/2005	11:31:56	3.9463	15.66	0.615	3.7885	0.615
1/9/2005	11:32:10	4.1813	15.66	0.603	4.0235	0.603
1/9/2005	11:32:25	4.4297	15.66	0.589	4.2719	0.589
1/9/2005	11:32:41	4.693	15.66	0.574	4.5352	0.574
1/9/2005	11:32:58	4.973	15.67	0.562	4.8152	0.562
1/9/2005	11:33:16	5.2697	15.67	0.548	5.1119	0.548
1/9/2005	11:33:34	5.583	15.67	0.536	5.4252	0.536
1/9/2005	11:33:54	5.9147	15.67	0.526	5.7569	0.526
1/9/2005	11:34:15	6.2663	15.67	0.516	6.1085	0.516
1/9/2005	11:34:38	6.6397	15.67	0.501	6.4819	0.501
1/9/2005	11:35:02	7.0347	15.67	0.491	6.8769	0.491
1/9/2005	11:35:27	7.453	15.67	0.481	7.2952	0.481
1/9/2005	11:35:53	7.8963	15.67	0.471	7.7385	0.471
1/9/2005	11:36:21	8.3663	15.67	0.459	8.2085	0.459
1/9/2005	11:36:51	8.8647	15.67	0.447	8.7069	0.447
1/9/2005	11:37:23	9.3913	15.68	0.434	9.2335	0.434
1/9/2005	11:37:56	9.9497	15.68	0.422	9.7919	0.422
1/9/2005	11:38:32	10.5413	15.68	0.41	10.3835	0.41
1/9/2005	11:39:10	11.168	15.68	0.396	11.0102	0.396
1/9/2005	11:39:49	11.8313	15.68	0.382	11.6735	0.382
1/9/2005	11:40:32	12.5347	15.68	0.368	12.3769	0.368
1/9/2005	11:41:16	13.2797	15.68	0.353	13.1219	0.353
1/9/2005	11:42:04	14.0697	15.68	0.339	13.9119	0.339
1/9/2005	11:42:54	14.9063	15.68	0.325	14.7485	0.325
1/9/2005	11:43:47	15.7913	15.68	0.313	15.6335	0.313
1/9/2005	11:44:43	16.7297	15.68	0.297	16.5719	0.297
1/9/2005	11:45:43	17.723	15.7	0.284	17.5652	0.284
1/9/2005	11:46:46	18.7763	15.7	0.268	18.6185	0.268
1/9/2005	11:47:53	19.8913	15.7	0.256	19.7335	0.256

1/9/2005	11:49:04	21.073	15.7	0.242	20.9152	0.242
1/9/2005	11:50:19	22.3247	15.7	0.23	22.1669	0.23
1/9/2005	11:51:38	23.6497	15.7	0.222	23.4919	0.222
1/9/2005	11:53:03	25.0547	15.7	0.214	24.8969	0.214
1/9/2005	11:54:32	26.543	15.71	0.205	26.3852	0.205
1/9/2005	11:56:07	28.118	15.71	0.193	27.9602	0.193
1/9/2005	11:57:47	29.7863	15.71	0.185	29.6285	0.185
1/9/2005	11:59:33	31.5547	15.71	0.177	31.3969	0.177
1/9/2005	12:01:25	33.428	15.71	0.167	33.2702	0.167



12MWT36 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT36-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:50

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT36
Test Date: 1-9-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.05023 ft/day
y0 = 0.9011 ft

AQUIFER DATA

Saturated Thickness: 13.48 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT36)

Initial Displacement: 1.029 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 13.48 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSW CRANE WELL/BORING NO.: 12MWT36 R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/27.75 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 14.27 DATE: 1/9/05

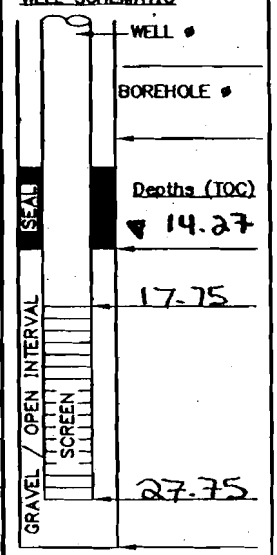
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

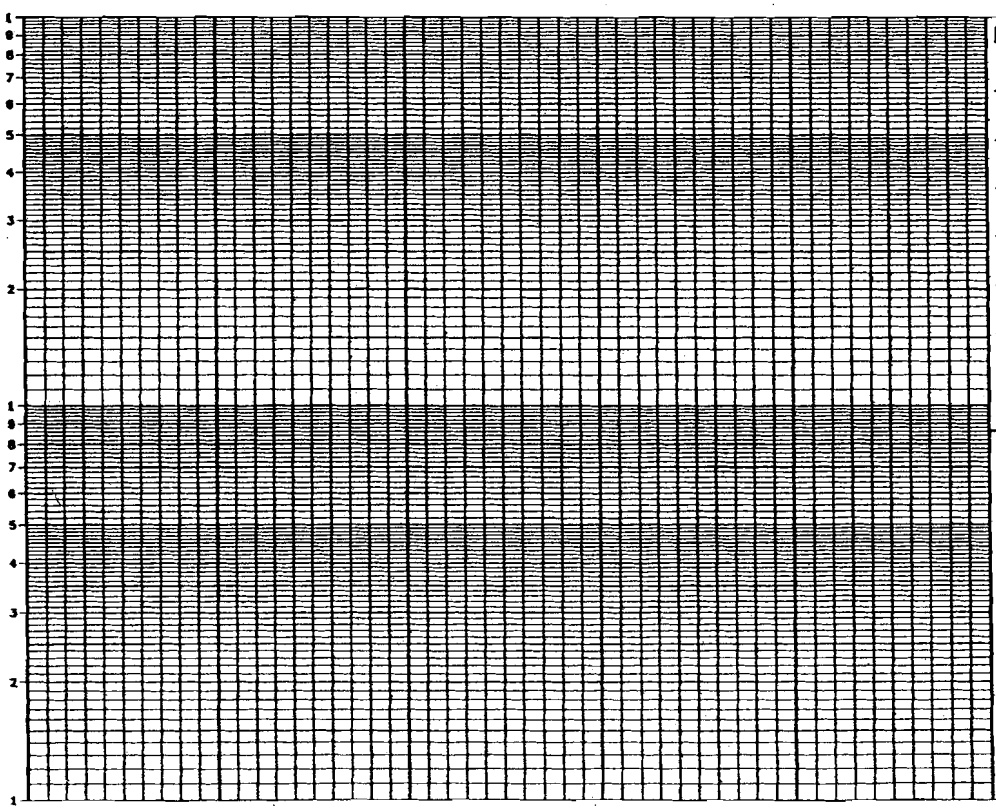
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.1		-1.09	50		.33
.2		-.96			
1		-.88			
2		-.84			
3		-.80			
5		-.75			
10		-.64			
15		-.57		13.48	
20		-.51			
25		-.47			
30		-.43			
40		-.37			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Start @ 1210 HRS

Graph Good

CALCS,SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/08/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/9/2005 13:01:49
Report fror ...\SN08927 2005-01-09 121000 12MWT36-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT36-R

Test define 1/9/2005 12:03:38
Test sched 1/9/2005 12:10:00
Test starte 1/9/2005 12:10:00
Test stopp 1/9/2005 13:01:39

Data gathered using Logarithmic testing
Maximun Minutes.
Number 129

TOTAL DA 129

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 13.323 Feet H2O

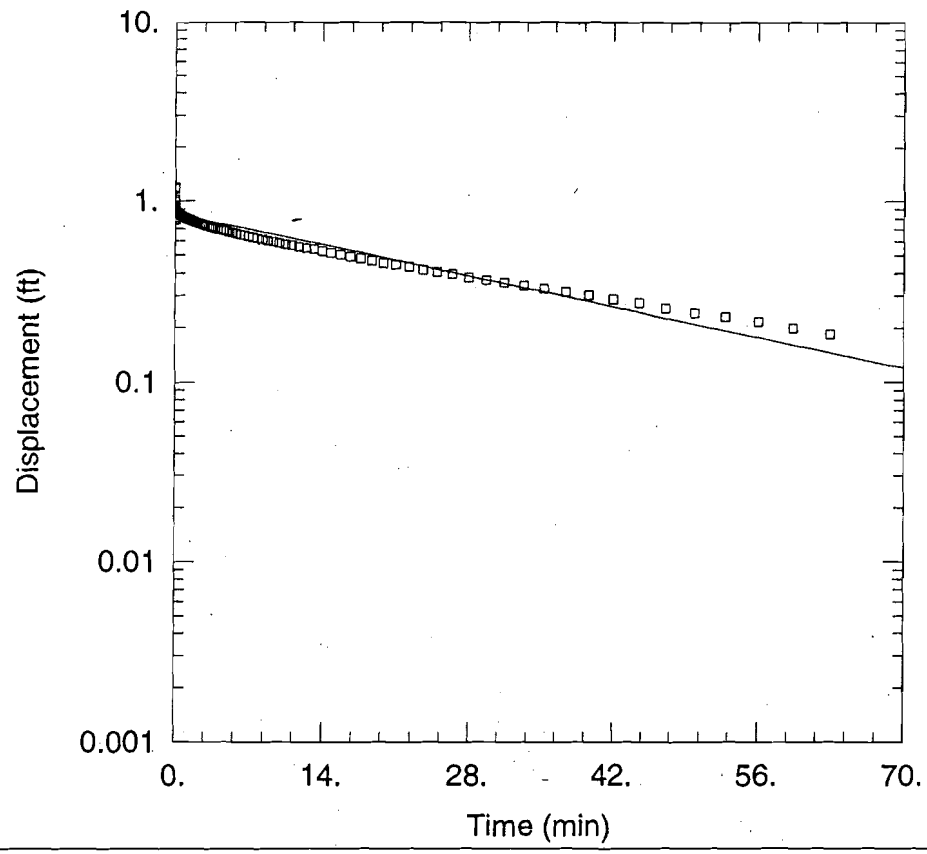
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/9/2005	12:10:00	0	15.72	0
1/9/2005	12:10:00	0.005	15.74	0.002
1/9/2005	12:10:00	0.01	15.74	0.004
1/9/2005	12:10:00	0.015	15.75	0.004
1/9/2005	12:10:01	0.02	15.75	0.004
1/9/2005	12:10:01	0.025	15.75	0.006
1/9/2005	12:10:01	0.03	15.75	0.006
1/9/2005	12:10:02	0.035	15.76	0.005
1/9/2005	12:10:02	0.04	15.76	0.005

1/9/2005	12:10:02	0.045	15.76	0.005
1/9/2005	12:10:03	0.05	15.76	0.005
1/9/2005	12:10:03	0.055	15.76	0.005
1/9/2005	12:10:03	0.06	15.76	0.005
1/9/2005	12:10:03	0.065	15.76	0.005
1/9/2005	12:10:04	0.07	15.76	-0.45
1/9/2005	12:10:04	0.075	15.76	-1.296
1/9/2005	12:10:04	0.08	15.76	-0.549
1/9/2005	12:10:05	0.085	15.76	-0.962
1/9/2005	12:10:05	0.09	15.76	-0.794
1/9/2005	12:10:05	0.095	15.76	-1.167
1/9/2005	12:10:06	0.1	15.76	-0.875
1/9/2005	12:10:06	0.1058	15.76	-1.092
1/9/2005	12:10:06	0.112	15.77	-0.928
1/9/2005	12:10:07	0.1185	15.77	-1.037
1/9/2005	12:10:07	0.1255	15.77	-0.92
1/9/2005	12:10:07	0.1328	15.77	-1.029
1/9/2005	12:10:08	0.1407	15.77	-0.928
1/9/2005	12:10:08	0.149	15.77	-0.968
1/9/2005	12:10:09	0.1578	15.77	-0.983
1/9/2005	12:10:10	0.1672	15.76	-0.948
1/9/2005	12:10:10	0.177	15.76	-0.946
1/9/2005	12:10:11	0.1875	15.76	-0.958
1/9/2005	12:10:11	0.1985	15.76	-0.958
1/9/2005	12:10:12	0.2102	15.76	-0.956
1/9/2005	12:10:13	0.2227	15.76	-0.95
1/9/2005	12:10:14	0.2358	15.76	-0.948
1/9/2005	12:10:15	0.2498	15.75	-0.94
1/9/2005	12:10:15	0.2647	15.76	-0.936
1/9/2005	12:10:16	0.2803	15.76	-0.936
1/9/2005	12:10:17	0.297	15.75	-0.936
1/9/2005	12:10:18	0.3147	15.76	-0.932
1/9/2005	12:10:20	0.3333	15.76	-0.932
1/9/2005	12:10:21	0.3532	15.75	-0.928
1/9/2005	12:10:22	0.3742	15.75	-0.926
1/9/2005	12:10:23	0.3963	15.75	-0.924
1/9/2005	12:10:25	0.4198	15.75	-0.924
1/9/2005	12:10:26	0.4447	15.75	-0.919
1/9/2005	12:10:28	0.4697	15.75	-0.919
1/9/2005	12:10:29	0.4963	15.75	-0.915
1/9/2005	12:10:31	0.5247	15.75	-0.911
1/9/2005	12:10:33	0.5547	15.75	-0.913
1/9/2005	12:10:35	0.5863	15.75	-0.909
1/9/2005	12:10:37	0.6213	15.75	-0.905
1/9/2005	12:10:39	0.658	15.75	-0.905
1/9/2005	12:10:41	0.6963	15.75	-0.901
1/9/2005	12:10:44	0.738	15.75	-0.899
1/9/2005	12:10:46	0.7813	15.75	-0.897
1/9/2005	12:10:49	0.828	15.75	-0.893
1/9/2005	12:10:52	0.8763	15.75	-0.889
1/9/2005	12:10:55	0.928	15.75	-0.887
1/9/2005	12:10:58	0.983	15.75	-0.883

ET (min)	Feet H2O
0	1.029
0.0079	0.928
0.0162	0.968
0.025	0.983
0.0344	0.948
0.0442	0.946
0.0547	0.958
0.0657	0.958
0.0774	0.956
0.0899	0.95
0.103	0.948
0.117	0.94
0.1319	0.936
0.1475	0.936
0.1642	0.936
0.1819	0.932
0.2005	0.932
0.2204	0.928
0.2414	0.926
0.2635	0.924
0.287	0.924
0.3119	0.919
0.3369	0.919
0.3635	0.915
0.3919	0.911
0.4219	0.913
0.4535	0.909
0.4885	0.905
0.5252	0.905
0.5635	0.901
0.6052	0.899
0.6485	0.897
0.6952	0.893
0.7435	0.889
0.7952	0.887
0.8502	0.883

1/9/2005	12:11:02	1.0413	15.75	-0.879	0.9085	0.879
1/9/2005	12:11:06	1.103	15.75	-0.877	0.9702	0.877
1/9/2005	12:11:10	1.168	15.75	-0.873	1.0352	0.873
1/9/2005	12:11:14	1.238	15.75	-0.869	1.1052	0.869
1/9/2005	12:11:18	1.3113	15.74	-0.867	1.1785	0.867
1/9/2005	12:11:23	1.3897	15.74	-0.863	1.2569	0.863
1/9/2005	12:11:28	1.473	15.74	-0.859	1.3402	0.859
1/9/2005	12:11:33	1.5613	15.74	-0.854	1.4285	0.854
1/9/2005	12:11:39	1.6547	15.74	-0.85	1.5219	0.85
1/9/2005	12:11:45	1.753	15.74	-0.844	1.6202	0.844
1/9/2005	12:11:51	1.858	15.74	-0.842	1.7252	0.842
1/9/2005	12:11:58	1.968	15.74	-0.836	1.8352	0.836
1/9/2005	12:12:05	2.0847	15.74	-0.832	1.9519	0.832
1/9/2005	12:12:12	2.2097	15.74	-0.828	2.0769	0.828
1/9/2005	12:12:20	2.3413	15.74	-0.824	2.2085	0.824
1/9/2005	12:12:28	2.4813	15.74	-0.818	2.3485	0.818
1/9/2005	12:12:37	2.6297	15.74	-0.812	2.4969	0.812
1/9/2005	12:12:47	2.7863	15.74	-0.81	2.6535	0.81
1/9/2005	12:12:57	2.953	15.74	-0.802	2.8202	0.802
1/9/2005	12:13:07	3.1297	15.72	-0.796	2.9969	0.796
1/9/2005	12:13:18	3.3163	15.72	-0.792	3.1835	0.792
1/9/2005	12:13:30	3.5147	15.72	-0.785	3.3819	0.785
1/9/2005	12:13:43	3.7247	15.72	-0.779	3.5919	0.779
1/9/2005	12:13:56	3.9463	15.72	-0.773	3.8135	0.773
1/9/2005	12:14:10	4.1813	15.72	-0.765	4.0485	0.765
1/9/2005	12:14:25	4.4297	15.72	-0.759	4.2969	0.759
1/9/2005	12:14:41	4.693	15.72	-0.753	4.5602	0.753
1/9/2005	12:14:58	4.973	15.72	-0.745	4.8402	0.745
1/9/2005	12:15:16	5.2697	15.72	-0.737	5.1369	0.737
1/9/2005	12:15:34	5.583	15.72	-0.729	5.4502	0.729
1/9/2005	12:15:54	5.9147	15.72	-0.723	5.7819	0.723
1/9/2005	12:16:15	6.2663	15.72	-0.717	6.1335	0.717
1/9/2005	12:16:38	6.6397	15.72	-0.706	6.5069	0.706
1/9/2005	12:17:02	7.0347	15.72	-0.698	6.9019	0.698
1/9/2005	12:17:27	7.453	15.72	-0.69	7.3202	0.69
1/9/2005	12:17:53	7.8963	15.72	-0.682	7.7635	0.682
1/9/2005	12:18:21	8.3663	15.72	-0.672	8.2335	0.672
1/9/2005	12:18:51	8.8647	15.72	-0.662	8.7319	0.662
1/9/2005	12:19:23	9.3913	15.72	-0.654	9.2585	0.654
1/9/2005	12:19:56	9.9497	15.72	-0.644	9.8169	0.644
1/9/2005	12:20:32	10.5413	15.72	-0.634	10.4085	0.634
1/9/2005	12:21:10	11.168	15.72	-0.623	11.0352	0.623
1/9/2005	12:21:49	11.8313	15.72	-0.615	11.6985	0.615
1/9/2005	12:22:32	12.5347	15.72	-0.603	12.4019	0.603
1/9/2005	12:23:16	13.2797	15.72	-0.593	13.1469	0.593
1/9/2005	12:24:04	14.0697	15.72	-0.583	13.9369	0.583
1/9/2005	12:24:54	14.9063	15.72	-0.571	14.7735	0.571
1/9/2005	12:25:47	15.7913	15.72	-0.559	15.6585	0.559
1/9/2005	12:26:43	16.7297	15.72	-0.547	16.5969	0.547
1/9/2005	12:27:43	17.723	15.72	-0.536	17.5902	0.536
1/9/2005	12:28:46	18.7763	15.72	-0.526	18.6435	0.526
1/9/2005	12:29:53	19.8913	15.74	-0.514	19.7585	0.514

1/9/2005	12:31:04	21.073	15.74	-0.502	20.9402	0.502
1/9/2005	12:32:19	22.3247	15.74	-0.49	22.1919	0.49
1/9/2005	12:33:38	23.6497	15.74	-0.478	23.5169	0.478
1/9/2005	12:35:03	25.0547	15.74	-0.466	24.9219	0.466
1/9/2005	12:36:32	26.543	15.74	-0.454	26.4102	0.454
1/9/2005	12:38:07	28.118	15.74	-0.442	27.9852	0.442
1/9/2005	12:39:47	29.7863	15.74	-0.429	29.6535	0.429
1/9/2005	12:41:33	31.5547	15.74	-0.417	31.4219	0.417
1/9/2005	12:43:25	33.428	15.74	-0.405	33.2952	0.405
1/9/2005	12:45:24	35.4113	15.74	-0.395	35.2785	0.395
1/9/2005	12:47:30	37.513	15.74	-0.381	37.3802	0.381
1/9/2005	12:49:44	39.7397	15.74	-0.371	39.6069	0.371
1/9/2005	12:52:05	42.098	15.74	-0.361	41.9652	0.361
1/9/2005	12:54:35	44.5963	15.74	-0.348	44.4635	0.348
1/9/2005	12:57:14	47.243	15.74	-0.336	47.1102	0.336
1/9/2005	13:00:02	50.0463	15.74	-0.326	49.9135	0.326



12MWT38 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT38-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:54

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT38
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.05149 ft/day
y0 = 0.8498 ft

AQUIFER DATA

Saturated Thickness: 16.42 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT38)

Initial Displacement: 1.185 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 16.42 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT38-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/26.75 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 10.33 DATE: 1/10/05

TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

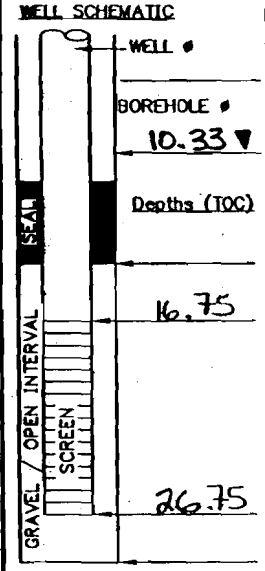
METHOD OF INDUCING WATER LEVEL CHANGE: 1-SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.07		1.05	25		.41
.09		.92	30		.37
.14		.92	40		.30
.2		.86	50		.24
.3		.86	63		.18
.5		.84			
1		.81			
3		.73		16.42	
5		.68			
10		.59			
15		.52			
20		.46			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

REMARKS:

XD @ 15.94

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 10:05:37
Report fror ...\SN08927 2005-01-10 090000 12MWT38-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT38-F

Test define 1/10/2005 8:54:17
Test sched 1/10/2005 9:00:00
Test starte 1/10/2005 9:00:00
Test stopp 1/10/2005 10:05:29

Data gathered using Logarithmic testing
Maximun Minutes.
Number 133

TOTAL DA 133

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 15.906 Feet H2O

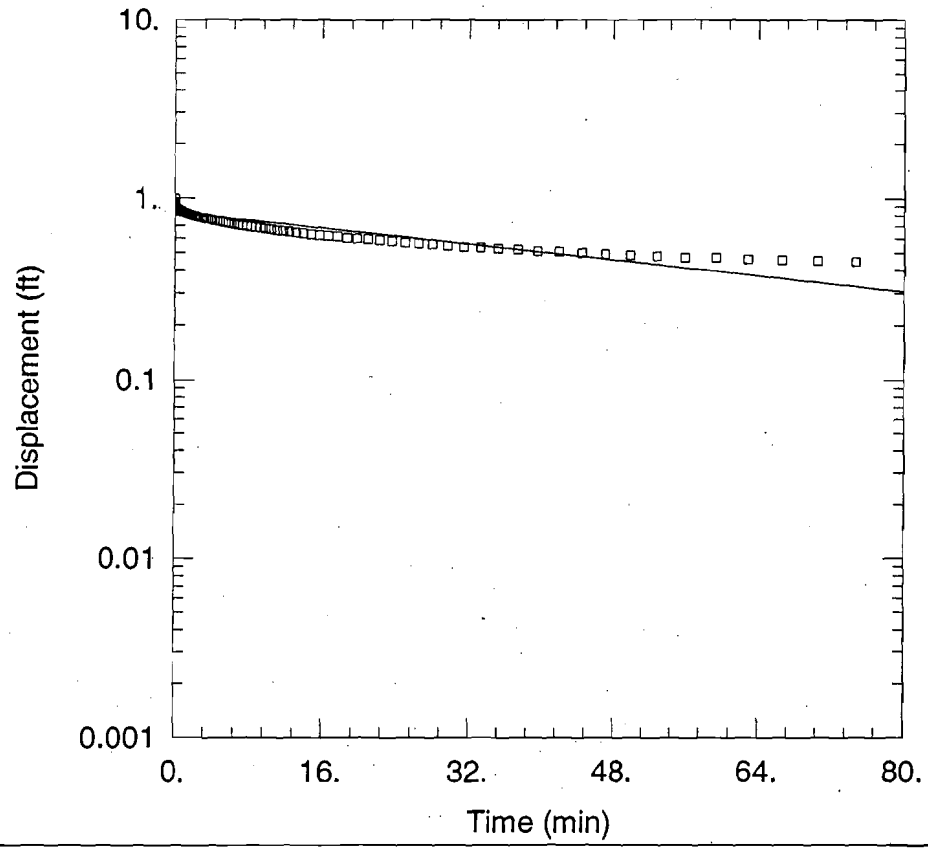
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/10/2005	9:00:00	0	15.19	0
1/10/2005	9:00:00	0.005	15.2	0.004
1/10/2005	9:00:00	0.01	15.22	0.006
1/10/2005	9:00:00	0.015	15.22	0.006
1/10/2005	9:00:01	0.02	15.22	0.008
1/10/2005	9:00:01	0.025	15.22	0.008
1/10/2005	9:00:01	0.03	15.23	0.007
1/10/2005	9:00:02	0.035	15.23	0.007
1/10/2005	9:00:02	0.04	15.23	0.022

1/10/2005	9:00:02	0.045	15.23	0.651
1/10/2005	9:00:03	0.05	15.23	1.359
1/10/2005	9:00:03	0.055	15.23	1.568
1/10/2005	9:00:03	0.06	15.23	1.242
1/10/2005	9:00:03	0.065	15.23	0.934
1/10/2005	9:00:04	0.07	15.24	1.051
1/10/2005	9:00:04	0.075	15.24	1.185
1/10/2005	9:00:04	0.08	15.24	1.199
1/10/2005	9:00:05	0.085	15.24	1.167
1/10/2005	9:00:05	0.09	15.24	0.922
1/10/2005	9:00:05	0.095	15.24	1.019
1/10/2005	9:00:06	0.1	15.24	0.938
1/10/2005	9:00:06	0.1058	15.24	0.859
1/10/2005	9:00:06	0.112	15.24	0.782
1/10/2005	9:00:07	0.1185	15.24	0.993
1/10/2005	9:00:07	0.1255	15.24	0.94
1/10/2005	9:00:07	0.1328	15.24	0.803
1/10/2005	9:00:08	0.1407	15.24	0.92
1/10/2005	9:00:08	0.149	15.24	0.906
1/10/2005	9:00:09	0.1578	15.24	0.847
1/10/2005	9:00:10	0.1672	15.23	0.908
1/10/2005	9:00:10	0.177	15.23	0.859
1/10/2005	9:00:11	0.1875	15.23	0.884
1/10/2005	9:00:11	0.1985	15.23	0.865
1/10/2005	9:00:12	0.2102	15.23	0.876
1/10/2005	9:00:13	0.2227	15.23	0.863
1/10/2005	9:00:14	0.2358	15.23	0.867
1/10/2005	9:00:15	0.2498	15.23	0.863
1/10/2005	9:00:15	0.2647	15.23	0.859
1/10/2005	9:00:16	0.2803	15.22	0.858
1/10/2005	9:00:17	0.297	15.23	0.857
1/10/2005	9:00:18	0.3147	15.23	0.855
1/10/2005	9:00:20	0.3333	15.23	0.853
1/10/2005	9:00:21	0.3532	15.23	0.851
1/10/2005	9:00:22	0.3742	15.23	0.849
1/10/2005	9:00:23	0.3963	15.22	0.845
1/10/2005	9:00:25	0.4198	15.23	0.843
1/10/2005	9:00:26	0.4447	15.22	0.841
1/10/2005	9:00:28	0.4697	15.22	0.839
1/10/2005	9:00:29	0.4963	15.22	0.837
1/10/2005	9:00:31	0.5247	15.22	0.835
1/10/2005	9:00:33	0.5547	15.22	0.833
1/10/2005	9:00:35	0.5863	15.22	0.831
1/10/2005	9:00:37	0.6213	15.22	0.829
1/10/2005	9:00:39	0.658	15.22	0.825
1/10/2005	9:00:41	0.6963	15.22	0.823
1/10/2005	9:00:44	0.738	15.22	0.821
1/10/2005	9:00:46	0.7813	15.22	0.819
1/10/2005	9:00:49	0.828	15.22	0.815
1/10/2005	9:00:52	0.8763	15.22	0.813
1/10/2005	9:00:55	0.928	15.22	0.809
1/10/2005	9:00:58	0.983	15.22	0.807

ET (min)	Feet H2O
0	1.185
0.005	1.199
0.01	1.167
0.015	0.922
0.02	1.019
0.025	0.938
0.0308	0.859
0.037	0.782
0.0435	0.993
0.0505	0.94
0.0578	0.803
0.0657	0.92
0.074	0.906
0.0828	0.847
0.0922	0.908
0.102	0.859
0.1125	0.884
0.1235	0.865
0.1352	0.876
0.1477	0.863
0.1608	0.867
0.1748	0.863
0.1897	0.859
0.2053	0.858
0.222	0.857
0.2397	0.855
0.2583	0.853
0.2782	0.851
0.2992	0.849
0.3213	0.845
0.3448	0.843
0.3697	0.841
0.3947	0.839
0.4213	0.837
0.4497	0.835
0.4797	0.833
0.5113	0.831
0.5463	0.829
0.583	0.825
0.6213	0.823
0.663	0.821
0.7063	0.819
0.753	0.815
0.8013	0.813
0.853	0.809
0.908	0.807

1/10/2005	9:01:02	1.0413	15.22	0.805	0.9663	0.805
1/10/2005	9:01:06	1.103	15.22	0.801	1.028	0.801
1/10/2005	9:01:10	1.168	15.22	0.799	1.093	0.799
1/10/2005	9:01:14	1.238	15.22	0.795	1.163	0.795
1/10/2005	9:01:18	1.3113	15.22	0.793	1.2363	0.793
1/10/2005	9:01:23	1.3897	15.22	0.791	1.3147	0.791
1/10/2005	9:01:28	1.473	15.22	0.785	1.398	0.785
1/10/2005	9:01:33	1.5613	15.22	0.781	1.4863	0.781
1/10/2005	9:01:39	1.6547	15.22	0.779	1.5797	0.779
1/10/2005	9:01:45	1.753	15.22	0.775	1.678	0.775
1/10/2005	9:01:51	1.858	15.22	0.771	1.783	0.771
1/10/2005	9:01:58	1.968	15.2	0.767	1.893	0.767
1/10/2005	9:02:05	2.0847	15.22	0.76	2.0097	0.76
1/10/2005	9:02:12	2.2097	15.2	0.757	2.1347	0.757
1/10/2005	9:02:20	2.3413	15.2	0.753	2.2663	0.753
1/10/2005	9:02:28	2.4813	15.2	0.749	2.4063	0.749
1/10/2005	9:02:37	2.6297	15.2	0.744	2.5547	0.744
1/10/2005	9:02:47	2.7863	15.2	0.738	2.7113	0.738
1/10/2005	9:02:57	2.953	15.2	0.734	2.878	0.734
1/10/2005	9:03:07	3.1297	15.2	0.728	3.0547	0.728
1/10/2005	9:03:18	3.3163	15.2	0.724	3.2413	0.724
1/10/2005	9:03:30	3.5147	15.2	0.716	3.4397	0.716
1/10/2005	9:03:43	3.7247	15.2	0.712	3.6497	0.712
1/10/2005	9:03:56	3.9463	15.2	0.706	3.8713	0.706
1/10/2005	9:04:10	4.1813	15.2	0.7	4.1063	0.7
1/10/2005	9:04:25	4.4297	15.2	0.694	4.3547	0.694
1/10/2005	9:04:41	4.693	15.22	0.688	4.618	0.688
1/10/2005	9:04:58	4.973	15.22	0.682	4.898	0.682
1/10/2005	9:05:16	5.2697	15.22	0.673	5.1947	0.673
1/10/2005	9:05:34	5.583	15.22	0.667	5.508	0.667
1/10/2005	9:05:54	5.9147	15.22	0.659	5.8397	0.659
1/10/2005	9:06:15	6.2663	15.22	0.651	6.1913	0.651
1/10/2005	9:06:38	6.6397	15.22	0.645	6.5647	0.645
1/10/2005	9:07:02	7.0347	15.22	0.637	6.9597	0.637
1/10/2005	9:07:27	7.453	15.22	0.629	7.378	0.629
1/10/2005	9:07:53	7.8963	15.22	0.621	7.8213	0.621
1/10/2005	9:08:21	8.3663	15.22	0.613	8.2913	0.613
1/10/2005	9:08:51	8.8647	15.22	0.603	8.7897	0.603
1/10/2005	9:09:23	9.3913	15.22	0.595	9.3163	0.595
1/10/2005	9:09:56	9.9497	15.22	0.586	9.8747	0.586
1/10/2005	9:10:32	10.5413	15.22	0.576	10.4663	0.576
1/10/2005	9:11:10	11.168	15.23	0.568	11.093	0.568
1/10/2005	9:11:49	11.8313	15.23	0.558	11.7563	0.558
1/10/2005	9:12:32	12.5347	15.23	0.548	12.4597	0.548
1/10/2005	9:13:16	13.2797	15.23	0.538	13.2047	0.538
1/10/2005	9:14:04	14.0697	15.23	0.526	13.9947	0.526
1/10/2005	9:14:54	14.9063	15.23	0.515	14.8313	0.515
1/10/2005	9:15:47	15.7913	15.23	0.505	15.7163	0.505
1/10/2005	9:16:43	16.7297	15.23	0.493	16.6547	0.493
1/10/2005	9:17:43	17.723	15.24	0.481	17.648	0.481
1/10/2005	9:18:46	18.7763	15.24	0.469	18.7013	0.469
1/10/2005	9:19:53	19.8913	15.24	0.456	19.8163	0.456

1/10/2005	9:21:04	21.073	15.24	0.446	20.998	0.446
1/10/2005	9:22:19	22.3247	15.24	0.434	22.2497	0.434
1/10/2005	9:23:38	23.6497	15.24	0.42	23.5747	0.42
1/10/2005	9:25:03	25.0547	15.24	0.408	24.9797	0.408
1/10/2005	9:26:32	26.543	15.26	0.396	26.468	0.396
1/10/2005	9:28:07	28.118	15.26	0.381	28.043	0.381
1/10/2005	9:29:47	29.7863	15.26	0.369	29.7113	0.369
1/10/2005	9:31:33	31.5547	15.26	0.355	31.4797	0.355
1/10/2005	9:33:25	33.428	15.27	0.343	33.353	0.343
1/10/2005	9:35:24	35.4113	15.27	0.329	35.3363	0.329
1/10/2005	9:37:30	37.513	15.27	0.316	37.438	0.316
1/10/2005	9:39:44	39.7397	15.27	0.302	39.6647	0.302
1/10/2005	9:42:05	42.098	15.27	0.288	42.023	0.288
1/10/2005	9:44:35	44.5963	15.27	0.274	44.5213	0.274
1/10/2005	9:47:14	47.243	15.27	0.258	47.168	0.258
1/10/2005	9:50:02	50.0463	15.28	0.243	49.9713	0.243
1/10/2005	9:53:00	53.0147	15.28	0.231	52.9397	0.231
1/10/2005	9:56:09	56.1597	15.28	0.217	56.0847	0.217
1/10/2005	9:59:29	59.4913	15.28	0.199	59.4163	0.199
1/10/2005	10:03:01	63.0197	15.28	0.185	62.9447	0.185



12MWT38 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT38-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:35:58

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT38
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.02275 ft/day
y0 = 0.8291 ft

AQUIFER DATA

Saturated Thickness: 16.42 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT38)

Initial Displacement: 0.992 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 16.42 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT38-R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10/26.75 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 10.33 DATE: 1/10/05

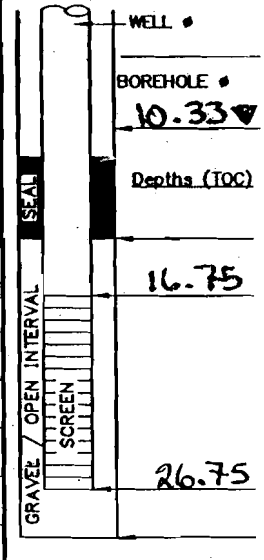
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.065		-1.18	50		-.49
.14		-.99	59		-.47
.2		-.93	74		-.45
.4		-.87			
1.04		-.84			
2		-.80			
3		-.78			
5		-.74		16.42	
10		-.68			
20		-.60			
30		-.55			
40		-.51			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

REMARKS:

CALCS,SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 11:34:15
Report fror ...\SN08927 2005-01-10 101500 12MWT38-R.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT38-R

Test define 1/10/2005 10:07:26
Test sched 1/10/2005 10:15:00
Test starte 1/10/2005 10:15:00
Test stopp 1/10/2005 11:34:03

Data gathered using Logarithmic testing
Maximun Minutes.
Number 136

TOTAL DA 136

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 16.052 Feet H2O

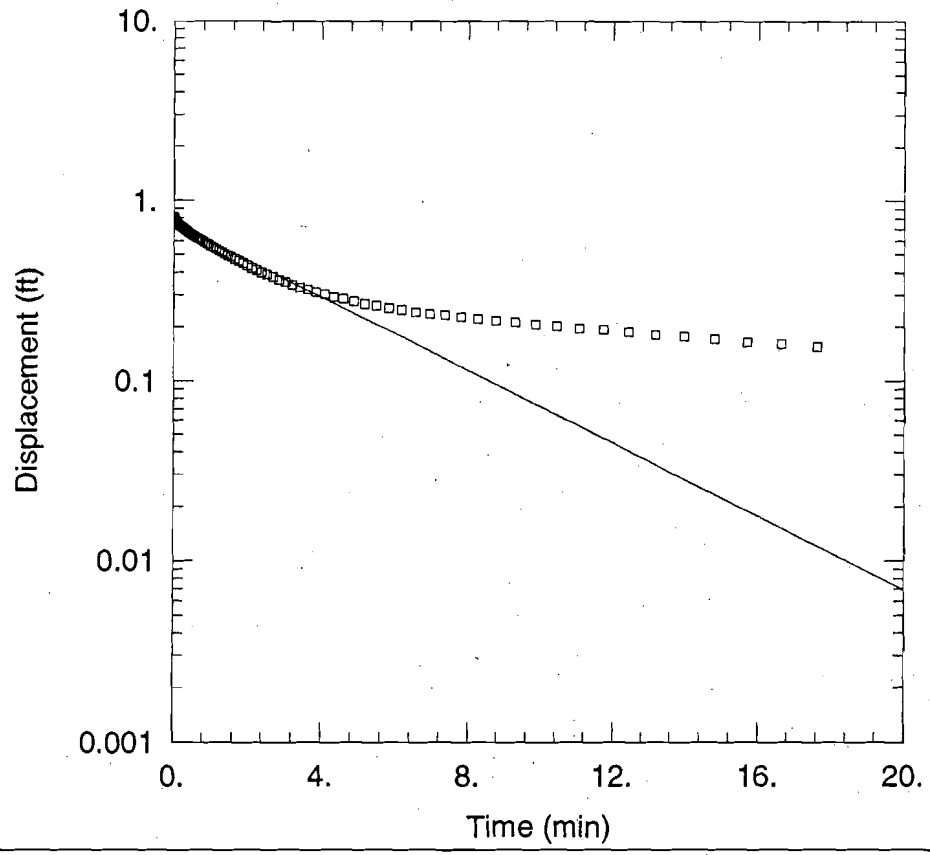
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/10/2005	10:15:00	0	15.29	0
1/10/2005	10:15:00	0.005	15.31	-0.004
1/10/2005	10:15:00	0.01	15.32	-0.002
1/10/2005	10:15:00	0.015	15.32	0.004
1/10/2005	10:15:01	0.02	15.32	0.006
1/10/2005	10:15:01	0.025	15.32	0.004
1/10/2005	10:15:01	0.03	15.33	-0.001
1/10/2005	10:15:02	0.035	15.33	0.001
1/10/2005	10:15:02	0.04	15.33	0.005

1/10/2005	10:15:02	0.045	15.33	0.005
1/10/2005	10:15:03	0.05	15.33	-0.015
1/10/2005	10:15:03	0.055	15.33	-0.193
1/10/2005	10:15:03	0.06	15.33	-0.535
1/10/2005	10:15:03	0.065	15.34	-1.185
1/10/2005	10:15:04	0.07	15.33	-0.581
1/10/2005	10:15:04	0.075	15.33	-0.296
1/10/2005	10:15:04	0.08	15.33	-0.474
1/10/2005	10:15:05	0.085	15.33	-1.266
1/10/2005	10:15:05	0.09	15.34	-1.341
1/10/2005	10:15:05	0.095	15.34	-0.65
1/10/2005	10:15:06	0.1	15.34	-0.711
1/10/2005	10:15:06	0.1058	15.34	-1.266
1/10/2005	10:15:06	0.112	15.34	-0.859
1/10/2005	10:15:07	0.1185	15.34	-0.762
1/10/2005	10:15:07	0.1255	15.34	-1.134
1/10/2005	10:15:07	0.1328	15.34	-0.754
1/10/2005	10:15:08	0.1407	15.34	-0.992
1/10/2005	10:15:08	0.149	15.34	-0.871
1/10/2005	10:15:09	0.1578	15.34	-0.903
1/10/2005	10:15:10	0.1672	15.33	-0.889
1/10/2005	10:15:10	0.177	15.33	-0.915
1/10/2005	10:15:11	0.1875	15.33	-0.853
1/10/2005	10:15:11	0.1985	15.33	-0.932
1/10/2005	10:15:12	0.2102	15.33	-0.857
1/10/2005	10:15:13	0.2227	15.33	-0.883
1/10/2005	10:15:14	0.2358	15.32	-0.903
1/10/2005	10:15:15	0.2498	15.32	-0.879
1/10/2005	10:15:15	0.2647	15.33	-0.869
1/10/2005	10:15:16	0.2803	15.32	-0.873
1/10/2005	10:15:17	0.297	15.32	-0.875
1/10/2005	10:15:18	0.3147	15.32	-0.875
1/10/2005	10:15:20	0.3333	15.32	-0.873
1/10/2005	10:15:21	0.3532	15.32	-0.871
1/10/2005	10:15:22	0.3742	15.32	-0.869
1/10/2005	10:15:23	0.3963	15.32	-0.869
1/10/2005	10:15:25	0.4198	15.32	-0.867
1/10/2005	10:15:26	0.4447	15.32	-0.863
1/10/2005	10:15:28	0.4697	15.32	-0.863
1/10/2005	10:15:29	0.4963	15.32	-0.861
1/10/2005	10:15:31	0.5247	15.32	-0.858
1/10/2005	10:15:33	0.5547	15.32	-0.856
1/10/2005	10:15:35	0.5863	15.32	-0.856
1/10/2005	10:15:37	0.6213	15.32	-0.854
1/10/2005	10:15:39	0.658	15.32	-0.852
1/10/2005	10:15:41	0.6963	15.32	-0.85
1/10/2005	10:15:44	0.738	15.32	-0.848
1/10/2005	10:15:46	0.7813	15.32	-0.846
1/10/2005	10:15:49	0.828	15.32	-0.844
1/10/2005	10:15:52	0.8763	15.32	-0.842
1/10/2005	10:15:55	0.928	15.31	-0.838
1/10/2005	10:15:58	0.983	15.32	-0.838

ET (min)	Feet H2O
0	0.992
0.0083	0.871
0.0171	0.903
0.0265	0.889
0.0363	0.915
0.0468	0.853
0.0578	0.932
0.0695	0.857
0.082	0.883
0.0951	0.903
0.1091	0.879
0.124	0.869
0.1396	0.873
0.1563	0.875
0.174	0.875
0.1926	0.873
0.2125	0.871
0.2335	0.869
0.2556	0.869
0.2791	0.867
0.304	0.863
0.329	0.863
0.3556	0.861
0.384	0.858
0.414	0.856
0.4456	0.856
0.4806	0.854
0.5173	0.852
0.5556	0.85
0.5973	0.848
0.6406	0.846
0.6873	0.844
0.7356	0.842
0.7873	0.838
0.8423	0.838

1/10/2005	10:16:02	1.0413	15.32	-0.834	0.9006	0.834
1/10/2005	10:16:06	1.103	15.31	-0.832	0.9623	0.832
1/10/2005	10:16:10	1.168	15.31	-0.83	1.0273	0.83
1/10/2005	10:16:14	1.238	15.31	-0.828	1.0973	0.828
1/10/2005	10:16:18	1.3113	15.31	-0.824	1.1706	0.824
1/10/2005	10:16:23	1.3897	15.31	-0.822	1.249	0.822
1/10/2005	10:16:28	1.473	15.31	-0.818	1.3323	0.818
1/10/2005	10:16:33	1.5613	15.31	-0.816	1.4206	0.816
1/10/2005	10:16:39	1.6547	15.31	-0.812	1.514	0.812
1/10/2005	10:16:45	1.753	15.31	-0.81	1.6123	0.81
1/10/2005	10:16:51	1.858	15.31	-0.808	1.7173	0.808
1/10/2005	10:16:58	1.968	15.31	-0.804	1.8273	0.804
1/10/2005	10:17:05	2.0847	15.31	-0.802	1.944	0.802
1/10/2005	10:17:12	2.2097	15.31	-0.798	2.069	0.798
1/10/2005	10:17:20	2.3413	15.31	-0.794	2.2006	0.794
1/10/2005	10:17:28	2.4813	15.31	-0.789	2.3406	0.789
1/10/2005	10:17:37	2.6297	15.31	-0.787	2.489	0.787
1/10/2005	10:17:47	2.7863	15.29	-0.785	2.6456	0.785
1/10/2005	10:17:57	2.953	15.29	-0.779	2.8123	0.779
1/10/2005	10:18:07	3.1297	15.29	-0.775	2.989	0.775
1/10/2005	10:18:18	3.3163	15.29	-0.771	3.1756	0.771
1/10/2005	10:18:30	3.5147	15.29	-0.767	3.374	0.767
1/10/2005	10:18:43	3.7247	15.29	-0.763	3.584	0.763
1/10/2005	10:18:56	3.9463	15.29	-0.759	3.8056	0.759
1/10/2005	10:19:10	4.1813	15.29	-0.755	4.0406	0.755
1/10/2005	10:19:25	4.4297	15.29	-0.749	4.289	0.749
1/10/2005	10:19:41	4.693	15.29	-0.745	4.5523	0.745
1/10/2005	10:19:58	4.973	15.29	-0.741	4.8323	0.741
1/10/2005	10:20:16	5.2697	15.29	-0.735	5.129	0.735
1/10/2005	10:20:34	5.583	15.29	-0.731	5.4423	0.731
1/10/2005	10:20:54	5.9147	15.29	-0.727	5.774	0.727
1/10/2005	10:21:15	6.2663	15.29	-0.72	6.1256	0.72
1/10/2005	10:21:38	6.6397	15.29	-0.714	6.499	0.714
1/10/2005	10:22:02	7.0347	15.29	-0.708	6.894	-0.708
1/10/2005	10:22:27	7.453	15.29	-0.704	7.3123	0.704
1/10/2005	10:22:53	7.8963	15.29	-0.698	7.7556	0.698
1/10/2005	10:23:21	8.3663	15.29	-0.692	8.2256	0.692
1/10/2005	10:23:51	8.8647	15.29	-0.686	8.724	0.686
1/10/2005	10:24:23	9.3913	15.29	-0.682	9.2506	0.682
1/10/2005	10:24:56	9.9497	15.29	-0.676	9.809	0.676
1/10/2005	10:25:32	10.5413	15.29	-0.67	10.4006	0.67
1/10/2005	10:26:10	11.168	15.29	-0.662	11.0273	0.662
1/10/2005	10:26:49	11.8313	15.29	-0.656	11.6906	0.656
1/10/2005	10:27:32	12.5347	15.29	-0.65	12.394	0.65
1/10/2005	10:28:16	13.2797	15.29	-0.644	13.139	0.644
1/10/2005	10:29:04	14.0697	15.29	-0.637	13.929	0.637
1/10/2005	10:29:54	14.9063	15.29	-0.629	14.7656	0.629
1/10/2005	10:30:47	15.7913	15.29	-0.623	15.6506	0.623
1/10/2005	10:31:43	16.7297	15.29	-0.617	16.589	0.617
1/10/2005	10:32:43	17.723	15.29	-0.611	17.5823	0.611
1/10/2005	10:33:46	18.7763	15.29	-0.603	18.6356	0.603
1/10/2005	10:34:53	19.8913	15.29	-0.597	19.7506	0.597

1/10/2005	10:36:04	21.073	15.29	-0.591	20.9323	0.591
1/10/2005	10:37:19	22.3247	15.29	-0.585	22.184	0.585
1/10/2005	10:38:38	23.6497	15.29	-0.577	23.509	0.577
1/10/2005	10:40:03	25.0547	15.29	-0.569	24.914	0.569
1/10/2005	10:41:32	26.543	15.29	-0.563	26.4023	0.563
1/10/2005	10:43:07	28.118	15.31	-0.557	27.9773	0.557
1/10/2005	10:44:47	29.7863	15.29	-0.548	29.6456	0.548
1/10/2005	10:46:33	31.5547	15.29	-0.542	31.414	0.542
1/10/2005	10:48:25	33.428	15.29	-0.536	33.2873	0.536
1/10/2005	10:50:24	35.4113	15.31	-0.53	35.2706	0.53
1/10/2005	10:52:30	37.513	15.31	-0.522	37.3723	0.522
1/10/2005	10:54:44	39.7397	15.31	-0.514	39.599	0.514
1/10/2005	10:57:05	42.098	15.31	-0.508	41.9573	0.508
1/10/2005	10:59:35	44.5963	15.31	-0.5	44.4556	0.5
1/10/2005	11:02:14	47.243	15.31	-0.494	47.1023	0.494
1/10/2005	11:05:02	50.0463	15.31	-0.486	49.9056	0.486
1/10/2005	11:08:00	53.0147	15.31	-0.48	52.874	0.48
1/10/2005	11:11:09	56.1597	15.31	-0.474	56.019	0.474
1/10/2005	11:14:29	59.4913	15.31	-0.47	59.3506	0.47
1/10/2005	11:18:01	63.0197	15.31	-0.464	62.879	0.464
1/10/2005	11:21:45	66.758	15.31	-0.458	66.6173	0.458
1/10/2005	11:25:43	70.718	15.31	-0.454	70.5773	0.454
1/10/2005	11:29:54	74.9113	15.31	-0.449	74.7706	0.449



12MWT45 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT45-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:36:01

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT45
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.4308 ft/day
y0 = 0.7423 ft

AQUIFER DATA

Saturated Thickness: 10.92 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT45)

Initial Displacement: 0.808 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 10.92 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT45 F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/26.71 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 15.79 DATE: 1/10/05

TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

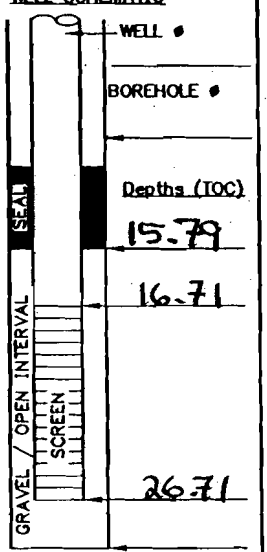
METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

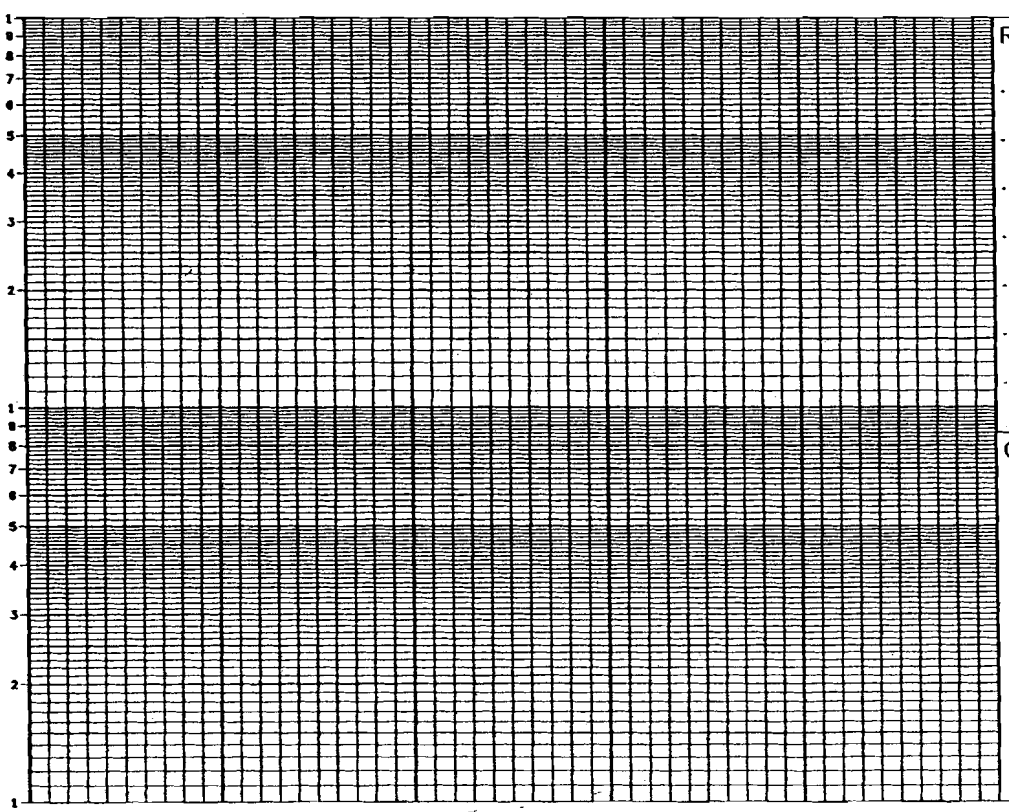
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	~~MEASURED WATER LEVEL~~ (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	~~MEASURED WATER LEVEL~~ (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.07		1.07	16.7		0.16
0.085		0.85			
0.1		0.81			
0.3		0.72			
0.5		0.67			
1.0		0.57			
2.0		0.45		0.92	
3.0		0.36			
5.0		0.28			
7.5		0.23			
10.0		0.21			
14.0		0.18			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph Good.

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 14:16:15
Report fror ...\SN04880 2005-01-10 135744 12MWT45-F.bin
Win-Situ V 4.47

Serial num 4880
Firmware \ 3.09
Unit name:

Test name: 12MWT45-F

Test define 1/10/2005 13:52:57
Test starte 1/10/2005 13:57:44
Test stopp 1/10/2005 14:16:05
Test extrac N/A N/A

Data gathered using Logarithmic testing
Maximun Minutes.
Number 111

TOTAL DA 111

Channel number [1]
Measurer Temperature
Channel name:

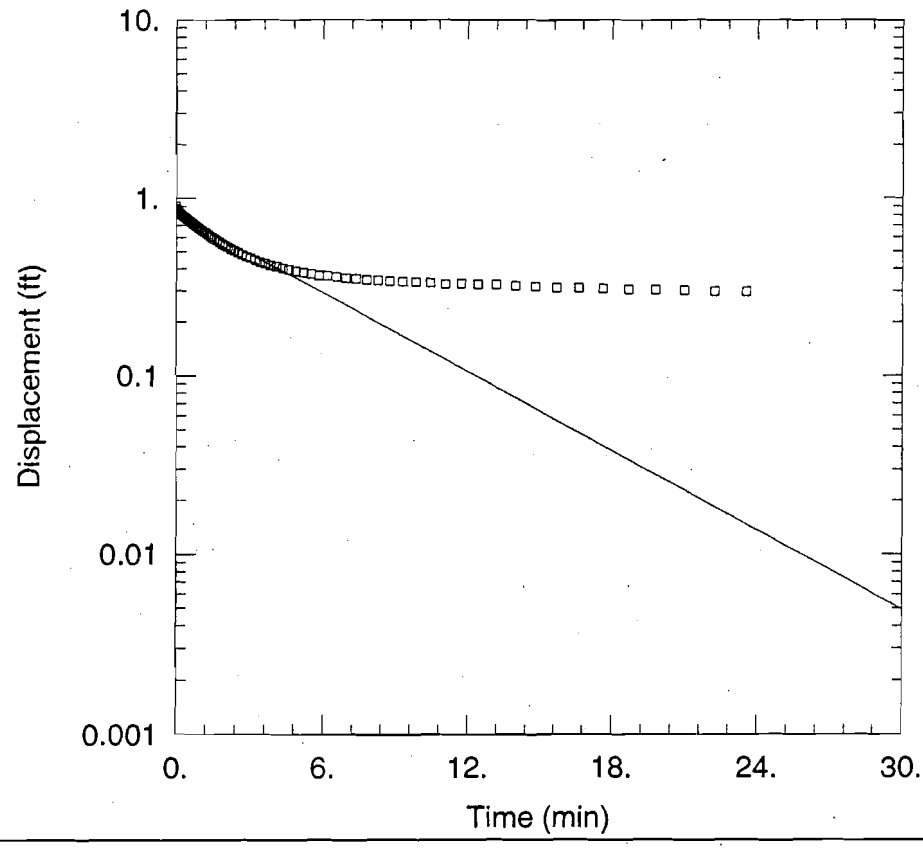
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 9.913 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O
1/10/2005	13:57:44	0	13.8	0
1/10/2005	13:57:44	0.005	13.81	-0.004
1/10/2005	13:57:44	0.01	13.83	0.457
1/10/2005	13:57:45	0.015	13.83	1.041
1/10/2005	13:57:45	0.02	13.83	1.22
1/10/2005	13:57:45	0.025	13.84	1.121
1/10/2005	13:57:46	0.03	13.84	1.105
1/10/2005	13:57:46	0.035	13.84	0.951
1/10/2005	13:57:46	0.04	13.84	1.003
1/10/2005	13:57:46	0.045	13.84	0.984

1/10/2005	13:57:47	0.05	13.84	0.869
1/10/2005	13:57:47	0.055	13.84	0.89
1/10/2005	13:57:47	0.06	13.85	0.753
1/10/2005	13:57:48	0.065	13.85	0.642
1/10/2005	13:57:48	0.07	13.85	1.069
1/10/2005	13:57:48	0.075	13.85	0.706
1/10/2005	13:57:49	0.08	13.85	0.771
1/10/2005	13:57:49	0.085	13.85	0.851
1/10/2005	13:57:49	0.09	13.85	0.769
1/10/2005	13:57:49	0.095	13.85	0.786
1/10/2005	13:57:50	0.1	13.85	0.808
1/10/2005	13:57:50	0.1058	13.85	0.771
1/10/2005	13:57:50	0.112	13.85	0.794
1/10/2005	13:57:51	0.1185	13.85	0.774
1/10/2005	13:57:51	0.1255	13.85	0.782
1/10/2005	13:57:52	0.1328	13.85	0.773
1/10/2005	13:57:52	0.1407	13.85	0.774
1/10/2005	13:57:53	0.149	13.85	0.767
1/10/2005	13:57:53	0.1578	13.86	0.766
1/10/2005	13:57:54	0.1672	13.84	0.755
1/10/2005	13:57:54	0.177	13.84	0.751
1/10/2005	13:57:55	0.1875	13.84	0.749
1/10/2005	13:57:56	0.1985	13.84	0.745
1/10/2005	13:57:56	0.2102	13.84	0.742
1/10/2005	13:57:57	0.2227	13.84	0.738
1/10/2005	13:57:58	0.2358	13.84	0.734
1/10/2005	13:57:59	0.2498	13.84	0.73
1/10/2005	13:58:00	0.2647	13.84	0.726
1/10/2005	13:58:01	0.2803	13.84	0.722
1/10/2005	13:58:02	0.297	13.84	0.718
1/10/2005	13:58:03	0.3147	13.84	0.714
1/10/2005	13:58:04	0.3333	13.84	0.708
1/10/2005	13:58:05	0.3532	13.84	0.704
1/10/2005	13:58:06	0.3742	13.83	0.699
1/10/2005	13:58:08	0.3963	13.84	0.695
1/10/2005	13:58:09	0.4198	13.84	0.689
1/10/2005	13:58:10	0.4447	13.84	0.683
1/10/2005	13:58:12	0.4697	13.83	0.677
1/10/2005	13:58:14	0.4963	13.83	0.67
1/10/2005	13:58:15	0.5247	13.83	0.664
1/10/2005	13:58:17	0.5547	13.84	0.659
1/10/2005	13:58:19	0.5863	13.83	0.652
1/10/2005	13:58:21	0.6213	13.83	0.644
1/10/2005	13:58:23	0.658	13.83	0.638
1/10/2005	13:58:26	0.6963	13.83	0.63
1/10/2005	13:58:28	0.738	13.83	0.623
1/10/2005	13:58:31	0.7813	13.83	0.615
1/10/2005	13:58:33	0.828	13.83	0.607
1/10/2005	13:58:36	0.8763	13.83	0.597
1/10/2005	13:58:39	0.928	13.83	0.587
1/10/2005	13:58:43	0.983	13.83	0.578
1/10/2005	13:58:46	1.0413	13.83	0.57

ET (min)	Feet H2O
0	0.808
0.0058	0.771
0.012	0.794
0.0185	0.774
0.0255	0.782
0.0328	0.773
0.0407	0.774
0.049	0.767
0.0578	0.766
0.0672	0.755
0.077	0.751
0.0875	0.749
0.0985	0.745
0.1102	0.742
0.1227	0.738
0.1358	0.734
0.1498	0.73
0.1647	0.726
0.1803	0.722
0.197	0.718
0.2147	0.714
0.2333	0.708
0.2532	0.704
0.2742	0.699
0.2963	0.695
0.3198	0.689
0.3447	0.683
0.3697	0.677
0.3963	0.67
0.4247	0.664
0.4547	0.659
0.4863	0.652
0.5213	0.644
0.558	0.638
0.5963	0.63
0.638	0.623
0.6813	0.615
0.728	0.607
0.7763	0.597
0.828	0.587
0.883	0.578
0.9413	0.57

1/10/2005	13:58:50	1.103	13.83	0.558	1.003	0.558
1/10/2005	13:58:54	1.168	13.83	0.55	1.068	0.55
1/10/2005	13:58:58	1.238	13.83	0.539	1.138	0.539
1/10/2005	13:59:02	1.3113	13.83	0.529	1.2113	0.529
1/10/2005	13:59:07	1.3897	13.83	0.517	1.2897	0.517
1/10/2005	13:59:12	1.473	13.83	0.505	1.373	0.505
1/10/2005	13:59:17	1.5613	13.83	0.494	1.4613	0.494
1/10/2005	13:59:23	1.6547	13.83	0.484	1.5547	0.484
1/10/2005	13:59:29	1.753	13.83	0.47	1.653	0.47
1/10/2005	13:59:35	1.858	13.83	0.459	1.758	0.459
1/10/2005	13:59:42	1.968	13.83	0.449	1.868	0.449
1/10/2005	13:59:49	2.0847	13.83	0.435	1.9847	0.435
1/10/2005	13:59:56	2.2097	13.83	0.421	2.1097	0.421
1/10/2005	14:00:04	2.3413	13.83	0.412	2.2413	0.412
1/10/2005	14:00:13	2.4813	13.83	0.4	2.3813	0.4
1/10/2005	14:00:22	2.6297	13.83	0.388	2.5297	0.388
1/10/2005	14:00:31	2.7863	13.83	0.376	2.6863	0.376
1/10/2005	14:00:41	2.953	13.83	0.363	2.853	0.363
1/10/2005	14:00:52	3.1297	13.83	0.353	3.0297	0.353
1/10/2005	14:01:03	3.3163	13.83	0.341	3.2163	0.341
1/10/2005	14:01:15	3.5147	13.83	0.33	3.4147	0.33
1/10/2005	14:01:27	3.7247	13.83	0.32	3.6247	0.32
1/10/2005	14:01:41	3.9463	13.83	0.31	3.8463	0.31
1/10/2005	14:01:55	4.1813	13.83	0.302	4.0813	0.302
1/10/2005	14:02:10	4.4297	13.83	0.292	4.3297	0.292
1/10/2005	14:02:25	4.693	13.83	0.285	4.593	0.285
1/10/2005	14:02:42	4.973	13.83	0.275	4.873	0.275
1/10/2005	14:03:00	5.2697	13.83	0.267	5.1697	0.267
1/10/2005	14:03:19	5.583	13.83	0.261	5.483	0.261
1/10/2005	14:03:39	5.9147	13.83	0.253	5.8147	0.253
1/10/2005	14:04:00	6.2663	13.83	0.248	6.1663	0.248
1/10/2005	14:04:22	6.6397	13.84	0.241	6.5397	0.241
1/10/2005	14:04:46	7.0347	13.83	0.236	6.9347	0.236
1/10/2005	14:05:11	7.453	13.84	0.232	7.353	0.232
1/10/2005	14:05:38	7.8963	13.84	0.226	7.7963	0.226
1/10/2005	14:06:06	8.3663	13.84	0.222	8.2663	0.222
1/10/2005	14:06:36	8.8647	13.84	0.216	8.7647	0.216
1/10/2005	14:07:07	9.3913	13.84	0.212	9.2913	0.212
1/10/2005	14:07:41	9.9497	13.84	0.206	9.8497	0.206
1/10/2005	14:08:16	10.5413	13.84	0.202	10.4413	0.202
1/10/2005	14:08:54	11.168	13.84	0.196	11.068	0.196
1/10/2005	14:09:34	11.8313	13.84	0.193	11.7313	0.193
1/10/2005	14:10:16	12.5347	13.84	0.187	12.4347	0.187
1/10/2005	14:11:01	13.2797	13.84	0.181	13.1797	0.181
1/10/2005	14:11:48	14.0697	13.85	0.177	13.9697	0.177
1/10/2005	14:12:38	14.9063	13.85	0.171	14.8063	0.171
1/10/2005	14:13:31	15.7913	13.85	0.165	15.6913	0.165
1/10/2005	14:14:28	16.7297	13.85	0.161	16.6297	0.161
1/10/2005	14:15:27	17.723	13.85	0.155	17.623	0.155



12MWT45 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT45-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:36:05

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT45
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.3137 ft/day
y0 = 0.8117 ft

AQUIFER DATA

Saturated Thickness: 10.92 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT45)

Initial Displacement: 0.9 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 10.92 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT45~ R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10'/26.71 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 15.79 DATE: 1/10/05

TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

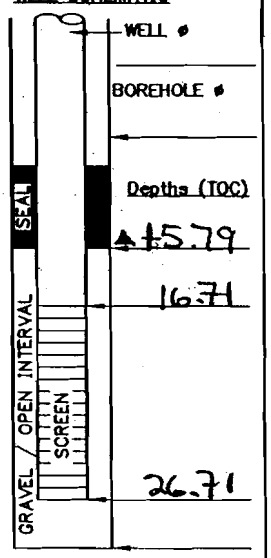
METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

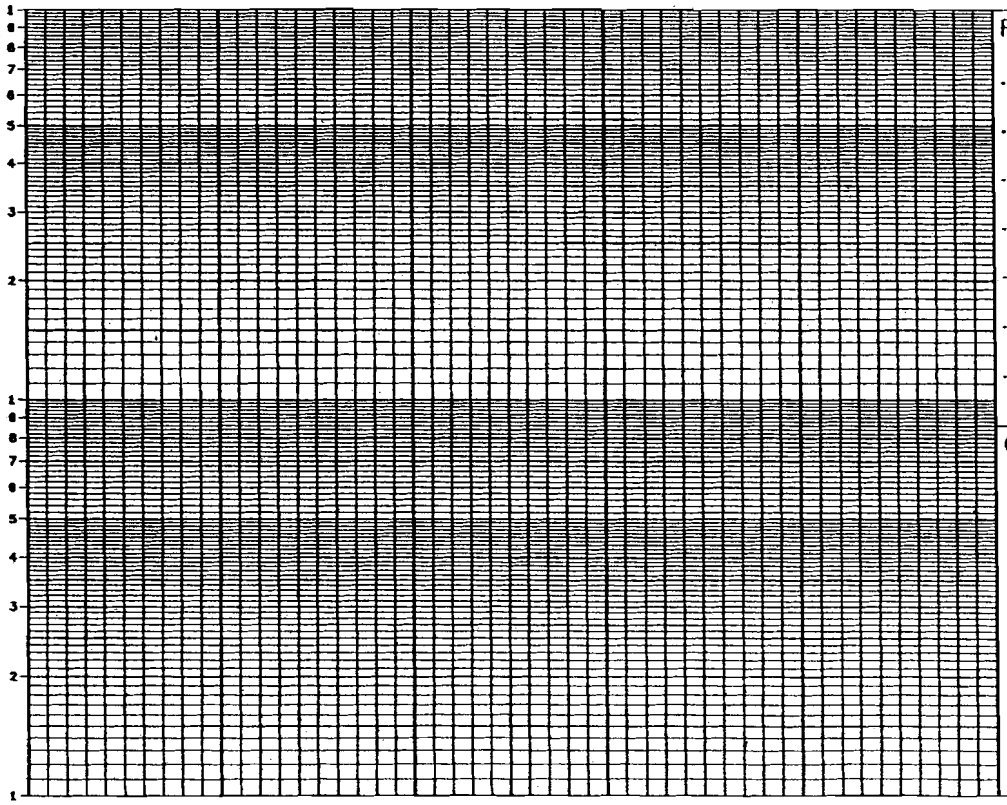
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
		10.92			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph Good
See Printout for
Data

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 14:46:20
Report fror ...\SN04880 2005-01-10 142118 12MWT45-R.bin
Win-Situ V 4.47

Serial num 4880
Firmware \ 3.09
Unit name:

Test name: 12MWT45-R

Test define 1/10/2005 14:20:46
Test starte 1/10/2005 14:21:18
Test stopp 1/10/2005 14:46:09
Test extrac N/A N/A

Data gathered using Logarithmic testing
Maximun Minutes.
Number 116

TOTAL DA 116

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 10.041 Feet H2O

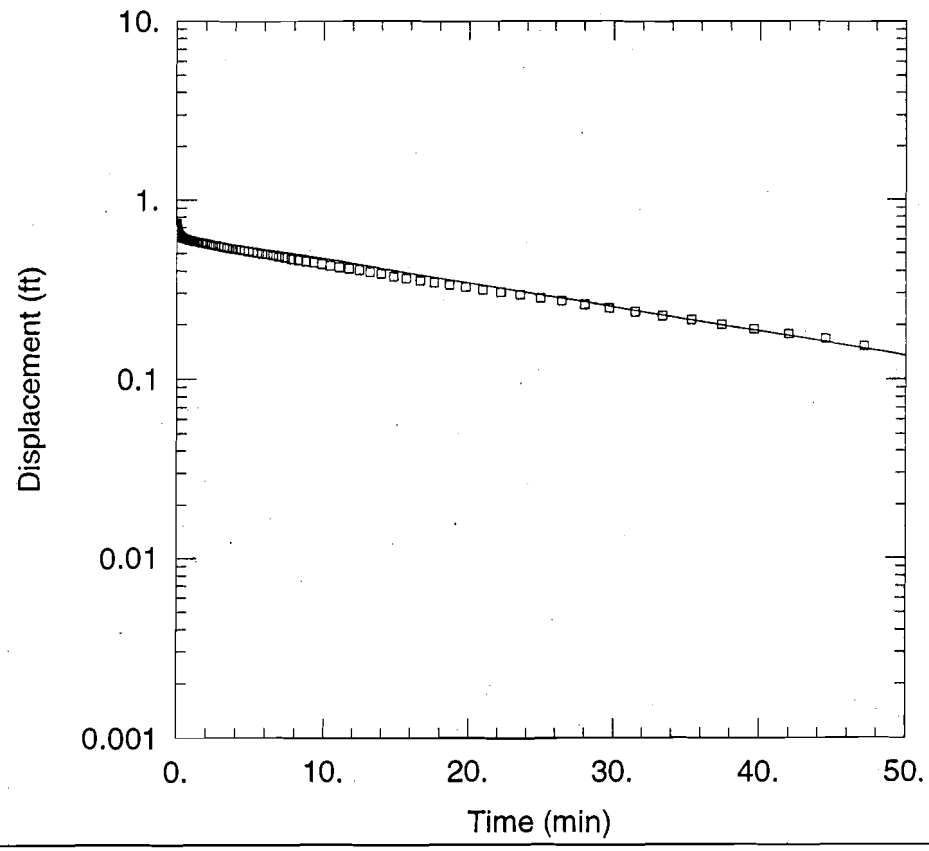
Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O
1/10/2005	14:21:18	0	13.86	0
1/10/2005	14:21:18	0.005	13.89	0.007
1/10/2005	14:21:18	0.01	13.89	-0.919
1/10/2005	14:21:19	0.015	13.9	-1.308
1/10/2005	14:21:19	0.02	13.9	-0.517
1/10/2005	14:21:19	0.025	13.9	-1.423
1/10/2005	14:21:20	0.03	13.9	-0.659
1/10/2005	14:21:20	0.035	13.9	-1.288
1/10/2005	14:21:20	0.04	13.91	-0.66
1/10/2005	14:21:21	0.045	13.91	-1.173

1/10/2005	14:21:21	0.05	13.91	-0.738
1/10/2005	14:21:21	0.055	13.91	-1.07
1/10/2005	14:21:21	0.06	13.91	-0.785
1/10/2005	14:21:22	0.065	13.91	-1.007
1/10/2005	14:21:22	0.07	13.91	-0.82
1/10/2005	14:21:22	0.075	13.91	-0.955
1/10/2005	14:21:23	0.08	13.91	-0.833
1/10/2005	14:21:23	0.085	13.91	-0.929
1/10/2005	14:21:23	0.09	13.91	-0.839
1/10/2005	14:21:24	0.095	13.91	-0.9
1/10/2005	14:21:24	0.1	13.93	-0.849
1/10/2005	14:21:24	0.1058	13.91	-0.878
1/10/2005	14:21:25	0.112	13.91	-0.871
1/10/2005	14:21:25	0.1185	13.91	-0.839
1/10/2005	14:21:25	0.1255	13.91	-0.861
1/10/2005	14:21:26	0.1328	13.91	-0.869
1/10/2005	14:21:26	0.1407	13.91	-0.855
1/10/2005	14:21:27	0.149	13.93	-0.84
1/10/2005	14:21:27	0.1578	13.93	-0.834
1/10/2005	14:21:28	0.1672	13.91	-0.837
1/10/2005	14:21:28	0.177	13.91	-0.839
1/10/2005	14:21:29	0.1875	13.9	-0.839
1/10/2005	14:21:30	0.1985	13.9	-0.837
1/10/2005	14:21:30	0.2102	13.9	-0.837
1/10/2005	14:21:31	0.2227	13.9	-0.831
1/10/2005	14:21:32	0.2358	13.9	-0.825
1/10/2005	14:21:33	0.2498	13.9	-0.825
1/10/2005	14:21:34	0.2647	13.9	-0.82
1/10/2005	14:21:35	0.2803	13.9	-0.818
1/10/2005	14:21:36	0.297	13.9	-0.812
1/10/2005	14:21:37	0.3147	13.9	-0.808
1/10/2005	14:21:38	0.3333	13.9	-0.804
1/10/2005	14:21:39	0.3532	13.9	-0.8
1/10/2005	14:21:40	0.3742	13.9	-0.796
1/10/2005	14:21:42	0.3963	13.9	-0.79
1/10/2005	14:21:43	0.4198	13.9	-0.786
1/10/2005	14:21:45	0.4447	13.89	-0.78
1/10/2005	14:21:46	0.4697	13.9	-0.775
1/10/2005	14:21:48	0.4963	13.9	-0.769
1/10/2005	14:21:49	0.5247	13.9	-0.765
1/10/2005	14:21:51	0.5547	13.9	-0.757
1/10/2005	14:21:53	0.5863	13.9	-0.751
1/10/2005	14:21:55	0.6213	13.89	-0.743
1/10/2005	14:21:57	0.658	13.89	-0.737
1/10/2005	14:22:00	0.6963	13.89	-0.729
1/10/2005	14:22:02	0.738	13.89	-0.722
1/10/2005	14:22:05	0.7813	13.89	-0.714
1/10/2005	14:22:08	0.828	13.89	-0.706
1/10/2005	14:22:10	0.8763	13.89	-0.698
1/10/2005	14:22:14	0.928	13.89	-0.688
1/10/2005	14:22:17	0.983	13.89	-0.681
1/10/2005	14:22:20	1.0413	13.89	-0.671

ET (min)	Feet H2O
0	0.9
0.005	0.849
0.0108	0.878
0.017	0.871
0.0235	0.839
0.0305	0.861
0.0378	0.869
0.0457	0.855
0.054	0.84
0.0628	0.834
0.0722	0.837
0.082	0.839
0.0925	0.839
0.1035	0.837
0.1152	0.837
0.1277	0.831
0.1408	0.825
0.1548	0.825
0.1697	0.82
0.1853	0.818
0.202	0.812
0.2197	0.808
0.2383	0.804
0.2582	0.8
0.2792	0.796
0.3013	0.79
0.3248	0.786
0.3497	0.78
0.3747	0.775
0.4013	0.769
0.4297	0.765
0.4597	0.757
0.4913	0.751
0.5263	0.743
0.563	0.737
0.6013	0.729
0.643	0.722
0.6863	0.714
0.733	0.706
0.7813	0.698
0.833	0.688
0.888	0.681
0.9463	0.671

1/10/2005	14:22:24	1.103	13.89	-0.661	1.008	0.661
1/10/2005	14:22:28	1.168	13.89	-0.651	1.073	0.651
1/10/2005	14:22:32	1.238	13.89	-0.639	1.143	0.639
1/10/2005	14:22:37	1.3113	13.89	-0.632	1.2163	0.632
1/10/2005	14:22:41	1.3897	13.89	-0.62	1.2947	0.62
1/10/2005	14:22:46	1.473	13.89	-0.608	1.378	0.608
1/10/2005	14:22:52	1.5613	13.89	-0.598	1.4663	0.598
1/10/2005	14:22:57	1.6547	13.89	-0.587	1.5597	0.587
1/10/2005	14:23:03	1.753	13.89	-0.575	1.658	0.575
1/10/2005	14:23:09	1.858	13.88	-0.563	1.763	0.563
1/10/2005	14:23:16	1.968	13.88	-0.551	1.873	0.551
1/10/2005	14:23:23	2.0847	13.88	-0.54	1.9897	0.54
1/10/2005	14:23:30	2.2097	13.88	-0.528	2.1147	0.528
1/10/2005	14:23:38	2.3413	13.88	-0.516	2.2463	0.516
1/10/2005	14:23:47	2.4813	13.88	-0.504	2.3863	0.504
1/10/2005	14:23:56	2.6297	13.88	-0.493	2.5347	0.493
1/10/2005	14:24:05	2.7863	13.88	-0.481	2.6913	0.481
1/10/2005	14:24:15	2.953	13.88	-0.469	2.858	0.469
1/10/2005	14:24:26	3.1297	13.88	-0.459	3.0347	0.459
1/10/2005	14:24:37	3.3163	13.88	-0.448	3.2213	0.448
1/10/2005	14:24:49	3.5147	13.88	-0.438	3.4197	0.438
1/10/2005	14:25:01	3.7247	13.88	-0.428	3.6297	0.428
1/10/2005	14:25:15	3.9463	13.88	-0.418	3.8513	0.418
1/10/2005	14:25:29	4.1813	13.88	-0.411	4.0863	0.411
1/10/2005	14:25:44	4.4297	13.88	-0.401	4.3347	0.401
1/10/2005	14:25:59	4.693	13.88	-0.393	4.598	0.393
1/10/2005	14:26:16	4.973	13.88	-0.385	4.878	0.385
1/10/2005	14:26:34	5.2697	13.88	-0.379	5.1747	0.379
1/10/2005	14:26:53	5.583	13.88	-0.373	5.488	0.373
1/10/2005	14:27:13	5.9147	13.88	-0.366	5.8197	0.366
1/10/2005	14:27:34	6.2663	13.88	-0.364	6.1713	0.364
1/10/2005	14:27:56	6.6397	13.88	-0.358	6.5447	0.358
1/10/2005	14:28:20	7.0347	13.88	-0.354	6.9397	0.354
1/10/2005	14:28:45	7.453	13.88	-0.35	7.358	0.35
1/10/2005	14:29:12	7.8963	13.88	-0.346	7.8013	0.346
1/10/2005	14:29:40	8.3663	13.88	-0.344	8.2713	0.344
1/10/2005	14:30:10	8.8647	13.88	-0.34	8.7697	0.34
1/10/2005	14:30:41	9.3913	13.88	-0.336	9.2963	0.336
1/10/2005	14:31:15	9.9497	13.88	-0.334	9.8547	0.334
1/10/2005	14:31:50	10.5413	13.88	-0.332	10.4463	0.332
1/10/2005	14:32:28	11.168	13.88	-0.329	11.073	0.329
1/10/2005	14:33:08	11.8313	13.88	-0.327	11.7363	0.327
1/10/2005	14:33:50	12.5347	13.88	-0.325	12.4397	0.325
1/10/2005	14:34:35	13.2797	13.89	-0.323	13.1847	0.323
1/10/2005	14:35:22	14.0697	13.89	-0.319	13.9747	0.319
1/10/2005	14:36:12	14.9063	13.89	-0.317	14.8113	0.317
1/10/2005	14:37:05	15.7913	13.89	-0.313	15.6963	0.313
1/10/2005	14:38:02	16.7297	13.89	-0.311	16.6347	0.311
1/10/2005	14:39:01	17.723	13.89	-0.307	17.628	0.307
1/10/2005	14:40:04	18.7763	13.89	-0.305	18.6813	0.305
1/10/2005	14:41:11	19.8913	13.89	-0.303	19.7963	0.303
1/10/2005	14:42:22	21.073	13.89	-0.3	20.978	0.3

1/10/2005	14:43:37	22.3247	13.89	-0.298	22.2297	0.298
1/10/2005	14:44:57	23.6497	13.89	-0.296	23.5547	0.296



12MWT46 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT46-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:36:10

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT46
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.05677 ft/day
y0 = 0.6331 ft

AQUIFER DATA

Saturated Thickness: 11.4 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT46)

Initial Displacement: 0.74 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 11.4 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MW746- F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10' TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 15.47 DATE: 1/10/05

TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

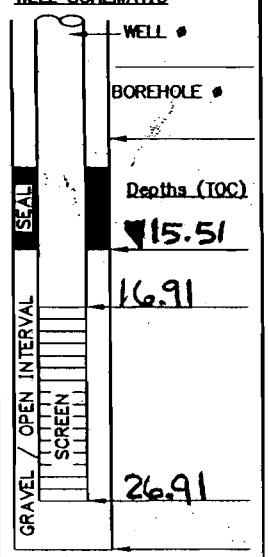
METHOD OF INDUCING WATER LEVEL CHANGE: 1 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

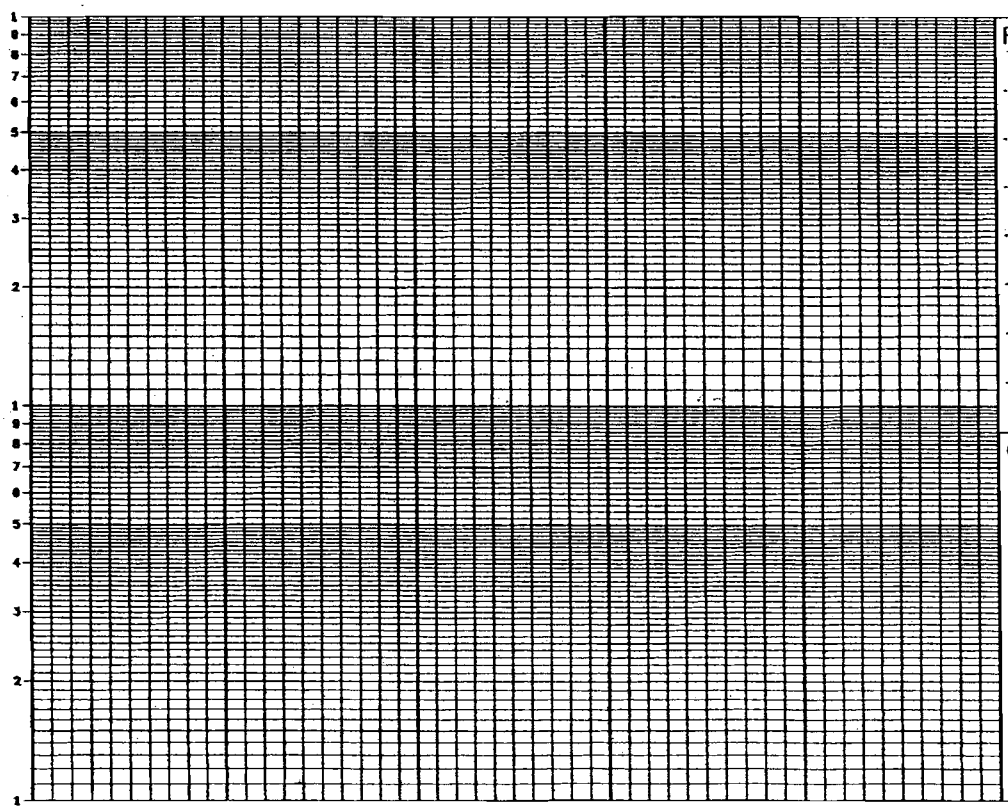
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.04		1.04	25		.28
.065		.89	30		.25
.1		.73	47		.15
.2		.67			
.3		.64			
.5		.62			
1		.60		11.4	
2		.57			
3		.55			
5		.51			
10		.43			
20		.32			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Start @ 1618 HRS

Graph Good.

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 18:31:29
Report fror ...\SN08927 2005-01-10 161820 12MWT46-F.bin
Win-Situ V 4.51

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT46-F

Test define 1/10/2005 16:17:58
Test starte 1/10/2005 16:18:20
Test stopp N/A N/A

Data gathered using Logarithmic testing
Maximun Minutes.
Number 128

TOTAL DA 128

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 10.783 Feet H2O

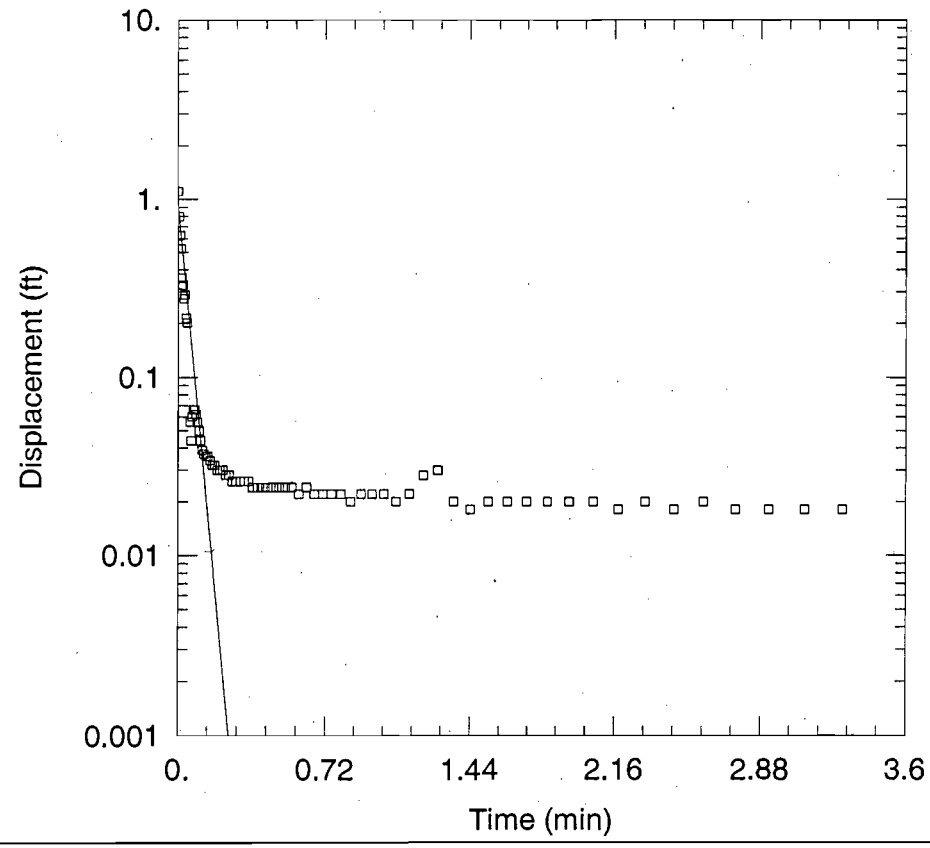
Date	Time	ET (min)	Chan[1] Temperatu Celsius	Chan[2] Pressure Feet H2O
1/10/2005	16:18:20	0	13.79	0
1/10/2005	16:18:20	0.005	13.8	0.012
1/10/2005	16:18:20	0.01	13.81	1.053
1/10/2005	16:18:20	0.015	13.81	1.419
1/10/2005	16:18:21	0.02	13.83	0.656
1/10/2005	16:18:21	0.025	13.83	1.326
1/10/2005	16:18:21	0.03	13.83	0.925
1/10/2005	16:18:22	0.035	13.83	1.17
1/10/2005	16:18:22	0.04	13.83	1.044
1/10/2005	16:18:22	0.045	13.83	0.992

1/10/2005	16:18:23	0.05	13.84	0.574
1/10/2005	16:18:23	0.055	13.84	0.771
1/10/2005	16:18:23	0.06	13.84	0.771
1/10/2005	16:18:23	0.065	13.84	0.886
1/10/2005	16:18:24	0.07	13.84	0.71
1/10/2005	16:18:24	0.075	13.84	0.761
1/10/2005	16:18:24	0.08	13.84	0.819
1/10/2005	16:18:25	0.085	13.84	0.726
1/10/2005	16:18:25	0.09	13.84	0.751
1/10/2005	16:18:25	0.095	13.84	0.771
1/10/2005	16:18:26	0.1	13.84	0.726
1/10/2005	16:18:26	0.1058	13.84	0.74
1/10/2005	16:18:26	0.112	13.85	0.73
1/10/2005	16:18:27	0.1185	13.84	0.72
1/10/2005	16:18:27	0.1255	13.85	0.72
1/10/2005	16:18:28	0.1328	13.85	0.708
1/10/2005	16:18:28	0.1407	13.85	0.706
1/10/2005	16:18:29	0.149	13.85	0.698
1/10/2005	16:18:29	0.1578	13.85	0.692
1/10/2005	16:18:30	0.1672	13.84	0.688
1/10/2005	16:18:30	0.177	13.84	0.68
1/10/2005	16:18:31	0.1875	13.84	0.676
1/10/2005	16:18:32	0.1985	13.84	0.67
1/10/2005	16:18:32	0.2102	13.84	0.663
1/10/2005	16:18:33	0.2227	13.84	0.659
1/10/2005	16:18:34	0.2358	13.84	0.655
1/10/2005	16:18:35	0.2498	13.84	0.651
1/10/2005	16:18:35	0.2647	13.84	0.647
1/10/2005	16:18:36	0.2803	13.84	0.643
1/10/2005	16:18:37	0.297	13.84	0.639
1/10/2005	16:18:38	0.3147	13.84	0.637
1/10/2005	16:18:40	0.3333	13.84	0.633
1/10/2005	16:18:41	0.3532	13.84	0.631
1/10/2005	16:18:42	0.3742	13.84	0.629
1/10/2005	16:18:43	0.3963	13.84	0.627
1/10/2005	16:18:45	0.4198	13.84	0.623
1/10/2005	16:18:46	0.4447	13.84	0.621
1/10/2005	16:18:48	0.4697	13.84	0.621
1/10/2005	16:18:49	0.4963	13.84	0.619
1/10/2005	16:18:51	0.5247	13.84	0.617
1/10/2005	16:18:53	0.5547	13.84	0.615
1/10/2005	16:18:55	0.5863	13.84	0.613
1/10/2005	16:18:57	0.6213	13.84	0.611
1/10/2005	16:18:59	0.658	13.84	0.609
1/10/2005	16:19:01	0.6963	13.84	0.609
1/10/2005	16:19:04	0.738	13.84	0.607
1/10/2005	16:19:06	0.7813	13.84	0.605
1/10/2005	16:19:09	0.828	13.85	0.603
1/10/2005	16:19:12	0.8763	13.85	0.603
1/10/2005	16:19:15	0.928	13.85	0.598
1/10/2005	16:19:19	0.983	13.85	0.598
1/10/2005	16:19:22	1.0413	13.85	0.596

ET (min)	Feet H2O
0	0.74
0.0062	0.73
0.0127	0.72
0.0197	0.72
0.027	0.708
0.0349	0.706
0.0432	0.698
0.052	0.692
0.0614	0.688
0.0712	0.68
0.0817	0.676
0.0927	0.67
0.1044	0.663
0.1169	0.659
0.13	0.655
0.144	0.651
0.1589	0.647
0.1745	0.643
0.1912	0.639
0.2089	0.637
0.2275	0.633
0.2474	0.631
0.2684	0.629
0.2905	0.627
0.314	0.623
0.3389	0.621
0.3639	0.621
0.3905	0.619
0.4189	0.617
0.4489	0.615
0.4805	0.613
0.5155	0.611
0.5522	0.609
0.5905	0.609
0.6322	0.607
0.6755	0.605
0.7222	0.603
0.7705	0.603
0.8222	0.598
0.8772	0.598
0.9355	0.596

1/10/2005	16:19:26	1.103	13.85	0.594	0.9972	0.594
1/10/2005	16:19:30	1.168	13.85	0.592	1.0622	0.592
1/10/2005	16:19:34	1.238	13.85	0.59	1.1322	0.59
1/10/2005	16:19:38	1.3113	13.85	0.588	1.2055	0.588
1/10/2005	16:19:43	1.3897	13.85	0.586	1.2839	0.586
1/10/2005	16:19:48	1.473	13.85	0.584	1.3672	0.584
1/10/2005	16:19:53	1.5613	13.85	0.582	1.4555	0.582
1/10/2005	16:19:59	1.6547	13.85	0.58	1.5489	0.58
1/10/2005	16:20:05	1.753	13.85	0.578	1.6472	0.578
1/10/2005	16:20:11	1.858	13.85	0.574	1.7522	0.574
1/10/2005	16:20:18	1.968	13.85	0.572	1.8622	0.572
1/10/2005	16:20:25	2.0847	13.85	0.57	1.9789	0.57
1/10/2005	16:20:32	2.2097	13.85	0.568	2.1039	0.568
1/10/2005	16:20:40	2.3413	13.85	0.564	2.2355	0.564
1/10/2005	16:20:48	2.4813	13.85	0.56	2.3755	0.56
1/10/2005	16:20:57	2.6297	13.85	0.558	2.5239	0.558
1/10/2005	16:21:07	2.7863	13.87	0.554	2.6805	0.554
1/10/2005	16:21:17	2.953	13.87	0.55	2.8472	0.55
1/10/2005	16:21:27	3.1297	13.87	0.548	3.0239	0.548
1/10/2005	16:21:39	3.3163	13.87	0.544	3.2105	0.544
1/10/2005	16:21:50	3.5147	13.87	0.54	3.4089	0.54
1/10/2005	16:22:03	3.7247	13.87	0.535	3.6189	0.535
1/10/2005	16:22:16	3.9463	13.87	0.531	3.8405	0.531
1/10/2005	16:22:30	4.1813	13.87	0.527	4.0755	0.527
1/10/2005	16:22:45	4.4297	13.88	0.521	4.3239	0.521
1/10/2005	16:23:01	4.693	13.88	0.517	4.5872	0.517
1/10/2005	16:23:18	4.973	13.88	0.513	4.8672	0.513
1/10/2005	16:23:36	5.2697	13.88	0.507	5.1639	0.507
1/10/2005	16:23:55	5.583	13.88	0.501	5.4772	0.501
1/10/2005	16:24:14	5.9147	13.88	0.495	5.8089	0.495
1/10/2005	16:24:36	6.2663	13.89	0.49	6.1605	0.49
1/10/2005	16:24:58	6.6397	13.89	0.484	6.5339	0.484
1/10/2005	16:25:22	7.0347	13.89	0.476	6.9289	0.476
1/10/2005	16:25:47	7.453	13.89	0.47	7.3472	0.47
1/10/2005	16:26:13	7.8963	13.89	0.462	7.7905	0.462
1/10/2005	16:26:42	8.3663	13.9	0.456	8.2605	0.456
1/10/2005	16:27:11	8.8647	13.9	0.448	8.7589	0.448
1/10/2005	16:27:43	9.3913	13.9	0.442	9.2855	0.442
1/10/2005	16:28:17	9.9497	13.9	0.434	9.8439	0.434
1/10/2005	16:28:52	10.5413	13.92	0.425	10.4355	0.425
1/10/2005	16:29:30	11.168	13.92	0.417	11.0622	0.417
1/10/2005	16:30:09	11.8313	13.92	0.409	11.7255	0.409
1/10/2005	16:30:52	12.5347	13.92	0.401	12.4289	0.401
1/10/2005	16:31:36	13.2797	13.92	0.391	13.1739	0.391
1/10/2005	16:32:24	14.0697	13.93	0.383	13.9639	0.383
1/10/2005	16:33:14	14.9063	13.93	0.372	14.8005	0.372
1/10/2005	16:34:07	15.7913	13.93	0.362	15.6855	0.362
1/10/2005	16:35:03	16.7297	13.93	0.352	16.6239	0.352
1/10/2005	16:36:03	17.723	13.94	0.344	17.6172	0.344
1/10/2005	16:37:06	18.7763	13.94	0.334	18.6705	0.334
1/10/2005	16:38:13	19.8913	13.94	0.324	19.7855	0.324
1/10/2005	16:39:24	21.073	13.94	0.313	20.9672	0.313

1/10/2005	16:40:39	22.3247	13.95	0.303	22.2189	0.303
1/10/2005	16:41:59	23.6497	13.95	0.293	23.5439	0.293
1/10/2005	16:43:23	25.0547	13.95	0.281	24.9489	0.281
1/10/2005	16:44:52	26.543	13.95	0.271	26.4372	0.271
1/10/2005	16:46:27	28.118	13.97	0.258	28.0122	0.258
1/10/2005	16:48:07	29.7863	13.97	0.248	29.6805	0.248
1/10/2005	16:49:53	31.5547	13.97	0.236	31.4489	0.236
1/10/2005	16:51:45	33.428	13.97	0.224	33.3222	0.224
1/10/2005	16:53:44	35.4113	13.97	0.214	35.3055	0.214
1/10/2005	16:55:50	37.513	13.98	0.201	37.4072	0.201
1/10/2005	16:58:04	39.7397	13.98	0.189	39.6339	0.189
1/10/2005	17:00:25	42.098	13.98	0.177	41.9922	0.177
1/10/2005	17:02:55	44.5963	13.98	0.167	44.4905	0.167
1/10/2005	17:05:34	47.243	13.98	0.153	47.1372	0.153



12MWT47 - FALLING HEAD TEST

Data Set: C:\Temp\Crane\12MWT47-F_Hvorslev.aqt
Date: 01/26/05 Time: 12:36:15

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT47
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 50.36 ft/day
y0 = 0.9179 ft

AQUIFER DATA

Saturated Thickness: 14.12 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT47)

Initial Displacement: 1.109 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 14.12 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT47-F

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"Φ SCREEN LENGTH/DEPTH: 10'/26.89 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 12.77 DATE: 1/10/05

TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

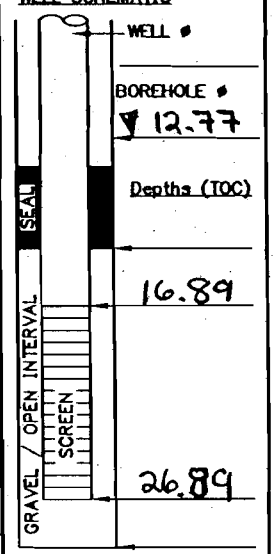
METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

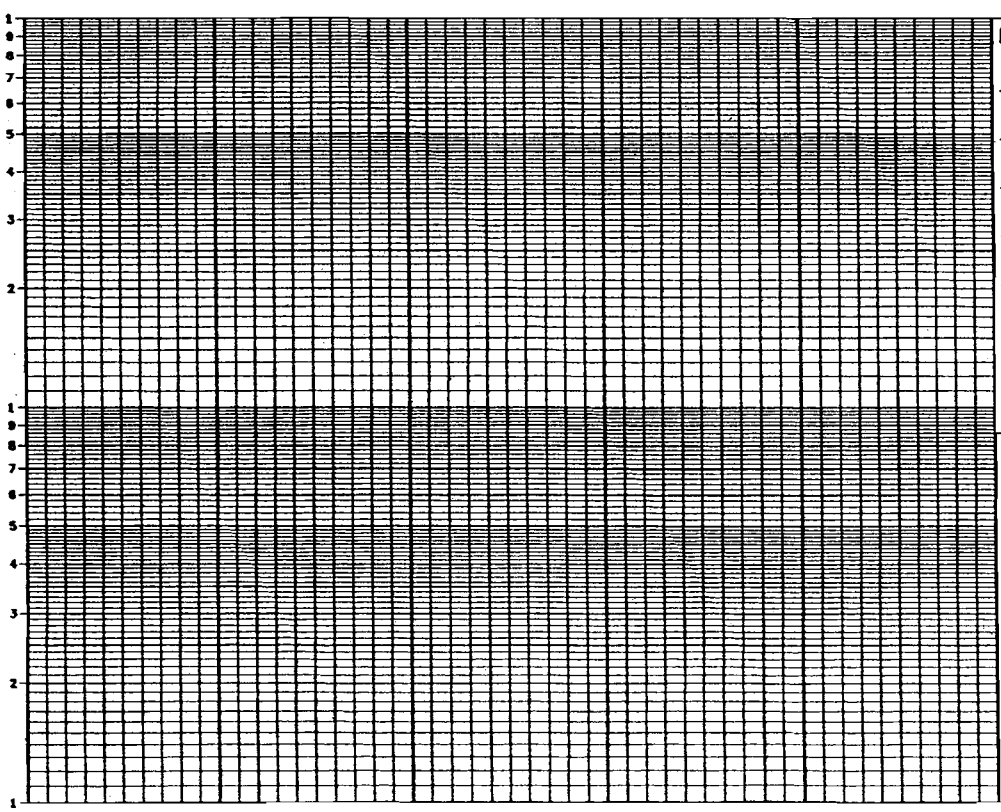
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
				4.12	

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph Good

See print out for

data

CALCS, SKETCH MAPS, ETC.:

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 15:50:02
Report fror ...\SN08927 2005-01-10 154614 12MWT47-F.bin
Win-Situ V 4.47

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT47-F

Test define 1/10/2005 15:44:54
Test starte 1/10/2005 15:46:14
Test stopp 1/10/2005 15:49:42
Test extrac N/A N/A

Data gathered using Logarithmic testing
Maximun Minutes.
Number 82

TOTAL DA 82

Channel number [1]
Measurer Temperature
Channel name:

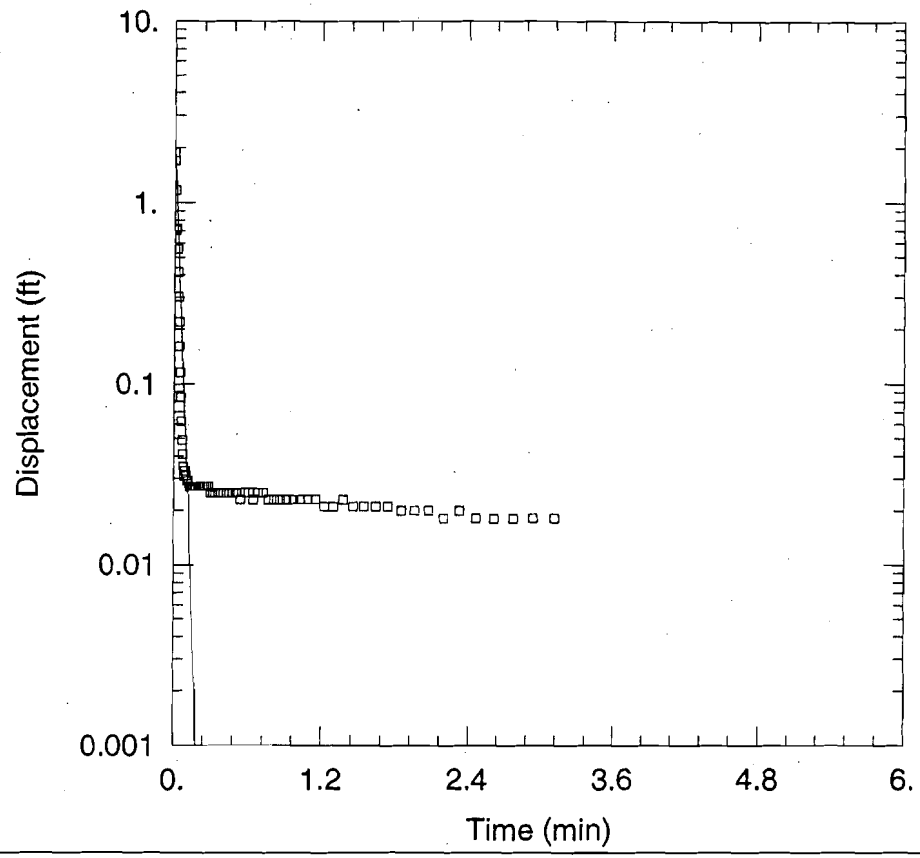
Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 13.664 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O
1/10/2005	15:46:14	0	13.25	0
1/10/2005	15:46:14	0.005	13.26	0.012
1/10/2005	15:46:14	0.01	13.27	0.212
1/10/2005	15:46:15	0.015	13.27	0.532
1/10/2005	15:46:15	0.02	13.28	0.712
1/10/2005	15:46:15	0.025	13.28	1.016
1/10/2005	15:46:15	0.03	13.28	1.109
1/10/2005	15:46:16	0.035	13.28	0.795
1/10/2005	15:46:16	0.04	13.28	0.625
1/10/2005	15:46:16	0.045	13.3	0.526

ET (min)	Feet H2O
0	1.109
0.005	0.795
0.01	0.625
0.015	0.526

1/10/2005	15:46:17	0.05	13.3	0.36	0.02	0.36
1/10/2005	15:46:17	0.055	13.3	0.329	0.025	0.329
1/10/2005	15:46:17	0.06	13.3	0.275	0.03	0.275
1/10/2005	15:46:18	0.065	13.3	0.289	0.035	0.289
1/10/2005	15:46:18	0.07	13.3	0.214	0.04	0.214
1/10/2005	15:46:18	0.075	13.3	0.202	0.045	0.202
1/10/2005	15:46:18	0.08	13.3	-0.246	0.05	-0.246
1/10/2005	15:46:19	0.085	13.3	-0.185	0.055	-0.185
1/10/2005	15:46:19	0.09	13.3	0.056	0.06	0.056
1/10/2005	15:46:19	0.095	13.3	0.044	0.065	0.044
1/10/2005	15:46:20	0.1	13.3	0.06	0.07	0.06
1/10/2005	15:46:20	0.1058	13.3	0.066	0.0758	0.066
1/10/2005	15:46:20	0.112	13.3	0.066	0.082	0.066
1/10/2005	15:46:21	0.1185	13.3	0.062	0.0885	0.062
1/10/2005	15:46:21	0.1255	13.3	0.056	0.0955	0.056
1/10/2005	15:46:22	0.1328	13.3	0.05	0.1028	0.05
1/10/2005	15:46:22	0.1407	13.3	0.044	0.1107	0.044
1/10/2005	15:46:23	0.149	13.31	0.039	0.119	0.039
1/10/2005	15:46:23	0.1578	13.31	0.037	0.1278	0.037
1/10/2005	15:46:24	0.1672	13.3	0.036	0.1372	0.036
1/10/2005	15:46:24	0.177	13.3	0.036	0.147	0.036
1/10/2005	15:46:25	0.1875	13.28	0.034	0.1575	0.034
1/10/2005	15:46:26	0.1985	13.28	0.032	0.1685	0.032
1/10/2005	15:46:26	0.2102	13.28	0.032	0.1802	0.032
1/10/2005	15:46:27	0.2227	13.28	0.03	0.1927	0.03
1/10/2005	15:46:28	0.2358	13.28	0.03	0.2058	0.03
1/10/2005	15:46:29	0.2498	13.28	0.03	0.2198	0.03
1/10/2005	15:46:30	0.2647	13.28	0.028	0.2347	0.028
1/10/2005	15:46:31	0.2803	13.28	0.028	0.2503	0.028
1/10/2005	15:46:32	0.297	13.28	0.026	0.267	0.026
1/10/2005	15:46:33	0.3147	13.28	0.026	0.2847	0.026
1/10/2005	15:46:34	0.3333	13.28	0.026	0.3033	0.026
1/10/2005	15:46:35	0.3532	13.28	0.026	0.3232	0.026
1/10/2005	15:46:36	0.3742	13.28	0.026	0.3442	0.026
1/10/2005	15:46:37	0.3963	13.28	0.024	0.3663	0.024
1/10/2005	15:46:39	0.4198	13.28	0.024	0.3898	0.024
1/10/2005	15:46:40	0.4447	13.28	0.024	0.4147	0.024
1/10/2005	15:46:42	0.4697	13.28	0.024	0.4397	0.024
1/10/2005	15:46:43	0.4963	13.27	0.024	0.4663	0.024
1/10/2005	15:46:45	0.5247	13.28	0.024	0.4947	0.024
1/10/2005	15:46:47	0.5547	13.28	0.024	0.5247	0.024
1/10/2005	15:46:49	0.5863	13.28	0.024	0.5563	0.024
1/10/2005	15:46:51	0.6213	13.28	0.022	0.5913	0.022
1/10/2005	15:46:53	0.658	13.28	0.024	0.628	0.024
1/10/2005	15:46:55	0.6963	13.28	0.022	0.6663	0.022
1/10/2005	15:46:58	0.738	13.27	0.022	0.708	0.022
1/10/2005	15:47:01	0.7813	13.27	0.022	0.7513	0.022
1/10/2005	15:47:03	0.828	13.27	0.022	0.798	0.022
1/10/2005	15:47:06	0.8763	13.27	0.02	0.8463	0.02
1/10/2005	15:47:09	0.928	13.27	0.022	0.898	0.022
1/10/2005	15:47:13	0.983	13.27	0.022	0.953	0.022
1/10/2005	15:47:16	1.0413	13.27	0.022	1.0113	0.022

1/10/2005	15:47:20	1.103	13.27	0.02	1.073	0.02
1/10/2005	15:47:24	1.168	13.27	0.022	1.138	0.022
1/10/2005	15:47:28	1.238	13.27	0.028	1.208	0.028
1/10/2005	15:47:32	1.3113	13.27	0.03	1.2813	0.03
1/10/2005	15:47:37	1.3897	13.27	0.02	1.3597	0.02
1/10/2005	15:47:42	1.473	13.27	0.018	1.443	0.018
1/10/2005	15:47:47	1.5613	13.27	0.02	1.5313	0.02
1/10/2005	15:47:53	1.6547	13.26	0.02	1.6247	0.02
1/10/2005	15:47:59	1.753	13.26	0.02	1.723	0.02
1/10/2005	15:48:05	1.858	13.26	0.02	1.828	0.02
1/10/2005	15:48:12	1.968	13.26	0.02	1.938	0.02
1/10/2005	15:48:19	2.0847	13.26	0.02	2.0547	0.02
1/10/2005	15:48:26	2.2097	13.26	0.018	2.1797	0.018
1/10/2005	15:48:34	2.3413	13.26	0.02	2.3113	0.02
1/10/2005	15:48:43	2.4813	13.26	0.018	2.4513	0.018
1/10/2005	15:48:51	2.6297	13.26	0.02	2.5997	0.02
1/10/2005	15:49:01	2.7863	13.26	0.018	2.7563	0.018
1/10/2005	15:49:11	2.953	13.26	0.018	2.923	0.018
1/10/2005	15:49:21	3.1297	13.25	0.018	3.0997	0.018
1/10/2005	15:49:33	3.3163	13.25	0.018	3.2863	0.018



12MWT47 - RISING HEAD TEST

Data Set: C:\Temp\Crane\12MWT47-R_Hvorslev.aqt
Date: 01/26/05 Time: 12:36:19

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: Navy - CRANE
Project: N6878
Test Location: NSWC CRANE - Indiana
Test Well: 12MWT47
Test Date: 1-10-2005

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 74.44 ft/day
y0 = 2.168 ft

AQUIFER DATA

Saturated Thickness: 14.12 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (12MWT47)

Initial Displacement: 1.884 ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft

Casing Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 14.12 ft

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: NSWC CRANE WELL/BORING NO.: 12MWT47 R

PROJECT NO.: N6878 GEOLOGIST: CONTI

WELL DIAMETER: 2"ϕ SCREEN LENGTH/DEPTH: 10' TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 12.77 DATE: 1/10/05

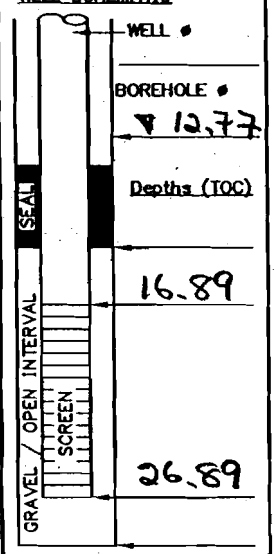
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: 2 SEC SLUG PAGE 1 OF 1

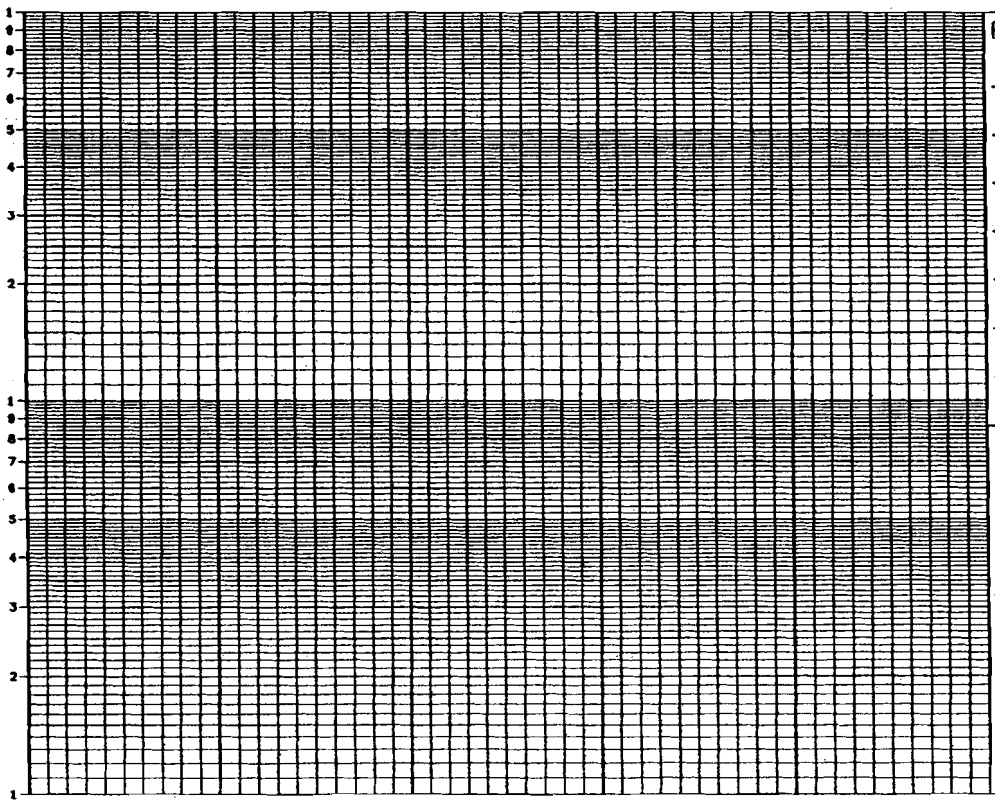
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
.015		-1.884			
.02		-1.695			
.03		-.707			
.04		-.56			
.05		-.30			
.06		-.16			
.07		-.08		14.12	
.08		-.05			
.1		-.03			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Graph Good

CALCS, SKETCH MAPS, ETC.:

ACAD: FORM_HYDCONTST.dwg 07/06/99 INL

In-Situ Inc. MiniTroll Pro

Report gen 1/10/2005 15:55:26
Report fror ...\SN08927 2005-01-10 155215 12MWT47-R.bin
Win-Situ V 4.47

Serial num 8927
Firmware \ 3.09
Unit name:

Test name: 12MWT47-R

Test define 1/10/2005 15:51:45
Test starte 1/10/2005 15:52:15
Test stopp 1/10/2005 15:55:28
Test extrac N/A N/A

Data gathered using Logarithmic testing
Maximun Minutes.
Number 81

TOTAL DA 81

Channel number [1]
Measurer Temperature
Channel name:

Channel number [2]
Measurer Pressure
Channel name:
Sensor R 30 PSIG.
Specific g 1
Mode: Surface
User-defi 0 Feet H2O
Referenc test start
Pressure 13.68 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O
1/10/2005	15:52:15	0	13.23	0
1/10/2005	15:52:15	0.005	13.26	0.004
1/10/2005	15:52:15	0.01	13.26	-0.964
1/10/2005	15:52:16	0.015	13.27	-1.884
1/10/2005	15:52:16	0.02	13.27	-1.695
1/10/2005	15:52:16	0.025	13.27	-1.169
1/10/2005	15:52:16	0.03	13.27	-0.707
1/10/2005	15:52:17	0.035	13.28	-0.722
1/10/2005	15:52:17	0.04	13.28	-0.558
1/10/2005	15:52:17	0.045	13.28	-0.416

ET (min)	Feet H2O
0	1.884
0.005	1.695
0.01	1.169
0.015	0.707
0.02	0.722
0.025	0.558
0.03	0.416

1/10/2005	15:52:18	0.05	13.28	-0.303	0.035	0.303
1/10/2005	15:52:18	0.055	13.28	-0.22	0.04	0.22
1/10/2005	15:52:18	0.06	13.28	-0.161	0.045	0.161
1/10/2005	15:52:19	0.065	13.28	-0.116	0.05	0.116
1/10/2005	15:52:19	0.07	13.28	-0.084	0.055	0.084
1/10/2005	15:52:19	0.075	13.28	-0.062	0.06	0.062
1/10/2005	15:52:19	0.08	13.28	-0.049	0.065	0.049
1/10/2005	15:52:20	0.085	13.28	-0.041	0.07	0.041
1/10/2005	15:52:20	0.09	13.28	-0.035	0.075	0.035
1/10/2005	15:52:20	0.095	13.28	-0.031	0.08	0.031
1/10/2005	15:52:21	0.1	13.28	-0.033	0.085	0.033
1/10/2005	15:52:21	0.1058	13.28	-0.033	0.0908	0.033
1/10/2005	15:52:21	0.112	13.28	-0.031	0.097	0.031
1/10/2005	15:52:22	0.1185	13.3	-0.031	0.1035	0.031
1/10/2005	15:52:22	0.1255	13.28	-0.029	0.1105	0.029
1/10/2005	15:52:23	0.1328	13.28	-0.029	0.1178	0.029
1/10/2005	15:52:23	0.1407	13.3	-0.027	0.1257	0.027
1/10/2005	15:52:24	0.149	13.3	-0.027	0.134	0.027
1/10/2005	15:52:24	0.1578	13.3	-0.027	0.1428	0.027
1/10/2005	15:52:25	0.1672	13.28	-0.027	0.1522	0.027
1/10/2005	15:52:25	0.177	13.28	-0.027	0.162	0.027
1/10/2005	15:52:26	0.1875	13.28	-0.027	0.1725	0.027
1/10/2005	15:52:27	0.1985	13.28	-0.027	0.1835	0.027
1/10/2005	15:52:27	0.2102	13.28	-0.027	0.1952	0.027
1/10/2005	15:52:28	0.2227	13.27	-0.027	0.2077	0.027
1/10/2005	15:52:29	0.2358	13.27	-0.027	0.2208	0.027
1/10/2005	15:52:30	0.2498	13.27	-0.027	0.2348	0.027
1/10/2005	15:52:31	0.2647	13.27	-0.027	0.2497	0.027
1/10/2005	15:52:31	0.2803	13.27	-0.027	0.2653	0.027
1/10/2005	15:52:32	0.297	13.27	-0.027	0.282	0.027
1/10/2005	15:52:34	0.3147	13.27	-0.025	0.2997	0.025
1/10/2005	15:52:35	0.3333	13.27	-0.025	0.3183	0.025
1/10/2005	15:52:36	0.3532	13.27	-0.025	0.3382	0.025
1/10/2005	15:52:37	0.3742	13.27	-0.025	0.3592	0.025
1/10/2005	15:52:38	0.3963	13.27	-0.025	0.3813	0.025
1/10/2005	15:52:40	0.4198	13.27	-0.025	0.4048	0.025
1/10/2005	15:52:41	0.4447	13.27	-0.025	0.4297	0.025
1/10/2005	15:52:43	0.4697	13.27	-0.025	0.4547	0.025
1/10/2005	15:52:44	0.4963	13.27	-0.025	0.4813	0.025
1/10/2005	15:52:46	0.5247	13.27	-0.025	0.5097	0.025
1/10/2005	15:52:48	0.5547	13.27	-0.023	0.5397	0.023
1/10/2005	15:52:50	0.5863	13.27	-0.025	0.5713	0.025
1/10/2005	15:52:52	0.6213	13.27	-0.025	0.6063	0.025
1/10/2005	15:52:54	0.658	13.27	-0.023	0.643	0.023
1/10/2005	15:52:56	0.6963	13.27	-0.025	0.6813	0.025
1/10/2005	15:52:59	0.738	13.27	-0.025	0.723	0.025
1/10/2005	15:53:02	0.7813	13.26	-0.023	0.7663	0.023
1/10/2005	15:53:04	0.828	13.26	-0.023	0.813	0.023
1/10/2005	15:53:07	0.8763	13.26	-0.023	0.8613	0.023
1/10/2005	15:53:10	0.928	13.26	-0.023	0.913	0.023
1/10/2005	15:53:14	0.983	13.26	-0.023	0.968	0.023
1/10/2005	15:53:17	1.0413	13.26	-0.023	1.0263	0.023

1/10/2005	15:53:21	1.103	13.26	-0.023	1.088	0.023
1/10/2005	15:53:25	1.168	13.26	-0.023	1.153	0.023
1/10/2005	15:53:29	1.238	13.26	-0.021	1.223	0.021
1/10/2005	15:53:33	1.3113	13.26	-0.021	1.2963	0.021
1/10/2005	15:53:38	1.3897	13.26	-0.023	1.3747	0.023
1/10/2005	15:53:43	1.473	13.26	-0.021	1.458	0.021
1/10/2005	15:53:48	1.5613	13.26	-0.021	1.5463	0.021
1/10/2005	15:53:54	1.6547	13.26	-0.021	1.6397	0.021
1/10/2005	15:54:00	1.753	13.26	-0.021	1.738	0.021
1/10/2005	15:54:06	1.858	13.25	-0.02	1.843	0.02
1/10/2005	15:54:13	1.968	13.25	-0.02	1.953	0.02
1/10/2005	15:54:20	2.0847	13.25	-0.02	2.0697	0.02
1/10/2005	15:54:27	2.2097	13.25	-0.018	2.1947	0.018
1/10/2005	15:54:35	2.3413	13.25	-0.02	2.3263	0.02
1/10/2005	15:54:44	2.4813	13.25	-0.018	2.4663	0.018
1/10/2005	15:54:52	2.6297	13.25	-0.018	2.6147	0.018
1/10/2005	15:55:02	2.7863	13.25	-0.018	2.7713	0.018
1/10/2005	15:55:12	2.953	13.25	-0.018	2.938	0.018
1/10/2005	15:55:22	3.1297	13.25	-0.018	3.1147	0.018

APPENDIX F

SWMU 12

HEALTH AND SAFETY DOCUMENTATION

ROUND 1 AND ROUND 2

APPENDIX F.1

SWMU 12

HEALTH AND SAFETY DOCUMENTATION ROUND 1

Project-Level H&S Recordkeeping

On-site H&S training (topics, participants, dates)...See Section F

Air monitoring instrument calibration...See Section C (C.9.1 & C.9.2)

Monitoring instrument results including background levels, breathing zone readings, personnel exposure records, etc. (air monitoring, noise monitoring, other H&S quantitative measurements)...See Section B.1

H&S training and medical certificates/documents for site personnel... See Section F

Site specific written program documentation... See Section F – HILL 600 RAILWAY ACCESS PLAN

H&S Site clearance letters... See Section F

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial investigation activities at CRANE and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present at the sites
- Use of personal protective equipment
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Initial response procedures
- Review of the contents of relevant Material Safety Data Sheets
- Review of the use of Safe Work Permits

I have been given the opportunity to ask questions and all of my questions have been answered to my satisfaction. I further state, that the dates of my training (introductory, refresher, and supervisory, as applicable) and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam
Josh Dean	7-8-04	8-'02	12-'03	NA	8-'03
Jim WAISH	7-8-04	may 87	12-2003	2001	2-1-04
BRUCE KIRKPATRICK	7-8-04	1986	1-2004	NA	11-03
DONALD NULL	7-8-04	1998	12-03	NA	11-03
Charles C. Lancey III	7-8-04	4/30/92	~~7/10~~ 9/5/02	1998	3-04
Jim Goerdt	7-8-04	12/91	10/03	NA	11/03
SJ CONTI	7-8-04	8/83	5/14/04	"84"	12/02
TERRY ROSAYN	7-8-04	9/85	1/04	1/04	11/02
Chad Mahaffy	7-23-04	2002	12-2003	12-2003	12/03
JOSH DUTTON	8/9/04	12/01	10/17/03	NA	1/16/04

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigation activities at NSWC Crane, and that I have received site-specific training that included the elements presented below:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- The contents of the health and safety plan including Table 5-1 and 6-1
- Emergency response procedures (evacuation and assembly points)
- Review contents of relevant Material Safety Data Sheets
- Review of Safe Work Permits

I have been given the opportunity to ask questions and that my questions have been answered to my satisfaction. The dates of my training and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam
KEN BOEHMER	8/26/04	9/87	12-27-03		FEB MARCH 04
JOHN DAVIS	8/26/04	11/02	12-27-03		12/03
Todd Wollenhaupt	8/26/04	11/02	12-27-03		11/03

Railway Access Plan Pre-Task Briefing
Attestment

By my signature below, I attest that I have participated in a pre-task briefing which included a review of the TtNUS Railway Access Plan for NSWC Crane Hill 600 activities. This briefing addressed supervision and communication of on-track safety methods prior to commencing work in this area, in accordance with Federal Railroad Administration regulation 49 CFR 214.315.

My signature also indicates that I was provided an opportunity to ask questions during this briefing, and that any questions raised were addressed to my satisfaction.

Name (Printed)	Signature	Date	FOL Initials*
JAMES R. WAISK		10-25-04	TR
Stan Conti		10-25-04	TR
TERRY ROJAHN		10-25-04	TR
Todd Wilkenhaupt		10-25-04	TR
Josh Dean		10-25-04	TR

NUS CORPORATION

Certificate of Training

THIS CERTIFIES THAT

TERRY ROJAHN

has successfully completed a course of instruction on

SUPERFUND TRAINING CLASS

prepared and conducted by the
NUS Corporation, Pittsburgh, Pennsylvania

SEPT. 30 - OCT. 4, 1985
Date of Award

Gary F. Smith, C.S.P.
Director; Health, Safety Training

E. Dennis Escher, P.E.
Vice President

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Terry R. Rojahn

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

February 25, 2005

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Terry Rojahn

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

January 30, 2004

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

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RELEASE TO DUTY

CLINIC INSTRUCTIONS: Complete and give to employee before they leave the facility. This is a requirement of Tetra-Tech NUS.

Employee Name: TERRY ROJAHN

Office Location: PITTSBURGH

Yes	No	
☑	☐	To work with hazardous materials in accordance with 29 CFR 1910.120.
☑	☐	To use respiratory protective equipment in accordance with 29 CFR 1910.134/

Based on the limited information available to me at this time, I find no necessity for immediate restrictions and I release this employee for duty. It is understood and agreed upon by the employer or potential employer of this examinee that subsequent comprehensive review of all laboratory and other test data by WorkCare may detect health conditions not apparent to me. It is further agreed and understood that such health conditions may necessitate the need for workplace restrictions. Examination has been performed in compliance with 1910.120 and 1910.134.

Signed: Anna Young M.D.

Date: 11/10/02

Employee

Bring this form back to the office and fax it to:
Matt Soltis, Corporate Health & Safety (412) 921-4040.

333 S. Anita Drive, Suite 630, Orange, CA 92868 • (714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154
E-mail: info@workcare.com • Website: www.workcare.com

WorkCare™

RELEASE TO DUTY

CLINIC INSTRUCTIONS: Complete and give to employee before they leave the facility. This is a requirement of Tetra-Tech.

Employee Name: Terry Rojhan

Office Location: Bluewater

Yes	No	
☒	☐	To work with hazardous materials in accordance with 29 CFR 1910.120.
☒	☐	To use respiratory protective equipment in accordance with 29 CFR 1910.134/

Based on the limited information available to me at this time, I find no necessity for immediate restrictions and I release this employee for duty. It is understood and agreed upon by the employer or potential employer of this examinee that subsequent comprehensive review of all laboratory and other test data by WorkCare may detect health conditions not apparent to me. It is further agreed and understood that such health conditions may necessitate the need for workplace restrictions. Examination has been performed in compliance with 1910.120 and 1910.134.

Signed: [illegible] M.D.

Date: 11-5-04

333 S. Anita Drive, Suite 630, Orange, CA 92868 • (714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154
E-mail info@workcare.com • Website: www.workcare.com

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, Pennsylvania 15220-2745
(412) 921-7090 • FAX (412) 921-4040 • www.tetratech.com

March 11, 2003

Mr. Stanley Conti
Tetra Tech NUS, Inc.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220

Whom It May Concern:

This letter is to certify that Mr. Stanley Conti successfully completed a course of instruction in Hazardous Materials Handling for Hazardous Waste Site Workers which meets the criteria established in 29 CFR 1910.120(e)(3)(i). This course was prepared and conducted by Tetra Tech NUS (formerly Brown and Root Environmental, a division of HALLIBURTON NUS Corporation) in September 1983. If you have any questions, please feel free to contact me.

Very truly yours,

James K. Laffey
Manager, Training Resources

JKL:lld

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Stan Conti

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910/120

GENERAL SITE WORKER REFRESHER
AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

May 14, 2004
Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Lafferty
Manager
Training Services

WORKCARE™

A Trademark of WorkCare, Inc.

RELEASE TO DUTY

CLINIC INSTRUCTIONS: Complete and give to employee before they leave the facility. This is a requirement of Tetra-Tech.

Employee Name: Stanley Conti

Office Location: Tetra Tech

Yes	No	
☒	☐	To work with hazardous materials in accordance with 29 CFR 1910.120.
☒	☐	To use respiratory protective equipment in accordance with 29 CFR 1910.134.

Based on the limited information available to me at this time, I find no necessity for immediate restrictions and I release this employee for duty. It is understood and agreed upon by the employer or potential employer of this examinee that subsequent comprehensive review of all laboratory and other test data by WorkCare may detect health conditions not apparent to me. It is further agreed and understood that such health conditions may necessitate the need for workplace restrictions. Examination has been performed in compliance with 1910.120 and 1910.134.

Signed: [illegible] M.D.

Date: 12/13/08

Employee

Bring this form back to the office and fax it to:
Matt Soltis, Corporate Health & Safety (412) 921-4040

333 S. Anita Drive, Suite 630, Orange, CA 92868 • (714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154
E-mail: info@workcare.com • Website: www.workcare.com

TECHNICAL ENVIRONMENTAL SERVICE TRAINING INSTITUTE

certifies that

CHARLES C. LANEY III

has successfully met the 29 CFR 1910.120 certificate requirements for the course entitled

40 HOUR HEALTH & SAFETY TRAINING - GENERAL SITE WORKER (E-3-1) -

and in evidence thereof is awarded this

CERTIFICATE OF COMPLETION

on the 30 TH day of APRIL, 1992

APRIL 30, 1992

Passed Exam

HSW-00780

Certificate Number

TEST institute

Anthony L. Egitto, Director

1110 Navaho Dr. • Suite 602 • Raleigh, North Carolina 27609 • 919-876-8440

© 00E5 461

LITHO IN U.S.A.

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Charles C. Laney III

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

September 5, 2002

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

WorkCare™

Release to Duty

NAME OF EXAMINEE: Charles Loney III

DATE: 7-18-02

CLINIC NAME: SECURE MEDICAL CARE
803 Russell Avenue
Gaithersburg, MD 20879-3584

COMPANY NAME: TT NUS

Based on the limited information WorkCare™ has requested me to review, as stipulated in the WorkCare Clinical Operations Manual, I find no necessity for immediate restrictions and I release this employee for duty. It is understood and agreed upon by the employer or potential employer of this examinee that subsequent comprehensive review of all laboratory and other test data by WorkCare, may detect health conditions not apparent to me. It is further agreed that such health conditions may necessitate the need for workplace restrictions.

MARTIN T. LISS, M.D.

Signed: _____ M.D.
Examining Physician

Dated: 7-18-2002

333 S. Anita Drive, Suite 630, Orange, CA 92868 • (714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Mark Peterson

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

January 29, 2004

Date of Award

Matthew M. Soltis, CIH, CSP
Manager
Health and Safety

APPLIED EDUCATIONAL SERIES

James D. Goerdt

APPLIED ASSOCIATES INTERNATIONAL INC

CERTIFICATE

OSHA, 1910.120 Hazardous Waste Operations and Emergency Response 40 Hour Course

ISSUE DATE: December 13, 1991

EXPIRATION: December 13, 1992

CERTIFICATE: HAZ9112001058

STEVEN L. WILLIAMS
President

THOMAS O. MURRAY
Certified Industrial Hygenist

P. O. Box 300068
Fern Park, Florida 32730-0068

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Jim Goerdt

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER
REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

October 10, 2003

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

EMPLOYEE:	Goerdt, James	**COMPANY:**	TT/NUS
SSN:	481-86-2691	**POSITION:**	Environmental Scientist
DATE OF EXAM:	11/07/2003	**LOCATION:**	TT/NUS-Pittsburgh
EXPIRATION DATE:	11/07/2005	**SITE:**	Pittsburgh

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☑	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☑	☐

STATUS

1. ☑ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. ☐ **NOT QUALIFIED**

4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Scott Hardy, M.D. Date: 11/11/03

Signature: Scott Hardy MD

WorkCare
333 S. Anita Drive, Suite 630, Orange, CA 92868
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

[redacted]

OCCUPATIONAL HEALTH & SAFETY SOLUTIONS

This certificate is confirmation that

Joshua Dutton

has successfully completed the course and examination for

40 HOUR HAZWOPER TRAINING

December, 2001

Indianapolis, Indiana

Certificate No. 010471

Course Director

TRAINING CERTIFICATE

Presented to:

Joshua Dutton

Has successfully completed the:

8-Hour HAZWOPER Refresher Course

Presented By: Scott Defenbaugh

Presented this 17th day of October, 2003

Workplace

Workplace Safety & Health Company, Inc.

Scott W. Defenbaugh – Trainer

MEDICAL APPROVAL FORM

For Employees of Environmental Field Services, Inc.

Participant Name : Joshua Dutton Date & Time of Examination: January 16th @ 8:00a.m.

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA 29 CFR 1910.120, and found to be medically
   (✓) qualified to perform work at hazardous work sites.
   ( ) not qualified to perform work at hazardous work sites.

- and -

2. Undergone a physical examination as per OSHA 29 CFR 1910.134, and found to be medically
   (✓) qualified to wear respiratory protection.
   ( ) not qualified to wear respirator protection.

My evaluation has been based on the following, as provided to me by the employer.

(✓) A Copy of OSHA Standards 29 CFR 1910.120 and appendices.
(✓) A description of the employee's duties as they relate to the employee's exposure.
( ) A list of known/suspected contaminants and their concentrations (if known)
(✓) A description of any personal protective equipment used or to be used.
(✓) Information from previous medical examinations of the employee which is used not readily available to the examining physician.

I, Josh T Perri, have examined Josh Dutton

Physician's Name (Print) Participant's Name (Print)

and have determined the following information:

1. Results of medical examination and test (excluding finding or diagnoses unrelated to occupational exposure):

   none

2. Any detected medical conditions which place the employee at increase risk of material impairment of the employee's health :

   none

3. Recommended limitations upon the employee's assigned work :

   none

I have informed this participant of the results of this medical examination and any medical conditions which require further examination of treatment.

Based on this information provided to me, and in view of the activities and hazardous potentials involved at hazardous work sites, his participant

(✓) may
( ) may not

perform his/her assigned tasks.

Physician's Signature : [signature]

Address: 14828 Grayland Ct 46032

Phone Number: 5829210

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

Kenneth A. Boehmer

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 348
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: Kenneth A Boehmer

To be placed on the certificate

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

Donald B. Kirkpatrick

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 344
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: Donald B Kirkpatrick

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

David W. Schrecengost

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 1236
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: David Schrecengost

To be placed on the certificate

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

Dennis A. Sink

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 1270
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: Dennis A Sink

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

John E. Filbrun

, entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 1006
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: John Filbrun

To be placed on the certificate

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

Timothy L. Boehmer

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 349
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: Timothy L Boehmer

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

Jon T. Keifer

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 2012
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature: Jon T. Keifer

To be placed on the certificate

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

James Nidzgorski

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 350
Expiration Date: December 31, 2004
DNR Receipt Number: 1010563
Signature:

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

Joseph C. McCloud

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 2013
Expiration Date: December 31, 2004
DNR Receipt Number:
Signature:

To be placed on the certificate

INDIANA WATER WELL DRILLING LICENSE
Department of Natural Resources
Issued by the Division of Water

James R. Walsh

is entitled to operate water well drilling equipment and engage in the drilling of water wells, pursuant to Indiana Code 25-39.

License Number: 852
Expiration Date: December 31, 2004
DNR Receipt Number:
Signature:

CHAD R MAHAFFY
001731-224
2/16/1981
295-76-2583
BOWSER MORNER

MedWork
Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 10.10.03

To: _____

From: _____

Re: Chad Mehaffy

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON 10.10.03. I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF ~~CHEST X-RAY~~, PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

_____
PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies
that

CHAD MAHAFFY

Has successfully completed

HAZWOPER

Annual Refresher training
Training
In Accordance with
29 CFR 1910.120
on the

29th of December 2003

Training Certificate No.
29DEC03 017

Scott Berndt, CHMM

29 Dec. 03.
Date

Occupational Hazard Management
2001 Bellewood Street
Findlay, Ohio 45840

Occupational Hazard Management

Certifies
that

CHAD MAHAFFY

Has successfully completed
PROCESS SAFETY MANAGEMENT
Training
In Accordance with
29 CFR 1910.119
on the

29 December 2003

Training Certificate No.
PSM 29DEC03 016

Scott Berndt, CHMM

29 Dec. 03
Date

Occupational Hazard Management
2001 Bellevue Road
Findlay, Ohio 45840

OCCUPATIONAL HAZARD MANAGEMENT

SCOTT BERNDT, CHMM
14655 County Road 205
Findlay, Ohio 45840

CERTIFIES
THAT

CHAD R. MAHAFFY

HAS
SUCCESSFULLY
COMPLETED

40 HOUR SITE WORKER & OPERATIONS TRAINING

IN ACCORDANCE WITH
29CFR1910.120
Certificate No: 020CT02 02

ON THE

2ND DAY OF OCTOBER 2002

Scott Berndt, CHMM — Date

12/29/2003

LAST NAME MAHAFFY
FIRST NAME CHAD

FIT TEST REPORT

Fit test information

ID NUMBER	295-76-2583		
LAST NAME	MAHAFFY	CUSTOM1	
FIRST NAME	CHAD	CUSTOM2	
COMPANY	BOWSER MORNER	CUSTOM3	
LOCATION	DAYTON	CUSTOM4	
NOTE			

TEST DATE	12/29/2003	PORTACOUNT S/N	44721
TEST TIME	09:47	N95 COMPANION	N
DUE DATE	12/29/2004		

RESPIRATOR		PROTOCOL	OSHA 29CFR1910.134
MANUFACTURER	SUVIVAIR	PASS LEVEL	1000
MODEL	20/20		
MASK STYLE	FULL FACE		
MASK SIZE	STANDARD		
APPROVAL			
EFF. < 99%	N		

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	11400	Y
DEEP BREATHING	60	4230	Y
HEAD SIDE TO SIDE	60	46300	Y
HEAD UP AND DOWN	60	78900	Y
TALKING	60	4560	Y
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	7380	Y
NORMAL BREATHING	60	26700	Y
OVERALL FF		9330	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME Chad Mahaffy DATE 12-29-03
CHAD MAHAFFY

MedWork
Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 2-27-04

To: Bowser Morner

From: MedWork

Re: Kenneth Bohmer

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON 2-27-04. I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF CHEST X-RAY, PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

A. Almarza MD

PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies

that

KEN BOEHMER

Has successfully completed

HAZWOPER

Annual Refresher training

Training

In Accordance with

29 CFR 1910.120

on the

29th of December 2003

Training Certificate No.

29DEC03 007

Scott Berndt, CHMM

29 Dec. 03

Date

Occupational Hazard Management
2004 Tollenwood Street
Findlay, Ohio 45840

Occupational Hazard Management

Certifies

that

KEN BOEHMER

Has successfully completed

PROCESS SAFETY MANAGEMENT

Training

In Accordance with

29 CFR 1910.119

on the

29 December 2003

Training Certificate No.

PSM 29DEC03 007

Scott Berndt, CHMM

29 Dec. 03.

Date

Occupational Hazard Management
2001 Bellevue Road
Findlay, Ohio 45840

1203

3

1

0

Certificate of Completion

This Certifies That

KEN BOEHMER

has completed the 40 hour course:

OSHA 40 Hour Personnel Protection & Safety Course
in accordance with 29CFR1910.120

Presented by

HAZCO

Spanning the Hazardous Materials
Health and Safety Horizons

August 31-September 3, 1987
Date

Pete Bolek
Training Director

Certificate of Completion

This is to certify that

KEN BOEHMER

has successfully completed the
MSHA 30 CFR Part 46.8
8-Hour Annual Refresher Training
given at
Bowser-Morner, Inc.
4518 Taylorsville Road, Dayton, Ohio

December 28, 2000

1228000001
Certificate Identification Number

Henry M. Butcher, REM, CEA

12/29/2003

LAST NAME BOEHMER
FIRST NAME KENNETH

FIT TEST REPORT

Fit test information

ID NUMBER 277521850
LAST NAME BOEHMER
FIRST NAME KENNETH
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 08:26
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE MED/LARGE
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	12200	Y
DEEP BREATHING	60	15000	Y
HEAD SIDE TO SIDE	60	30800	Y
HEAD UP AND DOWN	60	34300	Y
TALKING	60	3750	Y
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	7340	Y
NORMAL BREATHING	60	8990	Y
OVERALL FF		9670	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME Kenneth Boehmer DATE 12-29-03
KENNETH BOEHMER

OCCUPATIONAL CARE CONSULTANTS

OCC - East • 3028 Navarre Ave • Oregon, OH 43616
(419) 697-6850 • Fax (419) 697-6861

RESPIRATOR QUESTIONNAIRE

NAME: Joshua Dean **COMPANY:** Bowser Morner

A new questionnaire should be completed annually or sooner if a medical condition intervenes. OCC recommends that a pre-placement medical evaluation be done on all employees using a respirator.

PHYSICAL EXAMINATION REQUIRED: (YES) **NO**

(If examination is required, it must be completed within 30 days of questionnaire.)

Questionnaire Reviewed by: C. Van Kouffmt Date: 8/14/03
Nurse Signature

A. _____ No limitations regarding respirator use.

B. _____ Restrictions are placed on this employee for respirator use related to a medical condition or to the workplace conditions in which the respirator will be used. Restrictions are as follows:

_____

_____

C. _____ Follow-up medical evaluation is recommended as per NIOSH guidelines.
Every 5 years for persons under age 35
Every 2 years for persons aged 35 to 45
Every year for persons over the age of 45

Evaluations for persons performing strenuous work with SCBA:
Every 3 years for those under age 35
Every 18 months for those aged 35 to 45
Annually for those over the age of 45

D. _____ Your employee has been provided a copy of this Licensed Health Care Professional's written recommendation.

T.E. Lieser, MD; P.J. Eby, MD; G. J. Jabaly, MD; B.C. Russell, PA-C, G. Myak, RN, CNP

Occupational Hazard Management

Certifies
that

JOSH DEAN

Has successfully completed

HAZWOPER

Annual Refresher training
Training
In Accordance with
29 CFR 1910.120
on the

18th of December 2003

Training Certificate No.
18Dec03 001

Scott Berndt, CHMM

18Dec.03
Date

Occupational Hazard Management
2001 Collamwood Street
Findlay, Ohio 45840

FINDLAY

THE UNIVERSITY OF FINDLAY

Certificate of Achievement

awarded by

THE NATIONAL CENTER OF EXCELLENCE FOR ENVIRONMENTAL MANAGEMENT

ENVIRONMENTAL RESOURCE TRAINING CENTER

to

JOSHUA DEAN

for Successful Completion of

OSHA 40-HOUR SAFETY TRAINING WORKSHOP
(FULFILLS THE REQUIREMENTS OF 29 CFR 1910.120 COVERING HAZARDOUS WASTE OPERATIONS)
4.0 CEU'S
APRIL 27, 2002

EXECUTIVE DIRECTOR

INSTRUCTOR

NO. 8093 P. 4/4

12/29/2003

LAST NAME DEAN
FIRST NAME JOSHUA

FIT TEST REPORT

Fit test Information

ID NUMBER 270869191
LAST NAME DEAN
FIRST NAME JOSHUA
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 10:24
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

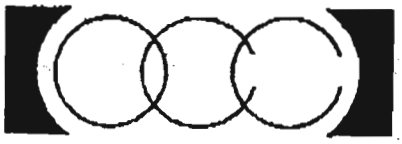
RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE STANDARD
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	44200	Y
DEEP BREATHING	60	18600	Y
HEAD SIDE TO SIDE	60	22300	Y
HEAD UP AND DOWN	60	18900	Y
TALKING	60	10400	Y
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	11900	Y
NORMAL BREATHING	60	46800	Y
OVERALL FF		18700	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME Joshua Dean DATE 12-29-03
JOSHUA DEAN



OCCUPATIONAL CARE CONSULTANTS

OCC - East • 3028 Navarre Ave • Oregon, OH 43616
(419) 697-6850 • Fax (419) 697-6861

RESPIRATOR QUESTIONNAIRE

NAME: James R Walsh **COMPANY:** Bowser Morner

A new questionnaire should be completed annually or sooner if a medical condition intervenes. OCC recommends that a pre-placement medical evaluation be done on all employees using a respirator.

PHYSICAL EXAMINATION REQUIRED: **YES** **NO**

(If examination is required, it must be completed within 30 days of questionnaire.)

Questionnaire Reviewed by: _____ Date: 3/2/04
Nurse Signature

A. ✓ No limitations regarding respirator use.

B. ____ Restrictions are placed on this employee for respirator use related to a medical condition or to the workplace conditions in which the respirator will be used. Restrictions are as follows:

_____

_____

C. ____ Follow-up medical evaluation is recommended as per NIOSH guidelines.
Every 5 years for persons under age 35
Every 2 years for persons aged 35 to 45
Every year for persons over the age of 45

Evaluations for persons performing strenuous work with SCBA:
Every 3 years for those under age 35
Every 18 months for those aged 35 to 45
✓ Annually for those over the age of 45

D. ____ Your employee has been provided a copy of this Licensed Health Care Professional's written recommendation.

_____

T.E. Lieser, MD; P.J. Eby, MD; G. J. Jabaly, MD; B.C. Russell, PA-C, G. Myak, RN, CNP

Occupational Hazard Management

Certifies
that

JAMES WALSH

Has successfully completed

HAZWOPER

Annual Refresher training
Training
In Accordance with
29 CFR 1910.120
on the

18th of December 2003

Training Certificate No:
18Dec03 002

Scott Berndt, CHMM

18 Dec. 03
Date

Occupational Hazard Management
2001 Tallmansville Road
Findlay, Ohio 45840

1203

0

Certificate Of Completion

This Certifies That

James R. Walsh

has completed the 40 hour course:

OSHA 40 Hour Personnel Protection & Safety Course

Presented by

HAZCO

Spanning the Hazardous Materials
Health and Safety Horizons

May 8-11, 1987

Date

Training Director

12/29/2003

LAST NAME WALSH
FIRST NAME JAMES

FIT TEST REPORT

Fit test information

ID NUMBER 6186
LAST NAME WALSH
FIRST NAME JAMES
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 10:35
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE STANDARD
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	2990	Y
DEEP BREATHING	60	2760	Y
HEAD SIDE TO SIDE	60	3080	Y
HEAD UP AND DOWN	60	31300	Y
TALKING	60	374	N
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	1330	Y
NORMAL BREATHING	60	22900	Y
OVERALL FF		1550	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME James A Walsh DATE 12-29-03
JAMES WALSH

FAX TRANSMISSION

BOWSER-MORNER

4518 Taylorsville Road • P.O. Box 51 • Dayton, Ohio 45401-0051
Phone (937) 236-8805 Fax (937) 233-2016

With other offices in:	**Toledo, Ohio**	**Lexington, Ky.**
Phone:	(419) 691-4800	(606) 233-0250
Fax:	(419) 691-4805	(606) 253-0183

To: Terry Rajaha

Company: Tetra Tech

Phone No:

Fax No.: 812-854-3981

Re:

From: Penny L. Keifer, Administrative Manager

Date: July 28, 2004

No. of Pages (including cover): 5

Message:

If you have any problems with, or do not receive all the pages in this transmission, please call our office.

BOWSER-MORNER *is an accredited independent testing laboratory and engineering consultant providing services in geotechnical engineering, environmental consulting, construction monitoring and testing, analytical sciences, and subsurface exploration and sampling.*

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MedWork

Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 11-15-03

To: Bowser-Morner

From: MedWork

Re: Todd Wollenhaupt

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON Todd Wollenhaupt, I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF CHEST X-RAY, PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies

that

TODD WOLLENHAUPT

Has successfully completed

HAZWOPER

Annual Refresher Training

Training

In Accordance with

29 CFR 1910.120

on the

29th of December 2003

Training Certificate No.

29DEC03 030

Scott Arendt, CHMM

Date

Occupational Hazard Management

2001 Tallmanwood Road

Findlay, Ohio 45840

OCCUPATIONAL HAZARD MANAGEMENT

CERTIFIES
THAT

TODD WALLENHAUPT

HAS SUCCESSFULLY COMPLETED

PROCESS SAFETY MANAGEMENT
TRAINING

IN ACCORDANCE WITH
29 CFR 1910.119
ON THE

28TH OF NOVEMBER 2003

TRAINING CERTIFICATE NO.
28NOV03 002

Scott S. Berndt — 28 NOV. 03.

SCOTT BERNDT, CHMM — DATE

OCCUPATIONAL HAZARD MANAGEMENT
3001 COTTONWOOD STREET
FINDLAY, OHIO 45840

OCCUPATIONAL HAZARD MANAGEMENT

SCOTT BERNDT, CHMM
14655 COUNTY ROAD 205
FINDLAY, OHIO 45840

CERTIFIES
THAT

TODD WOLLENHAUPT

HAS
SUCCESSFULLY
COMPLETED

40 HOUR SITE WORKER & OPERATIONS TRAINING

IN ACCORDANCE WITH
29CFR1910.120
CERTIFICATE No: 27NOV.02 001

ON THE

27TH OF NOVEMBER 2002

Scott Berndt 27NOV02

SCOTT BERNDT, CHMM DATE

12/29/2003

LAST NAME WOLLENHAUPT
FIRST NAME TODD

FIT TEST REPORT

Fit test information

ID NUMBER 283-61-6669
LAST NAME WOLLENHAUPT
FIRST NAME TODD
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 13:42
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE STANDARD
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	10600	Y
DEEP BREATHING	60	26300	Y
HEAD SIDE TO SIDE	60	83200	Y
HEAD UP AND DOWN	60	26600	Y
TALKING	60	12100	Y
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	10400	Y
NORMAL BREATHING	60	56200	Y
OVERALL FF		18500	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME Todd Wollenhaupt DATE 12-29-03
TODD WOLLENHAUPT

MedWork

Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 12-5-03

To: _____

From: _____

Re: John Davis
1-26-83

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON 12-5-03. I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF ~~CHEST X-RAY,~~ PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

_____
PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies

that

JOHN DAVIS

Has successfully completed

HAZWOPER

Annual Refresher training

Training

In Accordance with

29 CFR 1910.120

on the

29th of December 2003

Training Certificate No.

29DEC03 009

29 Dec. 03

Date

Occupational Hazard Management

1001 Tallmadge Road

Kent, Ohio 44240

OCCUPATIONAL HAZARD MANAGEMENT

SCOTT BERNDT, CHMM
14555 COUNTY ROAD 205
FINDLAY, OHIO 45840

CERTIFIES
THAT

JOHN DAVIS

HAS
SUCCESSFULLY
COMPLETED

40 HOUR SITE WORKER & OPERATIONS TRAINING

IN ACCORDANCE WITH
29CFR1910.120
CERTIFICATE No: 27NOV.02 003

ON THE

27TH OF NOVEMBER 2002

Scott L. Berndt 27 Nov 02

SCOTT BERNDT, CHMM DATE

Occupational Hazard Management

Certifies
that

JOHN DAVIS

Has successfully completed
PROCESS SAFETY MANAGEMENT
Training
In Accordance with
29 CFR 1910.119
on the

29 December 2003

Training Certificate No.
PSM 29DEC03 009

Rick Borendy, CHMM

29 Dec. 03
Date

Occupational Hazard Management
[illegible]
[illegible]

12/29/2003

LAST NAME DAVIS
FIRST NAME JOHN

FIT TEST REPORT

Fit test information

ID NUMBER 292689571
LAST NAME DAVIS
FIRST NAME JOHN
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 08:52
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE STANDARD
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	57300	Y
DEEP BREATHING	60	23100	Y
HEAD SIDE TO SIDE	60	54200	Y
HEAD UP AND DOWN	60	15200	Y
TALKING	60	10800	Y
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	14300	Y
NORMAL BREATHING	60	44200	Y
OVERALL FF		21200	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME John H. Davis DATE 12/29/03
JOHN DAVIS

MedWork

Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 2-27-04

To: Bowser Morner

From: MedWork

Re: Kenneth Barkmer

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON 2-27-04. I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF CHEST X-RAY, PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

A. Almeida MD

PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies

that

KEN BOEHMER

Has successfully completed

HAZWOPER

Annual Refresher training

Training

In Accordance with

29 CFR 1910.120

on the

29th of December 2003

Training Certificate No.

29DEC03 007

29 Dec. 03

Date

Occupational Hazard Management

1001 Cottonwood Road

Findlay, Ohio 45840

Occupational Hazard Management

Certifies
that

KEN BOEHMER

Has successfully completed
PROCESS SAFETY MANAGEMENT
Training
In Accordance with
29 CFR 1910.119
on the

29 December 2003

Training Certificate No.
PSM 29DEC03 007

Scott Berndt, CHMM

29 Dec. 03
Date

Occupational Hazard Management
[illegible]
[illegible]

1203

3
1
0

Certificate of Completion

This Certifies That

KEN BOEHMER

has completed the 40 hour course:

OSHA 40 Hour Personnel Protection & Safety Course
in accordance with 29CFR1910.120

Presented by

HAZCO

Spanning the Hazardous Materials
Health and Safety Horizons

August 31-September 3, 1987
Date

Pete Bolek
Training Director

Certificate of Completion

This is to certify that

KEN BOEHMER

has successfully completed the
MSHA 30 CFR Part 46.8
8-Hour Annual Refresher Training
given at
Bowser-Morner, Inc.
4518 Taylorsville Road, Dayton, Ohio

December 28, 2000

Henry Butcher

Henry M. Butcher, REM, CEA

1228000001
Certificate Identification Number

12/29/2003

LAST NAME BOEHMER
FIRST NAME KENNETH

FIT TEST REPORT

Fit test information

ID NUMBER 277521850
LAST NAME BOEHMER
FIRST NAME KENNETH
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 08:26
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE MED/LARGE
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	12200	Y
DEEP BREATHING	60	15000	Y
HEAD SIDE TO SIDE	60	30800	Y
HEAD UP AND DOWN	60	34300	Y
TALKING	60	3750	Y
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	7340	Y
NORMAL BREATHING	60	8990	Y
OVERALL FF		9670	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME Kenneth Boehmer DATE 12-29-03
KENNETH BOEHMER

MedWork

Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 11/15/2003

To: Bowser Morner

From: Medwork

Re: Donald Kirkpatrick

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON Donald Kirkpatrick. I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF CHEST X-RAY, PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies

that

BRUCE KIRKPATRICK

has successfully completed

HAZWOPER

Annual Refresher training

Training

In accordance with

29 CFR 1910.120

on the

29TH OF JANUARY 2004

Training Certificate No.

29JAN04 002

Scott Berndt, CHMM

29 Jan 04

Date

Occupational Hazard Management

2001 Cottonwood Street

Findlay, Ohio 45840

OCCUPATIONAL HAZARD MANAGEMENT

CERTIFIES

THAT

BRUCE KIRKPATRICK

HAS SUCCESSFULLY COMPLETED

PROCESS SAFETY MANAGEMENT TRAINING

IN ACCORDANCE WITH

29 CFR 1910.119

ON THE

29 JANUARY 2004

TRAINING CERTIFICATE NO.

PSM 29JAN04 001

SCOTT BERNDT, CHMM

21 Jan 04

DATE

OCCUPATIONAL HAZARD MANAGEMENT
2001 COTTONWOOD STREET
FINDLAY, OHIO 45840

Certificate of Completion

This is to certify that

BRUCE KIRKPATRICK

has successfully completed the
MSHA 30 CFR Part 46.8
8-Hour Annual Refresher Training
given at
Bowser-Morner, Inc.
4518 Taylorsville Road, Dayton, Ohio

January 18, 2001

118010001
Certificate Identification Number

Henry M. Butcher, REM, CEA

1203

3

1

0

Certificate Of Completion

This Certifies That

Bruce Kirkpatrick

has completed the 40 hour course:

OSHA 29CFR1910.120 Personnel Safety & Health Course

Presented by

HAZCO

Spanning the Hazardous Materials
Health and Safety Horizons

March 12-15, 1987

Respirator Fit-Test Record

Employee: Bruce Kirkpatrick **Date:** 2/5/00

Person Fitting Respirator: Scott Pönndorf

All respirator fit tests will be conducted per the protocol of Appendix A to 1910.134: Fit-testing Procedures. Any deviation from this protocol will be noted in the "Remarks" section below.

Respirator Information

Manufacturer: Sundstrom

Model: 4000

Size: Med

Optional Equipment

Spectacle Kit: N/A

Nose Cup: Yes

Communication: N/A

Testing

Pass: ✓ **Fail:**

Remarks

Stannic Chloride — Irritant

MedWork
Occupational Health Care

725 S. Ludlow Street, Dayton, Ohio 45402

Date: 11/15/03

To: Bowser Morner

From: MEDWORK

Re: Donald Null

THE ABOVE EMPLOYEE HAS BEEN EXAMINED AT MEDWORK, INC. ON Donald Null. I HAVE REVIEWED THEIR MEDICAL HISTORY, THERIF CHEST X-RAY, PULMONARY FUNCTION AND LABORTORY STUDIES (BLOOD AND URINE TESTS) AND FOUND THEM IN GOOD HEALTH, EXCEPT FOR THOSE COMMENTS NOTED ON THE PHYSICAL EXAMINATION. THIS PHYSICAL EXAMINATION MEETS THE MEDICAL SURVEILLANCE REQUIREMENTS FOR THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARDS 1910.120. IT IS MY OPINION THEY ARE ABLE TO WORK IN THIS TYPE OF ENVIRONMENT USING PROPER SAFETY MEASURES AND WEARING A RESPIRATOR.

IF YOU HAVE ANY FURTHER QUESTIONS, PLEASE CONTACT OUR OFFICE.

PHYSICIAN SIGNATURE

F:\2Forms\BOWSERRECERT03-00.doc

Occupational Hazard Management

Certifies

that

DONALD NULL

Has successfully completed

HAZWOPER

Annual Refresher training

Training

In Accordance with

29 CFR 1910.120

on the

29th of December 2003

Training Certificate No.

29DEC03 020

Scott Bernat, CHMM

29 Dec 03

Date

Occupational Hazard Management

2001 Tollgwood Street

Findlay, Ohio 45840

Occupational Hazard Management

Certifies
that

DONALD NULL

Has successfully completed
PROCESS SAFETY MANAGEMENT
Training
In Accordance with
29 CFR 1910.119
on the

29 December 2003

Training Certificate No.
PSM 29DEC03 019

Scott Berndt, CHMM

29 Dec 03.
Date

Occupational Hazard Management
2001 Cottonwood Street
Findlay, Ohio 45840

RESPONSE
UNLIMITED

CERTIFIES THAT

DONALD NULL

HAS ATTENDED THE COURSE AND
SUCCESSFULLY COMPLETED STUDIES IN

OSHA 40 HOUR SAFETY TRAINING FOR WASTE SITE WORKERS
(FULFILLS OSHA'S TRAINING REQUIREMENTS OF 29 CFR 1910.120)
(COVERING HAZARDOUS WASTE SITE OPERATIONS)

INSTRUCTOR

April 18, 1999
CERTIFICATE EXPIRATION DATE

April 18, 1998
DATE

Certificate of Completion

This is to certify that

DONALD NULL

has successfully completed the
MSHA 30 CFR Part 46.8
8-Hour Annual Refresher Training
given at
Bowser-Morner, Inc.
4518 Taylorsville Road, Dayton, Ohio

December 28, 2000

1228000010
Certificate Identification Number

Henry M. Butcher, REM, CEA

12/29/2003

LAST NAME NULL
FIRST NAME DONALD

FIT TEST REPORT

Fit test Information

ID NUMBER 297-68-4998
LAST NAME NULL
FIRST NAME DONALD
COMPANY BOWSER MORNER
LOCATION DAYTON
NOTE

CUSTOM1
CUSTOM2
CUSTOM3
CUSTOM4

TEST DATE 12/29/2003
TEST TIME 09:59
DUE DATE 12/29/2004

PORTACOUNT S/N 44721
N95 COMPANION N

RESPIRATOR
MANUFACTURER SUVIVAIR
MODEL 20/20
MASK STYLE FULL FACE
MASK SIZE STANDARD
APPROVAL
EFF. < 99% N

PROTOCOL OSHA 29CFR1910.134
PASS LEVEL 1000

EXERCISE	DURATION (SEC)	FIT FACTOR	PASS
NORMAL BREATHING	60	21100	Y
DEEP BREATHING	60	9370	Y
HEAD SIDE TO SIDE	60	25300	Y
HEAD UP AND DOWN	60	29000	Y
TALKING	60	664	N
GRIMACE	15	Excl.	X
BEND AND TOUCH TOES	60	8970	Y
NORMAL BREATHING	60	16000	Y
OVERALL FF		3670	Y

FIT TEST OPERATOR Eric Horstman DATE 12/29/03
ERIC HORSTMAN

NAME Donald Null DATE 12-29-03
DONALD NULL

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-06-4-023

June 8, 2004

Project Number 7448

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 324)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0343

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by a Tetra Tech NUS, Inc. employee under the CLEAN contract, and to attest that the individual identified herein is in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include locating and staking locations for proposed groundwater monitoring and soil boring locations in and around the following SWMUs at NSWC Crane site in Indiana:

- SWMU 12, Mine Fill A
- SWMU 13, Mine Fill B
- SWMU 16, Cast High Explosive Fill/ Building 146

This is scheduled to be conducted from June 10 through June 15, 2004. These activities will be performed by Mr. Stan Conti, a Tetra Tech NUS, Inc. employee. After an evaluation of available historical information, it has been determined that Mr. Conti's planned activities will not involve a reasonable potential for any exposures to hazardous waste site safety or health hazards, and as such, the requirements of OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations are not considered to be applicable for the purposes of this visit. Nonetheless, Mr. Conti is current in both HAZWOPER training and medical surveillance program requirements.

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld

c: Mr. B. Gorman (Code ES34)
Mrs. D. Humbert
Mr. M. Perry
Mr. K. Henn
Mr. R. Basinski
Dr. T. Johnston

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-07-4-017

July 7, 2004

Project Numbers 7448 and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 32)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers [redacted] and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. personnel under the CLEAN contract, and to attest that the personnel identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT at the NSWC Crane site in Indiana. This is scheduled to be conducted from July 8 through August 6, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow the Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator dated June 2004, prepared under CTO 0343 and the Health and Safety Plan for Mine Fill A (SWMU 12) prepared under CTO 0357. These individuals are as follows:

Stan Conti	Chip Laney
Jim Goerdt	Terry Rojahn

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld
c: B. Gorman (Code ES34)
D. Humbert
M. Perry
K. Henn
R. Basinski

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-07-4-052

July 27, 2004

Project Numbers 7448 and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 324)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0343 and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by a Tetra Tech NUS, Inc. employee under the CLEAN contract, and to attest that the individual identified herein is in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include oversite of field activities being conducted at NSWC Crane site in Indiana. This is scheduled to be conducted from July 28-29, 2004. These activities will be performed by Mr. Mark Peterson, a Tetra Tech NUS, Inc. employee.

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld
c: Mr. B. Gorman (Code ES34)
Mrs. D. Humbert
Mr. M. Perry
Mr. K. Henn
Mr. R. Basinski

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-08-4-019

August 6, 2004

Project Numbers 7448 and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 32)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Number [redacted] and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. personnel under the CLEAN contract, and to attest that the personnel identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT at the NSWC Crane site in Indiana. This is scheduled to be conducted from August 9 through September 6, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow the Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator dated June 2004, prepared under CTO 0343 and the Health and Safety Plan for Mine Fill A (SWMU 12) prepared under CTO 0357. These individuals are as follows:

Stan Conti	Chip Laney
Jim Goerdt	Terry Rojahn

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld
c: B. Gorman (Code ES34)
D. Humbert
M. Perry
K. Henn
R. Basinski

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PITT-08-4-031

August 13, 2004

Project Numbers 7448 and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers [redacted] and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to add personnel conducting the field activities at the NSWC Crane site from August 15-18, 2004. Mr. Tom Dickson has been added to the field crew performing this work. All other information in our letter dated August 6, 2004 remains the same.

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld

c: B. Gorman (Code ES 42)
D. Humbert
M. Perry
K. Henn
R. Basinski

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PITT-09-4-006

September 3, 2004

Project Numbers 7448 and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 32)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers [redacted] and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. personnel under the CLEAN contract, and to attest that the personnel identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; and surface water, seep and sediment sampling at the NSWC Crane site in Indiana. This is scheduled to be conducted from September 7 -30, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow the Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator dated June 2004, prepared under CTO 0343 and the Health and Safety Plan for Mine Fill A (SWMU 12) Revision 1, dated August 2004, prepared under CTO 0357. These individuals are as follows:

Stan Conti
Jim Goerdt
Terry Rojahn

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld
c: B. Gorman (Code ES34)
D. Humbert
M. Perry
K. Henn
R. Basinski

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PITT-10-4-057

October 25, 2004

Project Number 7448 and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Bill Gates (Code ES 324)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0343 and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by a Tetra Tech NUS, Inc. employee under the CLEAN contract, and to attest that the individual identified herein is in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT at the NSWC Crane site in Indiana. This is scheduled to be conducted from October 25 through November 22, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow the Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator dated August 2004, prepared under CTO 0343 and the Health and Safety Plan for Mine Fill A (SWMU 12) dated August 2004, prepared under CTO 0357. These individuals are as follows:

Stan Conti
Jim Goerdt
Terry Rojahn

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/mlg

c: Mr. B. Gorman (Code ES34)
Mrs. D. Humbert
Mr. M. Perry
Mr. K. Henn
Mr. R. Basinski
File copy CTO 0343 and CTO 0357

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PITT-11-4-003

November 3, 2004

Project Numbers N0039, N0989, and N8925

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Mark Davidson (Code ES33)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Number 0078, 0328, and 0859

Subject: Personnel Clearance for Site Visit

Dear Mr. Davidson:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. personnel under the CLEAN contract, and to attest that the personnel identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include collecting groundwater samples at Site 8, Sites 36 and 37, and Site 59; and collecting a soil sample at Site 37 at the NAS Cecil Field site in Jacksonville, Florida. This is scheduled to be conducted November 4 and November 30, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow the Health and Safety Plan for National Attenuation Groundwater Monitoring Sites, Revision 4 dated May 2004, and the Health and Safety Plan for Operable Unit 9, Site 59 - Buildings 324/1845 Area Remedial Investigation dated September 2004. These individuals are as follows:

Scott McGuire	Dave Siefken
Chris Gleaton	Shina Ballard
Gus Nelson	Mervin Dale

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS:lld
c: B. Gorman (Code ES34)
D. Humbert
M. Perry
K. Henn
M. Speranza
File

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PITT-12-4-003

December 3, 2004

Project Number N6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0160, 0331, 0343, and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from December 6, 2004 through December 17, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans.

- Health and Safety Plan for Solid Waste Management Unit 7, dated December 2004, prepared under CTO 0160.
- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.

These individuals are as follows:

Stan Conti
Jim Goerdt
Terry Rojahn
Donald Westerhoff

TETRA TECH NUS, INC.

PITT-12-4-003

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/mlg

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Roger Clark, Ph.D., TtNUS, Inc.
Mr. Ralph Basinski, TtNUS, Inc.
File copy CTO 0160, 0331, 0343, and 0357

TETRA TECH NUS, INC.
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Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-12-4-053

December 30, 2004

Project Numbers 3961, 1245, 7448, and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0160, 0331, 0343, and [redacted]

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from January 4-28, 2005. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans.

- Health and Safety Plan for Solid Waste Management Unit 7, dated December 2004, prepared under CTO 0160.
- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.

These individuals are as follows:

Stan Conti
Colin Doolan
Jim Goerdt
Terry Rojahn

TETRA TECH NUS, INC.

PITT-12-4-053

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/lld

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Roger Clark, Ph.D., TtNUS, Inc.
Mr. Ralph Basinski, TtNUS, Inc.
File copy CTO 0160, 0331, 0343, and 0357

TETRA TECH NUS, INC.
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Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-2-5-050

February 25, 2005

Project Numbers N1245, N6878, and 00042

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0331, 0357, and 0376

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from February 28 through March 16, 2005. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans.

- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.
- Health and Safety Plan for Risk Assessment and CMS at Solid Waste Management Unit (SWMU) 9, dated February 2005, prepared under CTO 0376.

These individuals are as follows:

Jim Goerdt
Terry Rojahn

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/lld

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Roger Clark, Ph.D., TtNUS, Inc.
Mr. Ralph Basinski, TtNUS, Inc.
File copy CTO 0331, 0357, and 0376

ATTACHMENT VI
NSWC CRANE
HILL 600 RAILWAY ACCESS PLAN

APPROVED BY:

Ralph R. Basinski,
Tetra Tech NUS, Inc.
Task Order Manager

Matthew M. Soltis, CIH, CSP
Tetra Tech NUS, Inc.
Health and Safety Manager

Thomas Brent
EFD South, RPM

Edward Scott
NSWC Crane Safety Office

Fred Winklepleck
NSWC Transportation

Michael Rose
NSWC Railroad Supervisor

NSWC CRANE
HILL 600 RAILWAY ACCESS PLAN

1. SCOPE:

This Hill 600 Railway Access Plan will be followed for all activities at NSWC Crane that require equipment or personnel access on the active railroad tracks in the Hill 600 area, located on the eastern side of Mine Fill A. The rail lines in this area are active, used by freight trains which may travel in either direction, and may be transporting energetic materials (i.e., explosives). The TtNUS Field Operations Leader (FOL) will conduct a **pre-task briefing** with TtNUS and Subcontractor personnel who will be participating site activities in Hill 600 area where access or close proximity of the rail lines is anticipated. This pre-task briefing will include a review of this Railway Access Plan, and **all personnel will be required to sign the Attestment Form at the end of this Plan.**

Implementation of this Access Plan will be required for all activities that require railway access, with one exception. After heavy equipment (e.g., drill rig, supporting equipment and supplies) have been delivered to the planned work area in accordance with this Access Plan, the delivery of TtNUS and subcontractor personnel on ensuing work days may be accomplished by transport in NSWC vehicles that are rail accessible and that are operated by authorized NSWC Crane personnel. In this case, the communications and authorizations specified in this Access Plan will be the responsibility of the NSWC Crane transport operators. These transportation arrangements must be coordinated by the TtNUS Field Geologist (FG) with Base Public Works (PW) prior to each day's activities. **The FG must remain aware that PW has a limited number of track-accessible vehicles**, and that PW has agreed to provide this transportation to TtNUS on a one-time per work day basis. In the event that PW cannot provide this transportation when needed, the FG will notify the NSWC Crane Railroad Dispatcher ("the Dispatcher") as specified in this Railway Access Plan and TtNUS and/or subcontractor personnel will be walking in to the work area.

Personnel exit from the Mine Fill A work areas will be accomplished by notifying the Dispatcher obtaining approval to access the rail line, and then walking out of the work area.

To aid in the effective implementation of this Access Plan, the TtNUS Task Order Manager is responsible for communicating planned work schedules and activities with the EFD South RPM and appropriate individuals at NSWC Crane.

2. PROCEDURES:

The most critical elements of this Railway Access Plan are effective communications, and avoidance of track obstructions or "fouling" (defined as placement of an individual or item of equipment within 6'6" of outer side of the nearest rail). These elements will be addressed by conforming to the required procedures specified below.

A. Communications

Any activities performed by Tetra Tech NUS (TtNUS) employees or by TtNUS subcontractors that will require access and travel on the rail lines at NSWC Crane will first require communication by the TtNUS FG with the NSWC Crane Railroad Dispatcher to obtain rail line access permission. The Dispatcher is responsible for maintaining an awareness of all railroad traffic at NSWC Crane, and has the authority to grant or deny rail access requests to avoid disruption of rail operations and railroad incidents.

As part of initial site mobilization (i.e., prior to the initiation of any activities that would involve rail access) the TtNUS FOL will be responsible for meeting with the Dispatcher to provide him with a copy of the well installation location map as well as to exchange key phone/cell phone numbers. At a minimum, the FOL will **obtain** contact information for the Dispatcher, and **provide** the Dispatcher with the following telephone numbers and contact names:

- FOL office phone number (and cell phone number, if available)
- Ralph Basinski: (412) 921-8308
  TtNUS Project Manager
- Tom Brent: (812) 854-6160 (work)
  EFD South RPM (812) 295-6230 (cell)
- Christine Freeman: (812) 854-4423 (work)
  NSWC Environmental Site Manager (812) 296-0545 cell)

NOTE: Train traffic does not commonly occur on Sundays. As a result, Dispatchers are usually not present on-base on Sundays. If TtNUS or subcontractor personnel require access on a Sunday, they are to contact NSWC Crane Security at **(812) 854-3300** to gain authorization for site access, followed by calling and leaving a message for the Dispatcher at **(812) 854-1613,** noting the date and the times of the requested access. This request should describe the track segment, working limits of the track, and time limits.

Prior to attempting any railroad access, the following communication sequence will be required:

(1) The FG is responsible for **contacting the NSWC Crane Railroad Dispatcher via handheld radio** (two hand-held radios will be provided by NSWC Crane to ensure that proper radio wattage and frequencies are used) **to request railroad access.** The Dispatcher's radio call sign is **Inchworm Alpha**. The FG must state the track segment (that is, the location and area of track that will be involved, visually determined and verbally communicated by the FG to the Dispatcher) and the time period for which access is requested. If, for any reason, radio communications are not available, the FG will contact the Dispatcher via land line or cell phone, whichever is most expedient.

(2) The Dispatcher will determine and verify that there is no active railroad traffic either in progress or imminent on the Hill 600 rail line and withhold authority of any trains to move into or within the working limits for a specified period of time. This duration of restricted rail activity is known as **"foul time"**. It is the Dispatcher's responsibility to establish "foul time" durations (based on factors such as track segments that will be involved in the activity and the anticipated period of time that fouling will occur) and to also communicate foul time to the TtNUS FG orally via radio communications. **Once the Dispatcher has established and communicated the foul time to the TtNUS FG, work may commence.**

(3) The TtNUS FG will then repeat to the dispatcher the track segment, track limits and time limits of the foul time to the Dispatcher for verification before the foul time becomes effective. The FG will then inform TtNUS and subcontractor personnel that the rail line is clear of traffic and access has been granted. Equipment and/or personnel will then **access the rail line and transport** necessary resources to the intended destination.

(4) Upon arriving at the intended destination, the FOL will ensure that all **equipment and personnel are safely removed from the rail line,** to a distance of **not less than 6'6" from the edge of the nearest rail.** This minimum distance must be maintained at all times, until and unless rail access and foul time is again requested from and granted by the Dispatcher.

(5) The TtNUS FG is responsible for **contacting the Dispatcher** to communicate that the line is clear.

(6) Conversely, after the TtNUS work crew has dismounted the rail line and begun field work, **the Dispatcher will contact the TtNUS FG via radio to alert the work crew of any approaching railroad traffic**. The Dispatcher will not authorize or permit any rail traffic to approach a TtNUS work location until and unless he has effectively contacted the TtNUS FG. This will enable the FOL to perform a precautionary inspection of the nearby rail lines to ensure that all personnel and equipment have not encroached within the 6'6" boundary limit, and also will aid in preventing injuries or incidents from occurring from crew members being startled or distracted by approaching train traffic.

(7) In the event of any notification from the Dispatcher that a **train is approaching** the work area as specified above, all TtNUS and subcontractor personnel who are in possession of cellular phones (cell phones) will immediately **turn all cell phones OFF**. Cell phones shall remain OFF until either the train has passed out of visual site, **or** until the last train car has traveled at least 50 feet from the work area. If the work area and bordering rail line is arranged so that this minimum 50 foot distance cannot be observed, the FOL shall observe the train's rate of speed and judge the amount of time that cell phones must remain OFF to allow the train to travel so that the last car has moved beyond the 50 foot distance.

(8) The FG is responsible for **documenting all communications** with the Dispatcher in the Field Log Book, and for ensuring that all operations performed in the Hill 600 rail line area are in conformance with the requirements of this procedure.

B. Rail Line Damage

The TtNUS FG is also responsible for performing a **visual inspection** of the rail lines **both prior to and immediately following** any rail line access or exit for **any rail line damage** (rails, ties, rail beds, etc.) If any is damage is observed or suspected, the FOL is responsible for **immediately** notifying the Dispatcher to relate the nature and location of the observed damage and the location of the rail line damage.

C. Personal Protective Equipment

In addition to any PPE specified in the HASP for specific tasks that are to be performed in the Hill 600 area, all personnel working in the proximity of rail lines (that is, within 25 feet) will be required to wear high-visibility vests to increase their visibility to train operators. This will aid train operators to see TtNUS and subcontractors working near rail lines so that the train operator can meet his/her responsibility to sound audible warning signals (sounding of both the train's whistle and bell) before the train approaches workers near the rail line (in accordance with 49 CFR 241.339).

APPENDIX F.2

SWMU 12

HEALTH AND SAFETY DOCUMENTATION ROUND 2

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigation activities at NSWC Crane, and that I have received site-specific training that included the elements presented below:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- The contents of the health and safety plan including Table 5-1 and 6-1
- Emergency response procedures (evacuation and assembly points)
- Review contents of relevant Material Safety Data Sheets
- Review of Safe Work Permits

I have been given the opportunity to ask questions and that my questions have been answered to my satisfaction. The dates of my training and my medical surveillance requirements are accurate and correct to the best of my knowledge.

	Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam	
245	Jay McFall Jay McFall	12/7/04	2/19/04	N/A	N/A	7/30/04	
IMU 9	DON WOBSTORHOFF [illegible]	"	1/93	8/04	8/04	2/12/03	
	TERRY ROVAHN [illegible]	"	10/85	1/04	1/04	11/10/04	ALSO SWMU 9
48 578 448	[illegible] [illegible]	12/8/04	12/91	10/04	NA	11/7/04	
	Stan Conti S Conti	12/8/04	8/83	5/04	8/84	12/6/04	
	Colin Doolan Colin Doolan	1/6/05	5/99	12/04	NA	12/04	

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

EMPLOYEE:	Rojahn, Terry	**COMPANY:**	TT/NUS
SSN:	XXX-XX-8670	**POSITION:**	Environmental Sampling
DATE OF EXAM:	11/05/2004	**LOCATION:**	TT/NUS-Pittsburgh
EXPIRATION DATE:	11/05/2006	**SITE:**	Pittsburgh

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☑	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☑	☐

STATUS

1. ☑ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. ☐ **NOT QUALIFIED**

4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Peter P. Greaney, M.D. Date: 11/10/04

Signature: Peter P Greaney MD

WorkCare
333 S. Anita Drive, Suite 630, Orange, CA 92868
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Terry Rojahn

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

January 30, 2004

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

NUS CORPORATION

Certificate of Training

THIS CERTIFIES THAT

TERRY ROJAHN

has successfully completed a course of instruction on

SUPERFUND TRAINING CLASS

prepared and conducted by the
NUS Corporation, Pittsburgh, Pennsylvania

SEPT. 30 - OCT. 4, 1985
Date of Award

Gary F. Smith, C.S.P.
Director; Health, Safety Training

E. Dennis Escher, P.E.
Vice President

WORKCARE™
A Trademark of WorkCare, Inc.

RELEASE TO DUTY

CLINIC INSTRUCTIONS: Complete and give to employee before they leave the facility. This is a requirement of Tetra-Tech.

Employee Name: Stanley J. Conti

Office Location: PIT

Yes	No	
☑	☐	To work with hazardous materials in accordance with 29 CFR 1910.120.
☑	☐	To use respiratory protective equipment in accordance with 29 CFR 1910.134.

Based on the limited information available to me at this time, I find no necessity for immediate restrictions and I release this employee for duty. It is understood and agreed upon by the employer or potential employer of this examinee that subsequent comprehensive review of all laboratory and other test data by WorkCare may detect health conditions not apparent to me. It is further agreed and understood that such health conditions may necessitate the need for workplace restrictions. Examination has been performed in compliance with 1910.120 and 1910.134.

Signed: [illegible] M.D.

Date: 12-6-04

Employee

Bring this form back to the office and fax it to:
Matt Soltis, Corporate Health & Safety (412) 921-4040

333 S. Anita Drive, Suite 630, Orange, CA 92868 • (714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Stan Conti

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER
AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

May 14, 2004
Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

TETRA TECH NUS, INC.
661 Andersen Drive ▪ Pittsburgh, Pennsylvania 15220-2745
(412) 921-7090 ▪ FAX (412) 921-4040 ▪ www.tetratech.com

March 11, 2003

Mr. Stanley Conti
Tetra Tech NUS, Inc.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220

Whom It May Concern:

This letter is to certify that Mr. Stanley Conti successfully completed a course of instruction in Hazardous Materials Handling for Hazardous Waste Site Workers which meets the criteria established in 29 CFR 1910.120(e)(3)(i). This course was prepared and conducted by Tetra Tech NUS (formerly Brown and Root Environmental, a division of HALLIBURTON NUS Corporation) in September 1983. If you have any questions, please feel free to contact me.

Very truly yours,

James K. Laffey
Manager, Training Resources

JKL:lld

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

EMPLOYEE:	Goerdt, James	COMPANY:	TT/NUS
SSN:	481-86-2691	POSITION:	Environmental Scientist
DATE OF EXAM:	11/07/2003	LOCATION:	TT/NUS-Pittsburgh
EXPIRATION DATE:	11/07/2005	SITE:	Pittsburgh

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☑	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☑	☐

STATUS

1. ☑ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. ☐ **NOT QUALIFIED**

4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Scott Hardy, M.D. Date: 11/11/03

Signature: Scott Hardy MD

WorkCare
333 S. Anita Drive, Suite 630, Orange, CA 92868
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Jim Goerdt

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

October 22, 2004

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

APPLIED EDUCATIONAL SERIES

James D. Goerdt

APPLIED ASSOCIATES INTERNATIONAL INC.

CERTIFICATE

OSHA, 1910.120 Hazardous Waste Operations and Emergency Response 40 Hour Course

ISSUE DATE: December 13, 1991

EXPIRATION: December 13, 1992

CERTIFICATE: HAZ9112001058

STEVEN L. WILLIAMS
President

THOMAS O. MURRAY
Certified Industrial Hygenist

P. O. Box 300068
Fern Park, Florida 32730-0068

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Baseline Examination **UPDATE**

EMPLOYEE:	Doolan, Colin	**COMPANY:**	TT/NUS
SSN:	XXX-XX-8351	**POSITION:**	Earth Scientist
DATE OF EXAM:	12/02/2004	**LOCATION:**	TT/NUS-Pittsburgh
EXPIRATION DATE:	12/02/2006	**SITE:**	Pittsburgh

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☑	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☑	☐

STATUS

1. ☑ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. ☐ **NOT QUALIFIED**

4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS: ***Status changed to Biennial.***

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Peter P. Greaney, M.D. Date: 12/07/04

Signature: Peter P Greaney MD

WorkCare
333 S. Anita Drive, Suite 630, Orange, CA 92868
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Colin A. Doolan

has successfully completed an 8-hour course of instruction in
OSHA 29 CFR 1910.120

GENERAL SITE WORKER
REFRESHER TRAINING

prepared and instructed by Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

December 23, 2004
Date of Award

Clyde Snyder
Senior Instructor
Training Services

James R. Lafferty
Manager
Training Services

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-12-4-003

December 3, 2004

Project Number N6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0160, 0331, 0343, and 0357

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from December 6, 2004 through December 17, 2004. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans.

- Health and Safety Plan for Solid Waste Management Unit 7, dated December 2004, prepared under CTO 0160.
- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.

These individuals are as follows:

Stan Conti
Jim Goerdt
Terry Rojahn
Donald Westerhoff

TETRA TECH NUS, INC.

PITT-12-4-003

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/mlg

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Roger Clark, Ph.D., TtNUS, Inc.
Mr. Ralph Basinski, TtNUS, Inc.
File copy CTO 0160, 0331, 0343, and 0357

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-12-4-053

December 30, 2004

Project Numbers 3961, 1245, 7448, and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0160, 0331, 0343, an[redacted]

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from January 4-28, 2005. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans.

- Health and Safety Plan for Solid Waste Management Unit 7, dated December 2004, prepared under CTO 0160.
- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.

These individuals are as follows:

Stan Conti
Colin Doolan
Jim Goerdt
Terry Rojahn

TETRA TECH NUS, INC.

PITT-12-4-053

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/lld

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Roger Clark, Ph.D., TtNUS, Inc.
Mr. Ralph Basinski, TtNUS, Inc.
File copy CTO 0160, 0331, 0343, and 0357

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-2-5-050

February 25, 2005

Project Numbers N1245, N6878, and 00042

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0331, 0357, and 0376

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from February 28 through March 16, 2005. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans.

- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.
- Health and Safety Plan for Risk Assessment and CMS at Solid Waste Management Unit (SWMU) 9, dated February 2005, prepared under CTO 0376.

These individuals are as follows:

Jim Goerdt
Terry Rojahn

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/lld

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Roger Clark, Ph.D., TtNUS, Inc.
Mr. Ralph Basinski, TtNUS, Inc.
File copy CTO 0331, 0357, and 0376

APPENDIX G

ANALYTICAL DATA

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
Volatile Organics (ug/kg)							
1,1,1,2-TETRACHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,1,1-TRICHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,1,2,2-TETRACHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,1,2-TRICHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,1-DICHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,1-DICHLOROETHENE	1.05 U 12SS010002 0.986 U 12SB010609						
1,2,3-TRICHLOROPROPANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,2-DIBROMO-3-CHLOROPROPANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,2-DIBROMOETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,2-DICHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
1,2-DICHLOROPROPANE	1.05 U 12SS010002 0.986 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
1,4-DIOXANE	100 U 12SS010002 94.1 U 12SB010609						
2-BUTANONE	1.05 U 12SS010002 0.986 U 12SB010609						
2-HEXANONE	1.05 U 12SS010002 0.986 U 12SB010609						
3-CHLOROPROPENE	1.05 U 12SS010002 0.986 U 12SB010609						
4-METHYL-2-PENTANONE	1.05 U 12SS010002 0.986 U 12SB010609						
ACETONE	2 U 12SS010002 3 U 12SB010609						
ACETONITRILE	40 U 12SS010002 37.6 U 12SB010609						
ACROLEIN	1.05 UR 12SS010002 0.986 UR 12SB010609						
ACRYLONITRILE	1.05 U 12SS010002 0.986 U 12SB010609						
BENZENE	1.05 U 12SS010002 0.986 U 12SB010609						
BROMODICHLOROMETHANE	1.05 U 12SS010002 0.986 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
BROMOFORM	1.05 U 12SS010002 0.986 U 12SB010609						
BROMOMETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
CARBON DISULFIDE	1.05 U 12SS010002 0.986 U 12SB010609						
CARBON TETRACHLORIDE	1.05 U 12SS010002 0.986 U 12SB010609						
CHLOROBENZENE	1.05 U 12SS010002 0.986 U 12SB010609						
CHLORODIBROMOMETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
CHLOROETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
CHLOROFORM	1.05 U 12SS010002 0.986 U 12SB010609						
CHLOROMETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
CHLOROPRENE	1.05 U 12SS010002 0.986 U 12SB010609						
CIS-1,2-DICHLOROETHENE	1.05 U 12SS010002 0.986 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
CIS-1,3-DICHLOROPROPENE	1.05 U 12SS010002 0.986 U 12SB010609						
DIBROMOMETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
DICHLORODIFLUOROMETHANE	1.05 UJ 12SS010002 0.986 UJ 12SB010609						
ETHYL METHACRYLATE	1.05 U 12SS010002 0.986 U 12SB010609						
ETHYLBENZENE	1.05 U 12SS010002 0.986 U 12SB010609						
ISOBUTANOL	40 U 12SS010002 37.6 U 12SB010609						
METHACRYLONITRILE	1.05 U 12SS010002 0.986 U 12SB010609						
METHYL IODIDE	1.05 UJ 12SS010002 0.986 UJ 12SB010609						
METHYL METHACRYLATE	1.05 U 12SS010002 0.986 U 12SB010609						
METHYLENE CHLORIDE	1.05 UJ 12SS010002 0.986 UJ 12SB010609						
PROPIONITRILE	40 U 12SS010002 37.6 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
STYRENE	1.05 U 12SS010002 0.986 U 12SB010609						
TETRACHLOROETHENE	1.05 U 12SS010002 0.986 U 12SB010609						
TOLUENE	1.05 U 12SS010002 0.986 U 12SB010609						
TOTAL XYLENES	1.05 U 12SS010002 0.986 U 12SB010609						
TRANS-1,2-DICHLOROETHENE	1.05 U 12SS010002 0.986 U 12SB010609						
TRANS-1,3-DICHLOROPROPENE	1.05 U 12SS010002 0.986 U 12SB010609						
TRANS-1,4-DICHLORO-2-BUTENE	1.05 U 12SS010002 0.986 U 12SB010609						
TRICHLOROETHENE	1.05 U 12SS010002 0.986 U 12SB010609						
TRICHLOROFLUOROMETHANE	1.05 U 12SS010002 0.986 U 12SB010609						
VINYL ACETATE	1.05 U 12SS010002 0.986 U 12SB010609						
VINYL CHLORIDE	1.05 U 12SS010002 0.986 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
Semivolatile Organics (ug/kg)							
1,2,4,5-TETRACHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
1,2,4-TRICHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
1,2-DICHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
1,3-DICHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
1,4-DICHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
1,4-NAPHTHOQUINONE	80.7 U 12SS010002 76 U 12SB010609						
1,4-PHENYLENEDIAMINE	80.7 U 12SS010002 76 U 12SB010609						
1-NAPHTHYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
2,2'-OXYBIS(1-CHLOROPROPANE)	80.7 U 12SS010002 76 U 12SB010609						
2,3,4,6-TETRACHLOROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2,4,5-TRICHLOROPHENOL	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
2,4,6-TRICHLOROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2,4-DICHLOROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2,4-DIMETHYLPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2,4-DINITROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2,6-DICHLOROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2-ACETYLAMINOFLUORENE	80.7 U 12SS010002 76 U 12SB010609						
2-CHLORONAPHTHALENE	80.7 U 12SS010002 76 U 12SB010609						
2-CHLOROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2-METHYLNAPHTHALENE	3.98 U 12SS010002 3.74 U 12SB010609						
2-METHYLPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2-NAPHTHYLAMINE	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
2-NITROANILINE	80.7 U 12SS010002 76 U 12SB010609						
2-NITROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
2-PICOLINE	80.7 U 12SS010002 76 U 12SB010609						
3&4-METHYLPHENOL	80.7 U 12SS010002 76 U 12SB010609						
3,3'-DICHLOROBENZIDINE	80.7 U 12SS010002 76 U 12SB010609						
3,3'-DIMETHYLBENZIDINE	80.7 U 12SS010002 76 U 12SB010609						
3-METHYLCHOLANTHRENE	80.7 U 12SS010002 76 U 12SB010609						
3-NITROANILINE	80.7 U 12SS010002 76 U 12SB010609						
4,6-DINITRO-2-METHYLPHENOL	80.7 U 12SS010002 76 U 12SB010609						
4-AMINOBIPHENYL	80.7 U 12SS010002 76 U 12SB010609						
4-BROMOPHENYL PHENYL ETHER	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
4-CHLORO-3-METHYLPHENOL	80.7 U 12SS010002 76 U 12SB010609						
4-CHLOROANILINE	80.7 U 12SS010002 76 U 12SB010609						
4-CHLOROPHENYL PHENYL ETHER	80.7 U 12SS010002 76 U 12SB010609						
4-NITROANILINE	80.7 U 12SS010002 76 U 12SB010609						
4-NITROPHENOL	80.7 U 12SS010002 76 U 12SB010609						
4-NITROQUINOLINE-1-OXIDE	80.7 UR 12SS010002 76 UR 12SB010609						
5-NITRO-O-TOLUIDINE	80.7 U 12SS010002 76 U 12SB010609						
7,12-DIMETHYLBENZ(A)ANTHRACENE	80.7 U 12SS010002 76 U 12SB010609						
A,A-DIMETHYLPHENETHYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
ACENAPHTHENE	3.98 U 12SS010002 3.74 U 12SB010609						
ACENAPHTHYLENE	3.98 U 12SS010002 3.74 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
ACETOPHENONE	80.7 U 12SS010002 76 U 12SB010609						
ANILINE	80.7 U 12SS010002 76 U 12SB010609						
ANTHRACENE	3.98 U 12SS010002 3.74 U 12SB010609						
ARAMITE	80.7 U 12SS010002 76 U 12SB010609						
BENZO(A)ANTHRACENE	3.98 U 12SS010002 3.74 U 12SB010609						
BENZO(A)PYRENE	3.98 U 12SS010002 3.74 U 12SB010609						
BENZO(B)FLUORANTHENE	3.98 U 12SS010002 3.74 U 12SB010609						
BENZO(G,H,I)PERYLENE	3.98 U 12SS010002 3.74 U 12SB010609						
BENZO(K)FLUORANTHENE	3.98 U 12SS010002 3.74 U 12SB010609						
BENZYL ALCOHOL	80.7 U 12SS010002 76 U 12SB010609						
BIS(2-CHLOROETHOXY)METHANE	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
BIS(2-CHLOROETHYL)ETHER	80.7 U 12SS010002 76 U 12SB010609						
BIS(2-ETHYLHEXYL)PHTHALATE	80.7 U 12SS010002 76 U 12SB010609						
BUTYL BENZYL PHTHALATE	80.7 U 12SS010002 76 U 12SB010609						
CHLOROBENZILATE	80.7 U 12SS010002 76 U 12SB010609						
CHRYSENE	3.98 U 12SS010002 3.74 U 12SB010609						
DI-N-BUTYL PHTHALATE	80.7 U 12SS010002 76 U 12SB010609						
DI-N-OCTYL PHTHALATE	80.7 U 12SS010002 76 U 12SB010609						
DIALLATE	80.7 U 12SS010002 76 U 12SB010609						
DIBENZO(A,H)ANTHRACENE	3.98 U 12SS010002 3.74 U 12SB010609						
DIBENZOFURAN	80.7 U 12SS010002 76 U 12SB010609						
DIETHYL PHTHALATE	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
DIMETHYL PHTHALATE	80.7 U 12SS010002 76 U 12SB010609						
DIPHENYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
ETHYL METHANE SULFONATE	80.7 U 12SS010002 76 U 12SB010609						
FLUORANTHENE	3.98 U 12SS010002 3.74 U 12SB010609						
FLUORENE	3.98 U 12SS010002 3.74 U 12SB010609						
HEXACHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
HEXACHLOROBUTADIENE	80.7 U 12SS010002 76 U 12SB010609						
HEXACHLOROCYCLOPENTADIENE	80.7 UJ 12SS010002 76 UJ 12SB010609						
HEXACHLOROETHANE	80.7 U 12SS010002 76 U 12SB010609						
HEXACHLOROPROPENE	80.7 U 12SS010002 76 U 12SB010609						
INDENO(1,2,3-CD)PYRENE	3.98 U 12SS010002 3.74 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
ISODRIN	80.7 U 12SS010002 76 U 12SB010609						
ISOPHORONE	80.7 U 12SS010002 76 U 12SB010609						
ISOSAFROLE	80.7 U 12SS010002 76 U 12SB010609						
KEPONE	80.7 UJ 12SS010002 76 UJ 12SB010609						
METHAPYRILENE	80.7 U 12SS010002 76 U 12SB010609						
METHYL METHANE SULFONATE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSO-DI-N-BUTYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSO-DI-N-PROPYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSODIETHYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSODIMETHYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSODIPHENYLAMINE	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
N-NITROSOMETHYLETHYLAMINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSOMORPHOLINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSOPIPERIDINE	80.7 U 12SS010002 76 U 12SB010609						
N-NITROSOPYRROLIDINE	80.7 U 12SS010002 76 U 12SB010609						
NAPHTHALENE	3.98 U 12SS010002 3.74 U 12SB010609						
O,O,O-TRIETHYL PHOSPHOROTHIOATE	80.7 U 12SS010002 76 U 12SB010609						
O-TOLUIDINE	80.7 U 12SS010002 76 U 12SB010609						
P-(DIMETHYLAMINO)AZOBENZENE	80.7 U 12SS010002 76 U 12SB010609						
PENTACHLOROBENZENE	80.7 U 12SS010002 76 U 12SB010609						
PENTACHLOROETHANE	80.7 U 12SS010002 76 U 12SB010609						
PENTACHLORONITROBENZENE	80.7 U 12SS010002 76 U 12SB010609						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
PHENACETIN	80.7 U 12SS010002 76 U 12SB010609						
PHENANTHRENE	3.98 U 12SS010002 3.74 U 12SB010609						
PHENOL	80.7 U 12SS010002 76 U 12SB010609						
PRONAMIDE	80.7 U 12SS010002 76 U 12SB010609						
PYRENE	3.98 U 12SS010002 3.74 U 12SB010609						
PYRIDINE	80.7 U 12SS010002 76 U 12SB010609						
SAFROLE	80.7 U 12SS010002 76 U 12SB010609						
Energetics (mg/kg)							
1,3,5-TRINITROBENZENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
1,3-DINITROBENZENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
2,4,6-TRINITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
2,4-DINITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
2,6-DINITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
2-NITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
3-NITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
4-NITROTOLUENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
HMX	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
NITROBENZENE	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
RDX	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
TETRYL	0.25 U 12SS010002 0.25 U 12SB010609			0.287 U 12SS040002 0.316 U 12SB040207 0.26 U 12SB040712	0.333 U 12SS050002 0.305 U 12SB050204 0.25 U 12SB050204-D 0.25 U 12SB050509	0.25 U 12SS060002 0.25 U 12SB060205 0.25 U 12SB060509	0.287 U 12SS070002 0.313 U 12SB070206 0.297 U 12SB070610
Herbicides (ug/kg)							
HEXACHLOROPHENE	1.02 U 12SS010002 0.964 U 12SB010609						
PENTACHLOROPHENOL	0.542 U 12SS010002 0.51 U 12SB010609						
Inorganics (mg/kg)							
ALUMINUM	22100 12SS010002 12500 12SB010609			23700 J 12SS040002 33700 J 12SB040207 18700 J 12SB040712	22800 J 12SS050002 24600 J 12SB050204 22300 12SB050204-D 25800 12SB050509	25300 12SS060002 22300 12SB060205 27400 12SB060509	29800 J 12SS070002 28000 J 12SB070206 30100 J 12SB070610
ANTIMONY	0.49 U 12SS010002 0.25 U 12SB010609			0.59 J 12SS040002 0.38 J 12SB040207 0.22 U 12SB040712	0.49 J 12SS050002 0.53 J 12SB050204 0.63 U 12SB050204-D 0.34 U 12SB050509	0.49 U 12SS060002 0.87 U 12SB060205 0.35 U 12SB060509	1.4 J 12SS070002 0.71 J 12SB070206 0.33 U 12SB070610
ARSENIC	9 J 12SS010002 4.1 J 12SB010609			6.8 J 12SS040002 7 J 12SB040207 2.5 J 12SB040712	8 J 12SS050002 5.4 J 12SB050204 11 J 12SB050204-D 7 J 12SB050509	6.5 J 12SS060002 10.1 J 12SB060205 5.1 J 12SB060509	8.2 J 12SS070002 9 J 12SB070206 4.1 J 12SB070610
BARIUM	128 J 12SS010002 51.7 J 12SB010609			98.5 J 12SS040002 80.5 J 12SB040207 50.1 J 12SB040712	109 J 12SS050002 138 J 12SB050204 95.1 J 12SB050204-D 71.6 J 12SB050509	101 J 12SS060002 67.1 J 12SB060205 99.7 J 12SB060509	115 J 12SS070002 121 J 12SB070206 568 J 12SB070610
BERYLLIUM	0.89 J 12SS010002 0.47 J 12SB010609			0.84 J 12SS040002 0.62 J 12SB040207 1.1 J 12SB040712	0.94 J 12SS050002 0.99 J 12SB050204 0.7 J 12SB050204-D 0.73 J 12SB050509	0.9 12SS060002 0.69 J 12SB060205 1.4 12SB060509	0.69 J 12SS070002 0.92 J 12SB070206 1.5 J 12SB070610

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
CADMIUM	0.27 U 12SS010002 0.14 U 12SB010609			0.52 U 12SS040002 0.37 U 12SB040207 0.18 U 12SB040712	0.47 U 12SS050002 0.35 U 12SB050204 0.31 U 12SB050204-D 0.38 U 12SB050509	0.33 U 12SS060002 0.27 U 12SB060205 0.28 U 12SB060509	0.41 U 12SS070002 0.32 U 12SB070206 0.31 U 12SB070610
CALCIUM	957 J 12SS010002 515 J 12SB010609			7390 J 12SS040002 882 J 12SB040207 1380 J 12SB040712	1990 J 12SS050002 8100 J 12SB050204 2220 J 12SB050204-D 644 J 12SB050509	26000 J 12SS060002 738 J 12SB060205 650 J 12SB060509	285 J 12SS070002 2140 J 12SB070206 1040 J 12SB070610
CHROMIUM	25.8 J 12SS010002 26 J 12SB010609			23.4 J 12SS040002 27.7 J 12SB040207 24.1 J 12SB040712	26.9 J 12SS050002 22.9 J 12SB050204 25.7 J 12SB050204-D 24.6 J 12SB050509	23.6 J 12SS060002 24.1 J 12SB060205 32.5 J 12SB060509	24.8 J 12SS070002 23.4 J 12SB070206 30.6 J 12SB070610
COBALT	15.7 J 12SS010002 2.2 J 12SB010609			8.9 J 12SS040002 4 J 12SB040207 9.9 J 12SB040712	13.6 J 12SS050002 12.1 J 12SB050204 8.1 J 12SB050204-D 4.8 J 12SB050509	9 J 12SS060002 5.2 J 12SB060205 10.5 J 12SB060509	6.3 J 12SS070002 12.4 J 12SB070206 27 J 12SB070610
COPPER	12.5 J 12SS010002 4 J 12SB010609			14.2 J 12SS040002 20.8 J 12SB040207 16.9 J 12SB040712	15.9 J 12SS050002 13.3 J 12SB050204 16.7 J 12SB050204-D 15.8 J 12SB050509	13.5 J 12SS060002 16.9 J 12SB060205 13.3 J 12SB060509	19 J 12SS070002 12.8 J 12SB070206 13.4 J 12SB070610
IRON	23800 J 12SS010002 23400 J 12SB010609			26600 J 12SS040002 26000 J 12SB040207 26800 J 12SB040712	30600 J 12SS050002 19100 J 12SB050204 32400 J 12SB050204-D 26800 J 12SB050509	26400 J 12SS060002 31100 J 12SB060205 49600 J 12SB060509	24800 J 12SS070002 26500 J 12SB070206 48200 J 12SB070610
LEAD	18.1 J 12SS010002 9.3 J 12SB010609			14.7 J 12SS040002 12 J 12SB040207 10.9 J 12SB040712	17.4 J 12SS050002 17.5 J 12SB050204 16.1 J 12SB050204-D 11 J 12SB050509	12.5 J 12SS060002 14.9 J 12SB060205 20.3 J 12SB060509	31.2 J 12SS070002 16.8 J 12SB070206 16.2 J 12SB070610
MAGNESIUM	2270 J 12SS010002 991 J 12SB010609			3030 J 12SS040002 3360 J 12SB040207 4560 J 12SB040712	2490 J 12SS050002 2530 J 12SB050204 2980 J 12SB050204-D 2940 J 12SB050509	3050 J 12SS060002 3040 J 12SB060205 2800 J 12SB060509	2480 J 12SS070002 2660 J 12SB070206 2940 J 12SB070610
MANGANESE	1080 J 12SS010002 15.6 J 12SB010609			473 J 12SS040002 142 J 12SB040207 196 J 12SB040712	688 J 12SS050002 1600 J 12SB050204 295 J 12SB050204-D 88.6 J 12SB050509	509 J 12SS060002 218 J 12SB060205 668 J 12SB060509	255 J 12SS070002 694 J 12SB070206 617 J 12SB070610

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
MERCURY	0.028 J 12SS010002 0.008 J 12SB010609			0.041 J 12SS040002 0.13 12SB040207 0.023 J 12SB040712	0.035 J 12SS050002 0.022 J 12SB050204 0.024 J 12SB050204-D 0.007 UR 12SB050509	0.017 J 12SS060002 0.013 J 12SB060205 0.007 UR 12SB060509	0.032 J 12SS070002 0.05 J 12SB070206 0.013 J 12SB070610
NICKEL	17.7 J 12SS010002 8.4 J 12SB010609			18.1 J 12SS040002 14.9 J 12SB040207 26.8 J 12SB040712	21.4 J 12SS050002 19.6 J 12SB050204 16.4 J 12SB050204-D 14.7 J 12SB050509	18.4 J 12SS060002 14.8 J 12SB060205 22.2 J 12SB060509	19.7 J 12SS070002 19.3 J 12SB070206 26.2 J 12SB070610
POTASSIUM	1470 J 12SS010002 894 J 12SB010609			1860 J 12SS040002 2400 J 12SB040207 2130 J 12SB040712	1850 J 12SS050002 1880 J 12SB050204 1810 J 12SB050204-D 1860 J 12SB050509	1830 J 12SS060002 1910 J 12SB060205 1980 J 12SB060509	2120 J 12SS070002 2020 J 12SB070206 1790 J 12SB070610
SELENIUM	0.49 U 12SS010002 0.12 U 12SB010609			0.22 U 12SS040002 0.17 U 12SB040207 0.08 U 12SB040712	0.29 U 12SS050002 0.3 J 12SB050204 0.34 U 12SB050204-D 0.27 U 12SB050509	0.31 U 12SS060002 0.3 U 12SB060205 0.24 U 12SB060509	0.31 U 12SS070002 0.44 U 12SB070206 0.1 U 12SB070610
SILVER	0.05 U 12SS010002 0.042 U 12SB010609			0.05 U 12SS040002 0.048 U 12SB040207 0.042 U 12SB040712	0.05 U 12SS050002 0.047 U 12SB050204 0.048 U 12SB050204-D 0.2 U 12SB050509	0.06 U 12SS060002 0.046 U 12SB060205 0.08 U 12SB060509	0.042 U 12SS070002 0.048 U 12SB070206 0.047 U 12SB070610
SODIUM	46.8 U 12SS010002 81.5 J 12SB010609			51.1 U 12SS040002 77.7 U 12SB040207 179 J 12SB040712	26.9 U 12SS050002 99 U 12SB050204 66.7 J 12SB050204-D 92.9 J 12SB050509	59.8 J 12SS060002 62.1 J 12SB060205 70.4 J 12SB060509	37.2 U 12SS070002 93.4 U 12SB070206 101 U 12SB070610
THALLIUM	0.32 U 12SS010002 0.14 U 12SB010609			0.28 U 12SS040002 0.38 U 12SB040207 0.13 U 12SB040712	0.25 U 12SS050002 0.37 U 12SB050204 0.31 U 12SB050204-D 0.31 U 12SB050509	0.29 U 12SS060002 0.22 U 12SB060205 0.24 U 12SB060509	0.38 U 12SS070002 0.37 U 12SB070206 0 22 U 12SB070610
TIN	0.6 U 12SS010002 0.41 U 12SB010609			0.48 U 12SS040002 0.49 U 12SB040207 0.49 J 12SB040712	0.52 U 12SS050002 0.44 U 12SB050204 0.56 U 12SB050204-D 0.65 U 12SB050509	0.6 U 12SS060002 0.7 U 12SB060205 0.67 U 12SB060509	0.58 J 12SS070002 0.6 J 12SB070206 0.53 U 12SB070610
VANADIUM	44.9 J 12SS010002 28.1 J 12SB010609			38.6 J 12SS040002 49 J 12SB040207 23.6 J 12SB040712	39.6 J 12SS050002 42 J 12SB050204 46.5 J 12SB050204-D 37.5 J 12SB050509	39.2 J 12SS060002 42.6 J 12SB060205 47.5 J 12SB060509	48.6 J 12SS070002 47.4 J 12SB070206 43.7 J 12SB070610

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB01 8/15/2004	MFA 12SB02 8/15/2004	MFA 12SB03 8/15/2004	MFA 12SB04 8/15/2004	MFA 12SB05 8/15/2004	MFA 12SB06 8/15/2004	MFA 12SB07 8/15/2004
ZINC	47.7 J 12SS010002 9.8 J 12SB010609			47.7 J 12SS040002 55.2 J 12SB040207 66.7 J 12SB040712	57.8 J 12SS050002 50.4 J 12SB050204 48.1 J 12SB050204-D 45.8 J 12SB050509	45.6 J 12SS060002 52.4 J 12SB060205 48.3 J 12SB060509	165 J 12SS070002 52.2 J 12SB070206 52 J 12SB070610
Miscellaneous Parameters (MG/KG)							
AMMONIA-N		0.98 J 12SS020002 0.9 J 12SB020608 0.34 J 12SB020608-D	0.82 J 12SS030002 0.16 J 12SB030608				
CATION EXCHANGE CAPACITY (MEQ/1)		14 12SS020002 16 12SB020608 10 12SB020608-D	15 12SS030002 9.2 12SB030608				
CYANIDE	0.301 UJ 12SS010002 0.283 UJ 12SB010609						
PH (S.U.)		6 12SS020002 6.05 12SB020608 5.92 12SB020608-D	7.7 12SS030002 6.1 12SB030608				
TOTAL ORGANIC CARBON		11000 12SS020002 1000 U 12SB020608 1000 U 12SB020608-D	2200 12SS030002 1000 U 12SB030608				

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
Volatile Organics (ug/kg)							
1,1,1,2-TETRACHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,1,1-TRICHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,1,2,2-TETRACHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,1,2-TRICHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,1-DICHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,1-DICHLOROETHENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,2,3-TRICHLOROPROPANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,2-DIBROMO-3-CHLOROPROPANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,2-DIBROMOETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,2-DICHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
1,2-DICHLOROPROPANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
1,4-DIOXANE					94.8 U 12SS120002 87.2 U 12SB120204	88.8 U 12SS130002 88.9 U 12SB130204 88.8 U 12SB130607	105 U 12SS140002 93.2 U 12SB140204 92.4 U 12SB140607
2-BUTANONE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
2-HEXANONE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
3-CHLOROPROPENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
4-METHYL-2-PENTANONE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
ACETONE					4 U 12SS120002 4 U 12SB120204	0.921 UJ 12SS130002 2 U 12SB130204 5 U 12SB130607	6 U 12SS140002 4 BU 12SB140204 5 U 12SB140607
ACETONITRILE					37.9 U 12SS120002 34.9 U 12SB120204	35.5 U 12SS130002 35.5 U 12SB130204 35.5 U 12SB130607	42 U 12SS140002 37.3 U 12SB140204 37 U 12SB140607
ACROLEIN					0.994 UR 12SS120002 0.973 UR 12SB120204	0.921 UR 12SS130002 0.945 UR 12SB130204 1.03 UR 12SB130607	1.05 UR 12SS140002 0.976 UR 12SB140204 0.912 UR 12SB140607
ACRYLONITRILE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 UR 12SB140204 0.912 U 12SB140607
BENZENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
BROMODICHLOROMETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
BROMOFORM					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
BROMOMETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CARBON DISULFIDE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CARBON TETRACHLORIDE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CHLOROBENZENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CHLORODIBROMOMETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CHLOROETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CHLOROFORM					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CHLOROMETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CHLOROPRENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
CIS-1,2-DICHLOROETHENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
CIS-1,3-DICHLOROPROPENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
DIBROMOMETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
DICHLORODIFLUOROMETHANE					14 J 12SS120002 3 J 12SB120204	3 J 12SS130002 5 J 12SB130204 6 J 12SB130607	6 J 12SS140002 4 12SB140204 4 J 12SB140607
ETHYL METHACRYLATE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
ETHYLBENZENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
ISOBUTANOL					37.9 U 12SS120002 34.9 U 12SB120204	35.5 U 12SS130002 35.5 U 12SB130204 35.5 U 12SB130607	42 U 12SS140002 37.3 U 12SB140204 37 U 12SB140607
METHACRYLONITRILE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
METHYL IODIDE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
METHYL METHACRYLATE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
METHYLENE CHLORIDE					0.994 UJ 12SS120002 0.973 UJ 12SB120204	0.921 UJ 12SS130002 0.945 UJ 12SB130204 1.03 UJ 12SB130607	1.05 UJ 12SS140002 0.976 UJ 12SB140204 0.912 UJ 12SB140607
PROPIONITRILE					37.9 U 12SS120002 34.9 U 12SB120204	35.5 U 12SS130002 35.5 U 12SB130204 35.5 U 12SB130607	42 U 12SS140002 37.3 U 12SB140204 37 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
STYRENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TETRACHLOROETHENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TOLUENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TOTAL XYLENES					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TRANS-1,2-DICHLOROETHENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TRANS-1,3-DICHLOROPROPENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TRANS-1,4-DICHLORO-2-BUTENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TRICHLOROETHENE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
TRICHLOROFLUOROMETHANE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
VINYL ACETATE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607
VINYL CHLORIDE					0.994 U 12SS120002 0.973 U 12SB120204	0.921 U 12SS130002 0.945 U 12SB130204 1.03 U 12SB130607	1.05 U 12SS140002 0.976 U 12SB140204 0.912 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
Semivolatile Organics (ug/kg)							
1,2,4,5-TETRACHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1,2,4-TRICHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1,2-DICHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1,3-DICHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1,4-DICHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1,4-NAPHTHOQUINONE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1,4-PHENYLENEDIAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
1-NAPHTHYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2,2'-OXYBIS(1-CHLOROPROPANE)					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2,3,4,6-TETRACHLOROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2,4,5-TRICHLOROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
2,4,6-TRICHLOROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2,4-DICHLOROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2,4-DIMETHYLPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2,4-DINITROPHENOL					77.5 UR 12SS120002 74.9 UR 12SB120204	74.4 UR 12SS130002 75.4 UR 12SB130204 76.3 UR 12SB130607	76.4 UR 12SS140002 75.2 UR 12SB140204 77.4 UR 12SB140607
2,6-DICHLOROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-ACETYLAMINOFLUORENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-CHLORONAPHTHALENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-CHLOROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-METHYLNAPHTHALENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
2-METHYLPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-NAPHTHYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
2-NITROANILINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-NITROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
2-PICOLINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
3&4-METHYLPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
3,3'-DICHLOROBENZIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
3,3'-DIMETHYLBENZIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
3-METHYLCHOLANTHRENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
3-NITROANILINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
4,6-DINITRO-2-METHYLPHENOL					77.5 UR 12SS120002 74.9 UR 12SB120204	74.4 UR 12SS130002 75.4 UR 12SB130204 76.3 UR 12SB130607	76.4 UR 12SS140002 75.2 UR 12SB140204 77.4 UR 12SB140607
4-AMINOBIPHENYL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
4-BROMOPHENYL PHENYL ETHER					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
4-CHLORO-3-METHYLPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
4-CHLOROANILINE					77.5 UR 12SS120002 74.9 UR 12SB120204	74.4 UR 12SS130002 75.4 UR 12SB130204 76.3 UR 12SB130607	76.4 UR 12SS140002 75.2 UR 12SB140204 77.4 UR 12SB140607
4-CHLOROPHENYL PHENYL ETHER					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
4-NITROANILINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
4-NITROPHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
4-NITROQUINOLINE-1-OXIDE					77.5 UR 12SS120002 74.9 UR 12SB120204	74.4 UR 12SS130002 75.4 UR 12SB130204 76.3 UR 12SB130607	76.4 UR 12SS140002 75.2 UR 12SB140204 77.4 UR 12SB140607
5-NITRO-O-TOLUIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
7,12-DIMETHYLBENZ(A)ANTHRACENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
A,A-DIMETHYLPHENETHYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
ACENAPHTHENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
ACENAPHTHYLENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
ACETOPHENONE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
ANILINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
ANTHRACENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
ARAMITE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
BENZO(A)ANTHRACENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 8 12SB140607
BENZO(A)PYRENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
BENZO(B)FLUORANTHENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 16 12SB140607
BENZO(G,H,I)PERYLENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
BENZO(K)FLUORANTHENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
BENZYL ALCOHOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
BIS(2-CHLOROETHOXY)METHANE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
BIS(2-CHLOROETHYL)ETHER					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
BIS(2-ETHYLHEXYL)PHTHALATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 440 J 12SB140607
BUTYL BENZYL PHTHALATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
CHLOROBENZILATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
CHRYSENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 14 12SB140607
DI-N-BUTYL PHTHALATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
DI-N-OCTYL PHTHALATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
DIALLATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
DIBENZO(A,H)ANTHRACENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
DIBENZOFURAN					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
DIETHYL PHTHALATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
DIMETHYL PHTHALATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
DIPHENYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
ETHYL METHANE SULFONATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
FLUORANTHENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 11 12SB140607
FLUORENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
HEXACHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
HEXACHLOROBUTADIENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
HEXACHLOROCYCLOPENTADIENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
HEXACHLOROETHANE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
HEXACHLOROPROPENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
INDENO(1,2,3-CD)PYRENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
ISODRIN					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
ISOPHORONE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
ISOSAFROLE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
KEPONE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
METHAPYRILENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
METHYL METHANE SULFONATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSO-DI-N-BUTYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSO-DI-N-PROPYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSODIETHYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSODIMETHYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSODIPHENYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
N-NITROSOMETHYLETHYLAMINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSOMORPHOLINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSOPIPERIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
N-NITROSOPYRROLIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
NAPHTHALENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
O,O,O-TRIETHYL PHOSPHOROTHIOATE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
O-TOLUIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
P-(DIMETHYLAMINO)AZOBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
PENTACHLOROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
PENTACHLOROETHANE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
PENTACHLORONITROBENZENE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
PHENACETIN					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
PHENANTHRENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
PHENOL					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 UJ 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
PRONAMIDE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
PYRENE					3.82 U 12SS120002 3.69 U 12SB120204	3.66 U 12SS130002 3.71 U 12SB130204 3.76 U 12SB130607	3.76 U 12SS140002 3.7 U 12SB140204 3.81 U 12SB140607
PYRIDINE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 75.2 UJ 12SB140607
SAFROLE					77.5 UJ 12SS120002 74.9 UJ 12SB120204	74.4 U 12SS130002 75.4 UJ 12SB130204 76.3 UJ 12SB130607	76.4 UJ 12SS140002 75.2 UJ 12SB140204 77.4 UJ 12SB140607
Energetics (mg/kg)							
1,3,5-TRINITROBENZENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
1,3-DINITROBENZENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
2,4,6-TRINITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
2,4-DINITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
2,6-DINITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
2-AMINO-4,6-DINITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
2-NITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
3-NITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
4-AMINO-2,6-DINITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
4-NITROTOLUENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
HMX	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
NITROBENZENE	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
RDX	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
TETRYL	0.282 U 12SS080002 0.292 U 12SB080204 0.309 U 12SB080507	0.295 U 12SS090002 0.291 U 12SB090205 0.288 U 12SB090508	0.28 U 12SS100002 0.297 U 12SB100205 0.276 U 12SB100508	0.287 U 12SS110002 0.306 U 12SB110205 0.25 U 12SB110205-D 0.3 U 12SB110507	0.25 U 12SS120002 0.25 U 12SB120204	0.25 U 12SS130002 0.25 U 12SB130204 0.25 U 12SB130607	0.25 U 12SS140002 0.25 U 12SB140204 0.25 U 12SB140607
Herbicides (ug/kg)							
HEXACHLOROPHENE					0.983 U 12SS120002 0.951 U 12SB120204	0.943 U 12SS130002 0.956 U 12SB130204 0.968 U 12SB130607	0.969 U 12SS140002 0.954 U 12SB140204 0.982 U 12SB140607
PENTACHLOROPHENOL					0.52 U 12SS120002 0.503 U 12SB120204	0.499 U 12SS130002 0.506 U 12SB130204 0.513 U 12SB130607	0.513 U 12SS140002 0.505 U 12SB140204 0.52 U 12SB140607
Inorganics (mg/kg)							
ALUMINUM	22100 J 12SS080002 22000 J 12SB080204 27500 J 12SB080507	23300 J 12SS090002 18400 J 12SB090205 14500 J 12SB090508	17500 J 12SS100002 28500 J 12SB100205 11900 J 12SB100508	23800 J 12SS110002 37000 J 12SB110205 22700 12SB110205-D 22900 J 12SB110507	15300 J 12SS120002 12700 J 12SB120204	15300 J 12SS130002 16300 J 12SB130204 20100 J 12SB130607	20000 J 12SS140002 15400 J 12SB140204 24700 J 12SB140607
ANTIMONY	0.41 J 12SS080002 0.41 J 12SB080204 0.5 J 12SB080507	0.32 U 12SS090002 0.21 U 12SB090205 0.3 U 12SB090508	0.29 U 12SS100002 0.19 U 12SB100205 0.13 U 12SB100508	0.35 J 12SS110002 0.47 J 12SB110205 0.83 U 12SB110205-D 0.17 U 12SB110507	0.2 U 12SS120002 0.1 U 12SB120204	0.26 U 12SS130002 0.19 U 12SB130204 0.31 J 12SB130607	0.12 U 12SS140002 0.3 J 12SB140204 0.18 U 12SB140607
ARSENIC	5 J 12SS080002 6.2 J 12SB080204 12.3 J 12SB080507	8 J 12SS090002 3.2 J 12SB090205 8.6 J 12SB090508	4 J 12SS100002 3.8 J 12SB100205 3.1 J 12SB100508	5.3 J 12SS110002 6.9 J 12SB110205 10 J 12SB110205-D 8.7 J 12SB110507	2.8 J 12SS120002 0.95 J 12SB120204	4.1 J 12SS130002 1.9 J 12SB130204 2.8 J 12SB130607	2.6 J 12SS140002 3.6 J 12SB140204 2.2 J 12SB140607
BARIUM	88 J 12SS080002 195 J 12SB080204 88.5 J 12SB080507	60.1 J 12SS090002 45.2 J 12SB090205 74.5 J 12SB090508	50.2 J 12SS100002 193 J 12SB100205 67.4 J 12SB100508	64.3 J 12SS110002 190 J 12SB110205 102 J 12SB110205-D 161 J 12SB110507	76.5 J 12SS120002 49.6 J 12SB120204	54.1 J 12SS130002 32 J 12SB130204 40.8 J 12SB130607	104 J 12SS140002 53.8 J 12SB140204 109 J 12SB140607
BERYLLIUM	0.98 J 12SS080002 0.91 J 12SB080204 0.99 J 12SB080507	0.62 J 12SS090002 0.66 J 12SB090205 2 J 12SB090508	0.53 J 12SS100002 1.3 J 12SB100205 0.81 J 12SB100508	0.5 U 12SS110002 1.6 J 12SB110205 1.5 12SB110205-D 1 J 12SB110507	1.1 J 12SS120002 1.1 J 12SB120204	1.5 J 12SS130002 1.4 J 12SB130204 1.6 J 12SB130607	1.5 J 12SS140002 1.7 J 12SB140204 1.4 J 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
CADMIUM	0.43 U 12SS080002 0.3 U 12SB080204 0.34 U 12SB080507	0.3 U 12SS090002 0.22 U 12SB090205 0.27 U 12SB090508	0.33 U 12SS100002 0.32 U 12SB100205 0.17 U 12SB100508	0.27 U 12SS110002 0.3 U 12SB110205 0.3 U 12SB110205-D 0.2 U 12SB110507	0.23 U 12SS120002 0.12 U 12SB120204	0.47 U 12SS130002 0.29 U 12SB130204 0.32 U 12SB130607	0.23 U 12SS140002 0.2 U 12SB140204 0.17 U 12SB140607
CALCIUM	1560 J 12SS080002 1780 J 12SB080204 1500 J 12SB080507	971 J 12SS090002 593 J 12SB090205 437 J 12SB090508	708 J 12SS100002 745 J 12SB100205 357 J 12SB100508	862 J 12SS110002 832 J 12SB110205 596 J 12SB110205-D 544 J 12SB110507	644 J 12SS120002 557 J 12SB120204	877 J 12SS130002 492 J 12SB130204 726 J 12SB130607	859 J 12SS140002 578 J 12SB140204 713 J 12SB140607
CHROMIUM	25.7 J 12SS080002 28 J 12SB080204 25.8 J 12SB080507	25.6 J 12SS090002 21.2 J 12SB090205 28.5 J 12SB090508	18.1 J 12SS100002 30.8 J 12SB100205 26.2 J 12SB100508	22 J 12SS110002 38.7 J 12SB110205 32.2 J 12SB110205-D 26.4 J 12SB110507	22.4 J 12SS120002 18.6 J 12SB120204	40.3 J 12SS130002 33.4 J 12SB130204 38 J 12SB130607	36.1 J 12SS140002 29.8 J 12SB140204 35.7 J 12SB140607
COBALT	7.5 J 12SS080002 7.1 J 12SB080204 8.2 J 12SB080507	5.9 J 12SS090002 6.6 J 12SB090205 13.1 J 12SB090508	5.2 J 12SS100002 9.5 J 12SB100205 6.8 J 12SB100508	4.6 J 12SS110002 12.5 J 12SB110205 12.6 J 12SB110205-D 6.4 J 12SB110507	5.8 J 12SS120002 10.8 J 12SB120204	7.2 J 12SS130002 24.2 J 12SB130204 4.6 J 12SB130607	7.7 J 12SS140002 8.6 J 12SB140204 4.3 J 12SB140607
COPPER	10.9 J 12SS080002 11.1 J 12SB080204 14.5 J 12SB080507	11.9 J 12SS090002 6.9 J 12SB090205 22.9 J 12SB090508	8.1 J 12SS100002 11.7 J 12SB100205 10.6 J 12SB100508	12.2 J 12SS110002 13.3 J 12SB110205 13.1 J 12SB110205-D 10.3 J 12SB110507	8.7 J 12SS120002 7.8 J 12SB120204	22.9 J 12SS130002 15.3 J 12SB130204 23.9 J 12SB130607	9.8 J 12SS140002 7.3 J 12SB140204 5.4 J 12SB140607
IRON	20200 J 12SS080002 22200 J 12SB080204 34700 J 12SB080507	26200 J 12SS090002 13300 J 12SB090205 37400 J 12SB090508	18800 J 12SS100002 33500 J 12SB100205 8380 J 12SB100508	22100 J 12SS110002 41700 J 12SB110205 68600 J 12SB110205-D 32500 J 12SB110507	7160 J 12SS120002 26600 J 12SB120204	65900 J 12SS130002 93300 J 12SB130204 60000 J 12SB130607	16700 J 12SS140002 32000 J 12SB140204 6580 J 12SB140607
LEAD	13 J 12SS080002 16 J 12SB080204 39.4 J 12SB080507	14.9 J 12SS090002 8.8 J 12SB090205 21.3 J 12SB090508	10.7 J 12SS100002 14.1 J 12SB100205 11.7 J 12SB100508	12.1 J 12SS110002 11.9 J 12SB110205 70.2 J 12SB110205-D 9.1 J 12SB110507	10.6 J 12SS120002 20.4 J 12SB120204	30.7 J 12SS130002 25.4 J 12SB130204 19.7 J 12SB130607	8.3 J 12SS140002 14 J 12SB140204 14.2 J 12SB140607
MAGNESIUM	1690 J 12SS080002 1830 J 12SB080204 2880 J 12SB080507	2190 J 12SS090002 1620 J 12SB090205 1020 J 12SB090508	1360 J 12SS100002 1970 J 12SB100205 911 J 12SB100508	2080 J 12SS110002 2210 J 12SB110205 1400 J 12SB110205-D 1410 J 12SB110507	1280 J 12SS120002 824 J 12SB120204	940 J 12SS130002 904 J 12SB130204 1150 J 12SB130607	1660 J 12SS140002 946 J 12SB140204 1550 J 12SB140607
MANGANESE	140 J 12SS080002 156 J 12SB080204 448 J 12SB080507	141 J 12SS090002 34.3 J 12SB090205 119 J 12SB090508	201 J 12SS100002 43.6 J 12SB100205 12.5 J 12SB100508	150 J 12SS110002 83.6 J 12SB110205 518 J 12SB110205-D 34.6 J 12SB110507	68.7 J 12SS120002 299 J 12SB120204	200 J 12SS130002 796 J 12SB130204 65.1 J 12SB130607	157 J 12SS140002 191 J 12SB140204 22.6 J 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
MERCURY	0.014 J 12SS080002 0.029 J 12SB080204 0.029 J 12SB080507	0.009 J 12SS090002 0.007 U 12SB090205 0.007 U 12SB090508	0.009 J 12SS100002 0.011 J 12SB100205 0.007 J 12SB100508	0.04 J 12SS110002 0.007 U 12SB110205 0.013 J 12SB110205-D 0.018 J 12SB110507	0.007 U 12SS120002 0.007 U 12SB120204	0.02 J 12SS130002 0.007 U 12SB130204 0.068 J 12SB130607	0.007 U 12SS140002 0.007 U 12SB140204 0.007 U 12SB140607
NICKEL	17.8 J 12SS080002 16.3 J 12SB080204 16.5 J 12SB080507	13.5 J 12SS090002 14.7 J 12SB090205 47.3 J 12SB090508	12.1 J 12SS100002 26.8 J 12SB100205 15.8 J 12SB100508	13.7 J 12SS110002 31.4 J 12SB110205 19.4 J 12SB110205-D 16.8 J 12SB110507	25.4 J 12SS120002 39.7 J 12SB120204	44.6 J 12SS130002 72.6 J 12SB130204 25 J 12SB130607	31.7 J 12SS140002 32 J 12SB140204 24 J 12SB140607
POTASSIUM	1930 J 12SS080002 1990 J 12SB080204 1820 J 12SB080507	1710 J 12SS090002 1370 J 12SB090205 2330 J 12SB090508	1130 J 12SS100002 2080 J 12SB100205 2490 J 12SB100508	1530 J 12SS110002 1850 J 12SB110205 1030 J 12SB110205-D 1750 J 12SB110507	2940 J 12SS120002 2340 J 12SB120204	2210 J 12SS130002 2640 J 12SB130204 3520 J 12SB130607	4370 J 12SS140002 2930 J 12SB140204 5130 J 12SB140607
SELENIUM	0.27 U 12SS080002 0.21 J 12SB080204 0.38 J 12SB080507	0.27 U 12SS090002 0.04 U 12SB090205 0.6 U 12SB090508	0.18 U 12SS100002 0.2 U 12SB100205 0.19 U 12SB100508	0.13 U 12SS110002 0.13 U 12SB110205 0.4 U 12SB110205-D 0.15 U 12SB110507	0.13 U 12SS120002 0.25 U 12SB120204	0.4 U 12SS130002 0.54 U 12SB130204 2.3 J 12SB130607	0.24 U 12SS140002 0.88 U 12SB140204 0.71 U 12SB140607
SILVER	0.21 J 12SS080002 0.05 U 12SB080204 0.046 U 12SB080507	0.048 U 12SS090002 0.042 U 12SB090205 0.047 U 12SB090508	0.14 U 12SS100002 0.046 U 12SB100205 0.041 U 12SB100508	0.043 U 12SS110002 0.044 U 12SB110205 0.05 U 12SB110205-D 0.046 U 12SB110507	0.042 U 12SS120002 0.043 U 12SB120204	0.042 U 12SS130002 0.044 U 12SB130204 0.26 U 12SB130607	0.045 U 12SS140002 0.046 U 12SB140204 0.06 U 12SB140607
SODIUM	62.6 U 12SS080002 81.7 U 12SB080204 94.6 U 12SB080507	61.2 U 12SS090002 53.3 U 12SB090205 84.5 U 12SB090508	59 U 12SS100002 80.9 U 12SB100205 78.6 U 12SB100508	43.2 U 12SS110002 78 U 12SB110205 34.8 U 12SB110205-D 58.9 U 12SB110507	153 U 12SS120002 191 U 12SB120204	109 U 12SS130002 140 U 12SB130204 235 U 12SB130607	136 U 12SS140002 155 U 12SB140204 246 U 12SB140607
THALLIUM	0.37 U 12SS080002 0.26 U 12SB080204 0.3 U 12SB080507	0.24 U 12SS090002 0.16 U 12SB090205 0.23 U 12SB090508	0.26 U 12SS100002 0.25 U 12SB100205 0.17 U 12SB100508	0.23 U 12SS110002 0.37 U 12SB110205 0.37 U 12SB110205-D 0.28 U 12SB110507	0.17 U 12SS120002 0.15 U 12SB120204	0.15 U 12SS130002 0.2 U 12SB130204 0.42 U 12SB130607	0.24 U 12SS140002 0.21 U 12SB140204 0.34 U 12SB140607
TIN	0.61 J 12SS080002 0.41 U 12SB080204 0.49 U 12SB080507	0.39 U 12SS090002 0.31 U 12SB090205 0.31 U 12SB090508	0.38 U 12SS100002 0.3 U 12SB100205 0.27 U 12SB100508	0.43 U 12SS110002 0.66 J 12SB110205 0.51 U 12SB110205-D 0.43 U 12SB110507	0.77 U 12SS120002 0.26 U 12SB120204	2.3 U 12SS130002 0.42 U 12SB130204 0.52 U 12SB130607	0.46 U 12SS140002 0.26 U 12SB140204 0.33 U 12SB140607
VANADIUM	31.8 J 12SS080002 34.8 J 12SB080204 50.5 J 12SB080507	45.3 J 12SS090002 27.8 J 12SB090205 23.9 J 12SB090508	28.4 J 12SS100002 40 J 12SB100205 17.4 J 12SB100508	38.3 J 12SS110002 45.8 J 12SB110205 45 J 12SB110205-D 33.3 J 12SB110507	21.6 J 12SS120002 23 J 12SB120204	33.5 J 12SS130002 23.9 J 12SB130204 20.6 J 12SB130607	26 J 12SS140002 25.3 J 12SB140204 26.9 J 12SB140607

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	MFA 12SB08 8/15/2004	MFA 12SB09 8/15/2004	MFA 12SB10 8/15/2004	MFA 12SB11 8/15/2004	BDA 12SB12 8/13/2004	BDA 12SB13 8/13/2004	BDA 12SB14 8/13/2004
ZINC	33.5 J 12SS080002 32.8 J 12SB080204 50.1 J 12SB080507	30.2 J 12SS090002 22.7 J 12SB090205 99.2 J 12SB090508	23.3 J 12SS100002 37.6 J 12SB100205 32.7 J 12SB100508	30.6 J 12SS110002 43.9 J 12SB110205 33.3 J 12SB110205-D 25.9 J 12SB110507	102 J 12SS120002 59.7 J 12SB120204	206 J 12SS130002 128 J 12SB130204 53.5 J 12SB130607	41.2 J 12SS140002 54.8 J 12SB140204 36.1 J 12SB140607
Miscellaneous Parameters (MG/KG)							
AMMONIA-N							
CATION EXCHANGE CAPACITY (MEQ/1)							
CYANIDE							
PH (S.U.)							
TOTAL ORGANIC CARBON							

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
Volatile Organics (ug/kg)						
1,1,1,2-TETRACHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,1,1-TRICHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,1,2,2-TETRACHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,1,2-TRICHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,1-DICHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,1-DICHLOROETHENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,2,3-TRICHLOROPROPANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 UJ 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,2-DIBROMO-3-CHLOROPROPANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 UJ 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,2-DIBROMOETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,2-DICHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
1,2-DICHLOROPROPANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
1,4-DIOXANE	96.1 U 12SS150002 92.2 U 12SB150204 97.6 U 12SB150607	112 U 12SS180002 100 U 12SB180204 94.4 U 12SB180608 95.1 U 12SB180608-D	111 U 12SS190002 99.4 U 12SB190204	110 U 12SS200002 105 U 12SB200204 98.2 U 12SB200608	76.7 UJ 12SS210002	94.9 U 12SS220002
2-BUTANONE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
2-HEXANONE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
3-CHLOROPROPENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
4-METHYL-2-PENTANONE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
ACETONE	4 U 12SS150002 7 U 12SB150204 4 U 12SB150607	2 BU 12SS180002 3 BU 12SB180204 0.865 UJ 12SB180608 2 BU 12SB180608-D	21 BU 12SS190002 3 BU 12SB190204	2 U 12SS200002 6 U 12SB200204 2 BU 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
ACETONITRILE	38.4 U 12SS150002 36.9 U 12SB150204 39.1 U 12SB150607	44.9 U 12SS180002 40 U 12SB180204 37.8 U 12SB180608 38 U 12SB180608-D	44.5 U 12SS190002 39.7 U 12SB190204	44 U 12SS200002 42.1 U 12SB200204 39.3 U 12SB200608	30.7 UJ 12SS210002	38 U 12SS220002
ACROLEIN	0.961 UR 12SS150002 0.967 UR 12SB150204 1.01 UR 12SB150607	1.25 UR 12SS180002 1.13 UR 12SB180204 0.865 UR 12SB180608 0.985 UR 12SB180608-D	1.14 UR 12SS190002 1.08 UR 12SB190204	1.14 UR 12SS200002 0.92 UR 12SB200204 0.971 UR 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
ACRYLONITRILE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 UR 12SS180002 1.13 UR 12SB180204 0.865 UR 12SB180608 0.985 UR 12SB180608-D	1.14 UR 12SS190002 1.08 UR 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 UR 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
BENZENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
BROMODICHLOROMETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
BROMOFORM	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
BROMOMETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CARBON DISULFIDE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CARBON TETRACHLORIDE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CHLOROBENZENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CHLORODIBROMOMETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CHLOROETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CHLOROFORM	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CHLOROMETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CHLOROPRENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
CIS-1,2-DICHLOROETHENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
CIS-1,3-DICHLOROPROPENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
DIBROMOMETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
DICHLORODIFLUOROMETHANE	7 J 12SS150002 6 J 12SB150204 4 J 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	2 J 12SS190002 3 J 12SB190204	1.14 UJ 12SS200002 0.92 UJ 12SB200204 4 12SB200608	15 12SS210002	10 12SS220002
ETHYL METHACRYLATE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
ETHYLBENZENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
ISOBUTANOL	38.4 U 12SS150002 36.9 U 12SB150204 39.1 U 12SB150607	44.9 U 12SS180002 40 U 12SB180204 37.8 U 12SB180608 38 U 12SB180608-D	44.5 U 12SS190002 39.7 U 12SB190204	44 U 12SS200002 42.1 U 12SB200204 39.3 U 12SB200608	30.7 UJ 12SS210002	38 U 12SS220002
METHACRYLONITRILE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
METHYL IODIDE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 UJ 12SS180002 1.13 UJ 12SB180204 0.865 UJ 12SB180608 0.985 UJ 12SB180608-D	1.14 UJ 12SS190002 1.08 UJ 12SB190204	1.14 UJ 12SS200002 0.92 UJ 12SB200204 0.971 UJ 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
METHYL METHACRYLATE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
METHYLENE CHLORIDE	0.961 UJ 12SS150002 0.967 UJ 12SB150204 1.01 UJ 12SB150607	1.25 UJ 12SS180002 1.13 UJ 12SB180204 0.865 UJ 12SB180608 0.985 UJ 12SB180608-D	1.14 UJ 12SS190002 1.08 UJ 12SB190204	1.14 UJ 12SS200002 0.92 UJ 12SB200204 0.971 UJ 12SB200608	1.6 UJ 12SS210002	2 J 12SS220002
PROPIONITRILE	38.4 U 12SS150002 36.9 U 12SB150204 39.1 U 12SB150607	44.9 U 12SS180002 40 U 12SB180204 37.8 U 12SB180608 38 U 12SB180608-D	44.5 U 12SS190002 39.7 U 12SB190204	44 U 12SS200002 42.1 U 12SB200204 39.3 U 12SB200608	30.7 UJ 12SS210002	38 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
STYRENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TETRACHLOROETHENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TOLUENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TOTAL XYLENES	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TRANS-1,2-DICHLOROETHENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TRANS-1,3-DICHLOROPROPENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TRANS-1,4-DICHLORO-2-BUTENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TRICHLOROETHENE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
TRICHLOROFLUOROMETHANE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
VINYL ACETATE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002
VINYL CHLORIDE	0.961 U 12SS150002 0.967 U 12SB150204 1.01 U 12SB150607	1.25 U 12SS180002 1.13 U 12SB180204 0.865 U 12SB180608 0.985 U 12SB180608-D	1.14 U 12SS190002 1.08 U 12SB190204	1.14 U 12SS200002 0.92 U 12SB200204 0.971 U 12SB200608	1.6 U 12SS210002	1.04 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
Semivolatile Organics (ug/kg)						
1,2,4,5-TETRACHLOROBENZENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1,2,4-TRICHLOROBENZENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1,2-DICHLOROBENZENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1,3-DICHLOROBENZENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1,4-DICHLOROBENZENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1,4-NAPHTHOQUINONE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1,4-PHENYLENEDIAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
1-NAPHTHYLAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,2'-OXYBIS(1-CHLOROPROPANE)	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,3,4,6-TETRACHLOROPHENOL	77.5 U 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,4,5-TRICHLOROPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
2,4,6-TRICHLOROPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,4-DICHLOROPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,4-DIMETHYLPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UR 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,4-DINITROPHENOL	77.5 UR 12SS150002 75.4 UR 12SB150204 78.8 UR 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2,6-DICHLOROPHENOL	77.5 U 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-ACETYLAMINOFLUORENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-CHLORONAPHTHALENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-CHLOROPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-METHYLNAPHTHALENE	3.82 U 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	3.73 U 12SS220002
2-METHYLPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UJ 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-NAPHTHYLAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
2-NITROANILINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-NITROPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
2-PICOLINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
3&4-METHYLPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UJ 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
3,3'-DICHLOROBENZIDINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UR 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
3,3'-DIMETHYLBENZIDINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
3-METHYLCHOLANTHRENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
3-NITROANILINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UR 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4,6-DINITRO-2-METHYLPHENOL	77.5 UR 12SS150002 75.4 UR 12SB150204 78.8 UR 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-AMINOBIPHENYL	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-BROMOPHENYL PHENYL ETHER	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
4-CHLORO-3-METHYLPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-CHLOROANILINE	77.5 UR 12SS150002 75.4 UR 12SB150204 78.8 UR 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-CHLOROPHENYL PHENYL ETHER	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-NITROANILINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-NITROPHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
4-NITROQUINOLINE-1-OXIDE	77.5 UR 12SS150002 75.4 UR 12SB150204 78.8 UR 12SB150607	73.7 UR 12SS180002 72.9 UR 12SB180204 76.2 UR 12SB180608 76.7 UR 12SB180608-D	74.6 UR 12SS190002 72.4 UR 12SB190204	73.6 UR 12SS200002 73.4 UR 12SB200204 75.6 UR 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
5-NITRO-O-TOLUIDINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
7,12-DIMETHYLBENZ(A)ANTHRACENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
A,A-DIMETHYLPHENETHYLAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
ACENAPHTHENE	4 J 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	3.73 U 12SS220002
ACENAPHTHYLENE	19 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	3.73 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
ACETOPHENONE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
ANILINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
ANTHRACENE	21 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	3.73 U 12SS220002
ARAMITE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
BENZO(A)ANTHRACENE	98 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	5 J 12SS210002	14 12SS220002
BENZO(A)PYRENE	110 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	14 12SS220002
BENZO(B)FLUORANTHENE	150 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	54 12SS210002	13 12SS220002
BENZO(G,H,I)PERYLENE	93 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	13 12SS210002	14 12SS220002
BENZO(K)FLUORANTHENE	90 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	6 J 12SS210002	11 12SS220002
BENZYL ALCOHOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
BIS(2-CHLOROETHOXY)METHANE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
BIS(2-CHLOROETHYL)ETHER	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
BIS(2-ETHYLHEXYL)PHTHALATE	1300 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
BUTYL BENZYL PHTHALATE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
CHLOROBENZILATE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
CHRYSENE	100 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	110 12SS210002	14 12SS220002
DI-N-BUTYL PHTHALATE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	170 J 12SS210002	75.7 UJ 12SS220002
DI-N-OCTYL PHTHALATE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
DIALLATE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
DIBENZO(A,H)ANTHRACENE	21 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	3.73 U 12SS220002
DIBENZOFURAN	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
DIETHYL PHTHALATE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
DIMETHYL PHTHALATE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
DIPHENYLAMINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UR 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
ETHYL METHANE SULFONATE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
FLUORANTHENE	140 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	45 12SS210002	13 12SS220002
FLUORENE	4 J 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	3.47 U 12SS210002	3.73 U 12SS220002
HEXACHLOROBENZENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
HEXACHLOROBUTADIENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
HEXACHLOROCYCLOPENTADIENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 UJ 12SS180002 72.9 UJ 12SB180204 76.2 UJ 12SB180608 76.7 UJ 12SB180608-D	74.6 UJ 12SS190002 72.4 UJ 12SB190204	73.6 UJ 12SS200002 73.4 UJ 12SB200204 75.6 UJ 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
HEXACHLOROETHANE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
HEXACHLOROPROPENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
INDENO(1,2,3-CD)PYRENE	80 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	11 12SS210002	11 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
ISODRIN	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
ISOPHORONE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
ISOSAFROLE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	8400 12SS180002 690 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	2300 12SS190002 260 J 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
KEPONE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 UJ 12SS180002 72.9 UJ 12SB180204 76.2 UJ 12SB180608 76.7 UJ 12SB180608-D	74.6 UJ 12SS190002 72.4 UJ 12SB190204	73.6 UJ 12SS200002 73.4 UJ 12SB200204 75.6 UJ 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
METHAPYRILENE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
METHYL METHANE SULFONATE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSO-DI-N-BUTYLAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSO-DI-N-PROPYLAMINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSODIETHYLAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSODIMETHYLAMINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSODIPHENYLAMINE	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 UR 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
N-NITROSOMETHYLETHYLAMINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSOMORPHOLINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSOPIPERIDINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
N-NITROSOPYRROLIDINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
NAPHTHALENE	4 J 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	38 12SS210002	7 J 12SS220002
O,O,O-TRIETHYL PHOSPHOROTHIOATE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
O-TOLUIDINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
P-(DIMETHYLAMINO)AZOBENZENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
PENTACHLOROBENZENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
PENTACHLOROETHANE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
PENTACHLORONITROBENZENE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
PHENACETIN	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
PHENANTHRENE	30 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	140 J 12SS210002	9 J 12SS220002
PHENOL	77.5 UJ 12SS150002 75.4 UJ 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
PRONAMIDE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
PYRENE	180 12SS150002 3.71 U 12SB150204 3.88 U 12SB150607	3.63 U 12SS180002 3.59 U 12SB180204 3.75 U 12SB180608 3.78 U 12SB180608-D	3.67 U 12SS190002 3.56 U 12SB190204	3.63 U 12SS200002 3.61 U 12SB200204 3.72 U 12SB200608	22 12SS210002	22 12SS220002
PYRIDINE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
SAFROLE	77.5 U 12SS150002 75.4 U 12SB150204 78.8 UJ 12SB150607	73.7 U 12SS180002 72.9 U 12SB180204 76.2 U 12SB180608 76.7 U 12SB180608-D	74.6 U 12SS190002 72.4 U 12SB190204	73.6 U 12SS200002 73.4 U 12SB200204 75.6 U 12SB200608	70.4 UJ 12SS210002	75.7 UJ 12SS220002
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.84 12SS210002	0.25 U 12SS220002
1,3-DINITROBENZENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
2,4,6-TRINITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
2,4-DINITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
2,6-DINITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
2-NITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
3-NITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
4-NITROTOLUENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002
HMX	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	1.7 12SS210002	0.25 U 12SS220002
NITROBENZENE	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 U 12SS210002	0.25 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
RDX	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	6.1 12SS210002	0.25 U 12SS220002
TETRYL	0.25 U 12SS150002 0.25 U 12SB150204 0.25 U 12SB150607	0.25 U 12SS180002 0.25 U 12SB180204 0.25 U 12SB180608 0.25 U 12SB180608-D	0.25 U 12SS190002 0.25 U 12SB190204	0.25 U 12SS200002 0.25 U 12SB200204 0.25 U 12SB200608	0.25 UJ 12SS210002	0.25 UJ 12SS220002
Herbicides (ug/kg)						
HEXACHLOROPHENE	0.984 U 12SS150002 0.956 U 12SB150204 1 U 12SB150607	0.935 U 12SS180002 0.925 U 12SB180204 0.967 U 12SB180608 0.974 U 12SB180608-D	0.947 U 12SS190002 0.918 U 12SB190204	0.934 U 12SS200002 0.931 U 12SB200204 0.959 U 12SB200608	0.893 U 12SS210002	0.96 U 12SS220002
PENTACHLOROPHENOL	0.521 U 12SS150002 0.506 U 12SB150204 0.529 U 12SB150607	0.495 U 12SS180002 0.49 U 12SB180204 0.512 U 12SB180608 0.515 U 12SB180608-D	0.501 U 12SS190002 0.486 U 12SB190204	0.495 U 12SS200002 0.493 U 12SB200204 0.508 U 12SB200608	0.473 U 12SS210002	0.508 U 12SS220002
Inorganics (mg/kg)						
ALUMINUM	18000 J 12SS150002 16200 J 12SB150204 24200 J 12SB150607	17300 12SS180002 18700 12SB180204 17300 12SB180608 24600 12SB180608-D	23700 12SS190002 18700 12SB190204	15200 12SS200002 14900 12SB200204 13400 12SB200608	8780 J 12SS210002	13200 J 12SS220002
ANTIMONY	0.38 J 12SS150002 0.22 U 12SB150204 0.12 U 12SB150607	0.95 U 12SS180002 0.88 U 12SB180204 0.43 U 12SB180608 0.49 U 12SB180608-D	0.51 U 12SS190002 1.2 U 12SB190204	0.35 U 12SS200002 0.24 U 12SB200204 0.35 U 12SB200608	3610 J 12SS210002	11.4 J 12SS220002
ARSENIC	4.4 J 12SS150002 2.7 J 12SB150204 1.8 J 12SB150607	7.1 J 12SS180002 5.1 J 12SB180204 2 J 12SB180608 2.4 J 12SB180608-D	9.2 J 12SS190002 6.4 J 12SB190204	5.7 J 12SS200002 3.9 J 12SB200204 3.1 J 12SB200608	94.2 J 12SS210002	5.4 J 12SS220002
BARIUM	71.6 J 12SS150002 33.7 J 12SB150204 96.8 J 12SB150607	166 J 12SS180002 47.3 J 12SB180204 44.8 J 12SB180608 52.2 J 12SB180608-D	112 J 12SS190002 67.7 J 12SB190204	86 J 12SS200002 792 J 12SB200204 57.1 J 12SB200608	505 J 12SS210002	313 J 12SS220002
BERYLLIUM	0.97 J 12SS150002 1.4 J 12SB150204 1.6 J 12SB150607	0.77 J 12SS180002 0.75 J 12SB180204 1.6 12SB180608 1.8 12SB180608-D	0.8 J 12SS190002 0.51 J 12SB190204	0.72 J 12SS200002 0.53 J 12SB200204 1.3 12SB200608	0.35 U 12SS210002	0.96 U 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
CADMIUM	0.26 U 12SS150002 0.19 U 12SB150204 0.17 U 12SB150607	0.3 U 12SS180002 0.19 U 12SB180204 0.19 U 12SB180608 0.22 U 12SB180608-D	0.32 U 12SS190002 0.31 U 12SB190204	0.2 U 12SS200002 0.16 U 12SB200204 0.24 U 12SB200608	5.8 J 12SS210002	6.3 J 12SS220002
CALCIUM	17800 J 12SS150002 658 J 12SB150204 902 J 12SB150607	1800 J 12SS180002 439 J 12SB180204 1160 J 12SB180608 2980 J 12SB180608-D	883 J 12SS190002 645 J 12SB190204	299 J 12SS200002 287 J 12SB200204 539 J 12SB200608	5400 J 12SS210002	9150 J 12SS220002
CHROMIUM	30.3 J 12SS150002 34.1 J 12SB150204 38.8 J 12SB150607	20 J 12SS180002 27.3 J 12SB180204 30.5 J 12SB180608 39.5 J 12SB180608-D	22.5 J 12SS190002 20.5 J 12SB190204	19.6 J 12SS200002 23.5 J 12SB200204 30.2 J 12SB200608	48.5 J 12SS210002	50.2 J 12SS220002
COBALT	5 J 12SS150002 13.1 J 12SB150204 11.3 J 12SB150607	11.5 J 12SS180002 3.9 J 12SB180204 13.1 J 12SB180608 12.9 J 12SB180608-D	9.1 J 12SS190002 4.4 J 12SB190204	10.4 J 12SS200002 3.3 J 12SB200204 16 J 12SB200608	6.2 J 12SS210002	13.6 J 12SS220002
COPPER	9.9 J 12SS150002 8.1 J 12SB150204 22.5 J 12SB150607	10.6 J 12SS180002 7.4 J 12SB180204 18.7 J 12SB180608 18 J 12SB180608-D	15.8 J 12SS190002 10.6 J 12SB190204	9.1 J 12SS200002 8.2 J 12SB200204 10.8 J 12SB200608	345 J 12SS210002	292 J 12SS220002
IRON	15900 J 12SS150002 81400 J 12SB150204 43500 J 12SB150607	16800 J 12SS180002 28700 J 12SB180204 34000 J 12SB180608 41700 J 12SB180608-D	23200 J 12SS190002 19400 J 12SB190204	16500 J 12SS200002 21300 J 12SB200204 46400 J 12SB200608	29500 J 12SS210002	32200 J 12SS220002
LEAD	8.2 J 12SS150002 17.4 J 12SB150204 19.4 J 12SB150607	15.6 J 12SS180002 14.3 J 12SB180204 19.1 J 12SB180608 20 J 12SB180608-D	15.6 J 12SS190002 10.8 J 12SB190204	14.1 J 12SS200002 13.1 J 12SB200204 15.8 J 12SB200608	429000 J 12SS210002	506 J 12SS220002
MAGNESIUM	2050 J 12SS150002 896 J 12SB150204 1490 J 12SB150607	1930 J 12SS180002 1450 J 12SB180204 1550 J 12SB180608 1970 J 12SB180608-D	2430 J 12SS190002 1910 J 12SB190204	1630 J 12SS200002 1310 J 12SB200204 1460 J 12SB200608	1720 J 12SS210002	2750 J 12SS220002
MANGANESE	90.6 J 12SS150002 397 J 12SB150204 205 J 12SB150607	938 J 12SS180002 81.4 J 12SB180204 56.8 J 12SB180608 66.1 J 12SB180608-D	352 J 12SS190002 143 J 12SB190204	717 J 12SS200002 88.6 J 12SB200204 174 J 12SB200608	516 12SS210002	1340 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
MERCURY	0.009 J 12SS150002 0.008 J 12SB150204 0.014 J 12SB150607	0.014 J 12SS180002 0.007 UR 12SB180204 0.008 J 12SB180608 0.013 J 12SB180608-D	0.034 J 12SS190002 1 J 12SB190204	0.032 J 12SS200002 0.008 J 12SB200204 0.011 J 12SB200608	0.31 12SS210002	0.069 J 12SS220002
NICKEL	19.8 J 12SS150002 48.3 J 12SB150204 43.6 J 12SB150607	16.4 J 12SS180002 10.7 J 12SB180204 34.8 J 12SB180608 47.6 J 12SB180608-D	18.1 J 12SS190002 11.7 J 12SB190204	14 J 12SS200002 10.7 J 12SB200204 51.4 J 12SB200608	17.3 J 12SS210002	30.5 J 12SS220002
POTASSIUM	3570 J 12SS150002 2520 J 12SB150204 4550 J 12SB150607	1540 J 12SS180002 1280 J 12SB180204 3250 J 12SB180608 4030 J 12SB180608-D	1730 J 12SS190002 1490 J 12SB190204	1090 J 12SS200002 1010 J 12SB200204 2110 J 12SB200608	558 J 12SS210002	2000 J 12SS220002
SELENIUM	0.56 U 12SS150002 0.33 U 12SB150204 0.43 U 12SB150607	0.45 U 12SS180002 0.18 U 12SB180204 0.67 J 12SB180608 0.72 J 12SB180608-D	0.45 U 12SS190002 0.3 U 12SB190204	0.28 U 12SS200002 0.13 U 12SB200204 0.32 U 12SB200608	0.29 U 12SS210002	0.37 U 12SS220002
SILVER	0.08 U 12SS150002 0.041 U 12SB150204 0.044 U 12SB150607	0.08 U 12SS180002 0.04 U 12SB180204 0.042 U 12SB180608 0.04 U 12SB180608-D	0.042 U 12SS190002 0.18 U 12SB190204	0.043 U 12SS200002 0.04 U 12SB200204 0.041 U 12SB200608	18.5 J 12SS210002	0.72 U 12SS220002
SODIUM	132 U 12SS150002 141 U 12SB150204 229 U 12SB150607	37 U 12SS180002 56.8 J 12SB180204 361 J 12SB180608 435 J 12SB180608-D	31.6 U 12SS190002 37.4 U 12SB190204	20.5 U 12SS200002 65.7 J 12SB200204 505 J 12SB200608	298 J 12SS210002	370 J 12SS220002
THALLIUM	0.23 U 12SS150002 0.2 U 12SB150204 0.28 U 12SB150607	0.33 U 12SS180002 0.21 U 12SB180204 0.23 U 12SB180608 0.36 U 12SB180608-D	0.34 U 12SS190002 0.31 U 12SB190204	0.23 U 12SS200002 0.18 U 12SB200204 0.19 U 12SB200608	6.4 J 12SS210002	0.18 U 12SS220002
TIN	0.52 U 12SS150002 0.3 U 12SB150204 0.37 U 12SB150607	0.49 U 12SS180002 0.37 U 12SB180204 0.44 U 12SB180608 0.45 U 12SB180608-D	0.56 U 12SS190002 0.52 U 12SB190204	0.46 U 12SS200002 0.37 U 12SB200204 0.37 U 12SB200608	838 J 12SS210002	90.7 J 12SS220002
VANADIUM	29.3 J 12SS150002 25.2 J 12SB150204 30 J 12SB150607	35.9 J 12SS180002 33.3 J 12SB180204 25.5 J 12SB180608 29.4 J 12SB180608-D	42.8 J 12SS190002 34 J 12SB190204	30.9 J 12SS200002 30 J 12SB200204 30 J 12SB200608	16.8 J 12SS210002	23.5 J 12SS220002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB15 8/13/2004	BDA 12SB18 8/15/2004	BDA 12SB19 8/15/2004	BDA 12SB20 8/15/2004	BDA 12SB21 9/21/2004	BDA 12SB22 9/21/2004
ZINC	31 J 12SS150002 61 J 12SB150204 63.3 J 12SB150607	52.1 J 12SS180002 17.9 J 12SB180204 61.6 J 12SB180608 73.2 J 12SB180608-D	63.9 J 12SS190002 30.9 J 12SB190204	35.5 J 12SS200002 17.8 J 12SB200204 46.4 J 12SB200608	2050 J 12SS210002	2490 J 12SS220002
Miscellaneous Parameters (MG/KG)						
AMMONIA-N						
CATION EXCHANGE CAPACITY (MEQ/1)						
CYANIDE						
PH (S.U.)						
TOTAL ORGANIC CARBON						

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
Volatile Organics (ug/kg)		
1,1,1,2-TETRACHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,1,1-TRICHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,1,2,2-TETRACHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,1,2-TRICHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,1-DICHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,1-DICHLOROETHENE	1.3 U 12SS230002	0.918 U 12SS240002
1,2,3-TRICHLOROPROPANE	1.3 U 12SS230002	0.918 U 12SS240002
1,2-DIBROMO-3-CHLOROPROPANE	1.3 U 12SS230002	0.918 U 12SS240002
1,2-DIBROMOETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,2-DICHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
1,2-DICHLOROPROPANE	1.3 U 12SS230002	0.918 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
1,4-DIOXANE	151 U 12SS230002	135 U 12SS240002
2-BUTANONE	1.3 U 12SS230002	0.918 U 12SS240002
2-HEXANONE	1.3 U 12SS230002	0.918 U 12SS240002
3-CHLOROPROPENE	1.3 U 12SS230002	0.918 U 12SS240002
4-METHYL-2-PENTANONE	1.3 U 12SS230002	0.918 U 12SS240002
ACETONE	1.3 U 12SS230002	2 U 12SS240002
ACETONITRILE	60.2 U 12SS230002	54 U 12SS240002
ACROLEIN	1.3 U 12SS230002	0.918 U 12SS240002
ACRYLONITRILE	1.3 U 12SS230002	0.918 U 12SS240002
BENZENE	1.3 U 12SS230002	0.918 U 12SS240002
BROMODICHLOROMETHANE	1.3 U 12SS230002	0.918 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
BROMOFORM	1.3 U 12SS230002	0.918 U 12SS240002
BROMOMETHANE	1.3 U 12SS230002	0.918 U 12SS240002
CARBON DISULFIDE	1.3 U 12SS230002	0.918 U 12SS240002
CARBON TETRACHLORIDE	1.3 U 12SS230002	0.918 U 12SS240002
CHLOROBENZENE	1.3 U 12SS230002	0.918 U 12SS240002
CHLORODIBROMOMETHANE	1.3 U 12SS230002	0.918 U 12SS240002
CHLOROETHANE	1.3 U 12SS230002	0.918 U 12SS240002
CHLOROFORM	1.3 U 12SS230002	0.918 U 12SS240002
CHLOROMETHANE	1.3 U 12SS230002	0.918 U 12SS240002
CHLOROPRENE	1.3 U 12SS230002	0.918 U 12SS240002
CIS-1,2-DICHLOROETHENE	1.3 U 12SS230002	0.918 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
CIS-1,3-DICHLOROPROPENE	1.3 U 12SS230002	0.918 U 12SS240002
DIBROMOMETHANE	1.3 U 12SS230002	0.918 U 12SS240002
DICHLORODIFLUOROMETHANE	14 12SS230002	5 12SS240002
ETHYL METHACRYLATE	1.3 U 12SS230002	0.918 U 12SS240002
ETHYLBENZENE	1.3 U 12SS230002	0.918 U 12SS240002
ISOBUTANOL	60.2 U 12SS230002	54 U 12SS240002
METHACRYLONITRILE	1.3 U 12SS230002	0.918 U 12SS240002
METHYL IODIDE	1.3 U 12SS230002	0.918 U 12SS240002
METHYL METHACRYLATE	1.3 U 12SS230002	0.918 U 12SS240002
METHYLENE CHLORIDE	2 J 12SS230002	1 J 12SS240002
PROPIONITRILE	60.2 U 12SS230002	54 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
STYRENE	1.3 U 12SS230002	0.918 U 12SS240002
TETRACHLOROETHENE	1.3 U 12SS230002	0.918 U 12SS240002
TOLUENE	1.3 U 12SS230002	0.918 U 12SS240002
TOTAL XYLENES	1.3 U 12SS230002	0.918 U 12SS240002
TRANS-1,2-DICHLOROETHENE	1.3 U 12SS230002	0.918 U 12SS240002
TRANS-1,3-DICHLOROPROPENE	1.3 U 12SS230002	0.918 U 12SS240002
TRANS-1,4-DICHLORO-2-BUTENE	1.3 U 12SS230002	0.918 U 12SS240002
TRICHLOROETHENE	1.3 U 12SS230002	0.918 U 12SS240002
TRICHLOROFLUOROMETHANE	1.3 U 12SS230002	0.918 U 12SS240002
VINYL ACETATE	1.3 U 12SS230002	0.918 U 12SS240002
VINYL CHLORIDE	1.3 U 12SS230002	0.918 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
Semivolatile Organics (ug/kg)		
1,2,4,5-TETRACHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1,2,4-TRICHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1,2-DICHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1,3-DICHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1,4-DICHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1,4-NAPHTHOQUINONE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1,4-PHENYLENEDIAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
1-NAPHTHYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,2'-OXYBIS(1-CHLOROPROPANE)	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,3,4,6-TETRACHLOROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,4,5-TRICHLOROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
2,4,6-TRICHLOROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,4-DICHLOROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,4-DIMETHYLPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,4-DINITROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2,6-DICHLOROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-ACETYLAMINOFLUORENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-CHLORONAPHTHALENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-CHLOROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-METHYLNAPHTHALENE	3.76 U 12SS230002	3.65 U 12SS240002
2-METHYLPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-NAPHTHYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
2-NITROANILINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-NITROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
2-PICOLINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
3&4-METHYLPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
3,3'-DICHLOROBENZIDINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
3,3'-DIMETHYLBENZIDINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
3-METHYLCHOLANTHRENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
3-NITROANILINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4,6-DINITRO-2-METHYLPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-AMINOBIPHENYL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-BROMOPHENYL PHENYL ETHER	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
4-CHLORO-3-METHYLPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-CHLOROANILINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-CHLOROPHENYL PHENYL ETHER	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-NITROANILINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-NITROPHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
4-NITROQUINOLINE-1-OXIDE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
5-NITRO-O-TOLUIDINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
7,12-DIMETHYLBENZ(A)ANTHRACENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
A,A-DIMETHYLPHENETHYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
ACENAPHTHENE	3.76 U 12SS230002	3.65 U 12SS240002
ACENAPHTHYLENE	3.76 U 12SS230002	3.65 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
ACETOPHENONE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
ANILINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
ANTHRACENE	3.76 U 12SS230002	3.65 U 12SS240002
ARAMITE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
BENZO(A)ANTHRACENE	16 12SS230002	8 12SS240002
BENZO(A)PYRENE	17 12SS230002	12 12SS240002
BENZO(B)FLUORANTHENE	17 12SS230002	19 12SS240002
BENZO(G,H,I)PERYLENE	13 12SS230002	25 12SS240002
BENZO(K)FLUORANTHENE	10 12SS230002	4 J 12SS240002
BENZYL ALCOHOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
BIS(2-CHLOROETHOXY)METHANE	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
BIS(2-CHLOROETHYL)ETHER	76.4 UJ 12SS230002	74.1 UJ 12SS240002
BIS(2-ETHYLHEXYL)PHTHALATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
BUTYL BENZYL PHTHALATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
CHLOROBENZILATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
CHRYSENE	16 12SS230002	12 12SS240002
DI-N-BUTYL PHTHALATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
DI-N-OCTYL PHTHALATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
DIALLATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
DIBENZO(A,H)ANTHRACENE	3.76 U 12SS230002	3.65 U 12SS240002
DIBENZOFURAN	76.4 UJ 12SS230002	74.1 UJ 12SS240002
DIETHYL PHTHALATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
DIMETHYL PHTHALATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
DIPHENYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
ETHYL METHANE SULFONATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
FLUORANTHENE	23 12SS230002	11 12SS240002
FLUORENE	3.76 U 12SS230002	3.65 U 12SS240002
HEXACHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
HEXACHLOROBUTADIENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
HEXACHLOROCYCLOPENTADIENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
HEXACHLOROETHANE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
HEXACHLOROPROPENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
INDENO(1,2,3-CD)PYRENE	11 12SS230002	17 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
ISODRIN	76.4 UJ 12SS230002	74.1 UJ 12SS240002
ISOPHORONE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
ISOSAFROLE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
KEPONE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
METHAPYRILENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
METHYL METHANE SULFONATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSO-DI-N-BUTYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSO-DI-N-PROPYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSODIETHYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSODIMETHYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSODIPHENYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
N-NITROSOMETHYLETHYLAMINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSOMORPHOLINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSOPIPERIDINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
N-NITROSOPYRROLIDINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
NAPHTHALENE	3.76 U 12SS230002	3.65 U 12SS240002
O,O,O-TRIETHYL PHOSPHOROTHIOATE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
O-TOLUIDINE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
P-(DIMETHYLAMINO)AZOBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
PENTACHLOROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
PENTACHLOROETHANE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
PENTACHLORONITROBENZENE	76.4 UJ 12SS230002	74.1 UJ 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
PHENACETIN	76.4 UJ 12SS230002	74.1 UJ 12SS240002
PHENANTHRENE	15 J 12SS230002	11 J 12SS240002
PHENOL	76.4 UJ 12SS230002	74.1 UJ 12SS240002
PRONAMIDE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
PYRENE	36 12SS230002	19 12SS240002
PYRIDINE	76.4 UJ 12SS230002	74 1 UJ 12SS240002
SAFROLE	76.4 UJ 12SS230002	74.1 UJ 12SS240002
Energetics (mg/kg)		
1,3,5-TRINITROBENZENE	0.25 U 12SS230002	0.25 U 12SS240002
1,3-DINITROBENZENE	0.25 U 12SS230002	0.25 U 12SS240002
2,4,6-TRINITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
2,4-DINITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
2,6-DINITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
2-NITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
3-NITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
4-NITROTOLUENE	0.25 U 12SS230002	0.25 U 12SS240002
HMX	0.25 U 12SS230002	0.25 U 12SS240002
NITROBENZENE	0.25 U 12SS230002	0.25 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
RDX	0.25 U 12SS230002	0.25 U 12SS240002
TETRYL	0.25 UJ 12SS230002	0.25 UJ 12SS240002
Herbicides (ug/kg)		
HEXACHLOROPHENE	0.969 U 12SS230002	0.94 U 12SS240002
PENTACHLOROPHENOL	0.513 U 12SS230002	0.498 U 12SS240002
Inorganics (mg/kg)		
ALUMINUM	18700 J 12SS230002	19600 J 12SS240002
ANTIMONY	34.1 J 12SS230002	213 J 12SS240002
ARSENIC	7.6 J 12SS230002	158 J 12SS240002
BARIUM	147 J 12SS230002	97.3 J 12SS240002
BERYLLIUM	0.96 U 12SS230002	1 U 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
CADMIUM	0.81 U 12SS230002	0.75 U 12SS240002
CALCIUM	2550 J 12SS230002	7590 J 12SS240002
CHROMIUM	18.3 J 12SS230002	51.7 J 12SS240002
COBALT	12.9 J 12SS230002	12 J 12SS240002
COPPER	26.2 J 12SS230002	27.9 J 12SS240002
IRON	18700 J 12SS230002	51200 J 12SS240002
LEAD	3230 J 12SS230002	366 J 12SS240002
MAGNESIUM	1580 J 12SS230002	1710 J 12SS240002
MANGANESE	1400 12SS230002	451 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
MERCURY	0.042 J 12SS230002	0.034 J 12SS240002
NICKEL	15.9 J 12SS230002	23.9 J 12SS240002
POTASSIUM	1160 J 12SS230002	1980 J 12SS240002
SELENIUM	0.49 J 12SS230002	0.61 J 12SS240002
SILVER	0.24 U 12SS230002	0.08 U 12SS240002
SODIUM	51 U 12SS230002	78.2 J 12SS240002
THALLIUM	0.29 U 12SS230002	0.23 U 12SS240002
TIN	12.4 J 12SS230002	45.2 J 12SS240002
VANADIUM	31.4 J 12SS230002	42.7 J 12SS240002

APPENDIX TABLE G-1
RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
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AREA OF CONCERN LOCATION SAMPLE DATE	BDA 12SB23 9/21/2004	BDA 12SB24 9/21/2004
ZINC	156 J 12SS230002	206 J 12SS240002
Miscellaneous Parameters (MG/KG)		
AMMONIA-N		
CATION EXCHANGE CAPACITY (MEQ/1)		
CYANIDE		
PH (S.U.)		
TOTAL ORGANIC CARBON		

Data qualifiers (e.g., U, J) are defined in section 3 of the text.
MFA - mine fill a proper
BDA - battery site
ug/kg - micrograms per kilogram
mg/kg milligrams per kilogram
MEQ/1 - milliequivalents per 100 grams
S.U. - standard units

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB21 9/21/2004	BDA-MCD 12SB22 10/10/2006, 11/01/2005	BDA-MCD 12SB23 10/31/2005	BDA-MCD 12SB24 10/10/2006, 11/01/2005	BDA-MCD 12SB25 10/10/2006, 11/01/2005
Inorganics (mg/kg)					
ALUMINUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	16000 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	14400 12SB240204 13100 12SB240204-D 12SB240608 - REFUSAL	12500 J 12SS250001 12200 J 12SB250204 8630 12SB250204-D 12000 12SB250405
ANTIMONY	12SB210204 - REFUSAL 12SB210608 - REFUSAL	0.73 U 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	0.30 U 12SB240204 0.13 U 12SB240204-D 12SB240608 - REFUSAL	3.8 J 12SS250001 0.38 U 12SB250204 0.48 U 12SB250204-D 0.17 U 12SB250405
ARSENIC	12SB210204 - REFUSAL 12SB210608 - REFUSAL	45.2 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	2 J 12SB240204 1.3 J 12SB240204-D 12SB240608 - REFUSAL	7.7 J 12SS250001 9 J 12SB250204 12.5 J 12SB250204-D 2.5 J 12SB250405
BARIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	45.1 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	40.9 J 12SB240204 45.3 J 12SB240204-D 12SB240608 - REFUSAL	263 J 12SS250001 47.9 J 12SB250204 47.3 J 12SB250204-D 30.5 J 12SB250405
BERYLLIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	2.3 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	1.5 J 12SB240204 1.1 J 12SB240204-D 12SB240608 - REFUSAL	0.71 J 12SS250001 1.6 J 12SB250204 1.7 J 12SB250204-D 0.98 J 12SB250405
CADMIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	0.10 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	0.05 J 12SB240204 0.04 J 12SB240204-D 12SB240608 - REFUSAL	20.2 J 12SS250001 0.23 U 12SB250204 0.20 U 12SB250204-D 0.18 U 12SB250405
CALCIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	645 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	672 J 12SB240204 680 J 12SB240204-D 12SB240608 - REFUSAL	5730 J 12SS250001 612 J 12SB250204 592 J 12SB250204-D 685 J 12SB250405
CHROMIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	49.5 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	25.4 J 12SB240204 25.4 J 12SB240204-D 12SB240608 - REFUSAL	122 J 12SS250001 31.5 J 12SB250204 31.3 J 12SB250204-D 24.7 J 12SB250405
COBALT	12SB210204 - REFUSAL 12SB210608 - REFUSAL	4.7 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	5.6 J 12SB240204 3 J 12SB240204-D 12SB240608 - REFUSAL	14.3 J 12SS250001 59.1 J 12SB250204 30.5 J 12SB250204-D 6.2 J 12SB250405

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB21 9/21/2004	BDA-MCD 12SB22 10/10/2006, 11/01/2005	BDA-MCD 12SB23 10/31/2005	BDA-MCD 12SB24 10/10/2006, 11/01/2005	BDA-MCD 12SB25 10/10/2006, 11/01/2005
Inorganics (mg/kg)					
COPPER	12SB210204 - REFUSAL 12SB210608 - REFUSAL	18.2 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	6.9 J 12SB240204 4.8 J 12SB240204-D 12SB240608 - REFUSAL	903 J 12SS250001 14.5 J 12SB250204 16.8 J 12SB250204-D 11.7 J 12SB250405
IRON	12SB210204 - REFUSAL 12SB210608 - REFUSAL	67600 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	30200 J 12SB240204 17700 J 12SB240204-D 12SB240608 - REFUSAL	61100 J 12SS250001 39100 J 12SB250204 50000 J 12SB250204-D 25400 J 12SB250405
LEAD	12SB210204 - REFUSAL 12SB210608 - REFUSAL	23.5 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	11.3 J 12SB240204 8.9 J 12SB240204-D 12SB240608 - REFUSAL	627 J 12SS250001 15 J 12SB250204 12.2 J 12SB250204-D 14.6 J 12SB250405
MAGNESIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	1010 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	924 J 12SB240204 942 J 12SB240204-D 12SB240608 - REFUSAL	1610 J 12SS250001 976 J 12SB250204 718 J 12SB250204-D 939 J 12SB250405
MANGANESE	12SB210204 - REFUSAL 12SB210608 - REFUSAL	227 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	123 J 12SB240204 57.3 J 12SB240204-D 12SB240608 - REFUSAL	1650 J 12SS250001 519 J 12SB250204 348 J 12SB250204-D 108 J 12SB250405
NICKEL	12SB210204 - REFUSAL 12SB210608 - REFUSAL	38 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	31.5 J 12SB240204 22.7 J 12SB240204-D 12SB240608 - REFUSAL	27.6 12SS250001 33.6 12SB250204 36.5 J 12SB250204-D 24.9 J 12SB250405
POTASSIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	2730 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	2290 J 12SB240204 2360 J 12SB240204-D 12SB240608 - REFUSAL	1300 J 12SS250001 2570 J 12SB250204 1890 J 12SB250204-D 2270 J 12SB250405
SELENIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	1.9 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	0.52 12SB240204 0.44 12SB240204-D 12SB240608 - REFUSAL	0.54 12SS250001 0.60 12SB250204 0.72 12SB250204-D 0.51 12SB250405

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB21 9/21/2004	BDA-MCD 12SB22 10/10/2006, 11/01/2005	BDA-MCD 12SB23 10/31/2005	BDA-MCD 12SB24 10/10/2006, 11/01/2005	BDA-MCD 12SB25 10/10/2006, 11/01/2005
Inorganics (mg/kg)					
SILVER	12SB210204 - REFUSAL 12SB210608 - REFUSAL	0.043 U 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	0.041 U 12SB240204 0.04 J 12SB240204-D 12SB240608 - REFUSAL	0.90 12SS250001 0.045 U 12SB250204 0.042 U 12SB250204-D 0.042 U 12SB250405
SODIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	170 U 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	208 U 12SB240204 244 U 12SB240204-D 12SB240608 - REFUSAL	165 U 12SS250001 175 U 12SB250204 128 J 12SB250204-D 182 J 12SB250405
THALLIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	0.22 U 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	0.18 U 12SB240204 0.16 U 12SB240204-D 12SB240608 - REFUSAL	0.27 U 12SS250001 0.29 U 12SB250204 0.23 U 12SB250204-D 0.23 U 12SB250405
TITANIUM					
VANADIUM	12SB210204 - REFUSAL 12SB210608 - REFUSAL	28.3 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	18.9 J 12SB240204 15.9 J 12SB240204-D 12SB240608 - REFUSAL	23.8 J 12SS250001 29.4 J 12SB250204 24.8 J 12SB250204-D 16.6 J 12SB250405
ZINC	12SB210204 - REFUSAL 12SB210608 - REFUSAL	96.8 J 12SB220204 12SB220608 - REFUSAL	12SB230204 - REFUSAL 12SB230406 - REFUSAL	58.8 U 12SB240204 29.2 J 12SB240204-D 12SB240608 - REFUSAL	5110 J 12SS250001 35.5 J 12SB250204 54.4 J 12SB250204-D 34.4 J 12SB250405

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB26 10/10/2006, 11/01/2005	BDA-MCD 12SB27 10/10/2006, 11/01/2005	BDA-MCD 12SB28 10/10/2006, 11/01/2005	BDA-MCD 12SB29 10/10/2006, 11/01/2005	BDA-MCD 12SB30 10/10/2006, 11/01/2005
Inorganics (mg/kg)					
ALUMINUM	12700 J 12SS260001 10900 12SB260204 12SB260608 - REFUSAL	13100 12SS270001 9350 12SB270103 12SB270608 - REFUSAL	14600 12SS280001 13300 12SS280001-D 15700 12SB280204 9230 12SB280405	12700 12SS290001 13400 12SB290204 14500 12SB290405	22700 12SS300001 19200 12SB300204 14100 12SB300405
ANTIMONY	4.4 J 12SS260001 0.16 U 12SB260204 12SB260608 - REFUSAL	0.77 U 12SS270001 0.24 U 12SB270103 12SB270608 - REFUSAL	20.1 J 12SS280001 34.9 J 12SS280001-D 0.38 U 12SB280204 0.11 U 12SB280405	0.41 U 12SS290001 0.45 U 12SB290204 0.13 U 12SB290405	11 J 12SS300001 0.38 U 12SB300204 0.18 U 12SB300405
ARSENIC	12.3 J 12SS260001 1.1 J 12SB260204 12SB260608 - REFUSAL	4.5 J 12SS270001 2.9 J 12SB270103 12SB270608 - REFUSAL	4 J 12SS280001 5.4 J 12SS280001-D 9.4 J 12SB280204 1.2 J 12SB280405	5.1 J 12SS290001 17 J 12SB290204 0.71 J 12SB290405	11.3 J 12SS300001 5.4 J 12SB300204 3 J 12SB300405
BARIUM	217 J 12SS260001 41.6 J 12SB260204 12SB260608 - REFUSAL	63.9 J 12SS270001 47.9 J 12SB270103 12SB270608 - REFUSAL	154 J 12SS280001 162 J 12SS280001-D 95.2 J 12SB280204 26 J 12SB280405	79.6 J 12SS290001 45.9 J 12SB290204 42.3 J 12SB290405	119 J 12SS300001 40.1 J 12SB300204 47.3 J 12SB300405
BERYLLIUM	0.80 J 12SS260001 1 J 12SB260204 12SB260608 - REFUSAL	0.47 J 12SS270001 0.79 J 12SB270103 12SB270608 - REFUSAL	1.2 J 12SS280001 1.2 J 12SS280001-D 2.9 J 12SB280204 2 J 12SB280405	0.40 J 12SS290001 1.7 J 12SB290204 0.87 J 12SB290405	0.67 J 12SS300001 0.50 J 12SB300204 0.99 J 12SB300405
CADMIUM	49.3 J 12SS260001 0.16 U 12SB260204 12SB260608 - REFUSAL	0.80 12SS270001 0.07 J 12SB270103 12SB270608 - REFUSAL	1.7 12SS280001 2.2 12SS280001-D 0.17 J 12SB280204 0.21 U 12SB280405	0.37 J 12SS290001 0.14 J 12SB290204 0.17 U 12SB290405	2 12SS300001 0.13 J 12SB300204 0.18 U 12SB300405
CALCIUM	2710 J 12SS260001 616 J 12SB260204 12SB260608 - REFUSAL	3040 J 12SS270001 370 J 12SB270103 12SB270608 - REFUSAL	2850 J 12SS280001 4050 J 12SS280001-D 503 J 12SB280204 427 J 12SB280405	182000 J J 12SS290001 496 J 12SB290204 499 J 12SB290405	4510 J 12SS300001 192 J 12SB300204 333 J 12SB300405
CHROMIUM	78.7 J 12SS260001 20 J 12SB260204 12SB260608 - REFUSAL	24.1 J 12SS270001 26.7 J 12SB270103 12SB270608 - REFUSAL	59.7 J 12SS280001 59.3 J 12SS280001-D 32.1 J 12SB280204 25.6 J 12SB280405	18.5 J 12SS290001 31 J 12SB290204 22 J 12SB290405	50.2 J 12SS300001 33.3 J 12SB300204 33.4 J 12SB300405
COBALT	14 J 2SS260001 4 J 12SB260204 12SB260608 - REFUSAL	3 J 12SS270001 1.5 J 12SB270103 12SB270608 - REFUSAL	13 J 12SS280001 13.7 J 12SS280001-D 22 J 12SB280204 14.1 J 12SB280405	3.2 J 12SS290001 9.5 J 12SB290204 13.2 J 12SB290405	4.7 J 12SS300001 1.7 J 12SB300204 2.4 J 12SB300405

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB26 10/10/2006, 11/01/2005	BDA-MCD 12SB27 10/10/2006, 11/01/2005	BDA-MCD 12SB28 10/10/2006, 11/01/2005	BDA-MCD 12SB29 10/10/2006, 11/01/2005	BDA-MCD 12SB30 10/10/2006, 11/01/2005
Inorganics (mg/kg)					
COPPER	1460 J 12SS260001 11.6 J 12SB260204 12SB260608 - REFUSAL	115 J 12SS270001 13.3 J 12SB270103 12SB270608 - REFUSAL	65.2 J 12SS280001 102 J 12SS280001-D 10.9 J 12SB280204 11.6 J 12SB280405	10.7 J 12SS290001 30.4 J 12SB290204 3.9 J 12SB290405	138 J 2SS300001 8.8 J 12SB300204 19 J 12SB300405
IRON	59000 J 12SS260001 35000 J 12SB260204 12SB260608 - REFUSAL	23100 J 12SS270001 24000 J 12SB270103 12SB270608 - REFUSAL	26100 J 12SS280001 30300 J 12SS280001-D 125000 J J 12SB280204 36400 J 12SB280405	13600 J 12SS290001 54300 J 12SB290204 15600 J 12SB290405	45800 J 12SS300001 27100 J 12SB300204 45900 J 12SB300405
LEAD	989 J 12SS260001 10.6 J 12SB260204 12SB260608 - REFUSAL	132 J 12SS270001 10.5 J 12SB270103 12SB270608 - REFUSAL	1410 J 12SS280001 601 J 12SS280001-D 18.2 J 12SB280204 18.9 J 12SB280405	13.9 J 12SS290001 18 J 12SB290204 9.5 J 12SB290405	439 J 12SS300001 10 J 12SB300204 13.3 J 12SB300405
MAGNESIUM	1500 J 12SS260001 803 J 12SB260204 12SB260608 - REFUSAL	1010 J 12SS270001 717 J 12SB270103 12SB270608 - REFUSAL	1410 J 12SS280001 1320 J 12SS280001-D 836 J 12SB280204 602 J 12SB280405	13200 J 12SS290001 871 J 12SB290204 907 J 12SB290405	1630 J 12SS300001 1160 J 12SB300204 893 J 12SB300405
MANGANESE	9680 J 12SS260001 77.4 J 12SB260204 12SB260608 - REFUSAL	239 J 12SS270001 25.4 J 12SB270103 12SB270608 - REFUSAL	752 J 12SS280001 650 J 12SS280001-D 831 J 12SB280204 326 J 12SB280405	231 J 12SS290001 243 J 12SB290204 136 J 12SB290405	642 J 12SS300001 12.7 J 12SB300204 81.2 J 12SB300405
NICKEL	30.7 12SS260001 30.1 J 12SB260204 12SB260608 - REFUSAL	12.8 J 12SS270001 12.1 J 12SB270103 12SB270608 - REFUSAL	32.9 J 12SS280001 34.3 J 12SS280001-D 78 J 12SB280204 54.4 J 12SB280405	11.5 J 12SS290001 36.3 J 12SB290204 17 J 12SB290405	24.1 J 12SS300001 9 J 12SB300204 14.5 J 12SB300405
POTASSIUM	1570 J 12SS260001 1880 J 12SB260204 12SB260608 - REFUSAL	943 J 12SS270001 1550 J 12SB270103 12SB270608 - REFUSAL	2810 J 12SS280001 2480 J 12SS280001-D 2160 J 12SB280204 1720 J 12SB280405	1300 J 12SS290001 2150 J 12SB290204 2510 J 12SB290405	1050 J 12SS300001 1500 J 12SB300204 2010 J 12SB300405
SELENIUM	0.74 12SS260001 0.42 J 12SB260204 12SB260608 - REFUSAL	0.31 J 12SS270001 0.19 J 12SB270103 12SB270608 - REFUSAL	0.41 J 12SS280001 0.45 J 12SS280001-D 0.85 12SB280204 0.34 J 12SB280405	0.30 J 12SS290001 0.95 12SB290204 0 30 J 12SB290405	0.41 J 12SS300001 0.19 J 12SB300204 0.36 J 12SB300405

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB26 10/10/2006, 11/01/2005	BDA-MCD 12SB27 10/10/2006, 11/01/2005	BDA-MCD 12SB28 10/10/2006, 11/01/2005	BDA-MCD 12SB29 10/10/2006, 11/01/2005	BDA-MCD 12SB30 10/10/2006, 11/01/2005
Inorganics (mg/kg)					
SILVER	1.8 12SS260001 0.044 U 12SB260204 12SB260608 - REFUSAL	0.14 J 12SS270001 0.044 U 12SB270103 12SB270608 - REFUSAL	0.24 J 12SS280001 0.26 J 12SS280001-D 0.047 U 12SB280204 0.045 U 12SB280405	0.045 U 12SS290001 0.044 U 12SB290204 0.048 U 12SB290405	0.22 J 12SS300001 0.044 U 12SB300204 0.046 U 12SB300405
SODIUM	119 U 12SS260001 171 J 12SB260204 12SB260608 - REFUSAL	34.5 U 12SS270001 20.6 U 12SB270103 12SB270608 - REFUSAL	126 U 12SS280001 118 U 12SS280001-D 67.2 U 12SB280204 102 J 12SB280405	113 U 12SS290001 95.7 U 12SB290204 151 J 12SB290405	59.3 U 12SS300001 22.7 U 12SB300204 108 J 12SB300405
THALLIUM	0.26 U 12SS260001 0.23 U 12SB260204 12SB260608 - REFUSAL	0.16 U 12SS270001 0.15 U 12SB270103 12SB270608 - REFUSAL	0.22 U 12SS280001 0.21 U 12SS280001-D 0.21 U 12SB280204 0.17 U 12SB280405	0.18 U 12SS290001 0.22 U 12SB290204 0.21 U 12SB290405	0.24 U 12SS300001 0.24 U 12SB300204 0.20 U 12SB300405
TITANIUM					
VANADIUM	26 J 12SS260001 21.7 J 12SB260204 12SB260608 - REFUSAL	23 J 12SS270001 18.5 J 12SB270103 12SB270608 - REFUSAL	24.3 J 12SS280001 23.5 J 12SS280001-D 43.5 J 12SB280204 17.6 J 12SB280405	25.7 J 12SS290001 27.8 J 12SB290204 18 J 12SB290405	48.3 J 12SS300001 39.6 J 12SB300204 22.3 J 12SB300405
ZINC	23100 J 12SS260001 40.9 J 12SB260204 12SB260608 - REFUSAL	296 J 12SS270001 16.2 J 12SB270103 12SB270608 - REFUSAL	2780 J 12SS280001 3620 J 12SS280001-D 93.4 J 12SB280204 58.7 U 12SB280405	41.5 J 12SS290001 85.3 J 12SB290204 27.3 J 12SB290405	1590 J 12SS300001 12.2 J 12SB300204 22.3 J 12SB300405

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB31 10/10/2006, 11/01/2005		BDA-MCD 12SB32 10/10/2006, 11/01/2005		BDA-MCD 12SB33 10/10/2006, 11/01/2005		BDA-MCD 12SB34 10/10/2006, 11/01/2005		BDA-MCD 12SB35 10/10/2006, 11/01/2005	
Inorganics (mg/kg)										
ALUMINUM	12400	12SS310001	23600	12SS320001	21300	12SS330001	13900	12SS340001	23500	12SS350001
	13300	12SB310204	12700	12SB320103	16800	12SB330204	12800	12SB340204	13200	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	28100	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
ANTIMONY	6.6 J	12SS310001	0.50 U	12SS320001	1.9 J	12SS330001	1.4 J	12SS340001	4.2 J	12SS350001
	0.21 U	12SB310204	0.26 U	12SB320103	0.57 U	12SB330204	0.27 U	12SB340204	0.42 U	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	8.1 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
ARSENIC	1.7 J	12SS310001	5.3 J	12SS320001	8.9 J	12SS330001	15.1 J	12SS340001	11.2 J	12SS350001
	2.3 J	12SB310204	2.4 J	12SB320103	12.8 J	12SB330204	2.3 J	12SB340204	7.4 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	7.6 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
BARIUM	54.1 J	12SS310001	97.7 J	12SS320001	111 J	12SS330001	104 J	12SS340001	230 J	12SS350001
	29.6 J	12SB310204	208 J	12SB320103	91.1 J	12SB330204	34.2 J	12SB340204	23.4 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	281 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
BERYLLIUM	1.2 J	12SS310001	0.66 J	12SS320001	0.82 J	12SS330001	1.7 J	12SS340001	0.75 J	12SS350001
	2 J	12SB310204	0.32 J	12SB320103	0.85 J	12SB330204	1.5 J	12SB340204	0.53 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	0.69 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
CADMIUM	0.40 J	12SS310001	0.59	12SS320001	0.88	12SS330001	1.2	12SS340001	5.7	12SS350001
	0.16 J	12SB310204	0.08 J	12SB320103	0.45	12SB330204	0.15 J	12SB340204	0.11 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	73.2 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
CALCIUM	1090 J	12SS310001	18600 J	12SS320001	4980 J	12SS330001	1740 J	12SS340001	7740 J	12SS350001
	446 J	12SB310204	330 J	12SB320103	1790 J	12SB330204	523 J	12SB340204	418 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	5010 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
CHROMIUM	27.9 J	12SS310001	24.8 J	12SS320001	28.7 J	12SS330001	36.9 J	12SS340001	77 J	12SS350001
	33 J	12SB310204	21.7 J	12SB320103	20.3 J	12SB330204	25.9 J	12SB340204	39.6 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	116 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
COBALT	4.8 J	12SS310001	5.7 J	12SS320001	8.6 J	12SS330001	13.8 J	12SS340001	6.6 J	12SS350001
	23.4 J	12SB310204	1.3 J	12SB320103	13.7 J	12SB330204	6.1 J	12SB340204	1.6 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	7.7 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB31 10/10/2006, 11/01/2005		BDA-MCD 12SB32 10/10/2006, 11/01/2005		BDA-MCD 12SB33 10/10/2006, 11/01/2005		BDA-MCD 12SB34 10/10/2006, 11/01/2005		BDA-MCD 12SB35 10/10/2006, 11/01/2005	
Inorganics (mg/kg)										
COPPER	25.6 J	12SS310001	34.9 J	12SS320001	46.7 J	12SS330001	60 J	12SS340001	402 J	12SS350001
	12.9 J	12SB310204	4.3 J	12SB320103	15.3 J	12SB330204	7.7 J	12SB340204	9.2 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	1100 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
IRON	13600 J	12SS310001	19000 J	12SS320001	25800 J	12SS330001	32000 J	12SS340001	38400 J	12SS350001
	90200 J	12SB310204	11800 J	12SB320103	30300 J	12SB330204	44900 J	12SB340204	39200 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	33300 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
LEAD	54.6 J	12SS310001	34.4 J	12SS320001	155 J	12SS330001	142 J	12SS340001	690 J	12SS350001
	15 J	12SB310204	9.4 J	12SB320103	26.3 J	12SB330204	13.6 J	12SB340204	10.9 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	1440 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
MAGNESIUM	1130 J	12SS310001	2180 J	12SS320001	2230 J	12SS330001	1070 J	12SS340001	2320 J	12SS350001
	773 J	12SB310204	901 J	12SB320103	2060 J	12SB330204	945 J	12SB340204	916 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	2090 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
MANGANESE	140 J	12SS310001	551 J	12SS320001	637 J	12SS330001	525 J	12SS340001	676 J	12SS350001
	520 J	12SB310204	13.9 J	12SB320103	844 J	12SB330204	181 J	12SB340204	16.1 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	552 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
NICKEL	22.4 J	12SS310001	15.2 J	12SS320001	22.4 J	12SS330001	33.6 J	12SS340001	21.2 J	12SS350001
	83.2 J	12SB310204	5.8 J	12SB320103	19.2 J	12SB330204	30.6 J	12SB340204	7.8 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	254 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
POTASSIUM	2660 J	12SS310001	1180 J	12SS320001	1520 J	12SS330001	2570 J	12SS340001	1680 J	12SS350001
	2070 J	12SB310204	830 J	12SB320103	1370 J	12SB330204	2250 J	12SB340204	941 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	1650 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL
SELENIUM	0.29 J	12SS310001	0.31 J	12SS320001	0.46 J	12SS330001	0.54	12SS340001	0.45 J	12SS350001
	1.1	12SB310204	0.12 J	12SB320103	0.31 J	12SB330204	0.55	12SB340204	0.37 J	12SB350204
		12SB310608 - REFUSAL		12SB320608 - REFUSAL	0.31 J	12SB330406		12SB340608 - REFUSAL		12SB350608 - REFUSAL

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB31 10/10/2006, 11/01/2005	BDA-MCD 12SB32 10/10/2006, 11/01/2005	BDA-MCD 12SB33 10/10/2006, 11/01/2005	BDA-MCD 12SB34 10/10/2006, 11/01/2005	BDA-MCD 12SB35 10/10/2006, 11/01/2005
inorganics (mg/kg)					
SILVER	0.044 U 12SS310001 0.044 U 12SB310204 12SB310608 - REFUSAL	0.10 J 12SS320001 0.044 U 12SB320103 12SB320608 - REFUSAL	0.08 J 12SS330001 0.04 U 12SB330204 1.3 12SB330406	0.12 J 12SS340001 0.05 J 12SB340204 12SB340608 - REFUSAL	1.2 12SS350001 0.045 U 12SB350204 12SB350608 - REFUSAL
SODIUM	64.3 U 12SS310001 93.1 U 12SB310204 12SB310608 - REFUSAL	53.6 U 12SS320001 3.36 U 12SB320103 12SB320608 - REFUSAL	65.2 U 12SS330001 3.09 U 12SB330204 556 J 12SB330406	65.9 U 12SS340001 71.5 U 12SB340204 12SB340608 - REFUSAL	199 U 12SS350001 21.6 U 12SB350204 12SB350608 - REFUSAL
THALLIUM	0.16 U 12SS310001 0.18 U 12SB310204 12SB310608 - REFUSAL	0.29 U 12SS320001 0.16 U 12SB320103 12SB320608 - REFUSAL	0.28 U 12SS330001 0.24 U 12SB330204 0.28 U 12SB330406	0.23 U 12SS340001 0.23 U 12SB340204 12SB340608 - REFUSAL	0.27 U 12SS350001 0.18 U 12SB350204 12SB350608 - REFUSAL
TITANIUM					
VANADIUM	19.9 J 12SS310001 23.5 J 12SB310204 12SB310608 - REFUSAL	35.3 J 12SS320001 23.6 J 12SB320103 12SB320608 - REFUSAL	35.7 J 12SS330001 30.1 J 12SB330204 30 J 12SB330406	26 J 2SS340001 20 J 2SB340204 12SB340608 - REFUSAL	47.5 J 12SS350001 35.7 J 12SB350204 12SB350608 - REFUSAL
ZINC	498 J 12SS310001 131 J 12SB310204 12SB310608 - REFUSAL	155 J 12SS320001 8.7 J 12SB320103 12SB320608 - REFUSAL	303 J 12SS330001 255 J 12SB330204 2340 J 12SB330406	1080 J 12SS340001 40.6 J 12SB340204 12SB340608 - REFUSAL	1370 J 12SS350001 13.3 J 12SB350204 12SB350608 - REFUSAL

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB36 10/10/2006, 11/01/2005	BDA-MCD 12SB37 10/10/2006, 11/01/2005	BDA-MCD 12SB38 10/10/2006, 11/01/2005	BDA-MCD 12SB39 10/10/2006, 11/01/2005	ADDITIONAL MCD 12SB72 10/10/2006, 11/01/2005	ADDITIONAL MCD 12SB73 --
inorganics (mg/kg)						
ALUMINUM	10500 12SS360001 12500 12SB360103 12SB360608 - REFUSAL	9530 12SS370001 18800 12SB370204 12SB370608 - REFUSAL	18400 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	11000 J 12SS390001 12800 12SB390103 12SB390608 - REFUSAL	20900 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
ANTIMONY	1.2 U 12SS360001 0.22 U 12SB360103 12SB360608 - REFUSAL	1.1 U 12SS370001 0.27 U 12SB370204 12SB370608 - REFUSAL	1.9 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	1.5 J 12SS390001 0.15 U 12SB390103 12SB390608 - REFUSAL	2.2 2SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
ARSENIC	4 J 12SS360001 3.3 J 12SB360103 12SB360608 - REFUSAL	2.4 J 12SS370001 9.4 J 12SB370204 12SB370608 - REFUSAL	6.6 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	5.1 J 12SS390001 2.5 J 12SB390103 12SB390608 - REFUSAL	12.2 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
BARIUM	101 J 12SS360001 125 J 12SB360103 12SB360608 - REFUSAL	81 J 12SS370001 60.6 J 12SB370204 12SB370608 - REFUSAL	113 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	134 J 12SS390001 148 J 12SB390103 12SB390608 - REFUSAL	108 J 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
BERYLLIUM	1 J 12SS360001 2.4 J 12SB360103 12SB360608 - REFUSAL	0.84 J 12SS370001 2.3 J 12SB370204 12SB370608 - REFUSAL	0.58 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	0.60 J 12SS390001 1.4 J 12SB390103 12SB390608 - REFUSAL	0.615 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
CADMIUM	1.6 12SS360001 0.18 J 12SB360103 12SB360608 - REFUSAL	0.58 12SS370001 0.20 J 12SB370204 12SB370608 - REFUSAL	1.1 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	3.6 J 12SS390001 0.18 U 12SB390103 12SB390608 - REFUSAL	1.25 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
CALCIUM	2850 J 12SS360001 406 J 12SB360103 12SB360608 - REFUSAL	1080 J 12SS370001 567 J 12SB370204 12SB370608 - REFUSAL	50200 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	2790 J 12SS390001 631 J 12SB390103 12SB390608 - REFUSAL	4400 J 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
CHROMIUM	34.1 J 12SS360001 34.2 J 12SB360103 12SB360608 - REFUSAL	23.6 J 12SS370001 34.9 J 12SB370204 12SB370608 - REFUSAL	24.2 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	34.2 J 12SS390001 30.7 J 12SB390103 12SB390608 - REFUSAL	49.6 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
COBALT	11.1 J 12SS360001 29.6 J 12SB360103 12SB360608 - REFUSAL	10.6 J 12SS370001 12.2 J 12SB370204 12SB370608 - REFUSAL	7.3 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	8.4 J 12SS390001 19.6 J 12SB390103 12SB390608 - REFUSAL	7.23 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB36 10/10/2006, 11/01/2005	BDA-MCD 12SB37 10/10/2006, 11/01/2005	BDA-MCD 12SB38 10/10/2006, 11/01/2005	BDA-MCD 12SB39 10/10/2006, 11/01/2005	ADDITIONAL MCD 12SB72 10/10/2006, 11/01/2005	ADDITIONAL MCD 12SB73 --
Inorganics (mg/kg)						
COPPER	101 J 12SS360001 17.3 J 12SB360103 12SB360608 - REFUSAL	59.2 J 12SS370001 8.8 J 12SB370204 12SB370608 - REFUSAL	45.6 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	174 J 12SS390001 14.9 J 12SB390103 12SB390608 - REFUSAL	46.3 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
IRON	30900 J 12SS360001 66700 J 12SB360103 12SB360608 - REFUSAL	15200 J 12SS370001 57600 J 12SB370204 12SB370608 - REFUSAL	20800 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	23400 J 12SS390001 28100 J 12SB390103 12SB390608 - REFUSAL	39100 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
LEAD	210 J 12SS360001 22.7 J 12SB360103 12SB360608 - REFUSAL	84.6 J 12SS370001 12 J 12SB370204 12SB370608 - REFUSAL	134 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	295 J 12SS390001 24.3 J 12SB390103 12SB390608 - REFUSAL	143 J 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
MAGNESIUM	936 J 12SS360001 913 J 12SB360103 12SB360608 - REFUSAL	822 J 12SS370001 1230 J 12SB370204 12SB370608 - REFUSAL	3990 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	1010 J 12SS390001 1040 J 12SB390103 12SB390608 - REFUSAL	1950 J 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
MANGANESE	769 J 12SS360001 1780 J 12SB360103 12SB360608 - REFUSAL	522 J 12SS370001 275 J 12SB370204 12SB370608 - REFUSAL	648 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	491 J 12SS390001 990 J 12SB390103 12SB390608 - REFUSAL	825 2SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
NICKEL	28.7 J 12SS360001 63.2 J 12SB360103 12SB360608 - REFUSAL	19 J 12SS370001 48 J 12SB370204 12SB370608 - REFUSAL	15.6 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	21.2 12SS390001 24.1 J 12SB390103 12SB390608 - REFUSAL	16.3 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
POTASSIUM	1450 J 12SS360001 1980 J 12SB360103 12SB360608 - REFUSAL	1740 J 12SS370001 3040 J 12SB370204 12SB370608 - REFUSAL	1370 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	1080 J 12SS390001 2650 J 12SB390103 12SB390608 - REFUSAL	1630 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
SELENIUM	0.44 J 12SS360001 0.42 J 12SB360103 12SB360608 - REFUSAL	0.27 J 12SS370001 0.91 12SB370204 12SB370608 - REFUSAL	0.39 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	0.29 J 12SS390001 0.41 J 12SB390103 12SB390608 - REFUSAL	0.398 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-MCD 12SB36 10/10/2006, 11/01/2005	BDA-MCD 12SB37 10/10/2006, 11/01/2005	BDA-MCD 12SB38 10/10/2006, 11/01/2005	BDA-MCD 12SB39 10/10/2006, 11/01/2005	ADDITIONAL MCD 12SB72 10/10/2006, 11/01/2005	ADDITIONAL MCD 12SB73 --
Inorganics (mg/kg)						
SILVER	0.15 J 12SS360001 0.041 U 12SB360103 12SB360608 - REFUSAL	0.06 J 12SS370001 0.044 U 12SB370204 12SB370608 - REFUSAL	0.08 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	0.45 J 12SS390001 0.041 U 12SB390103 12SB390608 - REFUSAL	0.186 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
SODIUM	55 U 12SS360001 45.1 U 12SB360103 12SB360608 - REFUSAL	58.5 U 12SS370001 130 U 12SB370204 12SB370608 - REFUSAL	97.5 U 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	72.8 U 12SS390001 145 J 12SB390103 12SB390608 - REFUSAL	53.6 U 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
THALLIUM	0.14 U 12SS360001 0.33 U 12SB360103 12SB360608 - REFUSAL	0.14 U 12SS370001 0.22 U 12SB370204 12SB370608 - REFUSAL	0.30 U 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	0.17 U 12SS390001 0.32 U 12SB390103 12SB390608 - REFUSAL	0.256 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
TITANIUM					313 J 12SS720002	12SS730001 - E & H
VANADIUM	20.9 J 12SS360001 32.8 J 12SB360103 12SB360608 - REFUSAL	16.5 J 12SS370001 30.7 J 12SB370204 12SB370608 - REFUSAL	32.2 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	21.6 J 12SS390001 26.7 J 12SB390103 12SB390608 - REFUSAL	53.0 12SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H
ZINC	738 J 12SS360001 124 J 12SB360103 12SB360608 - REFUSAL	441 J 12SS370001 58.8 J 12SB370204 12SB370608 - REFUSAL	306 J 12SS380001 12SB380204 - REFUSAL 12SB380608 - REFUSAL	1930 J 12SS390001 41.2 J 12SB390103 12SB390608 - REFUSAL	204 2SS720002 12SB720204 - REFUSAL 12SB720406 - REFUSAL	12SS730001 - E & H 12SB730204 - E & H 12SB730406 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB74 10/10/2006		ADDITIONAL MCD 12SB75 --	ADDITIONAL MCD 12SB76 10/10/18, 10/18/2006		ADDITIONAL MCD 12SB77 10/10/2006, 10/17/2006		ADDITIONAL MCD 12SB78 10/10/2006, 10/17/2006	
Inorganics (mg/kg)									
ALUMINUM	16800	12SS740002	12SS750001 - E & H	8430	12SS760002	9960	12SS770002	9910	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	8540	12SS760002-D	11100	12SB770204	12900	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	9400	12SB760204				
			12SB750608 - E & H	11900	12SB760406				
				17800	12SB760406-D				
				10400	12SB760608				
ANTIMONY	1.5	2SS740002	12SS750001 - E & H	0.67 U	12SS760002	0.73 U	12SS770002	0.15 U	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	1.0 U	12SS760002-D	1.7	12SB770204	0.055 U	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	0.28 U	12SB760204				
			12SB750608 - E & H	0.049 U	12SB760406				
				0.12 U	12SB760406-D				
				0.19 U	12SB760608				
ARSENIC	10.3	12SS740002	12SS750001 - E & H	2.47	12SS760002	2.12	12SS770002	1.76	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	2.95	12SS760002-D	17.4	12SB770204	1.03	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	1.59	12SB760204				
			12SB750608 - E & H	0.973	12SB760406				
				6.41	12SB760406-D				
				3.23	12SB760608				
BARIUM	119 J	12SS740002	12SS750001 - E & H	62.1 J	12SS760002	43.8 J	12SS770002	167 J	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	71.7 J	12SS760002-D	175 J	12SB770204	50.3 J	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	51.2 J	12SB760204				
			12SB750608 - E & H	50.8 J	12SB760406				
				83.5 J	12SB760406-D				
				71.6 J	12SB760608				
BERYLLIUM	0.819	12SS740002	12SS750001 - E & H	0.473	12SS760002	0.773	12SS770002	1.03	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	0.527	12SS760002-D	1.14 J	12SB770204	1.45 J	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	2.66 J	12SB760204				
			12SB750608 - E & H	1.03 J	12SB760406				
				1.28 J	12SB760406-D				
				1.83 J	12SB760608				
CADMIUM	0.890	12SS740002	12SS750001 - E & H	0.874	12SS760002	0.393	12SS770002	0.367	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	1.11	12SS760002-D	0.286	12SB770204	0.299	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	0.478	12SB760204				
			12SB750608 - E & H	0.221	12SB760406				
				0.513	12SB760406-D				
				0.274	12SB760608				
CALCIUM	8780 J	12SS740002	12SS750001 - E & H	206000 J	12SS760002	8790 J	12SS770002	736 J	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	121000 J	12SS760002-D	655 U	12SB770204	634 U	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	491 U	12SB760204				
			12SB750608 - E & H	672 U	12SB760406				
				805 U	12SB760406-D				
				852 U	12SB760608				
CHROMIUM	32.2	12SS740002	12SS750001 - E & H	26.1	12SS760002	33.4	12SS770002	33.6	12SS780002
				27.4	12SS760002-D				
		12SB740204 - REFUSAL	12SB750204 - E & H	30.1 J	12SB760204	26.6 J	12SB770204	28.8 J	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	24.1 J	12SB760406				
			12SB750608 - E & H	32.6 J	12SB760406-D				
				26.7 J	12SB760608				
COBALT	8.17	12SS740002	12SS750001 - E & H	6.95	12SS760002	3.58	12SS770002	17.9	12SS780002
		12SB740204 - REFUSAL	12SB750204 - E & H	27.4	12SS760002-D	43.4 J	12SB770204	18.2 J	12SB780204
		12SB740406 - REFUSAL	12SB750406 - E & H	36.8 J	12SB760204				
			12SB750608 - E & H	30.1 J	12SB760406				
				34.2 J	12SB760406-D				
				19.4 J	12SB760608				

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB74 10/10/2006		ADDITIONAL MCD 12SB75 --	ADDITIONAL MCD 12SB76 10/10/18, 10/18/2006		ADDITIONAL MCD 12SB77 10/10/2006, 10/17/2006		ADDITIONAL MCD 12SB78 10/10/2006, 10/17/2006	
Inorganics (mg/kg)									
COPPER	34.0	2SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	28.0 42.7 16.0 8.23 10.6 11.6	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	16.0 14.5	12SS770002 12SB770204	16.9 12.9	12SS780002 12SB780204
IRON	27100	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	20100 19600 58400 11800 12800 72600	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	25900 15300	12SS770002 12SB770204	28600 15900	12SS780002 12SB780204
LEAD	82.7 J	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	105 J 64.3 J 13.5 J 8.01 J 8.71 J 25.6 J	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	71.6 J 17.7 J	12SS770002 12SB770204	20.5 J 9.03 J	12SS780002 12SB780204
MAGNESIUM	1670 J	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	5530 J 2880 J 1050 1460 1680 901	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	965 J 1310	12SS770002 12SB770204	831 J 1440	12SS780002 12SB780204
MANGANESE	302	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	244 235 741 411 373 671	2SS760002 2SS760002-D 2SB760204 2SB760406 2SB760406-D 2SB760608	129 1340	12SS770002 12SB770204	1130 326	12SS780002 12SB780204
NICKEL	22.9	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	28.1 23.4 68.2 J 26.2 J 31.8 J 60.1 J	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	15.9 27.6 J	12SS770002 12SB770204	31.2 25.4 J	12SS780002 12SB780204
POTASSIUM	1660	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	1580 1260 2180 2160 3230 1350	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	1690 2000	12SS770002 12SB770204	2220 2270	12SS780002 12SB780204
SELENIUM	0.327	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	0.470 0.271 0.674 0.512 0.634 1.04	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	0.247 0.741	12SS770002 12SB770204	0.403 0.477	12SS780002 12SB780204

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB74 10/10/2006		ADDITIONAL MCD 12SB75 --	ADDITIONAL MCD 12SB76 10/10/18, 10/18/2006		ADDITIONAL MCD 12SB77 10/10/2006, 10/17/2006		ADDITIONAL MCD 12SB78 10/10/2006, 10/17/2006	
Inorganics (mg/kg)									
SILVER	0.219	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	0.250 0.296 0.0577 J 0.0426 J 0.115 J 0.0691 J	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	0.0860 0.0564 J	12SS770002 12SB770204	0.0515 0.0474 J	12SS780002 12SB780204
SODIUM	105 U	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	119 U 73.9 U 212 U 254 U 325 251 U	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	57.3 U 296 U	12SS770002 12SB770204	101 U 239 U	12SS780002 12SB780204
THALLIUM	0.219	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	0.105 0.112 0.128 J 0.131 J 0.187 J 0.259 J	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	0.113 0.179 J	12SS770002 12SB770204	0.292 0.179 J	12SS780002 12SB780204
TITANIUM	219 J	12SS740002 12SB740406 - REFUSAL		43.4 J 36.5 J 23.9 J 19.1 J 38.3 J 15.4 J	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	23.3 J 17.1 J	12SS770002 12SB770204	23.4 J 17.3 J	12SS780002 12SB780204
VANADIUM	34.0	12SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	20.5 21.0 33.8 J 17.2 J 29.7 J 27.2 J	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	20.4 17.6 J	12SS770002 12SB770204	21.6 23.3 J	12SS780002 12SB780204
ZINC	222	2SS740002 12SB740204 - REFUSAL 12SB740406 - REFUSAL	12SS750001 - E & H 12SB750204 - E & H 12SB750406 - E & H 12SB750608 - E & H	237 321 170 30.8 39.4 120	12SS760002 12SS760002-D 12SB760204 12SB760406 12SB760406-D 12SB760608	38.1 51.7	12SS770002 12SB770204	45.2 48.3	12SS780002 12SB780204

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB79 10/10/2006, 10/18/2006	ADDITIONAL MCD 12SB80 10/10/2006, 10/18/2006	ADDITIONAL MCD 12SB81 10/10/2006	ADDITIONAL MCD 12SB82 10/10/2006, 10/17/2006	ADDITIONAL MCD 12SB83 --	ADDITIONAL MCD 12SB84 10/10/2006
Inorganics (mg/kg)						
ALUMINUM	9940 12SS790002 14000 12SB790204	9250 12SS800002 12400 12SB800204	20000 12SS810002 12SB810204 - REFUSAL	16700 12SS820002 13700 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	9620 12SS840002 12SB840204 - E & H
ANTIMONY	1.9 12SS790002 0.049 U 12SB790204	0.14 U 12SS800002 0.18 U 12SB800204	8.7 2SS810002 12SB810204 - REFUSAL	0.59 U 12SS820002 0.12 U 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	0.058 U 12SS840002 12SB840204 - E & H
ARSENIC	4.17 12SS790002 1.27 12SB790204	2.55 12SS800002 4.31 12SB800204	13.6 12SS810002 12SB810204 - REFUSAL	3.23 12SS820002 1.91 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	1.33 12SS840002 12SB840204 - E & H
BARIUM	135 J 12SS790002 47.0 J 12SB790204	44.8 J 12SS800002 227 J 12SB800204	118 J 12SS810002 12SB810204 - REFUSAL	98.0 J 12SS820002 33.3 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	41.1 J 12SS840002 12SB840204 - E & H
BERYLLIUM	1.16 12SS790002 1.88 J 12SB790204	0.992 12SS800002 2.09 J 12SB800204	1.43 12SS810002 12SB810204 - REFUSAL	1.31 12SS820002 1.06 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	1.24 12SS840002 12SB840204 - E & H
CADMIUM	2.33 12SS790002 0.427 12SB790204	0.543 12SS800002 0.464 12SB800204	1.27 12SS810002 12SB810204 - REFUSAL	1.40 12SS820002 0.496 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	0.322 12SS840002 12SB840204 - E & H
CALCIUM	1430 J 12SS790002 783 U 12SB790204	1260 J 12SS800002 747 U 12SB800204	22200 J 12SS810002 12SB810204 - REFUSAL	1750 J 12SS820002 519 U 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	953 J 12SS840002 12SB840204 - E & H
CHROMIUM	37.4 12SS790002 33.0 J 12SB790204	27.4 12SS800002 29.1 J 12SB800204	69.5 12SS810002 12SB810204 - REFUSAL	38.3 12SS820002 27.5 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	30.9 12SS840002 12SB840204 - E & H
COBALT	10.4 12SS790002 27.6 J 12SB790204	3.84 12SS800002 82.7 J 12SB800204	12.4 12SS810002 12SB810204 - REFUSAL	10.5 12SS820002 11.1 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	14.5 12SS840002 12SB840204 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB79 10/10/2006, 10/18/2006	ADDITIONAL MCD 12SB80 10/10/2006, 10/18/2006	ADDITIONAL MCD 12SB81 10/10/2006	ADDITIONAL MCD 12SB82 10/10/2006, 10/17/2006	ADDITIONAL MCD 12SB83 --	ADDITIONAL MCD 12SB84 10/10/2006
Inorganics (mg/kg)						
COPPER	86.4 12SS790002 16.2 12SB790204	20.1 12SS800002 15.9 12SB800204	56.7 12SS810002 12SB810204 - REFUSAL	57.7 12SS820002 9.19 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	16.1 12SS840002 12SB840204 - E & H
IRON	39400 12SS790002 44300 12SB790204	23900 12SS800002 40800 12SB800204	57500 12SS810002 12SB810204 - REFUSAL	19800 12SS820002 34900 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	37900 12SS840002 12SB840204 - E & H
LEAD	75.4 J 12SS790002 17.7 J 12SB790204	12.6 J 12SS800002 46.3 J 12SB800204	165 J 12SS810002 12SB810204 - REFUSAL	44.4 J 12SS820002 15.2 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	14.2 J 12SS840002 12SB840204 - E & H
MAGNESIUM	687 J 12SS790002 1660 12SB790204	749 J 12SS800002 1310 12SB800204	6020 J 12SS810002 12SB810204 - REFUSAL	1390 J 12SS820002 1260 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	776 J 12SS840002 12SB840204 - E & H
MANGANESE	372 2SS790002 794 2SB790204	333 12SS800002 3310 12SB800204	677 2SS810002 12SB810204 - REFUSAL	323 2SS820002 243 2SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	392 2SS840002 12SB840204 - E & H
NICKEL	31.7 12SS790002 61.8 J 12SB790204	22.8 12SS800002 103 J 12SB800204	19.2 12SS810002 12SB810204 - REFUSAL	21.5 12SS820002 42.2 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	33.3 12SS840002 12SB840204 - E & H
POTASSIUM	1580 12SS790002 2320 12SB790204	2080 12SS800002 1960 12SB800204	1450 12SS810002 12SB810204 - REFUSAL	3660 12SS820002 2170 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	2370 12SS840002 12SB840204 - E & H
SELENIUM	0.368 12SS790002 0.675 12SB790204	0.410 12SS800002 0.957 12SB800204	0.648 12SS810002 12SB810204 - REFUSAL	0.271 12SS820002 0.736 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	0.252 U 12SS840002 12SB840204 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB79 10/10/2006, 10/18/2006	ADDITIONAL MCD 12SB80 10/10/2006, 10/18/2006	ADDITIONAL MCD 12SB81 10/10/2006	ADDITIONAL MCD 12SB82 10/10/2006, 10/17/2006	ADDITIONAL MCD 12SB83 --	ADDITIONAL MCD 12SB84 10/10/2006
Inorganics (mg/kg)						
SILVER	0.603 12SS790002 0.0606 J 12SB790204	0.0715 12SS800002 0.105 J 12SB800204	0.269 12SS810002 12SB810204 - REFUSAL	0.185 12SS820002 0.0853 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	0.0487 12SS840002 12SB840204 - E & H
SODIUM	66.0 U 12SS790002 267 12SB790204	111 U 12SS800002 198 U 12SB800204	136 U 12SS810002 12SB810204 - REFUSAL	118 U 12SS820002 272 U 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	65.2 U 12SS840002 12SB840204 - E & H
THALLIUM	0.111 12SS790002 0.161 J 12SB790204	0.0967 12SS800002 0.537 J 12SB800204	0.254 12SS810002 12SB810204 - REFUSAL	0.209 12SS820002 0.154 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	0 127 12SS840002 12SB840204 - E & H
TITANIUM	33.3 J 12SS790002 34.8 J 12SB790204	26.1 J 12SS800002 26.5 J 12SB800204	212 J 12SS810002	39.3 J 12SS820002 23.0 J 12SB820204	12SS830001 - E & H	21.3 J 12SS840002
VANADIUM	24.0 12SS790002 25.1 J 12SB790204	22.6 12SS800002 29.3 J 12SB800204	56.6 12SS810002 12SB810204 - REFUSAL	35.8 12SS820002 23.9 J 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	21.9 12SS840002 12SB840204 - E & H
ZINC	364 2SS790002 120 12SB790204	133 2SS800002 121 2SB800204	288 2SS810002 12SB810204 - REFUSAL	761 12SS820002 61.7 12SB820204	12SS830001 - E & H 12SB830204 - REFUSAL	75.2 12SS840002 12SB840204 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB85 10/10/2006	
Inorganics (mg/kg)		
ALUMINUM	12600	12SS850002 12SB850204 - E & H
ANTIMONY	0.11 U	12SS850002 12SB850204 - E & H
ARSENIC	1.23	12SS850002 12SB850204 - E & H
BARIUM	65.9 J	12SS850002 12SB850204 - E & H
BERYLLIUM	1.30	12SS850002 12SB850204 - E & H
CADMIUM	0.522	12SS850002 12SB850204 - E & H
CALCIUM	1080 J	12SS850002 12SB850204 - E & H
CHROMIUM	33.0	12SS850002 12SB850204 - E & H
COBALT	22.6	12SS850002

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB85 10/10/2006	
Inorganics (mg/kg)		
COPPER	16.7	12SS850002 12SB850204 - E & H
IRON	22100	12SS850002 12SB850204 - E & H
LEAD	19.6 J	12SS850002 12SB850204 - E & H
MAGNESIUM	1120 J	12SS850002 12SB850204 - E & H
MANGANESE	708	2SS850002 12SB850204 - E & H
NICKEL	38.5	12SS850002 12SB850204 - E & H
POTASSIUM	3050	12SS850002 12SB850204 - E & H
SELENIUM	0.249 U	12SS850002 12SB850204 - E & H

APPENDIX TABLE G-2

RESULTS FOR CHEMICALS ANALYZED IN SOIL SAMPLES DURING THE METALS CONTAMINATION DELINEATION SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	ADDITIONAL MCD 12SB85 10/10/2006	
Inorganics (mg/kg)		
SILVER	0.0680	12SS850002 12SB850204 - E & H
SODIUM	121 U	12SS850002 12SB850204 - E & H
THALLIUM	0.144	12SS850002 12SB850204 - E & H
TITANIUM	26.1 J	12SS850002
VANADIUM	26.1	12SS850002 12SB850204 - E & H
ZINC	136	2SS850002 12SB850204 - E & H

Data qualifiers (e.g., U, J) are defined in section 3 of the text.

BDA - Battery Site
E&H - Extract and hold. Sample was collected but not analyzed.
ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
MEQ/1 - milliequivalents per 100 grams
MCD - Metals contamination delineation
REFUSAL - No result avialable. Bedrock encountered at a depth shallower than designated sampling depth.
S.U. - standard units

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB40 2/16/2006	BDA-ES/DI 12SB41 2/20/2006	BDA-ES/DI 12SB42 2/20/2006	BDA-ES/DI 12SB43 2/20/2006	BDA-ES/DI 12SB44 2/16/2006	BDA-ES/DI 12SB45 2/16/2006
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
1,3-DINITROBENZENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
2,4,6-TRINITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
2,4-DIAMINO-6-NITROTOLUENE	0.25 U 12SB400507	0.25 U 12SB410709	0.25 U 12SB420810	0.25 U 12SB430608	0.25 U 12SB440709	0.25 U 12SB450507
2,4-DINITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
2,6-DIAMINO-4-NITROTOLUENE	0.25 U 12SB400507	0.25 U 12SB410709	0.25 U 12SB420810	0.25 U 12SB430608	0.25 U 12SB440709	0.25 U 12SB450507
2,6-DINITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
2-NITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
3,5-DINITROANILINE	0.25 U 12SB400507	0.25 U 12SB410709	0.25 U 12SB420810	0.25 U 12SB430608	0.25 U 12SB440709	0.25 U 12SB450507
3-NITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
4,4'-TN-AZOXY	0.5 U 12SB400507	0.5 U 12SB410709	0.5 U 12SB420810	0.5 U 12SB430608	0.5 U 12SB440709	0.5 U 12SB450507
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB40 2/16/2006	BDA-ES/DI 12SB41 2/20/2006	BDA-ES/DI 12SB42 2/20/2006	BDA-ES/DI 12SB43 2/20/2006	BDA-ES/DI 12SB44 2/16/2006	BDA-ES/DI 12SB45 2/16/2006
Energetics (mg/kg)						
4-NITROTOLUENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
DNX	0.25 U 12SB400507	0.25 U 12SB410709	0.25 U 12SB420810	0.25 U 12SB430608	0.25 U 12SB440709	0.25 U 12SB450507
HMX	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.43 J 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
MNX	0.25 U 12SB400507	0.25 U 12SB410709	0.25 U 12SB420810	0.25 U 12SB430608	0.25 U 12SB440709	0.25 U 12SB450507
NITROBENZENE	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
RDX	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 3.4 J 12SB420406 0.25 UJ 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
TETRYL	0.25 U 12SS400002 0.25 U 12SB400305 0.25 U 12SB400507	0.25 U 12SS410002 0.25 U 12SB410507 0.25 U 12SB410709	0.25 U 12SS420002 0.25 U 12SB420406 0.25 U 12SB420406-D 0.25 U 12SB420810	0.25 U 12SS430002 0.25 U 12SB430204 0.25 U 12SB430608	0.25 U 12SS440002 0.25 U 12SB440305 0.25 U 12SB440709	0.25 U 12SS450002 0.25 U 12SB450305 0.25 U 12SB450507
TNX	0.25 U 12SB400507	0.25 U 12SB410709	0.25 U 12SB420810	0.25 U 12SB430608	0.25 U 12SB440709	0.25 U 12SB450507

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB46 2/17/2006	BDA-ES/DI 12SB47 2/17/2006	BDA-ES/DI 12SB48 2/17/2006	BDA-ES/DI 12SB49 2/17/2006	BDA-ES/DI 12SB50 2/17/2006	BDA-ES/DI 12SB51 2/16/2006
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.43 J 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
1,3-DINITROBENZENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
2,4,6-TRINITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	1 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	1.6 12SS480002 0.9 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.42 J 12SB490608 0.25 U 12SB490810	65 12SS500002 1.4 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
2,4-DIAMINO-6-NITROTOLUENE	0.25 U 12SB460608	0.25 U 12SB470608	0.25 U 12SB480608	0.25 U 12SB490810	0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SB510608
2,4-DINITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
2,6-DIAMINO-4-NITROTOLUENE	0.25 U 12SB460608	0.25 U 12SB470608	0.25 U 12SB480608	0.25 U 12SB490810	0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SB510608
2,6-DINITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.62 J 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.85 J 12SS480002 0.41 J 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.27 J 12SB490810	3.7 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
2-NITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
3,5-DINITROANILINE	0.25 U 12SB460608	0.25 U 12SB470608	0.25 U 12SB480608	0.25 U 12SB490810	0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SB510608
3-NITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
4,4'-TN-AZOXY	0.5 U 12SB460608	0.5 U 12SB470608	0.5 U 12SB480608	0.5 U 12SB490810	0.5 U 12SB500810 0.5 U 12SB500810-D	0.5 U 12SB510608
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	2.5 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	1.2 12SS480002 0.73 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.38 J 12SB490810	32 J 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB46 2/17/2006	BDA-ES/DI 12SB47 2/17/2006	BDA-ES/DI 12SB48 2/17/2006	BDA-ES/DI 12SB49 2/17/2006	BDA-ES/DI 12SB50 2/17/2006	BDA-ES/DI 12SB51 2/16/2006
Energetics (mg/kg)						
4-NITROTOLUENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
DNX	0.25 U 12SB460608	0.25 U 12SB470608	0.25 U 12SB480608	0.25 U 12SB490810	0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SB510608
HMX	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	11 12SS470002 0.64 12SB470204 0.73 12SB470608	0.66 12SS480002 1.3 12SB480204 0.38 J 12SB480608	0.25 U 12SS490002 1.2 12SB490608 1.1 12SB490810	800 12SS500002 1.7 12SB500608 0.43 J 12SB500810 0.41 J 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
MNX	0.25 U 12SB460608	0.25 U 12SB470608	0.25 U 12SB480608	0.25 U 12SB490810	0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SB510608
NITROBENZENE	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
RDX	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	2.6 12SS470002 0.25 U 12SB470204 2 12SB470608	0.77 12SS480002 0.32 J 12SB480204 1.2 12SB480608	0.25 U 12SS490002 0.92 12SB490608 1.6 12SB490810	4800 12SS500002 4.2 12SB500608 0.48 J 12SB500810 0.92 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
TETRYL	0.25 U 12SS460002 0.25 U 12SB460204 0.25 U 12SB460608	0.25 U 12SS470002 0.25 U 12SB470204 0.25 U 12SB470608	0.25 U 12SS480002 0.25 U 12SB480204 0.25 U 12SB480608	0.25 U 12SS490002 0.25 U 12SB490608 0.25 U 12SB490810	0.25 U 12SS500002 0.25 U 12SB500608 0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SS510002 0.25 U 12SB510406 0.25 U 12SB510608
TNX	0.25 U 12SB460608	0.25 U 12SB470608	0.25 U 12SB480608	0.25 U 12SB490810	0.25 U 12SB500810 0.25 U 12SB500810-D	0.25 U 12SB510608

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB52 2/16/2006	BDA-ES/DI 12SB53 2/16/2006	BDA-ES/DI 12SB54 2/16/2006	BDA-ES/DI 12SB55 2/16/2006	BDA-ES/DI 12SB56 2/20/2006	BDA-ES/DI 12SB57 2/20/2006
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
1,3-DINITROBENZENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
2,4,6-TRINITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.28 J 12SS550002 0.64 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.78 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
2,4-DIAMINO-6-NITROTOLUENE	0.25 U 12SB520507	0.25 U 12SB530507	0.25 U 12SB540810	0.25 U 12SB550608	0.25 U 12SB560608	0.25 U 12SB570507
2,4-DINITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
2,6-DIAMINO-4-NITROTOLUENE	0.25 U 12SB520507	0.25 U 12SB530507	0.25 U 12SB540810	0.25 U 12SB550608	0.25 U 12SB560608	0.25 U 12SB570507
2,6-DINITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.49 J 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
2-NITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
3,5-DINITROANILINE	0.25 U 12SB520507	0.25 U 12SB530507	0.25 U 12SB540810	0.25 U 12SB550608	0.25 U 12SB560608	0.25 U 12SB570507
3-NITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
4,4'-TN-AZOXY	0.5 U 12SB520507	0.5 U 12SB530507	0.5 U 12SB540810	0.5 U 12SB550608	0.5 U 12SB560608	0.5 U 12SB570507
4-AMINO-2,6-DINITROTOLUENE	0.28 J 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.42 J 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.73 J 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB52 2/16/2006	BDA-ES/DI 12SB53 2/16/2006	BDA-ES/DI 12SB54 2/16/2006	BDA-ES/DI 12SB55 2/16/2006	BDA-ES/DI 12SB56 2/20/2006	BDA-ES/DI 12SB57 2/20/2006
Energetics (mg/kg)						
4-NITROTOLUENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
DNX	0.25 U 12SB520507	0.25 U 12SB530507	0.25 U 12SB540810	0.25 U 12SB550608	0.25 U 12SB560608	0.25 U 12SB570507
HMX	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.4 J 12SB540406 0.39 J 12SB540406-D 0.25 U 12SB540810	0.26 J 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	200 J 12SS570002 11 12SB570305 7.1 12SB570305-D 5.4 12SB570507
MNX	0.25 U 12SB520507	0.25 U 12SB530507	0.25 U 12SB540810	0.25 U 12SB550608	0.25 U 12SB560608	0.25 U 12SB570507
NITROBENZENE	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
RDX	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.52 J 12SB540406 0.48 J 12SB540406-D 0.27 J 12SB540810	0.45 J 12SS550002 0.55 12SB550406 0.73 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	120 12SS570002 5 12SB570305 3.7 12SB570305-D 1.3 12SB570507
TETRYL	0.25 U 12SS520002 0.25 U 12SB520204 0.25 U 12SB520507	0.25 U 12SS530002 0.25 U 12SB530204 0.25 U 12SB530507	0.25 U 12SS540002 0.25 U 12SB540406 0.25 U 12SB540406-D 0.25 U 12SB540810	0.25 U 12SS550002 0.25 U 12SB550406 0.25 U 12SB550608	0.25 U 12SS560002 0.25 U 12SB560406 0.25 U 12SB560608	0.25 U 12SS570002 0.25 U 12SB570305 0.25 U 12SB570305-D 0.25 U 12SB570507
TNX	0.25 U 12SB520507	0.25 U 12SB530507	0.25 U 12SB540810	0.25 U 12SB550608	0.25 U 12SB560608	0.25 U 12SB570507

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB58 2/20/2006	BDA-ES/DI 12SB59 2/16/2006	BDA-ES/DI 12SB60 2/16/2006	BDA-ES/DI 12SB61 2/17/2006	BDA-ES/DI 12SB62 2/17/2006	BDA-ES/DI 12SB63 2/17/2006
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 4.2 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
1,3-DINITROBENZENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
2,4,6-TRINITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	1 12SS590002 0.49 J 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 12 12SB600406 0.25 U 12SB600608	1.8 12SS610002 1.1 12SB610204 12SB610810 - REFUSAL	2.5 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
2,4-DIAMINO-6-NITROTOLUENE	0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SB590607	0.25 U 12SB600608	0.5 R 12SB610204 12SB610810 - REFUSAL	0.25 U 12SB620709	0.25 U 12SB630608
2,4-DINITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
2,6-DIAMINO-4-NITROTOLUENE	0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SB590607	0.25 U 12SB600608	0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SB620709	0.25 U 12SB630608
2,6-DINITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.66 J 12SS610002 0.35 J 12SB610204 12SB610810 - REFUSAL	0.63 J 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
2-NITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
3,5-DINITROANILINE	0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SB590607	0.25 U 12SB600608	0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SB620709	0.25 U 12SB630608
3-NITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
4,4'-TN-AZOXY	0.5 U 12SB580507 0.5 U 12SB580507-D	0.5 U 12SB590607	0.5 U 12SB600608	1.3 12SB610204 12SB610810 - REFUSAL	0.5 U 12SB620709	0.5 U 12SB630608
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	3.2 J 12SS610002 0.9 12SB610204 12SB610810 - REFUSAL	2.2 J 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB58 2/20/2006	BDA-ES/DI 12SB59 2/16/2006	BDA-ES/DI 12SB60 2/16/2006	BDA-ES/DI 12SB61 2/17/2006	BDA-ES/DI 12SB62 2/17/2006	BDA-ES/DI 12SB63 2/17/2006
Energetics (mg/kg)						
4-NITROTOLUENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
DNX	0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SB590607	0.25 U 12SB600608	0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SB620709	0.25 U 12SB630608
HMX	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.72 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	560 J 12SS610002 40 12SB610204 12SB610810 - REFUSAL	600 J 12SS620002 2.8 J 12SB620406 0.28 J 12SB620709	0.25 U 12SS630002 0.64 J 12SB630406 0.25 U 12SB630608
MNX	0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SB590607	0.25 U 12SB600608	0.52 12SB610204 12SB610810 - REFUSAL	0.25 U 12SB620709	0.25 U 12SB630608
NITROBENZENE	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
RDX	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.34 J 12SB590406 1.9 12SB590607	0.25 U 12SS600002 0.55 12SB600406 0.25 U 12SB600608	1100 12SS610002 62 12SB610204 12SB610810 - REFUSAL	390 12SS620002 2.5 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
TETRYL	0.25 U 12SS580002 0.25 U 12SB580305 0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SS590002 0.25 U 12SB590406 0.25 U 12SB590607	0.25 U 12SS600002 0.25 U 12SB600406 0.25 U 12SB600608	0.25 U 12SS610002 0.25 U 12SB610204 12SB610810 - REFUSAL	0.25 U 12SS620002 0.25 U 12SB620406 0.25 U 12SB620709	0.25 U 12SS630002 0.25 U 12SB630406 0.25 U 12SB630608
TNX	0.25 U 12SB580507 0.25 U 12SB580507-D	0.25 U 12SB590607	0.25 U 12SB600608	0.39 J 12SB610204 12SB610810 - REFUSAL	0.25 U 12SB620709	0.25 U 12SB630608

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB64 2/17/2006	BDA-ES/DI 12SB65 2/17/2006	BDA-ES/DI 12SB66 2/17/2006	BDA-ES/DI 12SB67 2/18/2006	BDA-ES/DI 12SB68 2/16/2006	BDA-ES/DI 12SB69 2/16/2006
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
1,3-DINITROBENZENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
2,4,6-TRINITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 2.7 12SB680204 12SB680810 - REFUSAL	0.71 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
2,4-DIAMINO-6-NITROTOLUENE	0.25 U 12SB640608	0.25 U 12SB650507	0.25 U 12SB660608	0.25 U 12SB670810	0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SB690204 12SB690810 - REFUSAL
2,4-DINITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
2,6-DIAMINO-4-NITROTOLUENE	0.25 U 12SB640608	0.25 U 12SB650507	0.25 U 12SB660608	0.25 U 12SB670810	0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SB690204 12SB690810 - REFUSAL
2,6-DINITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.39 J 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
2-NITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
3,5-DINITROANILINE	0.25 U 12SB640608	0.25 U 12SB650507	0.25 U 12SB660608	0.25 U 12SB670810	0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SB690204 12SB690810 - REFUSAL
3-NITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
4,4'-TN-AZOXY	0.5 U 12SB640608	0.5 U 12SB650507	0.5 U 12SB660608	0.5 U 12SB670810	0.5 U 12SB680204 12SB680810 - REFUSAL	0.5 U 12SB690204 12SB690810 - REFUSAL
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.77 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB64 2/17/2006	BDA-ES/DI 12SB65 2/17/2006	BDA-ES/DI 12SB66 2/17/2006	BDA-ES/DI 12SB67 2/18/2006	BDA-ES/DI 12SB68 2/16/2006	BDA-ES/DI 12SB69 2/16/2006
Energetics (mg/kg)						
4-NITROTOLUENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
DNX	0.25 U 12SB640608	0.25 U 12SB650507	0.25 U 12SB660608	0.25 U 12SB670810	0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SB690204 12SB690810 - REFUSAL
HMX	0.25 U 12SS640002 0.68 J 12SB640406 0.31 J 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 1.4 12SB680204 12SB680810 - REFUSAL	1.2 12SS690002 0.4 J 12SB690204 12SB690810 - REFUSAL
MNX	0.25 U 12SB640608	0.25 U 12SB650507	0.25 U 12SB660608	0.25 U 12SB670810	0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SB690204 12SB690810 - REFUSAL
NITROBENZENE	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
RDX	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.4 J 12SB650204 0.25 J 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 4.2 12SB680204 12SB680810 - REFUSAL	3.6 12SS690002 0.82 12SB690204 12SB690810 - REFUSAL
TETRYL	0.25 U 12SS640002 0.25 U 12SB640406 0.25 U 12SB640608	0.25 U 12SS650002 0.25 U 12SB650204 0.25 U 12SB650507	0.25 U 12SS660002 0.25 U 12SB660406 0.25 U 12SB660406-D 0.25 U 12SB660608	0.25 U 12SS670002 0.25 U 12SB670608 0.25 U 12SB670810	0.25 U 12SS680002 0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SS690002 0.25 U 12SB690204 12SB690810 - REFUSAL
TNX	0.25 U 12SB640608	0.25 U 12SB650507	0.25 U 12SB660608	0.25 U 12SB670810	0.25 U 12SB680204 12SB680810 - REFUSAL	0.25 U 12SB690204 12SB690810 - REFUSAL

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB70 2/16/2006	BDA-ES/DI 12SB71 2/21/2006
Energetics (mg/kg)		
1,3,5-TRINITROBENZENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
1,3-DINITROBENZENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
2,4,6-TRINITROTOLUENE	0.25 U 12SS700002 1 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
2,4-DIAMINO-6-NITROTOLUENE	0.25 U 12SB701012	0.25 U 12SB710406 12SB710810 - REFUSAL
2,4-DINITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
2,6-DIAMINO-4-NITROTOLUENE	0.25 U 12SB701012	0.25 U 12SB710406 12SB710810 - REFUSAL
2,6-DINITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
2-AMINO-4,6-DINITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
2-NITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
3,5-DINITROANILINE	0.25 U 12SB701012	0.25 U 12SB710406 12SB710810 - REFUSAL
3-NITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
4,4'-TN-AZOXY	0.5 U 12SB701012	0.5 U 12SB710406 12SB710810 - REFUSAL
4-AMINO-2,6-DINITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL

APPENDIX TABLE G-3

RESULTS FOR CHEMICALS ANALYZED IN ALL SOIL SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

AREA OF CONCERN LOCATION SAMPLE DATE	BDA-ES/DI 12SB70 2/16/2006	BDA-ES/DI 12SB71 2/21/2006
Energetics (mg/kg)		
4-NITROTOLUENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
DNX	0.25 U 12SB701012	0.25 U 12SB710406 12SB710810 - REFUSAL
HMX	0.39 J 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
MNX	0.25 U 12SB701012	0.25 U 12SB710406 12SB710810 - REFUSAL
NITROBENZENE	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
RDX	0.4 J 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
TETRYL	0.25 U 12SS700002 0.25 U 12SB700406 0.25 U 12SB700810 0.25 U 12SB701012	0.25 U 12SS710002 0.25 U 12SB710406 12SB710810 - REFUSAL
TNX	0.25 U 12SB701012	0.25 U 12SB710406 12SB710810 - REFUSAL

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB
SAMPLING ORDER	01	01	01	01	01	01	02	02	02	02	02	02
LOCATION	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16
SAMPLE NUMBER	12SW2301	12SW2301-F	12SW2401	12SW2401-F	12SW1601	12SW1601-F	12SW2302	12SW2302-F	12SW2402	12SW2402-F	12SW1602	12SW1602-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/27/2004	10/27/2004	10/13/2004	10/13/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005
Semivolatile Organics (ug/L)												
1,2,4,5-TETRACHLOROBENZENE												
1,2,4-TRICHLOROBENZENE												
1,2-DICHLOROBENZENE												
1,3-DICHLOROBENZENE												
1,4-DICHLOROBENZENE												
1,4-NAPHTHOQUINONE												
1,4-PHENYLENEDIAMINE												
1-NAPHTHYLAMINE												
2,2'-OXYBIS(1-CHLOROPROPANE)												
2,3,4,6-TETRACHLOROPHENOL												
2,4,5-TRICHLOROPHENOL												
2,4,6-TRICHLOROPHENOL												
2,4-DICHLOROPHENOL												
2,4-DIMETHYLPHENOL												
2,4-DINITROPHENOL												
2,6-DICHLOROPHENOL												
2-ACETYLAMINOFLUORENE												
2-CHLORONAPHTHALENE												
2-CHLOROPHENOL												
2-METHYLNAPHTHALENE												
2-METHYLPHENOL												
2-NAPHTHYLAMINE												
2-NITROANILINE												
2-NITROPHENOL												
2-PICOLINE												
3&4-METHYLPHENOL												
3,3'-DICHLOROBENZIDINE												
3,3'-DIMETHYLBENZIDINE												
3-METHYLCHOLANTHRENE												
3-NITROANILINE												
4,6-DINITRO-2-METHYLPHENOL												
4-AMINOBIPHENYL												
4-BROMOPHENYL PHENYL ETHER												
4-CHLORO-3-METHYLPHENOL												
4-CHLOROANILINE												
4-CHLOROPHENYL PHENYL ETHER												
4-NITROANILINE												
4-NITROPHENOL												
4-NITROQUINOLINE-1-OXIDE												
5-NITRO-O-TOLUIDINE												

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB
SAMPLING ORDER	01	01	01	01	01	01	02	02	02	02	02	02
LOCATION	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16
SAMPLE NUMBER	12SW2301	12SW2301-F	12SW2401	12SW2401-F	12SW1601	12SW1601-F	12SW2302	12SW2302-F	12SW2402	12SW2402-F	12SW1602	12SW1602-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/27/2004	10/27/2004	10/13/2004	10/13/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005
7,12-DIMETHYLBENZ(A)ANTHRACENE												
A,A-DIMETHYLPHENETHYLAMINE												
ACENAPHTHENE												
ACENAPHTHYLENE												
ACETOPHENONE												
ANILINE												
ANTHRACENE												
ARAMITE												
BENZO(A)ANTHRACENE												
BENZO(A)PYRENE												
BENZO(B)FLUORANTHENE												
BENZO(G,H,I)PERYLENE												
BENZO(K)FLUORANTHENE												
BENZYL ALCOHOL												
BIS(2-CHLOROETHOXY)METHANE												
BIS(2-CHLOROETHYL)ETHER												
BIS(2-ETHYLHEXYL)PHTHALATE												
BUTYL BENZYL PHTHALATE												
CHLOROBENZILATE												
CHRYSENE												
DI-N-BUTYL PHTHALATE												
DI-N-OCTYL PHTHALATE												
DIALLATE												
DIBENZO(A,H)ANTHRACENE												
DIBENZOFURAN												
DIETHYL PHTHALATE												
DIMETHYL PHTHALATE												
DIPHENYLAMINE												
ETHYL METHANE SULFONATE												
FLUORANTHENE												
FLUORENE												
HEXACHLOROBENZENE												
HEXACHLOROBUTADIENE												
HEXACHLOROCYCLOPENTADIENE												
HEXACHLOROETHANE												
HEXACHLOROPROPENE												
INDENO(1,2,3-CD)PYRENE												
ISODRIN												
ISOPHORONE												
ISOSAFROLE												
KEPONE												

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB
SAMPLING ORDER	01	01	01	01	01	01	02	02	02	02	02	02
LOCATION	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16
SAMPLE NUMBER	12SW2301	12SW2301-F	12SW2401	12SW2401-F	12SW1601	12SW1601-F	12SW2302	12SW2302-F	12SW2402	12SW2402-F	12SW1602	12SW1602-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/27/2004	10/27/2004	10/13/2004	10/13/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005
METHAPYRILENE												
METHYL METHANE SULFONATE												
N-NITROSO-DI-N-BUTYLAMINE												
N-NITROSO-DI-N-PROPYLAMINE												
N-NITROSODIETHYLAMINE												
N-NITROSODIMETHYLAMINE												
N-NITROSODIPHENYLAMINE												
N-NITROSOMETHYLETHYLAMINE												
N-NITROSOMORPHOLINE												
N-NITROSOPIPERIDINE												
N-NITROSOPYRROLIDINE												
NAPHTHALENE												
O,O,O-TRIETHYL PHOSPHOROTHIOATE												
O-TOLUIDINE												
P-(DIMETHYLAMINO)AZOBENZENE												
PENTACHLOROBENZENE												
PENTACHLOROETHANE												
PENTACHLORONITROBENZENE												
PHENACETIN												
PHENANTHRENE												
PHENOL												
PRONAMIDE												
PYRENE												
PYRIDINE												
SAFROLE												
Energetics (ug/L)												
1,3,5-TRINITROBENZENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
1,3-DINITROBENZENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2,4,6-TRINITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2,4-DIAMINO-6-NITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2,4-DINITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2,6-DIAMINO-4-NITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2,6-DINITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2-AMINO-4,6-DINITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
2-NITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
3,5-DINITROANILINE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
3-NITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
4,4'-TN-AZOXY	0.49 U		0.495 U		0.52 U		0.542 U		0.505 U		0.5 U	
4-AMINO-2,6-DINITROTOLUENE	0.245 U		0.56		0.26 U		0.42 J		0.252 J		0.25 U	
4-NITROTOLUENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
DNX	0.245 U		0.248 U		0.66 J		0.271 U		0.252 U		0.25 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB
SAMPLING ORDER	01	01	01	01	01	01	02	02	02	02	02	02
LOCATION	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16
SAMPLE NUMBER	12SW2301	12SW2301-F	12SW2401	12SW2401-F	12SW1601	12SW1601-F	12SW2302	12SW2302-F	12SW2402	12SW2402-F	12SW1602	12SW1602-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/27/2004	10/27/2004	10/13/2004	10/13/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005
HMX	0.245 U		0.55		0.26 U		0.38 J		0.28 J		0.36 J	
MNX	0.245 U		0.248 U		0.68		0.271 U		0.252 U		0.25 U	
NITROBENZENE	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
RDX	0.245 U		0.8		0.26 U		0.57		0.39 J		0.25 U	
TETRYL	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
TNX	0.245 U		0.248 U		0.26 U		0.271 U		0.252 U		0.25 U	
Herbicides (ug/L)												
HEXACHLOROPHENE												
PENTACHLOROPHENOL												
Total Metals (ug/L)												
ALUMINUM	40.7 J		257 J		102		85.1 U		52.8 U		45.3 U	
ANTIMONY	0.085 U		0.48 U		0.18 U		0.085 U		0.085 U		0.085 U	
ARSENIC	0.24 U		0.33 J		0.23 U		0.11 U		0.11 U		0.13 U	
BARIUM	64.2 J		51.2 J		41.8 J		38.2 J		42.7 J		39 J	
BERYLLIUM	0.02 U		0.02 U		0.02 J		0.02 U		0.02 U		0.02 U	
CADMIUM	0.08 U		1.4 U		0.07 U		0.039 U		0.039 U		0.039 U	
CALCIUM	59300 J		40400		47200 J		51900 J		48400 J		63500 J	
CHROMIUM	0.96 U		0.97 U		1.2 U		0.69 U		0.67 U		0.66 U	
COBALT	0.2 U		0.26 J		0.22 U		0.15 J		0.17 J		0.18 J	
COPPER	1.4 U		3.4 J		1.5 J		0.58 U		1.4 J		0.89 J	
IRON	340 J		584 J		345 J		252 J		258 J		337 J	
LEAD	0.29 U		0.48 U		0.24 U		0.069 U		0.136 J		0.28 J	
MAGNESIUM	10400 J		6740 J		9130 J		8580 J		7860 J		11100 J	
MANGANESE	7.1 J		6 J		7.5 J		1.2 J		3.3 J		2.1 J	
MERCURY	0.03 U		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U	
NICKEL	1.9 J		2.4 J		1.9 J		1.7 J		1.6 J		2.4 J	
POTASSIUM	2940 J		2470 J		2730 J		1260 J		1140 J		1170 J	
SELENIUM	0.36 U		0.54 U		0.38 U		0.23 U		0.14 U		0.28 U	
SILVER	0.028 U		0.12 U		0.03 U		0.028 U		0.028 U		0.028 U	
SODIUM	25000 J		11600 J		19700 J		14200 J		11700 J		28000 J	
THALLIUM	0.07 J		0.043 U		0.06 J		0.07 J		0.07 J		0.09 J	
TIN	0.1 U		0.08 U		0.08 U		0.1 U		0.09 U		0.17 U	
VANADIUM	1.14 U		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U	
ZINC	6.1 U		5.2 U		2.9 U		0.714 UJ		3.3 U		0.714 UJ	
Dissolved Metals (ug/L)												
ALUMINUM, FILTERED		8.6 U		18.6 U		8.6 U		9.6 J		8.7 J		8.35 U
ANTIMONY, FILTERED		0.085 U		0.34 U		0.085 U		0.085 U		0.085 U		0.085 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB	EASTTRIB
SAMPLING ORDER	01	01	01	01	01	01	02	02	02	02	02	02
LOCATION	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16	12SW/SD23	12SW/SD23	12SW/SD24	12SW/SD24	12SW/SD16	12SW/SD16
SAMPLE NUMBER	12SW2301	12SW2301-F	12SW2401	12SW2401-F	12SW1601	12SW1601-F	12SW2302	12SW2302-F	12SW2402	12SW2402-F	12SW1602	12SW1602-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/27/2004	10/27/2004	10/13/2004	10/13/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005	3/5/2005
ARSENIC, FILTERED		0.16 U		0.21 J		0.22 U		0.1 U		0.15 U		0.16 U
BARIUM, FILTERED		66.8 J		52 J		43.2 J		44.4 J		44.5 J		44.8 J
BERYLLIUM, FILTERED		0.02 U		0.02 U		0.02 U		0.02 U		0.02 U		0.02 U
CADMIUM, FILTERED		0.06 U		0.34 U		0.12 U		0.039 U		0.039 U		0.11 U
CALCIUM, FILTERED		57500 J		40100		49300 J		37400 J		36200 J		50700 J
CHROMIUM, FILTERED		0.82 U		0.65 U		1.5 U		1.6 J		1.2 J		1.4 J
COBALT, FILTERED		0.17 U		0.17 J		0.17 U		0.17 J		0.14 U		0.18 J
COPPER, FILTERED		1.3 U		2.8 J		1.4 U		1.5 J		1.3 J		0.89 J
IRON, FILTERED		305 J		292 J		251 J		284 J		229 J		321 J
LEAD, FILTERED		0.39 U		0.2 J		0.24 U		0.254 J		0.198 U		0.24 J
MAGNESIUM, FILTERED		10600 J		6920 J		9370 J		8840 J		8450 J		12300 J
MANGANESE, FILTERED		4.2 U		3.5 J		5.9 U		0.82 J		1.6 J		1.2 J
MERCURY, FILTERED		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U
NICKEL, FILTERED		2.2 J		2.5 J		2.7 J		2.8 J		2.3 J		3.3 J
POTASSIUM, FILTERED		3040 J		2560 J		2820 J		1530 J		1240 J		1330 J
SELENIUM, FILTERED		0.32 U		0.53 U		0.44 U		0.39 U		0.38 U		0.48 U
SILVER, FILTERED		0.028 U		0.09 U		0.028 U		0.028 U		0.028 U		0.028 U
SODIUM, FILTERED		23800 J		12000 J		21900 J		17400 J		13000 J		24100 J
THALLIUM, FILTERED		0.07 J		0.043 U		0.07 J		0.11 U		0.07 U		0.09 U
TIN, FILTERED		0.23 U		0.2 U		0.11 U		0.16 U		0.048 U		0.048 U
VANADIUM, FILTERED		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U
ZINC, FILTERED		3.3 U		6.5 U		4 U		2.1 J		5.2 J		1.5 J
Field Parameters												
DISSOLVED OXYGEN (mg/L)	11.17		11.74		8.86		2.92		2.79		2.09	
OXIDATION REDUCTION POTENTIAL (MV)	264.6		61.8		38.9		113		126		100	
PH (S.U.)	6.81		7.55		7.36		7.36		7.1		7.73	
SPECIFIC CONDUCTANCE (MS/CM)	0.331		0.2706		0.286		0.154		0.14		0.204	
TEMPERATURE (C)	13.93		15.66				6.1		5.59		6.52	
TURBIDITY (NTU)	4.6		18.3		5.1		3.5		3.1		3.5	
Miscellaneous Parameters (mg/L)												
AMMONIA-N	0.13 J		0.021 J		0.12 J		0.005 U		0.005 U		0.005 U	
NITRITE/NITRATE-N	0.11		0.1		0.1		0.025 UJ		0.025 UJ		0.1 J	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD01	12SW/SD01	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0101	12SW0101-F	12SW0201	12SW0201-F	12SW0301	12SW0301-D	12SW0301-F	12SW0401	12SW0401-F	12SW0501	12SW0501-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/12/2004	10/12/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/12/2004	10/12/2004	10/28/2004	10/28/2004
Semivolatile Organics (ug/L)											
1,2,4,5-TETRACHLOROBENZENE					0.98 U	0.94 U					
1,2,4-TRICHLOROBENZENE					0.98 U	0.94 U					
1,2-DICHLOROBENZENE					0.98 U	0.94 U					
1,3-DICHLOROBENZENE					0.98 U	0.94 U					
1,4-DICHLOROBENZENE					0.98 U	0.94 U					
1,4-NAPHTHOQUINONE					0.98 U	0.94 U					
1,4-PHENYLENEDIAMINE					0.98 U	0.94 U					
1-NAPHTHYLAMINE					0.98 U	0.94 U					
2,2'-OXYBIS(1-CHLOROPROPANE)					0.98 U	0.94 U					
2,3,4,6-TETRACHLOROPHENOL					0.98 U	0.94 U					
2,4,5-TRICHLOROPHENOL					0.98 U	0.94 U					
2,4,6-TRICHLOROPHENOL					0.98 U	0.94 U					
2,4-DICHLOROPHENOL					0.98 U	0.94 U					
2,4-DIMETHYLPHENOL					0.98 U	0.94 U					
2,4-DINITROPHENOL					0.98 U	0.94 U					
2,6-DICHLOROPHENOL					0.98 U	0.94 U					
2-ACETYLAMINOFLUORENE					0.98 U	0.94 U					
2-CHLORONAPHTHALENE					0.98 U	0.94 U					
2-CHLOROPHENOL					0.98 U	0.94 U					
2-METHYLNAPHTHALENE					0.05 U	0.05 U					
2-METHYLPHENOL					0.98 U	0.94 U					
2-NAPHTHYLAMINE					0.98 U	0.94 U					
2-NITROANILINE					0.98 U	0.94 U					
2-NITROPHENOL					0.98 U	0.94 U					
2-PICOLINE					0.98 U	0.94 U					
3&4-METHYLPHENOL					0.98 U	0.94 U					
3,3'-DICHLOROBENZIDINE					0.98 UJ	0.94 U					
3,3'-DIMETHYLBENZIDINE					0.98 U	0.94 U					
3-METHYLCHOLANTHRENE					0.98 U	0.94 U					
3-NITROANILINE					0.98 U	0.94 U					
4,6-DINITRO-2-METHYLPHENOL					0.98 U	0.94 U					
4-AMINOBIPHENYL					0.98 U	0.94 U					
4-BROMOPHENYL PHENYL ETHER					0.98 U	0.94 U					
4-CHLORO-3-METHYLPHENOL					0.98 U	0.94 U					
4-CHLOROANILINE					0.98 U	0.94 U					
4-CHLOROPHENYL PHENYL ETHER					0.98 U	0.94 U					
4-NITROANILINE					0.98 U	0.94 U					
4-NITROPHENOL					0.98 U	0.94 U					
4-NITROQUINOLINE-1-OXIDE					0.98 UR	0.94 UR					
5-NITRO-O-TOLUIDINE					0.98 U	0.94 U					

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD01	12SW/SD01	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0101	12SW0101-F	12SW0201	12SW0201-F	12SW0301	12SW0301-D	12SW0301-F	12SW0401	12SW0401-F	12SW0501	12SW0501-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/12/2004	10/12/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/12/2004	10/12/2004	10/28/2004	10/28/2004
7,12-DIMETHYLBENZ(A)ANTHRACENE					0.98 U	0.94 U					
A,A-DIMETHYLPHENETHYLAMINE					0.98 UJ	0.94 U					
ACENAPHTHENE					0.05 U	0.05 U					
ACENAPHTHYLENE					0.05 U	0.05 U					
ACETOPHENONE					0.98 U	0.94 U					
ANILINE					0.98 U	0.94 U					
ANTHRACENE					0.05 U	0.05 U					
ARAMITE					0.98 U	0.94 U					
BENZO(A)ANTHRACENE					0.05 U	0.05 U					
BENZO(A)PYRENE					0.05 U	0.05 U					
BENZO(B)FLUORANTHENE					0.05 U	0.05 U					
BENZO(G,H,I)PERYLENE					0.05 U	0.05 U					
BENZO(K)FLUORANTHENE					0.05 U	0.05 U					
BENZYL ALCOHOL					0.98 U	0.94 U					
BIS(2-CHLOROETHOXY)METHANE					0.98 U	0.94 U					
BIS(2-CHLOROETHYL)ETHER					0.98 U	0.94 U					
BIS(2-ETHYLHEXYL)PHTHALATE					0.98 U	0.94 U					
BUTYL BENZYL PHTHALATE					0.98 U	0.94 U					
CHLOROBENZILATE					0.98 U	0.94 U					
CHRYSENE					0.05 U	0.05 U					
DI-N-BUTYL PHTHALATE					0.98 U	0.94 U					
DI-N-OCTYL PHTHALATE					0.98 U	0.94 U					
DIALLATE						0.94 U					
DIBENZO(A,H)ANTHRACENE					0.05 U	0.05 U					
DIBENZOFURAN					0.98 U	0.94 U					
DIETHYL PHTHALATE					0.98 U	0.94 U					
DIMETHYL PHTHALATE					0.98 U	0.94 U					
DIPHENYLAMINE					0.98 U	0.94 U					
ETHYL METHANE SULFONATE					0.98 U	0.94 U					
FLUORANTHENE					0.05 U	0.05 U					
FLUORENE					0.05 U	0.05 U					
HEXACHLOROBENZENE					0.98 U	0.94 U					
HEXACHLOROBUTADIENE					0.98 U	0.94 U					
HEXACHLOROCYCLOPENTADIENE					0.98 UJ	0.94 UJ					
HEXACHLOROETHANE					0.98 U	0.94 U					
HEXACHLOROPROPENE					0.98 U	0.94 U					
INDENO(1,2,3-CD)PYRENE					0.05 U	0.05 U					
ISODRIN					0.98 U	0.94 U					
ISOPHORONE					0.98 U	0.94 U					
ISOSAFROLE					0.98 U	0.94 U					
KEPONE					0.98 UR	0.94 UJ					

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD01	12SW/SD01	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0101	12SW0101-F	12SW0201	12SW0201-F	12SW0301	12SW0301-D	12SW0301-F	12SW0401	12SW0401-F	12SW0501	12SW0501-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/12/2004	10/12/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/12/2004	10/12/2004	10/28/2004	10/28/2004
METHAPYRILENE					0.98 U	0.94 U					
METHYL METHANE SULFONATE					0.98 U	0.94 U					
N-NITROSO-DI-N-BUTYLAMINE					0.98 U	0.94 U					
N-NITROSO-DI-N-PROPYLAMINE					0.98 U	0.94 U					
N-NITROSODIETHYLAMINE					0.98 U	0.94 U					
N-NITROSODIMETHYLAMINE					0.98 U	0.94 U					
N-NITROSODIPHENYLAMINE					0.98 U	0.94 U					
N-NITROSOMETHYLETHYLAMINE					0.98 U	0.94 U					
N-NITROSOMORPHOLINE					0.98 UJ	0.94 U					
N-NITROSOPIPERIDINE					0.98 U	0.94 U					
N-NITROSOPYRROLIDINE					0.98 U	0.94 U					
NAPHTHALENE					0.05 U	0.05 U					
O,O,O-TRIETHYL PHOSPHOROTHIOATE					0.98 U	0.94 U					
O-TOLUIDINE					0.98 U	0.94 U					
P-(DIMETHYLAMINO)AZOBENZENE					0.98 U	0.94 U					
PENTACHLOROBENZENE					0.98 U	0.94 U					
PENTACHLOROETHANE					0.98 U	0.94 U					
PENTACHLORONITROBENZENE					0.98 U	0.94 U					
PHENACETIN					0.98 U	0.94 U					
PHENANTHRENE					0.05 U	0.05 U					
PHENOL					0.98 U	0.94 U					
PRONAMIDE					0.98 U	0.94 U					
PYRENE					0.05 U	0.05 U					
PYRIDINE					0.98 U	0.94 UJ					
SAFROLE					0.98 U	0.94 U					
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
1,3-DINITROBENZENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
2,4,6-TRINITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
2,4-DIAMINO-6-NITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
2,4-DINITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
2,6-DIAMINO-4-NITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
2,6-DINITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
2-AMINO-4,6-DINITROTOLUENE	0.248 U		0.38 J		0.24 U			0.258 U		0.264 U	
2-NITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
3,5-DINITROANILINE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
3-NITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
4,4'-TN-AZOXY	0.495 U		0.51 U		0.48 U			0.515 U		0.528 U	
4-AMINO-2,6-DINITROTOLUENE	0.248 U		0.84		0.24 U			0.258 U		0.54	
4-NITROTOLUENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
DNX	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD01	12SW/SD01	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0101	12SW0101-F	12SW0201	12SW0201-F	12SW0301	12SW0301-D	12SW0301-F	12SW0401	12SW0401-F	12SW0501	12SW0501-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/12/2004	10/12/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/12/2004	10/12/2004	10/28/2004	10/28/2004
HMX	1.8		25		0.24 U			0.9		18	
MNX	0.248 U		1.6		0.24 U			0.258 U		1.2	
NITROBENZENE	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
RDX	0.46 J		68		0.24 U			0.47 J		50	
TETRYL	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
TNX	0.248 U		0.255 U		0.24 U			0.258 U		0.264 U	
Herbicides (ug/L)											
HEXACHLOROPHENE					0.025 U	0.025 U					
PENTACHLOROPHENOL					0.013 U	0.013 U					
Total Metals (ug/L)											
ALUMINUM	3970		1320 J		17900 J			253		568 J	
ANTIMONY	0.085 U		0.95 U		0.085 U			0.085 U		0.085 U	
ARSENIC	11 J		11.2 J		7.3 J			0.92 J		5.8 J	
BARIUM	428 J		91.5 J		252 J			17.9 J		78.6 J	
BERYLLIUM	0.25 J		0.05 U		0.57 J			0.03 J		0.02 U	
CADMIUM	0.33 J		1.6 J		2.4 J			0.07 U		0.61 U	
CALCIUM	38000 J		50400		53600			35300 J		48500	
CHROMIUM	5 J		2.9 J		14.6 J			1.1 U		1.7 U	
COBALT	21.6 J		1.7		12.5			0.49 J		1.1	
COPPER	11.2 J		17.7 J		32.4 J			2.6 J		12.1 J	
IRON	12600 J		1820 J		23000 J			550 J		1120 J	
LEAD	5.4 J		1.7 J		36 J			0.31 U		0.9 J	
MAGNESIUM	7100 J		14000		4680			7290 J		12800	
MANGANESE	24200 J		37.2 J		1310 J			34.6 J		24.6 J	
MERCURY	0.03 U		0.03 U		0.03 U			0.03 U		0.03 U	
NICKEL	9 J		9.2 J		20.2 J			2.6 J		7.7 J	
POTASSIUM	12800 J		134000 J		3240 J			10800 J		94400 J	
SELENIUM	0.92 U		1.2 J		0.91 U			0.58 U		0.91 U	
SILVER	0.028 U		0.18 U		0.028 U			0.028 U		0.028 U	
SODIUM	10700 J		28100 U		3450 J			9280 J		18000 J	
THALLIUM	0.12 J		0.05 J		0.21 J			0.043 U		0.043 U	
TIN	0.25 U		0.43 U		0.52 U			0.11 U		0.1 U	
VANADIUM	9.8		9.2		38.1			1.14 U		4.9	
ZINC	41.8 J		55.7 J		178 J			4.3 U		18.6 J	
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED		24.1 J		35.6 U			32.2 U		20.9 J		19.2 U
ANTIMONY, FILTERED		0.085 U		0.76 U			0.085 U		0.085 U		0.39 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD01	12SW/SD01	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0101	12SW0101-F	12SW0201	12SW0201-F	12SW0301	12SW0301-D	12SW0301-F	12SW0401	12SW0401-F	12SW0501	12SW0501-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/12/2004	10/12/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/12/2004	10/12/2004	10/28/2004	10/28/2004
ARSENIC, FILTERED		1.3 J		10.1 J			0.32 U		0.75 J		5.3 J
BARIUM, FILTERED		39.8 J		93.7 J			58.2 J		17.1 J		66.2 J
BERYLLIUM, FILTERED		0.02 U		0.02 U			0.02 U		0.02 U		0.02 U
CADMIUM, FILTERED		0.1 U		0.64 U			0.45 U		0.07 U		0.47 U
CALCIUM, FILTERED		35900 J		53300			48300		32400 J		47900
CHROMIUM, FILTERED		1.1 U		1 U			0.41 U		0.9 U		0.9 U
COBALT, FILTERED		1.3 J		0.94 J			0.24 J		0.23 U		0.66 J
COPPER, FILTERED		1.8 U		14.5 J			2.9 J		2.3 U		10.4 J
IRON, FILTERED		374 J		371 J			306 J		171 J		319 J
LEAD, FILTERED		0.15 U		0.34 J			0.15 J		0.25 U		0.22 J
MAGNESIUM, FILTERED		7290 J		15700 J			4030 J		7410 J		12500 J
MANGANESE, FILTERED		1230 J		4.2 J			19.1 J		4.6 U		2.4 J
MERCURY, FILTERED		0.03 U		0.03 U			0.03 U		0.03 U		0.03 U
NICKEL, FILTERED		1.9 J		8.2 J			2.7 J		2.3 J		6.8 J
POTASSIUM, FILTERED		14200 J		133000 J			2660 J		10700 J		95200 J
SELENIUM, FILTERED		0.52 U		1.1 J			0.36 U		0.28 U		0.82 U
SILVER, FILTERED		0.028 U		0.14 U			0.028 U		0.03 U		0.028 U
SODIUM, FILTERED		12400 J		28400 U			4470 J		9220 J		18100 J
THALLIUM, FILTERED		0.05 J		0.043 UR			0.043 UR		0.043 U		0.043 UR
TIN, FILTERED		0.14 U		0.24 U			0.08 U		0.16 U		0.21 U
VANADIUM, FILTERED		1.14 U		6.3			1.14 U		1.14 U		3.5
ZINC, FILTERED		5.2 U		21.5 J			2.6 U		4.5 U		7.4 U
Field Parameters											
DISSOLVED OXYGEN (mg/L)	4.6		8.12		9.14			7.16		9.09	
OXIDATION REDUCTION POTENTIAL (MV)	43.8		70.9		56.2			46.5		67.4	
PH (S.U.)	7.68		7.96		7.62			7.63		7.87	
SPECIFIC CONDUCTANCE (MS/CM)	0.239		0.744		0.26			0.204		0.603	
TEMPERATURE (C)	16.3		15.97		16.1			13.07		16	
TURBIDITY (NTU)	29		25.5		30.1			13		15.9	
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.22 J		0.16		0.11			0.16 J		0.12	
NITRITE/NITRATE-N	0.025 U		5.2		0.025 U			0.94		4.1	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD06	12SW/SD06	12SW/SD07	12SW/SD07	12SW/SD09	12SW/SD09	12SW/SD10	12SW/SD10	12SW/SD11	12SW/SD11	12SW/SD12
SAMPLE NUMBER	12SW0601	12SW0601-F	12SW0701	12SW0701-F	12SW0901	12SW0901-F	12SW1001	12SW1001-F	12SW1101	12SW1101-F	12SW1201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/28/2004	10/28/2004	11/1/2004	11/1/2004	10/27/2004	10/27/2004	10/27/2004	10/27/2004	10/12/2004	10/12/2004	10/13/2004
Semivolatile Organics (ug/L)											
1,2,4,5-TETRACHLOROBENZENE											
1,2,4-TRICHLOROBENZENE											
1,2-DICHLOROBENZENE											
1,3-DICHLOROBENZENE											
1,4-DICHLOROBENZENE											
1,4-NAPHTHOQUINONE											
1,4-PHENYLENEDIAMINE											
1-NAPHTHYLAMINE											
2,2'-OXYBIS(1-CHLOROPROPANE)											
2,3,4,6-TETRACHLOROPHENOL											
2,4,5-TRICHLOROPHENOL											
2,4,6-TRICHLOROPHENOL											
2,4-DICHLOROPHENOL											
2,4-DIMETHYLPHENOL											
2,4-DINITROPHENOL											
2,6-DICHLOROPHENOL											
2-ACETYLAMINOFLUORENE											
2-CHLORONAPHTHALENE											
2-CHLOROPHENOL											
2-METHYLNAPHTHALENE											
2-METHYLPHENOL											
2-NAPHTHYLAMINE											
2-NITROANILINE											
2-NITROPHENOL											
2-PICOLINE											
3&4-METHYLPHENOL											
3,3'-DICHLOROBENZIDINE											
3,3'-DIMETHYLBENZIDINE											
3-METHYLCHOLANTHRENE											
3-NITROANILINE											
4,6-DINITRO-2-METHYLPHENOL											
4-AMINOBIPHENYL											
4-BROMOPHENYL PHENYL ETHER											
4-CHLORO-3-METHYLPHENOL											
4-CHLOROANILINE											
4-CHLOROPHENYL PHENYL ETHER											
4-NITROANILINE											
4-NITROPHENOL											
4-NITROQUINOLINE-1-OXIDE											
5-NITRO-O-TOLUIDINE											

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD06	12SW/SD06	12SW/SD07	12SW/SD07	12SW/SD09	12SW/SD09	12SW/SD10	12SW/SD10	12SW/SD11	12SW/SD11	12SW/SD12
SAMPLE NUMBER	12SW0601	12SW0601-F	12SW0701	12SW0701-F	12SW0901	12SW0901-F	12SW1001	12SW1001-F	12SW1101	12SW1101-F	12SW1201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/28/2004	10/28/2004	11/1/2004	11/1/2004	10/27/2004	10/27/2004	10/27/2004	10/27/2004	10/12/2004	10/12/2004	10/13/2004
7,12-DIMETHYLBENZ(A)ANTHRACENE											
A,A-DIMETHYLPHENETHYLAMINE											
ACENAPHTHENE											
ACENAPHTHYLENE											
ACETOPHENONE											
ANILINE											
ANTHRACENE											
ARAMITE											
BENZO(A)ANTHRACENE											
BENZO(A)PYRENE											
BENZO(B)FLUORANTHENE											
BENZO(G,H,I)PERYLENE											
BENZO(K)FLUORANTHENE											
BENZYL ALCOHOL											
BIS(2-CHLOROETHOXY)METHANE											
BIS(2-CHLOROETHYL)ETHER											
BIS(2-ETHYLHEXYL)PHTHALATE											
BUTYL BENZYL PHTHALATE											
CHLOROBENZILATE											
CHRYSENE											
DI-N-BUTYL PHTHALATE											
DI-N-OCTYL PHTHALATE											
DIALLATE											
DIBENZO(A,H)ANTHRACENE											
DIBENZOFURAN											
DIETHYL PHTHALATE											
DIMETHYL PHTHALATE											
DIPHENYLAMINE											
ETHYL METHANE SULFONATE											
FLUORANTHENE											
FLUORENE											
HEXACHLOROBENZENE											
HEXACHLOROBUTADIENE											
HEXACHLOROCYCLOPENTADIENE											
HEXACHLOROETHANE											
HEXACHLOROPROPENE											
INDENO(1,2,3-CD)PYRENE											
ISODRIN											
ISOPHORONE											
ISOSAFROLE											
KEPONE											

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD06	12SW/SD06	12SW/SD07	12SW/SD07	12SW/SD09	12SW/SD09	12SW/SD10	12SW/SD10	12SW/SD11	12SW/SD11	12SW/SD12
SAMPLE NUMBER	12SW0601	12SW0601-F	12SW0701	12SW0701-F	12SW0901	12SW0901-F	12SW1001	12SW1001-F	12SW1101	12SW1101-F	12SW1201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/28/2004	10/28/2004	11/1/2004	11/1/2004	10/27/2004	10/27/2004	10/27/2004	10/27/2004	10/12/2004	10/12/2004	10/13/2004
METHAPYRILENE											
METHYL METHANE SULFONATE											
N-NITROSO-DI-N-BUTYLAMINE											
N-NITROSO-DI-N-PROPYLAMINE											
N-NITROSODIETHYLAMINE											
N-NITROSODIMETHYLAMINE											
N-NITROSODIPHENYLAMINE											
N-NITROSOMETHYLETHYLAMINE											
N-NITROSOMORPHOLINE											
N-NITROSOPIPERIDINE											
N-NITROSOPYRROLIDINE											
NAPHTHALENE											
O,O,O-TRIETHYL PHOSPHOROTHIOATE											
O-TOLUIDINE											
P-(DIMETHYLAMINO)AZOBENZENE											
PENTACHLOROBENZENE											
PENTACHLOROETHANE											
PENTACHLORONITROBENZENE											
PHENACETIN											
PHENANTHRENE											
PHENOL											
PRONAMIDE											
PYRENE											
PYRIDINE											
SAFROLE											
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
1,3-DINITROBENZENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
2,4,6-TRINITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		16
2,4-DIAMINO-6-NITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		1.5 J
2,4-DINITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.47 J
2,6-DIAMINO-4-NITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
2,6-DINITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.27 J
2-AMINO-4,6-DINITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		19 J
2-NITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
3,5-DINITROANILINE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
3-NITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
4,4'-TN-AZOXY	0.48 U		0.49 U		0.528 U		0.52 U		0.48 UJ		0.485 U
4-AMINO-2,6-DINITROTOLUENE	0.24 U		0.245 U		0.61		0.46 J		0.24 UJ		74
4-NITROTOLUENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
DNX	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD06	12SW/SD06	12SW/SD07	12SW/SD07	12SW/SD09	12SW/SD09	12SW/SD10	12SW/SD10	12SW/SD11	12SW/SD11	12SW/SD12
SAMPLE NUMBER	12SW0601	12SW0601-F	12SW0701	12SW0701-F	12SW0901	12SW0901-F	12SW1001	12SW1001-F	12SW1101	12SW1101-F	12SW1201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/28/2004	10/28/2004	11/1/2004	11/1/2004	10/27/2004	10/27/2004	10/27/2004	10/27/2004	10/12/2004	10/12/2004	10/13/2004
HMX	1.1		0.245 U		6.4		4.1		2.4 J		12
MNX	0.24 U		0.245 U		0.52 J		0.38 J		0.24 UJ		0.84 J
NITROBENZENE	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
RDX	0.37 J		0.245 U		19		13		5.6 J		52
TETRYL	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
TNX	0.24 U		0.245 U		0.264 U		0.26 U		0.24 UJ		0.242 U
Herbicides (ug/L)											
HEXACHLOROPHENE											
PENTACHLOROPHENOL											
Total Metals (ug/L)											
ALUMINUM	346 J		2680 J		344 J		107 U		128		417
ANTIMONY	0.085 U		0.32 U		0.085 U		0.085 U		0.085 U		0.79 U
ARSENIC	1.2 J		1.2		0.97 J		0.41 J		5.1 J		0.52 J
BARIUM	73.8 J		46 J		66.7 J		63.6 J		265 J		26.5 J
BERYLLIUM	0.02 U		0.17 U		0.02 U		0.02 U		0.02 U		0.03 J
CADMIUM	1.4 U		0.21 J		1.1 U		1.1 U		0.11 U		0.11 U
CALCIUM	31100		3560 J		115000		27700		84000 J		34700 J
CHROMIUM	0.84 U		3 J		0.86 U		0.55 U		0.39 U		2.6 J
COBALT	0.65 J		1.6		0.48 J		0.26 J		2.2 J		0.95 J
COPPER	5.4 J		11.5 J		5.3 J		3.2 J		0.98 U		4.1 J
IRON	612 J		2830 J		587 J		345 J		9390 J		657 J
LEAD	0.34 U		2.6		0.34 U		0.15 U		0.69 U		0.66 U
MAGNESIUM	9960		1460		7590 J		6920 J		14000 J		6450 J
MANGANESE	10 J		69.9		10.9 J		5.1 J		7460 J		79 J
MERCURY	0.03 U		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U
NICKEL	4.6 J		5.6 J		4.2 J		3.6 J		3.3 J		2.6 J
POTASSIUM	68600 J		2900 J		122000 J		17300 J		10800 J		1950 J
SELENIUM	0.64 U		0.2 U		0.49 U		0.39 U		0.42 U		0.51 U
SILVER	0.028 U		0.028 U		0.028 U		0.028 U		0.028 U		0.028 U
SODIUM	13200 J		1530 J		8870 J		8850 J		5380 J		10200 J
THALLIUM	0.043 U		0.043 U		0.043 U		0.043 U		0.043 U		0.05 J
TIN	0.08 U		0.38 U		0.08 U		0.08 U		0.08 U		0.08 U
VANADIUM	1.3 J		5.3		1.3 J		1.14 U		1.14 U		1.14 U
ZINC	3 U		21.5 J		7 U		1.9 U		6 U		8.9 U
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED		30.9 U		589 J		137 U		35 U		23.6 J	
ANTIMONY, FILTERED		0.085 U		0.67 U		0.085 U		0.085 U		0.085 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD06	12SW/SD06	12SW/SD07	12SW/SD07	12SW/SD09	12SW/SD09	12SW/SD10	12SW/SD10	12SW/SD11	12SW/SD11	12SW/SD12
SAMPLE NUMBER	12SW0601	12SW0601-F	12SW0701	12SW0701-F	12SW0901	12SW0901-F	12SW1001	12SW1001-F	12SW1101	12SW1101-F	12SW1201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/28/2004	10/28/2004	11/1/2004	11/1/2004	10/27/2004	10/27/2004	10/27/2004	10/27/2004	10/12/2004	10/12/2004	10/13/2004
ARSENIC, FILTERED		1 J		0.47 J		0.86 J		0.31 J		2.9 J	
BARIUM, FILTERED		71.9 J		26.2 J		66.1 J		62 J		227 J	
BERYLLIUM, FILTERED		0.02 U		0.09 U		0.02 U		0.02 U		0.02 U	
CADMIUM, FILTERED		0.63 U		0.13 J		0.45 U		0.34 U		0.17 U	
CALCIUM, FILTERED		30600		3080 J		28900		26800		86600 J	
CHROMIUM, FILTERED		0.64 U		0.83 U		0.66 U		0.45 U		0.72 U	
COBALT, FILTERED		0.41 J		0.52 J		0.34 J		0.21 J		2.6 J	
COPPER, FILTERED		5.2 J		7.5 J		5.1 J		3.1 J		0.6 U	
IRON, FILTERED		203 J		606 J		251 J		167 J		715 J	
LEAD, FILTERED		0.23 J		0.82 J		0.25 J		0.29 J		0.3 U	
MAGNESIUM, FILTERED		10600 J		1480 J		8220 J		6960 J		18400 J	
MANGANESE, FILTERED		1.5 J		30.9		5 J		2.7 J		7170 J	
MERCURY, FILTERED		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U	
NICKEL, FILTERED		4.7 J		3.4 J		4.5 J		3.4 J		4.1 J	
POTASSIUM, FILTERED		68200 J		2810 J		31000 J		17400 J		14000 J	
SELENIUM, FILTERED		0.69 U		0.18 U		0.39 U		0.36 U		0.62 U	
SILVER, FILTERED		0.028 U		0.028 U		0.028 U		0.028 U		0.028 U	
SODIUM, FILTERED		13200 J		1630 J		9630 J		8800 J		7190 J	
THALLIUM, FILTERED		0.043 UR		0.043 U		0.043 U		0.043 U		0.043 U	
TIN, FILTERED		0.1 U		0.08 U		0.08 J		0.08 U		0.14 U	
VANADIUM, FILTERED		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U	
ZINC, FILTERED		2.3 U		5.9 J		4.9 U		2.5 U		5.5 U	
Field Parameters											
DISSOLVED OXYGEN (mg/L)	9.21		11.55		10.28		10.58		1.19		13.11
OXIDATION REDUCTION POTENTIAL (MV)	89.4		38.2		67.7		62.3		169.600000		210.8
PH (S.U.)	7.26		8.5		7.41		7.55		6.98		7.54
SPECIFIC CONDUCTANCE (MS/CM)	0.45		0.081		0.299		0.261		0.427		0.196
TEMPERATURE (C)	15.34		16.54		15.72		15.63		12.13		14.42
TURBIDITY (NTU)	97.5		88.7		17.1		7.27		82.6		15
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.14		0.031 J		0.03 J		0.039 J		4.2 J		0.15 J
NITRITE/NITRATE-N	8.2		0.044 J		1.9		1.1		0.025 U		3.2

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD12	12SW/SD13	12SW/SD13	12SW/SD14	12SW/SD14	12SW/SD15	12SW/SD15	12SW/SD17	12SW/SD17	12SW/SD18	12SW/SD18
SAMPLE NUMBER	12SW1201-F	12SW1301	12SW1301-F	12SW1401	12SW1401-F	12SW1501	12SW1501-F	12SW1701	12SW1701-F	12SW1801	12SW1801-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/13/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	10/29/2004	10/29/2004	11/1/2004	11/1/2004
Semivolatile Organics (ug/L)											
1,2,4,5-TETRACHLOROBENZENE											
1,2,4-TRICHLOROBENZENE											
1,2-DICHLOROBENZENE											
1,3-DICHLOROBENZENE											
1,4-DICHLOROBENZENE											
1,4-NAPHTHOQUINONE											
1,4-PHENYLENEDIAMINE											
1-NAPHTHYLAMINE											
2,2'-OXYBIS(1-CHLOROPROPANE)											
2,3,4,6-TETRACHLOROPHENOL											
2,4,5-TRICHLOROPHENOL											
2,4,6-TRICHLOROPHENOL											
2,4-DICHLOROPHENOL											
2,4-DIMETHYLPHENOL											
2,4-DINITROPHENOL											
2,6-DICHLOROPHENOL											
2-ACETYLAMINOFLUORENE											
2-CHLORONAPHTHALENE											
2-CHLOROPHENOL											
2-METHYLNAPHTHALENE											
2-METHYLPHENOL											
2-NAPHTHYLAMINE											
2-NITROANILINE											
2-NITROPHENOL											
2-PICOLINE											
3&4-METHYLPHENOL											
3,3'-DICHLOROBENZIDINE											
3,3'-DIMETHYLBENZIDINE											
3-METHYLCHOLANTHRENE											
3-NITROANILINE											
4,6-DINITRO-2-METHYLPHENOL											
4-AMINOBIPHENYL											
4-BROMOPHENYL PHENYL ETHER											
4-CHLORO-3-METHYLPHENOL											
4-CHLOROANILINE											
4-CHLOROPHENYL PHENYL ETHER											
4-NITROANILINE											
4-NITROPHENOL											
4-NITROQUINOLINE-1-OXIDE											
5-NITRO-O-TOLUIDINE											

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD12	12SW/SD13	12SW/SD13	12SW/SD14	12SW/SD14	12SW/SD15	12SW/SD15	12SW/SD17	12SW/SD17	12SW/SD18	12SW/SD18
SAMPLE NUMBER	12SW1201-F	12SW1301	12SW1301-F	12SW1401	12SW1401-F	12SW1501	12SW1501-F	12SW1701	12SW1701-F	12SW1801	12SW1801-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/13/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	10/29/2004	10/29/2004	11/1/2004	11/1/2004
7,12-DIMETHYLBENZ(A)ANTHRACENE											
A,A-DIMETHYLPHENETHYLAMINE											
ACENAPHTHENE											
ACENAPHTHYLENE											
ACETOPHENONE											
ANILINE											
ANTHRACENE											
ARAMITE											
BENZO(A)ANTHRACENE											
BENZO(A)PYRENE											
BENZO(B)FLUORANTHENE											
BENZO(G,H,I)PERYLENE											
BENZO(K)FLUORANTHENE											
BENZYL ALCOHOL											
BIS(2-CHLOROETHOXY)METHANE											
BIS(2-CHLOROETHYL)ETHER											
BIS(2-ETHYLHEXYL)PHTHALATE											
BUTYL BENZYL PHTHALATE											
CHLOROBENZILATE											
CHRYSENE											
DI-N-BUTYL PHTHALATE											
DI-N-OCTYL PHTHALATE											
DIALLATE											
DIBENZO(A,H)ANTHRACENE											
DIBENZOFURAN											
DIETHYL PHTHALATE											
DIMETHYL PHTHALATE											
DIPHENYLAMINE											
ETHYL METHANE SULFONATE											
FLUORANTHENE											
FLUORENE											
HEXACHLOROBENZENE											
HEXACHLOROBUTADIENE											
HEXACHLOROCYCLOPENTADIENE											
HEXACHLOROETHANE											
HEXACHLOROPROPENE											
INDENO(1,2,3-CD)PYRENE											
ISODRIN											
ISOPHORONE											
ISOSAFROLE											
KEPONE											

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD12	12SW/SD13	12SW/SD13	12SW/SD14	12SW/SD14	12SW/SD15	12SW/SD15	12SW/SD17	12SW/SD17	12SW/SD18	12SW/SD18
SAMPLE NUMBER	12SW1201-F	12SW1301	12SW1301-F	12SW1401	12SW1401-F	12SW1501	12SW1501-F	12SW1701	12SW1701-F	12SW1801	12SW1801-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/13/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	10/29/2004	10/29/2004	11/1/2004	11/1/2004
METHAPYRILENE											
METHYL METHANE SULFONATE											
N-NITROSO-DI-N-BUTYLAMINE											
N-NITROSO-DI-N-PROPYLAMINE											
N-NITROSODIETHYLAMINE											
N-NITROSODIMETHYLAMINE											
N-NITROSODIPHENYLAMINE											
N-NITROSOMETHYLETHYLAMINE											
N-NITROSOMORPHOLINE											
N-NITROSOPIPERIDINE											
N-NITROSOPYRROLIDINE											
NAPHTHALENE											
O,O,O-TRIETHYL PHOSPHOROTHIOATE											
O-TOLUIDINE											
P-(DIMETHYLAMINO)AZOBENZENE											
PENTACHLOROBENZENE											
PENTACHLOROETHANE											
PENTACHLORONITROBENZENE											
PHENACETIN											
PHENANTHRENE											
PHENOL											
PRONAMIDE											
PYRENE											
PYRIDINE											
SAFROLE											
Energetics (ug/L)											
1,3,5-TRINITROBENZENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
1,3-DINITROBENZENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
2,4,6-TRINITROTOLUENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
2,4-DIAMINO-6-NITROTOLUENE		0.79 J		0.24 U		0.258 U		0.242 U		0.264 U	
2,4-DINITROTOLUENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
2,6-DIAMINO-4-NITROTOLUENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
2,6-DINITROTOLUENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
2-AMINO-4,6-DINITROTOLUENE		6.8 J		2.1 J		0.258 U		0.242 U		0.264 U	
2-NITROTOLUENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
3,5-DINITROANILINE		1.9		0.24 U		0.258 U		0.242 U		0.264 U	
3-NITROTOLUENE		0.25 U		0.71 J		0.258 U		0.242 U		0.264 U	
4,4'-TN-AZOXY		0.5 U		0.48 U		0.515 U		0.485 U		0.528 U	
4-AMINO-2,6-DINITROTOLUENE		12		5.6		0.258 U		0.242 U		0.264 U	
4-NITROTOLUENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
DNX		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD12	12SW/SD13	12SW/SD13	12SW/SD14	12SW/SD14	12SW/SD15	12SW/SD15	12SW/SD17	12SW/SD17	12SW/SD18	12SW/SD18
SAMPLE NUMBER	12SW1201-F	12SW1301	12SW1301-F	12SW1401	12SW1401-F	12SW1501	12SW1501-F	12SW1701	12SW1701-F	12SW1801	12SW1801-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/13/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	10/29/2004	10/29/2004	11/1/2004	11/1/2004
HMX		6.5		4.5		0.258 U		0.242 U		0.264 U	
MNX		0.32 J		0.24 U		0.258 U		0.242 U		0.264 U	
NITROBENZENE		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
RDX		7.7		12		0.258 U		0.242 U		0.264 U	
TETRYL		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
TNX		0.25 U		0.24 U		0.258 U		0.242 U		0.264 U	
Herbicides (ug/L)											
HEXACHLOROPHENE											
PENTACHLOROPHENOL											
Total Metals (ug/L)											
ALUMINUM		616		1570 J		1810 J		392 J		557 J	
ANTIMONY		0.085 U		0.82 U		0.25 U		0.085 U		0.16 U	
ARSENIC		0.38 J		4.1		1.7		0.68 J		0.91 J	
BARIUM		91.8 J		85.3 J		79 J		90.8 J		47.6 J	
BERYLLIUM		0.22 J		0.07 U		0.09 U		0.02 U		0.02 U	
CADMIUM		0.27 U		0.53 J		3.9		2.2 J		1.5	
CALCIUM		48600 J		69100 J		38000 J		62700		52600 J	
CHROMIUM		1.1 U		3.3 J		3.6 J		3.2 J		1.1 U	
COBALT		3.1 J		2.1		1.2		3.1		0.37 J	
COPPER		2.4 J		21.6 J		9.1 J		4.3 J		5.4 J	
IRON		791 J		2160 J		2430 J		962 J		793 J	
LEAD		0.77 U		5.7		6.1		16.7 J		0.56 J	
MAGNESIUM		15200 J		14900		3690		6220		3660	
MANGANESE		1140 J		95.3		33.6		297 J		11.9	
MERCURY		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U	
NICKEL		14.1 J		9.1 J		3.7 J		4.8 J		3.2 J	
POTASSIUM		5440 J		167000 J		1170 J		1970 J		1160 J	
SELENIUM		0.63 U		1 J		0.16 U		0.46 U		0.12 U	
SILVER		0.028 U		0.05 U		0.028 U		0.028 U		0.028 U	
SODIUM		29500 J		30900 J		897 U		7720 J		1800 J	
THALLIUM		0.06 J		0.07 J		0.043 U		0.043 U		0.043 U	
TIN		0.14 U		0.56 U		0.11 U		0.35 U		0.13 U	
VANADIUM		1.14 U		8		4.7		1.14 U		1.5 J	
ZINC		26.9 J		56.9 J		29.5 J		103 J		6.1 J	
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED	27.2 J		116		370 J		47.6 U		9.4 U		8.9 U
ANTIMONY, FILTERED	0.67 U		0.085 U		0.8 U		0.55 U		0.34 U		0.2 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD12	12SW/SD13	12SW/SD13	12SW/SD14	12SW/SD14	12SW/SD15	12SW/SD15	12SW/SD17	12SW/SD17	12SW/SD18	12SW/SD18
SAMPLE NUMBER	12SW1201-F	12SW1301	12SW1301-F	12SW1401	12SW1401-F	12SW1501	12SW1501-F	12SW1701	12SW1701-F	12SW1801	12SW1801-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/13/2004	10/13/2004	10/13/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	10/29/2004	10/29/2004	11/1/2004	11/1/2004
ARSENIC, FILTERED	0.24 U		0.2 U		3.2		0.6 J		16.2 J		0.73 J
BARIUM, FILTERED	20.4 J		72.7 J		76.6 J		46 J		74.7 J		41.4 J
BERYLLIUM, FILTERED	0.03 J		0.14 J		0.02 U		0.02 U		0.02 U		0.02 U
CADMIUM, FILTERED	0.12 U		0.12 U		0.28 J		0.7 J		0.55 U		1
CALCIUM, FILTERED	34600 J		39800 J		59200 J		30700 J		58200		52800 J
CHROMIUM, FILTERED	1.6 U		0.45 U		1.5 U		0.93 U		0.74 U		0.6 U
COBALT, FILTERED	0.27 U		2 J		1.3		0.1 J		0.22 J		0.14 J
COPPER, FILTERED	2.8 J		1 U		16.5 J		4 J		2.5 J		4.6 J
IRON, FILTERED	157 J		193 J		676 J		126 J		360 J		190 J
LEAD, FILTERED	0.27 U		0.28 U		1.6		0.13 J		0.25 J		0.14 J
MAGNESIUM, FILTERED	5710 J		13800 J		15200 J		3400 J		7610 J		3870 J
MANGANESE, FILTERED	27.6 J		804 J		29.4		0.752 U		4.6 J		0.752 U
MERCURY, FILTERED	0.03 U		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U
NICKEL, FILTERED	2 J		9.9 J		8 J		1.7 J		3.6 J		2.6 J
POTASSIUM, FILTERED	1750 J		4870 J		168000 J		855 J		1960 J		1110 J
SELENIUM, FILTERED	0.32 U		0.48 U		0.7 J		0.1 U		0.4 U		0.18 U
SILVER, FILTERED	0.028 U		0.028 U		0.028 U		0.028 U		0.06 U		0.028 U
SODIUM, FILTERED	9050 J		24200 J		32600 J		948 U		9120 J		1960 J
THALLIUM, FILTERED	0.043 U		0.05 J		0.06 J		0.043 U		0.043 UR		0.043 U
TIN, FILTERED	0.1 U		0.11 U		0.26 U		0.19 U		7.4 J		0.09 U
VANADIUM, FILTERED	1.14 U		1.14 U		5.3		1.14 U		1.14 U		1.14 U
ZINC, FILTERED	5.5 U		16.6 U		27.5 J		4.2 J		29.6 J		4.9 J
Field Parameters											
DISSOLVED OXYGEN (mg/L)		5.63		10.26		10.93		5.59		9.78	
OXIDATION REDUCTION POTENTIAL (MV)		54.4		52.3		39.6		52.4		42.9	
PH (S.U.)		7.2		7.69		8.04		7.44		7.81	
SPECIFIC CONDUCTANCE (MS/CM)		0.17		0.86		0.155		0.334		0.227	
TEMPERATURE (C)		14.45		15.07		16.99		17.69		16.3	
TURBIDITY (NTU)		9.8		137		49		5.41		7.63	
Miscellaneous Parameters (mg/L)											
AMMONIA-N		0.17 J		0.24 J		0.027 J		0.05		0.019 J	
NITRITE/NITRATE-N		0.52		3.8		0.2		0.13		0.06	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD19	12SW/SD19	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD21	12SW/SD21	12SW/SD08	12SW/SD08	12SW/SD22
SAMPLE NUMBER	12SW1901	12SW1901-F	12SW2001	12SW2001-D	12SW2001-F	12SW2001-F-D	12SW2101	12SW2101-F	12SW0801	12SW0801-F	12SW2201
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/29/2004	10/29/2004	10/30/2004	10/30/2004	10/30/2004	10/30/2004	10/29/2004	10/29/2004	10/27/2004	10/27/2004	10/29/2004
Semivolatile Organics (ug/L)											
1,2,4,5-TETRACHLOROBENZENE											
1,2,4-TRICHLOROBENZENE											
1,2-DICHLOROBENZENE											
1,3-DICHLOROBENZENE											
1,4-DICHLOROBENZENE											
1,4-NAPHTHOQUINONE											
1,4-PHENYLENEDIAMINE											
1-NAPHTHYLAMINE											
2,2'-OXYBIS(1-CHLOROPROPANE)											
2,3,4,6-TETRACHLOROPHENOL											
2,4,5-TRICHLOROPHENOL											
2,4,6-TRICHLOROPHENOL											
2,4-DICHLOROPHENOL											
2,4-DIMETHYLPHENOL											
2,4-DINITROPHENOL											
2,6-DICHLOROPHENOL											
2-ACETYLAMINOFLUORENE											
2-CHLORONAPHTHALENE											
2-CHLOROPHENOL											
2-METHYLNAPHTHALENE											
2-METHYLPHENOL											
2-NAPHTHYLAMINE											
2-NITROANILINE											
2-NITROPHENOL											
2-PICOLINE											
3&4-METHYLPHENOL											
3,3'-DICHLOROBENZIDINE											
3,3'-DIMETHYLBENZIDINE											
3-METHYLCHOLANTHRENE											
3-NITROANILINE											
4,6-DINITRO-2-METHYLPHENOL											
4-AMINOBIPHENYL											
4-BROMOPHENYL PHENYL ETHER											
4-CHLORO-3-METHYLPHENOL											
4-CHLOROANILINE											
4-CHLOROPHENYL PHENYL ETHER											
4-NITROANILINE											
4-NITROPHENOL											
4-NITROQUINOLINE-1-OXIDE											
5-NITRO-O-TOLUIDINE											

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD19	12SW/SD19	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD21	12SW/SD21	12SW/SD08	12SW/SD08	12SW/SD22
SAMPLE NUMBER	12SW1901	12SW1901-F	12SW2001	12SW2001-D	12SW2001-F	12SW2001-F-D	12SW2101	12SW2101-F	12SW0801	12SW0801-F	12SW2201
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/29/2004	10/29/2004	10/30/2004	10/30/2004	10/30/2004	10/30/2004	10/29/2004	10/29/2004	10/27/2004	10/27/2004	10/29/2004
7,12-DIMETHYLBENZ(A)ANTHRACENE											
A,A-DIMETHYLPHENETHYLAMINE											
ACENAPHTHENE											
ACENAPHTHYLENE											
ACETOPHENONE											
ANILINE											
ANTHRACENE											
ARAMITE											
BENZO(A)ANTHRACENE											
BENZO(A)PYRENE											
BENZO(B)FLUORANTHENE											
BENZO(G,H,I)PERYLENE											
BENZO(K)FLUORANTHENE											
BENZYL ALCOHOL											
BIS(2-CHLOROETHOXY)METHANE											
BIS(2-CHLOROETHYL)ETHER											
BIS(2-ETHYLHEXYL)PHTHALATE											
BUTYL BENZYL PHTHALATE											
CHLOROBENZILATE											
CHRYSENE											
DI-N-BUTYL PHTHALATE											
DI-N-OCTYL PHTHALATE											
DIALLATE											
DIBENZO(A,H)ANTHRACENE											
DIBENZOFURAN											
DIETHYL PHTHALATE											
DIMETHYL PHTHALATE											
DIPHENYLAMINE											
ETHYL METHANE SULFONATE											
FLUORANTHENE											
FLUORENE											
HEXACHLOROBENZENE											
HEXACHLOROBUTADIENE											
HEXACHLOROCYCLOPENTADIENE											
HEXACHLOROETHANE											
HEXACHLOROPROPENE											
INDENO(1,2,3-CD)PYRENE											
ISODRIN											
ISOPHORONE											
ISOSAFROLE											
KEPONE											

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD19	12SW/SD19	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD21	12SW/SD21	12SW/SD08	12SW/SD08	12SW/SD22
SAMPLE NUMBER	12SW1901	12SW1901-F	12SW2001	12SW2001-D	12SW2001-F	12SW2001-F-D	12SW2101	12SW2101-F	12SW0801	12SW0801-F	12SW2201
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/29/2004	10/29/2004	10/30/2004	10/30/2004	10/30/2004	10/30/2004	10/29/2004	10/29/2004	10/27/2004	10/27/2004	10/29/2004
METHAPYRILENE											
METHYL METHANE SULFONATE											
N-NITROSO-DI-N-BUTYLAMINE											
N-NITROSO-DI-N-PROPYLAMINE											
N-NITROSODIETHYLAMINE											
N-NITROSODIMETHYLAMINE											
N-NITROSODIPHENYLAMINE											
N-NITROSOMETHYLETHYLAMINE											
N-NITROSOMORPHOLINE											
N-NITROSOPIPERIDINE											
N-NITROSOPYRROLIDINE											
NAPHTHALENE											
O,O,O-TRIETHYL PHOSPHOROTHIOATE											
O-TOLUIDINE											
P-(DIMETHYLAMINO)AZOBENZENE											
PENTACHLOROBENZENE											
PENTACHLOROETHANE											
PENTACHLORONITROBENZENE											
PHENACETIN											
PHENANTHRENE											
PHENOL											
PRONAMIDE											
PYRENE											
PYRIDINE											
SAFROLE											
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
1,3-DINITROBENZENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2,4,6-TRINITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2,4-DIAMINO-6-NITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2,4-DINITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2,6-DIAMINO-4-NITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2,6-DINITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2-AMINO-4,6-DINITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
2-NITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
3,5-DINITROANILINE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
3-NITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
4,4'-TN-AZOXY	0.49 U		0.51 U	0.485 U			0.5 U		0.48 U		0.48 U
4-AMINO-2,6-DINITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
4-NITROTOLUENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
DNX	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD19	12SW/SD19	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD21	12SW/SD21	12SW/SD08	12SW/SD08	12SW/SD22
SAMPLE NUMBER	12SW1901	12SW1901-F	12SW2001	12SW2001-D	12SW2001-F	12SW2001-F-D	12SW2101	12SW2101-F	12SW0801	12SW0801-F	12SW2201
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/29/2004	10/29/2004	10/30/2004	10/30/2004	10/30/2004	10/30/2004	10/29/2004	10/29/2004	10/27/2004	10/27/2004	10/29/2004
HMX	0.245 U		2	1.9			0.25 U		0.24 U		0.24 U
MNX	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
NITROBENZENE	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
RDX	0.245 U		5.1	4.8			0.36 J		0.24 U		0.24 U
TETRYL	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
TNX	0.245 U		0.255 U	0.242 U			0.25 U		0.24 U		0.24 U
Herbicides (ug/L)											
HEXACHLOROPHENE											
PENTACHLOROPHENOL											
Total Metals (ug/L)											
ALUMINUM	1140 J		1040 J	464 J			277 J		181 J		260 J
ANTIMONY	0.085 U		0.42 U	0.95 U			0.085 U		0.085 U		0.085 U
ARSENIC	0.68 J		1.2	1.2			0.32 U		0.22 J		0.15 U
BARIUM	105 J		89.6 J	88 J			58 J		61.8 J		76.9 J
BERYLLIUM	0.07 U		0.02 U	0.03 U			0.02 U		0.02 U		0.02 U
CADMIUM	1.5 U		0.09 J	0.09 J			1.2 U		1.4 U		0.83 U
CALCIUM	33100		60000 J	61000 J			21800		29700		31200
CHROMIUM	2 U		1.7 J	1.2 U			0.66 U		0.69 U		0.56 U
COBALT	1.2		0.5 J	0.44 J			0.28 J		0.29 J		0.23 J
COPPER	3.3 J		5.7 J	5.5 J			1.8 J		2.1 U		1.2 J
IRON	1820 J		925 J	715 J			450 J		461 J		334 J
LEAD	1.8 J		0.66 J	0.51 J			0.3 U		0.27 U		0.26 U
MAGNESIUM	4570		9520	9580			3560		5870 J		8320
MANGANESE	119		12.9	9.9			38.6 J		10 J		12 J
MERCURY	0.03 U		0.03 U	0.03 U			0.03 U		0.03 U		0.03 U
NICKEL	3.7 J		3.5 J	3.7 J			1.7 J		2.9 J		1.8 J
POTASSIUM	1990 J		17000 J	16800 J			5810 J		2240 J		1900 J
SELENIUM	0.32 U		0.4 U	0.53 U			0.27 U		0.39 U		0.28 U
SILVER	0.028 U		0.04 U	0.17 U			0.028 U		0.028 U		0.028 U
SODIUM	1320 U		14400 J	15000 J			4450 J		15100 J		2260 J
THALLIUM	0.043 U		0.07 J	0.06 J			0.043 U		0.043 U		0.043 U
TIN	0.08 U		0.17 U	0.23 U			0.08 U		0.17 U		0.08 U
VANADIUM	2.6		1.9 J	1.6 J			1.14 U		1.14 U		1.14 U
ZINC	9.5 J		8.7 J	8 J			3.5 U		1.4 U		4.7 U
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED		42.5 U			31 U	10.5 U		59.9 U		24.2 U	
ANTIMONY, FILTERED		0.085 U			0.21 U	0.34 U		0.085 U		0.085 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD19	12SW/SD19	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD20	12SW/SD21	12SW/SD21	12SW/SD08	12SW/SD08	12SW/SD22
SAMPLE NUMBER	12SW1901	12SW1901-F	12SW2001	12SW2001-D	12SW2001-F	12SW2001-F-D	12SW2101	12SW2101-F	12SW0801	12SW0801-F	12SW2201
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/29/2004	10/29/2004	10/30/2004	10/30/2004	10/30/2004	10/30/2004	10/29/2004	10/29/2004	10/27/2004	10/27/2004	10/29/2004
ARSENIC, FILTERED		0.11 U			0.8 J	0.81 J		0.15 U		0.11 U	
BARIUM, FILTERED		75.5 J			88 J	86.5 J		54.7 J		58.4 J	
BERYLLIUM, FILTERED		0.02 U			0.02 U	0.02 U		0.02 U		0.02 U	
CADMIUM, FILTERED		0.4 U			0.07 J	0.08 J		0.39 U		0.32 U	
CALCIUM, FILTERED		30900			60700 J	61700 J		21700		29500	
CHROMIUM, FILTERED		0.33 U			0.35 U	0.34 U		0.46 U		0.37 U	
COBALT, FILTERED		0.17 J			0.27 J	0.27 J		0.13 J		0.13 J	
COPPER, FILTERED		1.7 J			5.2 J	4.9 J		1.1 J		1.9 J	
IRON, FILTERED		201 J			247 J	233 J		155 J		187 J	
LEAD, FILTERED		0.17 J			0.18 J	0.14 J		0.14 J		0.22 J	
MAGNESIUM, FILTERED		4230 J			8710 J	8690 J		3570 J		6080 J	
MANGANESE, FILTERED		10.1 J			6.9	6.7		21.3 J		1.3 J	
MERCURY, FILTERED		0.03 U			0.03 U	0.03 U		0.03 U		0.03 U	
NICKEL, FILTERED		1.6 J			4.3 J	3.9 J		1.5 J		2.3 J	
POTASSIUM, FILTERED		1690 J			14000 J	14300 J		5880 J		2270 J	
SELENIUM, FILTERED		0.3 U			0.32 U	0.33 U		0.26 U		0.38 U	
SILVER, FILTERED		0.028 U			0.028 U	0.08 U		0.028 U		0.028 U	
SODIUM, FILTERED		1230 U			13900 J	14000 J		4460 J		15300 J	
THALLIUM, FILTERED		0.043 UR			0.05 J	0.06 J		0.043 UR		0.043 U	
TIN, FILTERED		0.1 U			0.09 U	0.12 U		0.21 U		0.08 U	
VANADIUM, FILTERED		1.14 U			1.14 U	1.14 U		1.14 U		1.14 U	
ZINC, FILTERED		6.8 U			6.4 J	3.7 J		2.1 U		4 U	
Field Parameters											
DISSOLVED OXYGEN (mg/L)	6.45		5.68				6.29		9.78		4.75
OXIDATION REDUCTION POTENTIAL (MV)	63.9		63				60		55.8		59.8
PH (S.U.)	7.43		7.35				7.19		7.62		7.37
SPECIFIC CONDUCTANCE (MS/CM)	0.161		0.4				0.15		0.24		0.204
TEMPERATURE (C)	16.23		19.39				16.32		15.21		16.38
TURBIDITY (NTU)	10.37		23.9				7.22		30.9		3.05
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.06		0.15 J	0.034 J			0.025		0.019 J		0.037
NITRITE/NITRATE-N	1		0.08	0.07			0.51		0.2		0.025 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	02	02	02
LOCATION	12SW/SD22	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD29	12SW/SD29	12SW/SD30	12SW/SD30	12SW/SD01	12SW/SD01	12SW/SD02
SAMPLE NUMBER	12SW2201-F	12SW2601	12SW2601-F	12SW2801	12SW2801-F	12SW2901	12SW2901-F	12SW3001	12SW3001-F	12SW0102	12SW0102-F	12SW0202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
SAMPLE DATE	10/29/2004	10/27/2004	10/27/2004	10/30/2004	10/30/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	3/7/2005	3/7/2005	3/6/2005
Semivolatile Organics (ug/L)												
1,2,4,5-TETRACHLOROBENZENE												
1,2,4-TRICHLOROBENZENE												
1,2-DICHLOROBENZENE												
1,3-DICHLOROBENZENE												
1,4-DICHLOROBENZENE												
1,4-NAPHTHOQUINONE												
1,4-PHENYLENEDIAMINE												
1-NAPHTHYLAMINE												
2,2'-OXYBIS(1-CHLOROPROPANE)												
2,3,4,6-TETRACHLOROPHENOL												
2,4,5-TRICHLOROPHENOL												
2,4,6-TRICHLOROPHENOL												
2,4-DICHLOROPHENOL												
2,4-DIMETHYLPHENOL												
2,4-DINITROPHENOL												
2,6-DICHLOROPHENOL												
2-ACETYLAMINOFLUORENE												
2-CHLORONAPHTHALENE												
2-CHLOROPHENOL												
2-METHYLNAPHTHALENE												
2-METHYLPHENOL												
2-NAPHTHYLAMINE												
2-NITROANILINE												
2-NITROPHENOL												
2-PICOLINE												
3&4-METHYLPHENOL												
3,3'-DICHLOROBENZIDINE												
3,3'-DIMETHYLBENZIDINE												
3-METHYLCHOLANTHRENE												
3-NITROANILINE												
4,6-DINITRO-2-METHYLPHENOL												
4-AMINOBIPHENYL												
4-BROMOPHENYL PHENYL ETHER												
4-CHLORO-3-METHYLPHENOL												
4-CHLOROANILINE												
4-CHLOROPHENYL PHENYL ETHER												
4-NITROANILINE												
4-NITROPHENOL												
4-NITROQUINOLINE-1-OXIDE												
5-NITRO-O-TOLUIDINE												

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	02	02	02
LOCATION	12SW/SD22	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD29	12SW/SD29	12SW/SD30	12SW/SD30	12SW/SD01	12SW/SD01	12SW/SD02
SAMPLE NUMBER	12SW2201-F	12SW2601	12SW2601-F	12SW2801	12SW2801-F	12SW2901	12SW2901-F	12SW3001	12SW3001-F	12SW0102	12SW0102-F	12SW0202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
SAMPLE DATE	10/29/2004	10/27/2004	10/27/2004	10/30/2004	10/30/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	3/7/2005	3/7/2005	3/6/2005
7,12-DIMETHYLBENZ(A)ANTHRACENE												
A,A-DIMETHYLPHENETHYLAMINE												
ACENAPHTHENE												
ACENAPHTHYLENE												
ACETOPHENONE												
ANILINE												
ANTHRACENE												
ARAMITE												
BENZO(A)ANTHRACENE												
BENZO(A)PYRENE												
BENZO(B)FLUORANTHENE												
BENZO(G,H,I)PERYLENE												
BENZO(K)FLUORANTHENE												
BENZYL ALCOHOL												
BIS(2-CHLOROETHOXY)METHANE												
BIS(2-CHLOROETHYL)ETHER												
BIS(2-ETHYLHEXYL)PHTHALATE												
BUTYL BENZYL PHTHALATE												
CHLOROBENZILATE												
CHRYSENE												
DI-N-BUTYL PHTHALATE												
DI-N-OCTYL PHTHALATE												
DIALLATE												
DIBENZO(A,H)ANTHRACENE												
DIBENZOFURAN												
DIETHYL PHTHALATE												
DIMETHYL PHTHALATE												
DIPHENYLAMINE												
ETHYL METHANE SULFONATE												
FLUORANTHENE												
FLUORENE												
HEXACHLOROBENZENE												
HEXACHLOROBUTADIENE												
HEXACHLOROCYCLOPENTADIENE												
HEXACHLOROETHANE												
HEXACHLOROPROPENE												
INDENO(1,2,3-CD)PYRENE												
ISODRIN												
ISOPHORONE												
ISOSAFROLE												
KEPONE												

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	02	02	02
LOCATION	12SW/SD22	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD29	12SW/SD29	12SW/SD30	12SW/SD30	12SW/SD01	12SW/SD01	12SW/SD02
SAMPLE NUMBER	12SW2201-F	12SW2601	12SW2601-F	12SW2801	12SW2801-F	12SW2901	12SW2901-F	12SW3001	12SW3001-F	12SW0102	12SW0102-F	12SW0202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
SAMPLE DATE	10/29/2004	10/27/2004	10/27/2004	10/30/2004	10/30/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	3/7/2005	3/7/2005	3/6/2005
METHAPYRILENE												
METHYL METHANE SULFONATE												
N-NITROSO-DI-N-BUTYLAMINE												
N-NITROSO-DI-N-PROPYLAMINE												
N-NITROSODIETHYLAMINE												
N-NITROSODIMETHYLAMINE												
N-NITROSODIPHENYLAMINE												
N-NITROSOMETHYLETHYLAMINE												
N-NITROSOMORPHOLINE												
N-NITROSOPIPERIDINE												
N-NITROSOPYRROLIDINE												
NAPHTHALENE												
O,O,O-TRIETHYL PHOSPHOROTHIOATE												
O-TOLUIDINE												
P-(DIMETHYLAMINO)AZOBENZENE												
PENTACHLOROBENZENE												
PENTACHLOROETHANE												
PENTACHLORONITROBENZENE												
PHENACETIN												
PHENANTHRENE												
PHENOL												
PRONAMIDE												
PYRENE												
PYRIDINE												
SAFROLE												
Energetics (ug/L)												
1,3,5-TRINITROBENZENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
1,3-DINITROBENZENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
2,4,6-TRINITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
2,4-DIAMINO-6-NITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
2,4-DINITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
2,6-DIAMINO-4-NITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
2,6-DINITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
2-AMINO-4,6-DINITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.35 J
2-NITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
3,5-DINITROANILINE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
3-NITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
4,4'-TN-AZOXY		0.52 U		0.528 U		0.5 U		0.51 U		0.542 U		0.538 U
4-AMINO-2,6-DINITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.64 J
4-NITROTOLUENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
DNX		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	02	02	02
LOCATION	12SW/SD22	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD29	12SW/SD29	12SW/SD30	12SW/SD30	12SW/SD01	12SW/SD01	12SW/SD02
SAMPLE NUMBER	12SW2201-F	12SW2601	12SW2601-F	12SW2801	12SW2801-F	12SW2901	12SW2901-F	12SW3001	12SW3001-F	12SW0102	12SW0102-F	12SW0202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
SAMPLE DATE	10/29/2004	10/27/2004	10/27/2004	10/30/2004	10/30/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	3/7/2005	3/7/2005	3/6/2005
HMX		0.26 U		0.264 U		0.25 U		0.255 U		5.7		41 J
MNX		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.75 J
NITROBENZENE		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
RDX		0.26 U		0.264 U		0.25 U		0.255 U		7.2		52 J
TETRYL		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
TNX		0.26 U		0.264 U		0.25 U		0.255 U		0.271 U		0.269 U
Herbicides (ug/L)												
HEXACHLOROPHENE												
PENTACHLOROPHENOL												
Total Metals (ug/L)												
ALUMINUM		424 J		102 J		1660 J		8920 J		701		5550
ANTIMONY		0.085 U		0.51 U		0.26 U		0.49 U		0.085 U		0.085 U
ARSENIC		0.4 J		0.21 J		2		8.6		1.1		3.6
BARIUM		45.2 J		46.1 J		53.7 J		112 J		26.8 J		81.5 J
BERYLLIUM		0.02 U		0.03 U		0.08 U		0.45 U		0.03 J		0.36 J
CADMIUM		0.25 U		0.039 U		0.11 J		1.6		0.04 U		0.29 U
CALCIUM		34700		32300 J		39100 J		75500 J		25300 J		41500 J
CHROMIUM		0.97 U		0.64 U		3 J		13.9 J		1.1 U		6.4 J
COBALT		0.29 J		0.44 J		1.2 J		9		2		6.7 J
COPPER		1.4 U		0.91 J		5.9 J		20.6 J		3.1 J		12.8 J
IRON		766 J		178 J		1930 J		14300 J		1490 J		6580 J
LEAD		0.34 U		0.08 J		2		25.3		0.935 J		8.5 J
MAGNESIUM		5720 J		7280		6250		11100		6410		10300
MANGANESE		8.3 J		33.4		46.3		289		983		276 J
MERCURY		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U
NICKEL		2.7 J		2.6 J		3.3 J		17.6 J		2.4 J		12.3 J
POTASSIUM		1790 J		1580 J		1960 J		2070 J		9330 J		29200 J
SELENIUM		0.61 U		0.28 U		0.3 U		0.73 J		0.4 U		0.61 U
SILVER		0.028 U		0.09 U		0.028 U		0.07 U		0.028 U		0.028 U
SODIUM		3450 J		9630 J		3450 J		24000 J		8740 J		10500 J
THALLIUM		0.043 U		0.06 J		0.043 U		0.21 J		0.043 U		0.12 J
TIN		0.11 U		0.32 U		0.2 U		0.75 U		0.048 U		0.3 U
VANADIUM		1.14 U		1.14 U		2.9		21.6		1.6 J		10.9
ZINC		7.4 U		5.7 J		11.4 J		532 J		6.1 J		54.4 J
Dissolved Metals (ug/L)												
ALUMINUM, FILTERED	138 J		40.7 U		29.7 U		11.4 U		36.5 U		8.35 U	
ANTIMONY, FILTERED	0.085 U		0.085 U		0.085 U		0.28 U		0.18 U		0.085 UJ	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	01	01	01	01	01	01	01	01	01	02	02	02
LOCATION	12SW/SD22	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD29	12SW/SD29	12SW/SD30	12SW/SD30	12SW/SD01	12SW/SD01	12SW/SD02
SAMPLE NUMBER	12SW2201-F	12SW2601	12SW2601-F	12SW2801	12SW2801-F	12SW2901	12SW2901-F	12SW3001	12SW3001-F	12SW0102	12SW0102-F	12SW0202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
SAMPLE DATE	10/29/2004	10/27/2004	10/27/2004	10/30/2004	10/30/2004	11/1/2004	11/1/2004	11/1/2004	11/1/2004	3/7/2005	3/7/2005	3/6/2005
ARSENIC, FILTERED	0.1 U		0.16 U		0.11 J		1		0.75 J		0.57 J	
BARIUM, FILTERED	72 J		46.8 J		46.2 J		45.3 J		46.7 J		28.1	
BERYLLIUM, FILTERED	0.02 U		0.02 U		0.03 U		0.02 U		0.02 U		0.02 U	
CADMIUM, FILTERED	0.37 U		0.62 U		0.06 J		0.039 U		0.16 J		0.57 J	
CALCIUM, FILTERED	30600		33600		34000 J		39900 J		57500 J		29500 J	
CHROMIUM, FILTERED	0.36 U		0.47 U		0.26 U		1 U		0.59 U		0.77 U	
COBALT, FILTERED	0.12 J		0.15 J		0.6 J		0.16 J		0.17 J		1.4	
COPPER, FILTERED	0.83 J		1.1 J		1.2 J		3.6 J		2.8 J		1.3 J	
IRON, FILTERED	192 J		231 J		152 J		153 J		219 J		180 J	
LEAD, FILTERED	0.28 J		0.2 J		0.18 J		0.12 J		0.2 J		0.125 J	
MAGNESIUM, FILTERED	7740 J		5620 J		7340 J		6030 J		8490 J		7620	
MANGANESE, FILTERED	2.4 J		4.2 J		43.5		10.7		3.3 J		988	
MERCURY, FILTERED	0.03 U		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U	
NICKEL, FILTERED	1.8 J		2.1 J		3.8 J		2.5 J		3.4 J		1.9	
POTASSIUM, FILTERED	1820 J		1680 J		1270 J		1470 J		853 J		9570 J	
SELENIUM, FILTERED	0.2 U		0.41 U		0.18 U		0.15 U		0.24 U		0.25 U	
SILVER, FILTERED	0.028 U		0.028 U		0.028 U		0.028 U		0.028 U		0.028 U	
SODIUM, FILTERED	2100 J		3370 J		10500 J		3410 J		27800 J		10800 J	
THALLIUM, FILTERED	0.043 UR		0.043 U		0.043 U		0.043 U		0.06 J		0.043 U	
TIN, FILTERED	0.23 U		0.1 U		0.11 U		0.08 U		0.21 U		0.048 U	
VANADIUM, FILTERED	1.14 U		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U	
ZINC, FILTERED	5.7 U		3.1 U		4.2 J		2.2 J		27.8 J		4.1 J	
Field Parameters												
DISSOLVED OXYGEN (mg/L)		11.38		6.36		11.59		11.02		12.57		3.08
OXIDATION REDUCTION POTENTIAL (MV)		65.4		119.4		51.9		50.2		92.6		112
PH (S.U.)		7.54		7.25		7.65		7.54		7.28		7.03
SPECIFIC CONDUCTANCE (MS/CM)		0.195		0.235		0.201		0.372		0.156		0.23
TEMPERATURE (C)		15.26		16.55		14.88		16.05		17.37		8.12
TURBIDITY (NTU)		23.9		3.84		29.8		121		150		120
Miscellaneous Parameters (mg/L)												
AMMONIA-N		0.013 J		0.005 UJ		0.024 J		0.032 J		0.11		0.08
NITRITE/NITRATE-N		0.26		0.025 U		0.3		0.6		0.05 U		0.05 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
LOCATION	12SW/SD02	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0202-D	12SW0202-F	12SW0202-F-D	12SW0302	12SW0302-D	12SW0302-F	12SW0402	12SW0402-F	12SW0502	12SW0502-D
SAMPLE CODE	DUP	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	3/6/2005	3/6/2005	3/6/2005	3/7/2005	3/7/2005	3/7/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005
Semivolatile Organics (ug/L)										
1,2,4,5-TETRACHLOROBENZENE				1 U	1 U					
1,2,4-TRICHLOROBENZENE				1 U	1 U					
1,2-DICHLOROBENZENE				1 U	1 U					
1,3-DICHLOROBENZENE				1 U	1 U					
1,4-DICHLOROBENZENE				1 U	1 U					
1,4-NAPHTHOQUINONE				1 UJ	1 UJ					
1,4-PHENYLENEDIAMINE				1 U	1 U					
1-NAPHTHYLAMINE				1 U	1 U					
2,2'-OXYBIS(1-CHLOROPROPANE)				1 U	1 U					
2,3,4,6-TETRACHLOROPHENOL				1 U	1 U					
2,4,5-TRICHLOROPHENOL				1 U	1 U					
2,4,6-TRICHLOROPHENOL				1 U	1 U					
2,4-DICHLOROPHENOL				1 U	1 U					
2,4-DIMETHYLPHENOL				1 U	1 U					
2,4-DINITROPHENOL				1 U	1 U					
2,6-DICHLOROPHENOL				1 U	1 U					
2-ACETYLAMINOFLUORENE				1 U	1 U					
2-CHLORONAPHTHALENE				1 U	1 U					
2-CHLOROPHENOL				1 U	1 U					
2-METHYLNAPHTHALENE				0.05 U	0.049 U					
2-METHYLPHENOL				1 U	1 U					
2-NAPHTHYLAMINE				1 U	1 U					
2-NITROANILINE				1 U	1 U					
2-NITROPHENOL				1 U	1 U					
2-PICOLINE				1 U	1 U					
3&4-METHYLPHENOL				1 U	1 U					
3,3'-DICHLOROBENZIDINE				1 U	1 U					
3,3'-DIMETHYLBENZIDINE				1 U	1 U					
3-METHYLCHOLANTHRENE				1 U	1 U					
3-NITROANILINE				1 U	1 U					
4,6-DINITRO-2-METHYLPHENOL				1 U	1 U					
4-AMINOBIPHENYL				1 U	1 U					
4-BROMOPHENYL PHENYL ETHER				1 U	1 U					
4-CHLORO-3-METHYLPHENOL				1 U	1 U					
4-CHLOROANILINE				1 U	1 U					
4-CHLOROPHENYL PHENYL ETHER				1 U	1 U					
4-NITROANILINE				1 U	1 U					
4-NITROPHENOL				1 U	1 U					
4-NITROQUINOLINE-1-OXIDE				1 U	1 U					
5-NITRO-O-TOLUIDINE				1 U	1 U					

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
LOCATION	12SW/SD02	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0202-D	12SW0202-F	12SW0202-F-D	12SW0302	12SW0302-D	12SW0302-F	12SW0402	12SW0402-F	12SW0502	12SW0502-D
SAMPLE CODE	DUP	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	3/6/2005	3/6/2005	3/6/2005	3/7/2005	3/7/2005	3/7/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005
7,12-DIMETHYLBENZ(A)ANTHRACENE				1 U	1 U					
A,A-DIMETHYLPHENETHYLAMINE				1 U	1 U					
ACENAPHTHENE				0.05 UJ	0.049 UJ					
ACENAPHTHYLENE				0.05 U	0.049 U					
ACETOPHENONE				1 U	1 U					
ANILINE				1 U	1 U					
ANTHRACENE				0.05 U	0.049 U					
ARAMITE				1 U	1 U					
BENZO(A)ANTHRACENE				0.05 U	0.049 U					
BENZO(A)PYRENE				0.05 U	0.049 U					
BENZO(B)FLUORANTHENE				0.05 U	0.049 U					
BENZO(G,H,I)PERYLENE				0.05 U	0.049 U					
BENZO(K)FLUORANTHENE				0.05 U	0.049 U					
BENZYL ALCOHOL				1 U	1 U					
BIS(2-CHLOROETHOXY)METHANE				1 U	1 U					
BIS(2-CHLOROETHYL)ETHER				1 U	1 U					
BIS(2-ETHYLHEXYL)PHTHALATE				1 U	1 U					
BUTYL BENZYL PHTHALATE				1 U	1 U					
CHLOROBENZILATE				1 U	1 U					
CHRYSENE				0.05 U	0.049 U					
DI-N-BUTYL PHTHALATE				1 U	1 U					
DI-N-OCTYL PHTHALATE				1 U	1 U					
DIALLATE				1 U	1 U					
DIBENZO(A,H)ANTHRACENE				0.05 U	0.049 U					
DIBENZOFURAN				1 U	1 U					
DIETHYL PHTHALATE				1 U	1 U					
DIMETHYL PHTHALATE				1 U	1 U					
DIPHENYLAMINE				1 U	1 U					
ETHYL METHANE SULFONATE				1 U	1 U					
FLUORANTHENE				0.05 U	0.049 U					
FLUORENE				0.05 U	0.049 U					
HEXACHLOROBENZENE				1 U	1 U					
HEXACHLOROBUTADIENE				1 U	1 U					
HEXACHLOROCYCLOPENTADIENE				1 UJ	1 UJ					
HEXACHLOROETHANE				1 U	1 U					
HEXACHLOROPROPENE				1 U	1 U					
INDENO(1,2,3-CD)PYRENE				0.05 U	0.049 U					
ISODRIN				1 U	1 U					
ISOPHORONE				1 U	1 U					
ISOSAFROLE				1 U	1 U					
KEPONE				1 UR	1 UR					

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
LOCATION	12SW/SD02	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0202-D	12SW0202-F	12SW0202-F-D	12SW0302	12SW0302-D	12SW0302-F	12SW0402	12SW0402-F	12SW0502	12SW0502-D
SAMPLE CODE	DUP	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	3/6/2005	3/6/2005	3/6/2005	3/7/2005	3/7/2005	3/7/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005
METHAPYRILENE				1 UJ	1 UJ					
METHYL METHANE SULFONATE				1 U	1 U					
N-NITROSO-DI-N-BUTYLAMINE				1 U	1 U					
N-NITROSO-DI-N-PROPYLAMINE				1 U	1 U					
N-NITROSODIETHYLAMINE				1 U	1 U					
N-NITROSODIMETHYLAMINE				1 U	1 U					
N-NITROSODIPHENYLAMINE				1 U	1 U					
N-NITROSOMETHYLETHYLAMINE				1 U	1 U					
N-NITROSOMORPHOLINE				1 U	1 U					
N-NITROSOPIPERIDINE				1 U	1 U					
N-NITROSOPYRROLIDINE				1 U	1 U					
NAPHTHALENE				0.05 U	0.049 U					
O,O,O-TRIETHYL PHOSPHOROTHIOATE				1 U	1 U					
O-TOLUIDINE				1 U	1 U					
P-(DIMETHYLAMINO)AZOBENZENE				1 U	1 U					
PENTACHLOROBENZENE				1 U	1 U					
PENTACHLOROETHANE				1 U	1 U					
PENTACHLORONITROBENZENE				1 U	1 U					
PHENACETIN				1 U	1 U					
PHENANTHRENE				0.05 U	0.049 U					
PHENOL				1 U	1 U					
PRONAMIDE				1 U	1 U					
PYRENE				0.05 U	0.049 U					
PYRIDINE				1 U	1 U					
SAFROLE				1 U	1 U					
Energetics (ug/L)										
1,3,5-TRINITROBENZENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
1,3-DINITROBENZENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
2,4-DIAMINO-6-NITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
2,4-DINITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
2,6-DIAMINO-4-NITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
2,6-DINITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.271 U			0.25 U			0.238 U		0.27 J	0.27 J
2-NITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
3,5-DINITROANILINE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
3-NITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
4,4'-TN-AZOXY	0.542 U			0.5 U			0.475 U		0.5 U	0.5 U
4-AMINO-2,6-DINITROTOLUENE	0.41 J			0.25 U			0.238 U		0.59	0.59
4-NITROTOLUENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
DNX	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
LOCATION	12SW/SD02	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0202-D	12SW0202-F	12SW0202-F-D	12SW0302	12SW0302-D	12SW0302-F	12SW0402	12SW0402-F	12SW0502	12SW0502-D
SAMPLE CODE	DUP	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	3/6/2005	3/6/2005	3/6/2005	3/7/2005	3/7/2005	3/7/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005
HMX	26 J			0.25 U			4.9		29	29
MNX	0.271 UJ			0.25 U			0.238 U		0.52	0.51 J
NITROBENZENE	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
RDX	32 J			0.25 U			6		32	32
TETRYL	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
TNX	0.271 U			0.25 U			0.238 U		0.25 U	0.25 U
Herbicides (ug/L)										
HEXACHLOROPHENE				0.025 U	0.025 U					
PENTACHLOROPHENOL				0.013 UJ	0.013 UJ					
Total Metals (ug/L)										
ALUMINUM	4130			1520			283		163 U	195
ANTIMONY	0.085 U			0.085 U			0.085 U		0.085 U	0.085 U
ARSENIC	3			0.52 J			0.47 J		1.8 J	1.7
BARIUM	73.1 J			52.1 J			20.6 J		35.5 J	36.9 J
BERYLLIUM	0.24 J			0.05 J			0.02 U		0.02 U	0.02 U
CADMIUM	0.2 U			0.07 U			0.039 U		0.039 U	0.04 U
CALCIUM	38700 J			49200 J			25400 J		49300 J	31600 J
CHROMIUM	4.9 J			2 U			0.79 U		1 U	0.76 U
COBALT	4.5 J			0.61 J			0.42 J		0.27 J	0.28 J
COPPER	12.1 J			2.1 J			1.2 J		2.8 J	2.4 J
IRON	4570 J			1640 J			559 J		355 J	398 J
LEAD	5.5 J			1			0.351 J		0.17 J	0.201 J
MAGNESIUM	10800			5450			6980		10500 J	10600
MANGANESE	171 J			19.3			27.7		2.6 J	4 J
MERCURY	0.96			0.03 U			0.03 U		0.03 U	0.076 J
NICKEL	9.4 J			3.4 J			2.3 J		2.7 J	2.8 J
POTASSIUM	31900 J			902 J			7860 J		43800 J	30900 J
SELENIUM	0.66 U			0.58 U			0.37 U		0.43 U	0.58 U
SILVER	0.028 U			0.028 U			0.028 U		0.028 U	0.028 U
SODIUM	11500 J			8350 J			9760 J		13000 J	13200 J
THALLIUM	0.1 J			0.043 U			0.043 U		0.08 J	0.06 J
TIN	0.23 U			0.048 U			0.048 U		0.17 U	0.048 U
VANADIUM	8.6			2.8			1.14 U		1.4 J	1.4 J
ZINC	47.1 J			7.6 J			1.6 J		2.3 U	5.9 J
Dissolved Metals (ug/L)										
ALUMINUM, FILTERED		966	770			8.35 U		21.7 J		
ANTIMONY, FILTERED		0.085 UJ	0.085 UJ			0.085 UJ		0.085 UJ		

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
LOCATION	12SW/SD02	12SW/SD02	12SW/SD02	12SW/SD03	12SW/SD03	12SW/SD03	12SW/SD04	12SW/SD04	12SW/SD05	12SW/SD05
SAMPLE NUMBER	12SW0202-D	12SW0202-F	12SW0202-F-D	12SW0302	12SW0302-D	12SW0302-F	12SW0402	12SW0402-F	12SW0502	12SW0502-D
SAMPLE CODE	DUP	ORIG	DUP	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	3/6/2005	3/6/2005	3/6/2005	3/7/2005	3/7/2005	3/7/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005
ARSENIC, FILTERED		1.2	0.94 J			0.047 U		0.07 J		
BARIUM, FILTERED		51.5	48.3			40.8		19.8		
BERYLLIUM, FILTERED		0.06 J	0.03 J			0.02 U		0.02 U		
CADMIUM, FILTERED		0.11 J	0.77 J			0.85 J		0.11 J		
CALCIUM, FILTERED		41000 J	38700 J			49100 J		30300 J		
CHROMIUM, FILTERED		1.9 U	1.5 U			0.77 U		1.2 U		
COBALT, FILTERED		1.5	1.1			0.12 J		0.088 U		
COPPER, FILTERED		5.3 J	3.6 J			1 J		1.3 J		
IRON, FILTERED		1310 J	945 J			128 J		85 J		
LEAD, FILTERED		1.8	1.1			0.069 U		0.214 J		
MAGNESIUM, FILTERED		10300	10300			5920		8040		
MANGANESE, FILTERED		51.2 J	32.8 J			9.5		1.6 J		
MERCURY, FILTERED		0.056 J	0.03 U			0.03 U		0.03 U		
NICKEL, FILTERED		4.8	4			1.6		1.9		
POTASSIUM, FILTERED		29000 J	27800 J			747 J		7630 J		
SELENIUM, FILTERED		0.32 U	0.34 U			0.41 U		0.2 U		
SILVER, FILTERED		0.028 U	0.028 U			0.028 U		0.028 U		
SODIUM, FILTERED		11800 J	11300 J			9690 J		11800 J		
THALLIUM, FILTERED		0.043 U	0.043 U			0.043 U		0.043 U		
TIN, FILTERED		0.14 J	0.048 U			0.048 U		0.048 U		
VANADIUM, FILTERED		2.6	2.3			1.14 U		1.14 U		
ZINC, FILTERED		34.9 J	11.9 J			2.1 J		16.6		
Field Parameters										
DISSOLVED OXYGEN (mg/L)				11.79			4.21		3.78	
OXIDATION REDUCTION POTENTIAL (MV)				123.600000			116		131	
PH (S.U.)				7.33			7.48		7.07	
SPECIFIC CONDUCTANCE (MS/CM)				0.144			0.126		0.185	
TEMPERATURE (C)				6.41			8.95		7.43	
TURBIDITY (NTU)				14.3			6.8		7.2	
Miscellaneous Parameters (mg/L)										
AMMONIA-N	0.06			0.05			0.06		0.005 U	0.01 U
NITRITE/NITRATE-N	0.25			0.05 U			0.05 U		0.7 J	0.43 J

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD	CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
GULLY	STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
02	SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
12SW/SD05	LOCATION	12SW/SD05	12SW/SD06	12SW/SD06	12SW/SD09	12SW/SD09	12SW/SD10	12SW/SD10	12SW/SD11	12SW/SD11	12SW/SD12
12SW0502-F	SAMPLE NUMBER	12SW0502-F-D	12SW0602	12SW0602-F	12SW0902	12SW0902-F	12SW1002	12SW1002-F	12SW1102	12SW1102-F	12SW1202
ORIG	SAMPLE CODE	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
3/6/2005	SAMPLE DATE	3/12/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	3/5/2005	3/5/2005	3/5/2005
	Semivolatile Organics (ug/L)										
	1,2,4,5-TETRACHLOROBENZENE										
	1,2,4-TRICHLOROBENZENE										
	1,2-DICHLOROBENZENE										
	1,3-DICHLOROBENZENE										
	1,4-DICHLOROBENZENE										
	1,4-NAPHTHOQUINONE										
	1,4-PHENYLENEDIAMINE										
	1-NAPHTHYLAMINE										
	2,2'-OXYBIS(1-CHLOROPROPANE)										
	2,3,4,6-TETRACHLOROPHENOL										
	2,4,5-TRICHLOROPHENOL										
	2,4,6-TRICHLOROPHENOL										
	2,4-DICHLOROPHENOL										
	2,4-DIMETHYLPHENOL										
	2,4-DINITROPHENOL										
	2,6-DICHLOROPHENOL										
	2-ACETYLAMINOFLUORENE										
	2-CHLORONAPHTHALENE										
	2-CHLOROPHENOL										
	2-METHYLNAPHTHALENE										
	2-METHYLPHENOL										
	2-NAPHTHYLAMINE										
	2-NITROANILINE										
	2-NITROPHENOL										
	2-PICOLINE										
	3&4-METHYLPHENOL										
	3,3'-DICHLOROBENZIDINE										
	3,3'-DIMETHYLBENZIDINE										
	3-METHYLCHOLANTHRENE										
	3-NITROANILINE										
	4,6-DINITRO-2-METHYLPHENOL										
	4-AMINOBIPHENYL										
	4-BROMOPHENYL PHENYL ETHER										
	4-CHLORO-3-METHYLPHENOL										
	4-CHLOROANILINE										
	4-CHLOROPHENYL PHENYL ETHER										
	4-NITROANILINE										
	4-NITROPHENOL										
	4-NITROQUINOLINE-1-OXIDE										
	5-NITRO-O-TOLUIDINE										

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F ORIG 3/6/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F-D DUP 3/12/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD12 12SW1202 NORMAL 3/5/2005
	7,12-DIMETHYLBENZ(A)ANTHRACENE										
	A,A-DIMETHYLPHENETHYLAMINE										
	ACENAPHTHENE										
	ACENAPHTHYLENE										
	ACETOPHENONE										
	ANILINE										
	ANTHRACENE										
	ARAMITE										
	BENZO(A)ANTHRACENE										
	BENZO(A)PYRENE										
	BENZO(B)FLUORANTHENE										
	BENZO(G,H,I)PERYLENE										
	BENZO(K)FLUORANTHENE										
	BENZYL ALCOHOL										
	BIS(2-CHLOROETHOXY)METHANE										
	BIS(2-CHLOROETHYL)ETHER										
	BIS(2-ETHYLHEXYL)PHTHALATE										
	BUTYL BENZYL PHTHALATE										
	CHLOROBENZILATE										
	CHRYSENE										
	DI-N-BUTYL PHTHALATE										
	DI-N-OCTYL PHTHALATE										
	DIALLATE										
	DIBENZO(A,H)ANTHRACENE										
	DIBENZOFURAN										
	DIETHYL PHTHALATE										
	DIMETHYL PHTHALATE										
	DIPHENYLAMINE										
	ETHYL METHANE SULFONATE										
	FLUORANTHENE										
	FLUORENE										
	HEXACHLOROBENZENE										
	HEXACHLOROBUTADIENE										
	HEXACHLOROCYCLOPENTADIENE										
	HEXACHLOROETHANE										
	HEXACHLOROPROPENE										
	INDENO(1,2,3-CD)PYRENE										
	ISODRIN										
	ISOPHORONE										
	ISOSAFROLE										
	KEPONE										

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F ORIG 3/6/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F-D DUP 3/12/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD12 12SW1202 NORMAL 3/5/2005
	METHAPYRILENE										
	METHYL METHANE SULFONATE										
	N-NITROSO-DI-N-BUTYLAMINE										
	N-NITROSO-DI-N-PROPYLAMINE										
	N-NITROSODIETHYLAMINE										
	N-NITROSODIMETHYLAMINE										
	N-NITROSODIPHENYLAMINE										
	N-NITROSOMETHYLETHYLAMINE										
	N-NITROSOMORPHOLINE										
	N-NITROSOPIPERIDINE										
	N-NITROSOPYRROLIDINE										
	NAPHTHALENE										
	O,O,O-TRIETHYL PHOSPHOROTHIOATE										
	O-TOLUIDINE										
	P-(DIMETHYLAMINO)AZOBENZENE										
	PENTACHLOROBENZENE										
	PENTACHLOROETHANE										
	PENTACHLORONITROBENZENE										
	PHENACETIN										
	PHENANTHRENE										
	PHENOL										
	PRONAMIDE										
	PYRENE										
	PYRIDINE										
	SAFROLE										
	Energetics (ug/L)										
	1,3,5-TRINITROBENZENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	1,3-DINITROBENZENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	2,4,6-TRINITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		20
	2,4-DIAMINO-6-NITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	2,4-DINITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.27 J
	2,6-DIAMINO-4-NITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	2,6-DINITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	2-AMINO-4,6-DINITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		5.8 J
	2-NITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	3,5-DINITROANILINE		0.24 U		0.258 U		0.26 U		0.24 U		0.6
	3-NITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	4,4'-TN-AZOXY		0.48 U		0.515 U		0.52 U		0.48 U		0.532 U
	4-AMINO-2,6-DINITROTOLUENE		0.24 U		0.36 J		0.26 U		0.24 U		13
	4-NITROTOLUENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	DNX		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F ORIG 3/6/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F-D DUP 3/12/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD12 12SW1202 NORMAL 3/5/2005
	HMX		1.3		5.1		2.5		1.3		3.7
	MNX		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	NITROBENZENE		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	RDX		1.9		8.3		4.3		1.9		9
	TETRYL		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	TNX		0.24 U		0.258 U		0.26 U		0.24 U		0.266 U
	Herbicides (ug/L)										
	HEXACHLOROPHENE										
	PENTACHLOROPHENOL										
	Total Metals (ug/L)										
	ALUMINUM		377 J		85.1 U		32 U		151 U		331 J
	ANTIMONY		0.085 U		0.085 U		0.085 U		0.085 U		0.085 U
	ARSENIC		0.73 J		0.45 J		0.11 U		0.18 U		0.32 J
	BARIUM		40.6 J		35.5 J		42.3 J		54.6 J		27.3 J
	BERYLLIUM		0.02 J		0.02 U		0.02 U		0.02 U		0.11 J
	CADMIUM		0.1 J		0.039 U		0.039 U		0.06 J		0.07 J
	CALCIUM		18800 J		18200 J		27000 J		29700 J		40800 J
	CHROMIUM		0.97 U		0.53 U		0.43 U		0.57 U		0.73 U
	COBALT		0.43 J		0.18 J		0.14 J		0.75 J		6.7 J
	COPPER		1.6 J		1.1 J		0.74 J		0.79 J		1.5 J
	IRON		459 J		185 J		161 J		587 J		1110 J
	LEAD		0.245 J		0.095 J		0.069 U		0.202 J		0.479 J
	MAGNESIUM		9800 J		7120 J		8040 J		6680 J		6850 J
	MANGANESE		8.1 J		3.6 J		1.7 J		161 J		974 J
	MERCURY		0.03 U		0.03 U		0.03 U		0.03 U		0.03 U
	NICKEL		2.5 J		1.6 J		1.6 J		1.9 J		7 J
	POTASSIUM		37800 J		9370 J		6100 J		3930 J		569 J
	SELENIUM		0.45 U		0.22 U		0.15 U		0.21 U		0.44 U
	SILVER		0.028 U		0.028 U		0.028 U		0.028 U		0.028 U
	SODIUM		11500 J		7940 J		9800 J		6790 J		10600 J
	THALLIUM		0.07 J		0.06 J		0.07 J		0.06 J		0.06 J
	TIN		0.13 U		0.048 U		0.048 U		0.1 U		0.14 U
	VANADIUM		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U
	ZINC		2.7 U		1.7 U		1.3 U		2.1 U		21.1 J
	Dissolved Metals (ug/L)										
12.7 J	ALUMINUM, FILTERED	8.35 U		8.35 U		8.35 U		8.35 U		8.35 U	
0.085 U	ANTIMONY, FILTERED	0.085 UJ		0.085 U		0.085 U		0.085 U		0.085 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F ORIG 3/6/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD05 12SW0502-F-D DUP 3/12/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD06 12SW0602-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD09 12SW0902-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD10 12SW1002-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD11 12SW1102-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD12 12SW1202 NORMAL 3/5/2005
1.6 J	ARSENIC, FILTERED	1.2		0.56 U		0.32 U		0.1 U		0.047 U	
35.4 J	BARIUM, FILTERED	33.5		40.9 J		35.6 J		45.6 J		58 J	
0.02 U	BERYLLIUM, FILTERED	0.02 U		0.02 U		0.02 U		0.02 U		0.02 U	
0.039 U	CADMIUM, FILTERED	0.75 J		0.05 U		0.039 U		0.039 U		0.039 U	
32100 J	CALCIUM, FILTERED	34700 J		18100 J		17100 J		24300 J		25400 J	
1.1 J	CHROMIUM, FILTERED	0.82 U		0.53 U		0.97 J		1.2 J		1.1 J	
0.19 J	COBALT, FILTERED	0.11 J		0.17 J		0.11 U		0.12 U		0.48 J	
2.8 J	COPPER, FILTERED	5.2 J		1.4 J		0.95 J		0.8 J		0.59 J	
195 J	IRON, FILTERED	84.1 J		123 J		116 J		154 J		334 J	
0.326 J	LEAD, FILTERED	0.069 U		0.205 J		0.192 U		0.069 U		0.143 U	
9710 J	MAGNESIUM, FILTERED	11700		9650 J		6840 J		8330 J		6910 J	
0.98 J	MANGANESE, FILTERED	0.752 U		0.77 J		0.752 U		0.752 U		124 J	
0.03 U	MERCURY, FILTERED	0.03 U		0.18 J		0.03 U		0.03 U		0.03 U	
3.4 J	NICKEL, FILTERED	2.2		2.7 J		2.2 J		2.1 J		2.4 J	
29700 J	POTASSIUM, FILTERED	34000 J		28500 J		8550 J		6430 J		4060 J	
0.73 J	SELENIUM, FILTERED	0.39 U		0.79 J		0.49 U		0.22 U		0.26 U	
0.028 U	SILVER, FILTERED	0.028 U		0.028 U		0.028 U		0.028 U		0.028 U	
12400 J	SODIUM, FILTERED	15000 J		11700 J		7750 J		10700 J		7160 J	
0.09 U	THALLIUM, FILTERED	0.043 U		0.08 U		0.05 U		0.07 U		0.08 U	
0.048 U	TIN, FILTERED	0.048 U		0.048 U		0.048 U		0.048 U		0.048 U	
1.14 U	VANADIUM, FILTERED	1.2 J		1.14 U		1.14 U		1.14 U		1.14 U	
3.8 J	ZINC, FILTERED	3.1 J		4 J		3.8 J		1.2 J		3.3 J	
	Field Parameters										
	DISSOLVED OXYGEN (mg/L)		3.58		4.64		4.99		2.45		2.75
	OXIDATION REDUCTION POTENTIAL (MV)		179		189		226		76		79
	PH (S.U.)		6.76		6.59		6.13		6.63		7.39
	SPECIFIC CONDUCTANCE (MS/CM)		0.145		0.095		0.143		0.107		0.121
	TEMPERATURE (C)		4.09		2.86		3.07		4.89		6.75
	TURBIDITY (NTU)		8.4		2.7		2.7		5.56		6.4
	Miscellaneous Parameters (mg/L)										
	AMMONIA-N		0.005 U		0.005 U		0.005 U		0.005 U		0.21
	NITRITE/NITRATE-N		2.5 J		0.37 J		0.025 UJ		0.025 UJ		0.55 J

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD	CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
GULLY	STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
02	SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
12SW/SD12	LOCATION	12SW/SD13	12SW/SD13	12SW/SD14	12SW/SD14	12SW/SD17	12SW/SD17	12SW/SD18	12SW/SD18	12SW/SD20	12SW/SD20
12SW1202-F	SAMPLE NUMBER	12SW1302	12SW1302-F	12SW1402	12SW1402-F	12SW1702	12SW1702-F	12SW1802	12SW1802-F	12SW2002	12SW2002-F
NORMAL	SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
3/5/2005	SAMPLE DATE	3/5/2005	3/5/2005	3/7/2005	3/7/2005	3/5/2005	3/5/2005	3/7/2005	3/7/2005	3/7/2005	3/7/2005
	Semivolatile Organics (ug/L)										
	1,2,4,5-TETRACHLOROBENZENE										
	1,2,4-TRICHLOROBENZENE										
	1,2-DICHLOROBENZENE										
	1,3-DICHLOROBENZENE										
	1,4-DICHLOROBENZENE										
	1,4-NAPHTHOQUINONE										
	1,4-PHENYLENEDIAMINE										
	1-NAPHTHYLAMINE										
	2,2'-OXYBIS(1-CHLOROPROPANE)										
	2,3,4,6-TETRACHLOROPHENOL										
	2,4,5-TRICHLOROPHENOL										
	2,4,6-TRICHLOROPHENOL										
	2,4-DICHLOROPHENOL										
	2,4-DIMETHYLPHENOL										
	2,4-DINITROPHENOL										
	2,6-DICHLOROPHENOL										
	2-ACETYLAMINOFLUORENE										
	2-CHLORONAPHTHALENE										
	2-CHLOROPHENOL										
	2-METHYLNAPHTHALENE										
	2-METHYLPHENOL										
	2-NAPHTHYLAMINE										
	2-NITROANILINE										
	2-NITROPHENOL										
	2-PICOLINE										
	3&4-METHYLPHENOL										
	3,3'-DICHLOROBENZIDINE										
	3,3'-DIMETHYLBENZIDINE										
	3-METHYLCHOLANTHRENE										
	3-NITROANILINE										
	4,6-DINITRO-2-METHYLPHENOL										
	4-AMINOBIPHENYL										
	4-BROMOPHENYL PHENYL ETHER										
	4-CHLORO-3-METHYLPHENOL										
	4-CHLOROANILINE										
	4-CHLOROPHENYL PHENYL ETHER										
	4-NITROANILINE										
	4-NITROPHENOL										
	4-NITROQUINOLINE-1-OXIDE										
	5-NITRO-O-TOLUIDINE										

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD12 12SW1202-F NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD13 12SW1302 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD13 12SW1302-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002-F NORMAL 3/7/2005
	7,12-DIMETHYLBENZ(A)ANTHRACENE										
	A,A-DIMETHYLPHENETHYLAMINE										
	ACENAPHTHENE										
	ACENAPHTHYLENE										
	ACETOPHENONE										
	ANILINE										
	ANTHRACENE										
	ARAMITE										
	BENZO(A)ANTHRACENE										
	BENZO(A)PYRENE										
	BENZO(B)FLUORANTHENE										
	BENZO(G,H,I)PERYLENE										
	BENZO(K)FLUORANTHENE										
	BENZYL ALCOHOL										
	BIS(2-CHLOROETHOXY)METHANE										
	BIS(2-CHLOROETHYL)ETHER										
	BIS(2-ETHYLHEXYL)PHTHALATE										
	BUTYL BENZYL PHTHALATE										
	CHLOROBENZILATE										
	CHRYSENE										
	DI-N-BUTYL PHTHALATE										
	DI-N-OCTYL PHTHALATE										
	DIALLATE										
	DIBENZO(A,H)ANTHRACENE										
	DIBENZOFURAN										
	DIETHYL PHTHALATE										
	DIMETHYL PHTHALATE										
	DIPHENYLAMINE										
	ETHYL METHANE SULFONATE										
	FLUORANTHENE										
	FLUORENE										
	HEXACHLOROBENZENE										
	HEXACHLOROBUTADIENE										
	HEXACHLOROCYCLOPENTADIENE										
	HEXACHLOROETHANE										
	HEXACHLOROPROPENE										
	INDENO(1,2,3-CD)PYRENE										
	ISODRIN										
	ISOPHORONE										
	ISOSAFROLE										
	KEPONE										

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD12 12SW1202-F NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD13 12SW1302 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD13 12SW1302-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002-F NORMAL 3/7/2005
	METHAPYRILENE										
	METHYL METHANE SULFONATE										
	N-NITROSO-DI-N-BUTYLAMINE										
	N-NITROSO-DI-N-PROPYLAMINE										
	N-NITROSODIETHYLAMINE										
	N-NITROSODIMETHYLAMINE										
	N-NITROSODIPHENYLAMINE										
	N-NITROSOMETHYLETHYLAMINE										
	N-NITROSOMORPHOLINE										
	N-NITROSOPIPERIDINE										
	N-NITROSOPYRROLIDINE										
	NAPHTHALENE										
	O,O,O-TRIETHYL PHOSPHOROTHIOATE										
	O-TOLUIDINE										
	P-(DIMETHYLAMINO)AZOBENZENE										
	PENTACHLOROBENZENE										
	PENTACHLOROETHANE										
	PENTACHLORONITROBENZENE										
	PHENACETIN										
	PHENANTHRENE										
	PHENOL										
	PRONAMIDE										
	PYRENE										
	PYRIDINE										
	SAFROLE										
	Energetics (ug/L)										
	1,3,5-TRINITROBENZENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	1,3-DINITROBENZENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	2,4,6-TRINITROTOLUENE	0.56		0.248 U		0.264 U		0.26 U		0.238 U	
	2,4-DIAMINO-6-NITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	2,4-DINITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	2,6-DIAMINO-4-NITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	2,6-DINITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	2-AMINO-4,6-DINITROTOLUENE	1 J		0.65 J		0.264 U		0.26 U		0.238 U	
	2-NITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	3,5-DINITROANILINE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	3-NITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	4,4'-TN-AZOXY	0.55 U		0.495 U		0.528 U		0.52 U		0.475 U	
	4-AMINO-2,6-DINITROTOLUENE	3		1.3		0.264 U		0.26 U		0.28 J	
	4-NITROTOLUENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	DNX	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD12 12SW1202-F NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD13 12SW1302 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD13 12SW1302-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002-F NORMAL 3/7/2005
	HMX	0.92		14		0.264 U		0.26 U		2.7	
	MNX	0.275 U		0.41 J		0.264 U		0.26 U		0.238 U	
	NITROBENZENE	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	RDX	2.6		55		0.264 U		0.26 U		7	
	TETRYL	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	TNX	0.275 U		0.248 U		0.264 U		0.26 U		0.238 U	
	Herbicides (ug/L)										
	HEXACHLOROPHENE										
	PENTACHLOROPHENOL										
	Total Metals (ug/L)										
	ALUMINUM	145 U		90.6		218 J		6240		3320	
	ANTIMONY	0.11 U		0.16 U		0.085 U		0.32 U		0.09 U	
	ARSENIC	0.19 U		0.16 J		0.35 J		2.9		1.8	
	BARIUM	34.4 J		0.37 U		35.4 J		124 J		86 J	
	BERYLLIUM	0.02 J		0.25 J		0.02 U		0.27 J		0.16 J	
	CADMIUM	0.039 U		0.34 U		0.17 J		3.1 J		0.23 U	
	CALCIUM	19000 J		1100 J		43800 J		111000 J		56800 J	
	CHROMIUM	0.6 U		0.08 U		1.6 J		8.1 J		4.1 J	
	COBALT	0.45 J		0.6 J		0.72 J		3.2		1.8	
	COPPER	0.84 J		1 J		1.3 J		8.7 J		6.2 J	
	IRON	297 J		405 J		401 J		7380 J		4080 J	
	LEAD	0.233 J		0.451 J		3.2 J		6.7		3.8	
	MAGNESIUM	7790 J		315		4890 J		9910		11800	
	MANGANESE	17.7 J		26.8		25.5 J		188		57	
	MERCURY	0.03 U		0.11 J		0.03 U		0.2		0.03 U	
	NICKEL	2 J		2		1.9 J		8.9 J		5.6 J	
	POTASSIUM	2630 J		107 J		789 J		1120 J		9900 J	
	SELENIUM	0.21 U		0.11 U		0.29 U		0.61 U		0.51 U	
	SILVER	0.028 U		0.03 U		0.028 U		0.05 U		0.028 U	
	SODIUM	8120 J		571 J		5580 J		6760 J		19000 J	
	THALLIUM	0.043 U		0.31 J		0.043 U		0.14 J		0.08 J	
	TIN	0.12 U		0.34 U		0.048 U		0.33 U		0.16 U	
	VANADIUM	1.14 U		1.14 U		1.14 U		12.1		6	
	ZINC	6.7 J		19.4		16.9 J		47 J		38.9	
	Dissolved Metals (ug/L)										
26.8 J	ALUMINUM, FILTERED		16.3 J		8.35 U		9.9 J		8.35 U		8.35 U
0.085 U	ANTIMONY, FILTERED		0.18 U		0.085 UJ		0.085 U		0.085 UJ		0.085 UJ

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD12 12SW1202-F NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD13 12SW1302 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD13 12SW1302-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD14 12SW1402-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702 NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD17 12SW1702-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD18 12SW1802-F NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002 NORMAL 3/7/2005	DOWNGRAD GULLY 02 12SW/SD20 12SW2002-F NORMAL 3/7/2005
0.12 U	ARSENIC, FILTERED		0.17 U		0.44 J		0.66 J		0.06 J		0.4 J
26.5 J	BARIUM, FILTERED		36.2 J		71.7		33.1 J		67.5		72.2
0.02 U	BERYLLIUM, FILTERED		0.02 U		0.02 U		0.02 U		0.02 U		0.02 U
0.07 U	CADMIUM, FILTERED		0.039 U		1.2		0.07 U		1		0.99 J
28600 J	CALCIUM, FILTERED		19900 J		59700 J		26900 J		103000 J		64300 J
1.1 J	CHROMIUM, FILTERED		0.96 J		0.99 U		1.4 J		0.89 U		0.82 U
6.1 J	COBALT, FILTERED		0.14 U		0.2 J		0.15 J		0.11 J		0.23 J
0.96 J	COPPER, FILTERED		0.61 J		2.9 J		0.98 J		0.92 J		2.2 J
364 J	IRON, FILTERED		115 J		151 J		141 J		252 J		161 J
0.393 J	LEAD, FILTERED		0.217 J		0.206 J		0.26 J		0.169 J		0.17 J
7050 J	MAGNESIUM, FILTERED		8370 J		12700		4850 J		10800		13700
739 J	MANGANESE, FILTERED		0.752 U		8		1.1 J		7.2		8.7
0.03 U	MERCURY, FILTERED		0.03 U		0.03 U		0.03 U		0.03 U		0.053 J
7.2 J	NICKEL, FILTERED		2.1 J		2.7		2 J		2.6		2.6
537 J	POTASSIUM, FILTERED		2560 J		47800 J		772 J		384 J		10100 J
0.38 U	SELENIUM, FILTERED		0.37 U		0.44 U		0.28 U		0.46 U		0.67 U
0.03 U	SILVER, FILTERED		0.09 U		0.028 U		0.04 U		0.04 J		0.028 U
11000 J	SODIUM, FILTERED		8930 J		40100 J		5770 J		7960 J		22800 J
0.07 U	THALLIUM, FILTERED		0.06 U		0.043 U		0.06 U		0.043 U		0.043 U
0.12 U	TIN, FILTERED		0.11 U		0.048 U		5.9 J		0.048 U		0.048 U
1.14 U	VANADIUM, FILTERED		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U
26.2 J	ZINC, FILTERED		2.9 J		25.1		7.7 J		6.7 J		7.9 J
	Field Parameters										
	DISSOLVED OXYGEN (mg/L)	2.54		4.33		2.76		5.64		10.6	
	OXIDATION REDUCTION POTENTIAL (MV)	118		241		89		186		166	
	PH (S.U.)	7.53		5.99		8		6.69		7.2	
	SPECIFIC CONDUCTANCE (MS/CM)	0.111		0.301		0.099		0.253		0.233	
	TEMPERATURE (C)	6.23		8.6		5.69		7.49		8.09	
	TURBIDITY (NTU)	6.2		59		6.9		71		77	
	Miscellaneous Parameters (mg/L)										
	AMMONIA-N	0.06		0.07		0.09		0.06		0.08	
	NITRITE/NITRATE-N	0.28 J		1.2		0.18 J		0.05 U		0.3	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD	CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD
GULLY	STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
02	SAMPLING ORDER	02	02	02	02	02	02	02	02	02	02
12SW/SD31	LOCATION	12SW/SD31	12SW/SD32	12SW/SD32	12SW/SD34	12SW/SD34	12SW/SD35	12SW/SD35	12SW/SD36	12SW/SD36	12SW/SD08
12SW3101	SAMPLE NUMBER	12SW3101-F	12SW3201	12SW3201-F	12SW3401	12SW3401-F	12SW3501	12SW3501-F	12SW3601	12SW3601-F	12SW0802
NORMAL	SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
3/5/2005	SAMPLE DATE	3/5/2005	3/3/2005	3/5/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005
	Semivolatile Organics (ug/L)										
	1,2,4,5-TETRACHLOROBENZENE										
	1,2,4-TRICHLOROBENZENE										
	1,2-DICHLOROBENZENE										
	1,3-DICHLOROBENZENE										
	1,4-DICHLOROBENZENE										
	1,4-NAPHTHOQUINONE										
	1,4-PHENYLENEDIAMINE										
	1-NAPHTHYLAMINE										
	2,2'-OXYBIS(1-CHLOROPROPANE)										
	2,3,4,6-TETRACHLOROPHENOL										
	2,4,5-TRICHLOROPHENOL										
	2,4,6-TRICHLOROPHENOL										
	2,4-DICHLOROPHENOL										
	2,4-DIMETHYLPHENOL										
	2,4-DINITROPHENOL										
	2,6-DICHLOROPHENOL										
	2-ACETYLAMINOFLUORENE										
	2-CHLORONAPHTHALENE										
	2-CHLOROPHENOL										
	2-METHYLNAPHTHALENE										
	2-METHYLPHENOL										
	2-NAPHTHYLAMINE										
	2-NITROANILINE										
	2-NITROPHENOL										
	2-PICOLINE										
	3&4-METHYLPHENOL										
	3,3'-DICHLOROBENZIDINE										
	3,3'-DIMETHYLBENZIDINE										
	3-METHYLCHOLANTHRENE										
	3-NITROANILINE										
	4,6-DINITRO-2-METHYLPHENOL										
	4-AMINOBIPHENYL										
	4-BROMOPHENYL PHENYL ETHER										
	4-CHLORO-3-METHYLPHENOL										
	4-CHLOROANILINE										
	4-CHLOROPHENYL PHENYL ETHER										
	4-NITROANILINE										
	4-NITROPHENOL										
	4-NITROQUINOLINE-1-OXIDE										
	5-NITRO-O-TOLUIDINE										

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD31 12SW3101 NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD31 12SW3101-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201 NORMAL 3/3/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601-F NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD08 12SW0802 NORMAL 3/6/2005
	7,12-DIMETHYLBENZ(A)ANTHRACENE										
	A,A-DIMETHYLPHENETHYLAMINE										
	ACENAPHTHENE										
	ACENAPHTHYLENE										
	ACETOPHENONE										
	ANILINE										
	ANTHRACENE										
	ARAMITE										
	BENZO(A)ANTHRACENE										
	BENZO(A)PYRENE										
	BENZO(B)FLUORANTHENE										
	BENZO(G,H,I)PERYLENE										
	BENZO(K)FLUORANTHENE										
	BENZYL ALCOHOL										
	BIS(2-CHLOROETHOXY)METHANE										
	BIS(2-CHLOROETHYL)ETHER										
	BIS(2-ETHYLHEXYL)PHTHALATE										
	BUTYL BENZYL PHTHALATE										
	CHLOROBENZILATE										
	CHRYSENE										
	DI-N-BUTYL PHTHALATE										
	DI-N-OCTYL PHTHALATE										
	DIALLATE										
	DIBENZO(A,H)ANTHRACENE										
	DIBENZOFURAN										
	DIETHYL PHTHALATE										
	DIMETHYL PHTHALATE										
	DIPHENYLAMINE										
	ETHYL METHANE SULFONATE										
	FLUORANTHENE										
	FLUORENE										
	HEXACHLOROBENZENE										
	HEXACHLOROBUTADIENE										
	HEXACHLOROCYCLOPENTADIENE										
	HEXACHLOROETHANE										
	HEXACHLOROPROPENE										
	INDENO(1,2,3-CD)PYRENE										
	ISODRIN										
	ISOPHORONE										
	ISOSAFROLE										
	KEPONE										

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD31 12SW3101 NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD31 12SW3101-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201 NORMAL 3/3/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601-F NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD08 12SW0802 NORMAL 3/6/2005
	METHAPYRILENE										
	METHYL METHANE SULFONATE										
	N-NITROSO-DI-N-BUTYLAMINE										
	N-NITROSO-DI-N-PROPYLAMINE										
	N-NITROSODIETHYLAMINE										
	N-NITROSODIMETHYLAMINE										
	N-NITROSODIPHENYLAMINE										
	N-NITROSOMETHYLETHYLAMINE										
	N-NITROSOMORPHOLINE										
	N-NITROSOPIPERIDINE										
	N-NITROSOPYRROLIDINE										
	NAPHTHALENE										
	O,O,O-TRIETHYL PHOSPHOROTHIOATE										
	O-TOLUIDINE										
	P-(DIMETHYLAMINO)AZOBENZENE										
	PENTACHLOROBENZENE										
	PENTACHLOROETHANE										
	PENTACHLORONITROBENZENE										
	PHENACETIN										
	PHENANTHRENE										
	PHENOL										
	PRONAMIDE										
	PYRENE										
	PYRIDINE										
	SAFROLE										
	Energetics (ug/L)										
0.96 J	1,3,5-TRINITROBENZENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.258 U	1,3-DINITROBENZENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
79	2,4,6-TRINITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
1.6 J	2,4-DIAMINO-6-NITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.36 J	2,4-DINITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.258 U	2,6-DIAMINO-4-NITROTOLUENE		0.255 U		0.271 U		0.278 U		0.27 J		0.26 U
0.258 U	2,6-DINITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
11 J	2-AMINO-4,6-DINITROTOLUENE		0.65 J		0.8 J		0.278 U		0.258 U		0.26 U
0.258 U	2-NITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
1.2	3,5-DINITROANILINE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.258 U	3-NITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.515 U	4,4'-TN-AZOXY		0.51 U		0.542 U		0.555 U		0.515 U		0.52 U
24	4-AMINO-2,6-DINITROTOLUENE		0.84		1.7		0.278 U		0.258 U		0.26 U
0.258 U	4-NITROTOLUENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.258 U	DNX		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD31 12SW3101 NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD31 12SW3101-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201 NORMAL 3/3/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601-F NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD08 12SW0802 NORMAL 3/6/2005
4.2	HMX		2.3		98		5.1		7.3		0.26 U
0.258 U	MNX		0.255 U		1.9		0.278 U		0.258 U		0.26 U
0.258 U	NITROBENZENE		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
20	RDX		4.5		140		2.1		6.5		0.26 U
0.258 U	TETRYL		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
0.258 U	TNX		0.255 U		0.271 U		0.278 U		0.258 U		0.26 U
	Herbicides (ug/L)										
	HEXACHLOROPHENE										
	PENTACHLOROPHENOL										
	Total Metals (ug/L)										
2190 J	ALUMINUM		1060 J		2550		67700		8360		255 J
0.39 U	ANTIMONY		0.085 U		0.38 U		1 U		0.09 U		0.085 U
1.3 J	ARSENIC		0.46 J		5.7		20.3		2.9		0.21 U
34.4 J	BARIUM		35.8 J		109 J		589 J		102 J		48.8 J
0.11 J	BERYLLIUM		0.16 J		0.13 J		5.2		0.68 J		0.02 U
0.37 J	CADMIUM		0.11 J		0.16 U		43.7 J		0.35 J		0.039 U
17500 J	CALCIUM		40500 J		49300 J		119000 J		36600 J		30700 J
3.5 J	CHROMIUM		1.1 U		3.9 J		105 J		8.4 J		0.75 U
3.6 J	COBALT		9.7 J		2.4		123		9.8		0.32 J
9.3 J	COPPER		2 J		11.5 J		1650 J		12.4 J		0.79 J
2650 J	IRON		4270 J		3010 J		95400 J		9080 J		315 J
3.4 J	LEAD		0.977 J		2.7		458		13		0.315 J
3910 J	MAGNESIUM		7740 J		19300		34500		6970		5950 J
463 J	MANGANESE		1630 J		72.5		3330		628		12.4 J
0.03 U	MERCURY		0.03 U		0.06 J		1.7		0.03 U		0.66
4.7 J	NICKEL		7.5 J		9.6 J		140 J		16.7 J		1.5 J
649 J	POTASSIUM		590 J		5.55 UJ		10900 J		2640 J		849 J
0.22 U	SELENIUM		0.39 U		0.91 U		9.6 J		0.5 U		0.26 U
0.028 U	SILVER		0.028 U		0.05 U		2.6 J		0.04 U		0.028 U
6180 J	SODIUM		12600 J		26900 J		16800 J		4920 J		16100 J
0.09 J	THALLIUM		0.07 J		0.12 J		0.67 J		0.16 J		0.09 J
0.12 U	TIN		0.048 U		0.56 U		2.1 J		0.27 U		0.048 U
3.9 J	VANADIUM		1.3 J		8		138		14.8		1.14 U
29.8 J	ZINC		16.3 J		37 J		5220		66.4		5.3 J
	Dissolved Metals (ug/L)										
	ALUMINUM, FILTERED	19.1 J		32.8 J		8.35 U		77.4		8.35 U	
	ANTIMONY, FILTERED	0.085 U		0.085 U		0.085 UJ		0.085 UJ		0.085 UJ	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

DOWNGRAD GULLY 02 12SW/SD31 12SW3101 NORMAL 3/5/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	DOWNGRAD GULLY 02 12SW/SD31 12SW3101-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201 NORMAL 3/3/2005	DOWNGRAD GULLY 02 12SW/SD32 12SW3201-F NORMAL 3/5/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD34 12SW3401-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD35 12SW3501-F NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601 NORMAL 3/6/2005	DOWNGRAD GULLY 02 12SW/SD36 12SW3601-F NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD08 12SW0802 NORMAL 3/6/2005
	ARSENIC, FILTERED	0.18 U		0.18 U		3.5		0.46 J		0.047 U	
	BARIUM, FILTERED	24.9 J		29.3 J		75.8		44.2		34.8	
	BERYLLIUM, FILTERED	0.02 U		0.03 U		0.02 U		0.02 U		0.02 U	
	CADMIUM, FILTERED	0.14 U		0.04 U		1.1		0.73 J		0.45 J	
	CALCIUM, FILTERED	17900 J		34100 J		51200 J		70800 J		37100 J	
	CHROMIUM, FILTERED	1.4 J		1.1 J		1.1 U		1 U		0.81 U	
	COBALT, FILTERED	1.6 J		8.5 J		0.55 J		0.64 J		0.18 J	
	COPPER, FILTERED	1.5 J		0.57 J		5.7 J		5.1 J		0.71 U	
	IRON, FILTERED	117 J		1320 J		141 J		309 J		107 J	
	LEAD, FILTERED	0.229 J		0.217 J		0.173 J		0.856 J		0.269 J	
	MAGNESIUM, FILTERED	3890 J		8270 J		21300		9900		6630	
	MANGANESE, FILTERED	250 J		1290 J		12.3		56		18.3	
	MERCURY, FILTERED	0.03 U		0.03 U		0.27		0.089 J		0.21	
	NICKEL, FILTERED	2.5 J		6.9 J		5.6		2.9		2.5	
	POTASSIUM, FILTERED	356 J		516 J		109000 J		3890 J		1750 J	
	SELENIUM, FILTERED	0.27 U		0.61 J		0.84 U		0.67 U		0.094 U	
	SILVER, FILTERED	0.028 U		0.028 U		0.028 U		0.028 U		0.028 U	
	SODIUM, FILTERED	6670 J		14000 J		29100 J		18500 J		5520 J	
	THALLIUM, FILTERED	0.06 U		0.08 U		0.043 U		0.043 U		0.043 U	
	TIN, FILTERED	0.048 U		0.048 U		0.048 U		0.048 U		0.048 U	
	VANADIUM, FILTERED	1.14 U		1.14 U		3		1.6 J		1.14 U	
	ZINC, FILTERED	11.9 J		9.9 J		9.1 J		18.6		3.6 J	
	Field Parameters										
3.55	DISSOLVED OXYGEN (mg/L)		3.75		3.52		3.32		5.33		5.87
98	OXIDATION REDUCTION POTENTIAL (MV)		49		141		107		110		194
7.46	PH (S.U.)		6.94		7.18		7.39		7.45		6.41
0.081	SPECIFIC CONDUCTANCE (MS/CM)		0.145		0.404		0.218		0.125		0.113
7.35	TEMPERATURE (C)		6.81		10.04		8.1		9.8		3.35
40	TURBIDITY (NTU)		10		130		1000 >		14		4.1
	Miscellaneous Parameters (mg/L)										
0.14	AMMONIA-N		0.31		0.08		1.2		0.07		0.005 U
0.51 J	NITRITE/NITRATE-N		0.025 UJ		0.81		0.05 U		0.05 U		0.11 J

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD	CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	UPGRAD
GULLY	STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
02	SAMPLING ORDER	02	02	02	02	02	02	01	01	01
12SW/SD08	LOCATION	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD33	12SW/SD33	12SW/SD27	12SW/SD27	12SW/SD25
12SW0802-F	SAMPLE NUMBER	12SW2602	12SW2602-F	12SW2802	12SW2802-F	12SW3301	12SW3301-F	12SW2701	12SW2701-F	12SW2501
NORMAL	SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
3/6/2005	SAMPLE DATE	3/5/2005	3/5/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	10/12/2004	10/12/2004	10/11/2004
	Semivolatile Organics (ug/L)									
	1,2,4,5-TETRACHLOROBENZENE									
	1,2,4-TRICHLOROBENZENE									
	1,2-DICHLOROBENZENE									
	1,3-DICHLOROBENZENE									
	1,4-DICHLOROBENZENE									
	1,4-NAPHTHOQUINONE									
	1,4-PHENYLENEDIAMINE									
	1-NAPHTHYLAMINE									
	2,2'-OXYBIS(1-CHLOROPROPANE)									
	2,3,4,6-TETRACHLOROPHENOL									
	2,4,5-TRICHLOROPHENOL									
	2,4,6-TRICHLOROPHENOL									
	2,4-DICHLOROPHENOL									
	2,4-DIMETHYLPHENOL									
	2,4-DINITROPHENOL									
	2,6-DICHLOROPHENOL									
	2-ACETYLAMINOFLUORENE									
	2-CHLORONAPHTHALENE									
	2-CHLOROPHENOL									
	2-METHYLNAPHTHALENE									
	2-METHYLPHENOL									
	2-NAPHTHYLAMINE									
	2-NITROANILINE									
	2-NITROPHENOL									
	2-PICOLINE									
	3&4-METHYLPHENOL									
	3,3'-DICHLOROBENZIDINE									
	3,3'-DIMETHYLBENZIDINE									
	3-METHYLCHOLANTHRENE									
	3-NITROANILINE									
	4,6-DINITRO-2-METHYLPHENOL									
	4-AMINOBIPHENYL									
	4-BROMOPHENYL PHENYL ETHER									
	4-CHLORO-3-METHYLPHENOL									
	4-CHLOROANILINE									
	4-CHLOROPHENYL PHENYL ETHER									
	4-NITROANILINE									
	4-NITROPHENOL									
	4-NITROQUINOLINE-1-OXIDE									
	5-NITRO-O-TOLUIDINE									

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD	CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	UPGRAD
GULLY	STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
02	SAMPLING ORDER	02	02	02	02	02	02	01	01	01
12SW/SD08	LOCATION	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD33	12SW/SD33	12SW/SD27	12SW/SD27	12SW/SD25
12SW0802-F	SAMPLE NUMBER	12SW2602	12SW2602-F	12SW2802	12SW2802-F	12SW3301	12SW3301-F	12SW2701	12SW2701-F	12SW2501
NORMAL	SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
3/6/2005	SAMPLE DATE	3/5/2005	3/5/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	10/12/2004	10/12/2004	10/11/2004
	7,12-DIMETHYLBENZ(A)ANTHRACENE									
	A,A-DIMETHYLPHENETHYLAMINE									
	ACENAPHTHENE									
	ACENAPHTHYLENE									
	ACETOPHENONE									
	ANILINE									
	ANTHRACENE									
	ARAMITE									
	BENZO(A)ANTHRACENE									
	BENZO(A)PYRENE									
	BENZO(B)FLUORANTHENE									
	BENZO(G,H,I)PERYLENE									
	BENZO(K)FLUORANTHENE									
	BENZYL ALCOHOL									
	BIS(2-CHLOROETHOXY)METHANE									
	BIS(2-CHLOROETHYL)ETHER									
	BIS(2-ETHYLHEXYL)PHTHALATE									
	BUTYL BENZYL PHTHALATE									
	CHLOROBENZILATE									
	CHRYSENE									
	DI-N-BUTYL PHTHALATE									
	DI-N-OCTYL PHTHALATE									
	DIALLATE									
	DIBENZO(A,H)ANTHRACENE									
	DIBENZOFURAN									
	DIETHYL PHTHALATE									
	DIMETHYL PHTHALATE									
	DIPHENYLAMINE									
	ETHYL METHANE SULFONATE									
	FLUORANTHENE									
	FLUORENE									
	HEXACHLOROBENZENE									
	HEXACHLOROBUTADIENE									
	HEXACHLOROCYCLOPENTADIENE									
	HEXACHLOROETHANE									
	HEXACHLOROPROPENE									
	INDENO(1,2,3-CD)PYRENE									
	ISODRIN									
	ISOPHORONE									
	ISOSAFROLE									
	KEPONE									

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD	CLASSIFICATION	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	UPGRAD
GULLY	STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
02	SAMPLING ORDER	02	02	02	02	02	02	01	01	01
12SW/SD08	LOCATION	12SW/SD26	12SW/SD26	12SW/SD28	12SW/SD28	12SW/SD33	12SW/SD33	12SW/SD27	12SW/SD27	12SW/SD25
12SW0802-F	SAMPLE NUMBER	12SW2602	12SW2602-F	12SW2802	12SW2802-F	12SW3301	12SW3301-F	12SW2701	12SW2701-F	12SW2501
NORMAL	SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG
3/6/2005	SAMPLE DATE	3/5/2005	3/5/2005	3/6/2005	3/6/2005	3/6/2005	3/6/2005	10/12/2004	10/12/2004	10/11/2004
	METHAPYRILENE									
	METHYL METHANE SULFONATE									
	N-NITROSO-DI-N-BUTYLAMINE									
	N-NITROSO-DI-N-PROPYLAMINE									
	N-NITROSODIETHYLAMINE									
	N-NITROSODIMETHYLAMINE									
	N-NITROSODIPHENYLAMINE									
	N-NITROSOMETHYLETHYLAMINE									
	N-NITROSOMORPHOLINE									
	N-NITROSOPIPERIDINE									
	N-NITROSOPYRROLIDINE									
	NAPHTHALENE									
	O,O,O-TRIETHYL PHOSPHOROTHIOATE									
	O-TOLUIDINE									
	P-(DIMETHYLAMINO)AZOBENZENE									
	PENTACHLOROBENZENE									
	PENTACHLOROETHANE									
	PENTACHLORONITROBENZENE									
	PHENACETIN									
	PHENANTHRENE									
	PHENOL									
	PRONAMIDE									
	PYRENE									
	PYRIDINE									
	SAFROLE									
	Energetics (ug/L)									
	1,3,5-TRINITROBENZENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	1,3-DINITROBENZENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2,4,6-TRINITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2,4-DIAMINO-6-NITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2,4-DINITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2,6-DIAMINO-4-NITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2,6-DINITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2-AMINO-4,6-DINITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	2-NITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	3,5-DINITROANILINE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	3-NITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	4,4'-TN-AZOXY	0.555 U		0.515 U		0.51 U		0.485 U		0.515 U
	4-AMINO-2,6-DINITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	4-NITROTOLUENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	DNX	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD GULLY 02 12SW/SD08 12SW0802-F NORMAL 3/6/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	UPGRAD GULLY 02 12SW/SD26 12SW2602 NORMAL 3/5/2005	UPGRAD GULLY 02 12SW/SD26 12SW2602-F NORMAL 3/5/2005	UPGRAD GULLY 02 12SW/SD28 12SW2802 NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD28 12SW2802-F NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD33 12SW3301 NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD33 12SW3301-F NORMAL 3/6/2005	DOWNGRAD TURKEYCREEK 01 12SW/SD27 12SW2701 NORMAL 10/12/2004	DOWNGRAD TURKEYCREEK 01 12SW/SD27 12SW2701-F NORMAL 10/12/2004	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501 ORIG 10/11/2004
	HMX	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	MNX	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	NITROBENZENE	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	RDX	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	TETRYL	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	TNX	0.278 U		0.258 U		0.255 U		0.242 U		0.258 U
	Herbicides (ug/L)									
	HEXACHLOROPHENE									
	PENTACHLOROPHENOL									
	Total Metals (ug/L)									
	ALUMINUM	264 J		169 U		598 J		24.1 J		59.3
	ANTIMONY	0.085 U		0.085 U		0.085 U		0.085 U		0.085 U
	ARSENIC	0.07 U		0.14 U		0.15 U		0.22 U		0.25 U
	BARIUM	49.1 J		36.1 J		33.9 J		69.8 J		75 J
	BERYLLIUM	0.02 U		0.03 J		0.31 J		0.02 J		0.04 J
	CADMIUM	0.039 U		0.039 U		0.13 J		0.07 U		0.04 U
	CALCIUM	54900 J		19100 J		36200 J		54500 J		61000 J
	CHROMIUM	1.2 U		0.49 U		0.48 U		0.74 U		1.1 U
	COBALT	0.3 J		0.73 J		9.2 J		0.31 U		0.3 U
	COPPER	0.46 U		0.56 U		0.74 J		0.82 U		0.85 U
	IRON	505 J		192 J		1200 J		456 J		510 J
	LEAD	0.2 J		0.127 J		0.207 J		0.18 U		0.66 U
	MAGNESIUM	6790 J		5810 J		7530 J		9220 J		9410 J
	MANGANESE	11.2 J		51.5 J		347 J		131 J		77.3 J
	MERCURY	0.03 U		0.03 U		0.03 U		0.03 U		0.03 U
	NICKEL	0.57 J		3.5 J		20.5 J		1.7 J		2 J
	POTASSIUM	1050 J		551 J		965 J		1600 J		1670 J
	SELENIUM	0.27 U		0.16 U		0.37 U		0.12 U		0.36 U
	SILVER	0.028 U		0.028 U		0.028 U		0.028 U		0.028 U
	SODIUM	5740 J		6640 J		11600 J		9630 J		10300 J
	THALLIUM	0.06 J		0.05 J		0.07 J		0.043 U		0.043 U
	TIN	0.048 U		0.048 U		0.048 U		0.08 U		0.09 U
	VANADIUM	1.14 U		1.14 U		1.14 U		1.14 U		1.14 U
	ZINC	3.6 U		7.7 J		41.3 J		3.3 U		4.1 U
	Dissolved Metals (ug/L)									
8.35 U	ALUMINUM, FILTERED		24.7 J		37.4 J		46.8 J		8.6 U	
0.085 U	ANTIMONY, FILTERED		0.085 U		0.085 U		0.085 U		0.085 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD GULLY 02 12SW/SD08 12SW0802-F NORMAL 3/6/2005	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	UPGRAD GULLY 02 12SW/SD26 12SW2602 NORMAL 3/5/2005	UPGRAD GULLY 02 12SW/SD26 12SW2602-F NORMAL 3/5/2005	UPGRAD GULLY 02 12SW/SD28 12SW2802 NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD28 12SW2802-F NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD33 12SW3301 NORMAL 3/6/2005	UPGRAD GULLY 02 12SW/SD33 12SW3301-F NORMAL 3/6/2005	DOWNGRAD TURKEYCREEK 01 12SW/SD27 12SW2701 NORMAL 10/12/2004	DOWNGRAD TURKEYCREEK 01 12SW/SD27 12SW2701-F NORMAL 10/12/2004	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501 ORIG 10/11/2004
0.047 U	ARSENIC, FILTERED		0.12 U		0.11 U		0.05 U		0.19 U	
41.1 J	BARIUM, FILTERED		49.2 J		36.5 J		47.8 J		64.4 J	
0.02 U	BERYLLIUM, FILTERED		0.02 U		0.02 U		0.1 J		0.02 U	
0.039 U	CADMIUM, FILTERED		0.039 U		0.039 U		0.12 U		0.06 U	
21600 J	CALCIUM, FILTERED		41100 J		19200 J		19800 J		53900 J	
0.46 U	CHROMIUM, FILTERED		0.51 U		0.84 U		0.92 J		0.64 U	
0.12 U	COBALT, FILTERED		0.15 J		0.64 J		8.9 J		0.28 U	
0.6 J	COPPER, FILTERED		0.6 J		0.5 J		0.68 J		0.78 U	
179 J	IRON, FILTERED		274 J		125 J		868 J		288 J	
0.184 U	LEAD, FILTERED		0.201 J		0.209 J		0.207 J		0.39 U	
5900 J	MAGNESIUM, FILTERED		8230 J		5860 J		7190 J		8900 J	
0.752 U	MANGANESE, FILTERED		1 J		45.1 J		235 J		124 J	
0.03 U	MERCURY, FILTERED		0.03 U		0.03 U		0.03 U		0.03 U	
1.7 J	NICKEL, FILTERED		2.4 J		4 J		20.6 J		1.7 J	
800 J	POTASSIUM, FILTERED		1090 J		553 J		899 J		1600 J	
0.26 U	SELENIUM, FILTERED		0.38 U		0.37 U		0.44 U		0.14 U	
0.03 U	SILVER, FILTERED		0.028 U		0.028 U		0.028 U		0.028 U	
16400 J	SODIUM, FILTERED		6950 J		6860 J		11300 J		9440 J	
0.08 U	THALLIUM, FILTERED		0.06 U		0.06 U		0.08 U		0.043 U	
0.048 U	TIN, FILTERED		0.52 U		0.048 U		0.048 U		0.09 U	
1.14 U	VANADIUM, FILTERED		1.14 U		1.14 U		1.14 U		1.14 U	
3.6 J	ZINC, FILTERED		3.2 J		6.9 J		41.2 J		2.7 U	
	Field Parameters									
	DISSOLVED OXYGEN (mg/L)	2.87		3.91		3.88		7.44		8.89
	OXIDATION REDUCTION POTENTIAL (MV)	118		174.700000		99		266.200000		260.5
	PH (S.U.)	6.87		6.8		6.68		6.81		6.92
	SPECIFIC CONDUCTANCE (MS/CM)	0.127		0.95		0.119		0.267		0.282
	TEMPERATURE (C)	4.71		5.55		5.28		13.55		12.58
	TURBIDITY (NTU)	8.06		4.2		5.9				2.4
	Miscellaneous Parameters (mg/L)									
	AMMONIA-N	0.005 U		0.005 U		0.005 U		0.18 J		0.005 UJ
	NITRITE/NITRATE-N	0.05 J		0.025 UJ		0.2 J		0.025 U		0.025 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD	CLASSIFICATION	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
TURKEYCREEK	STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
01	SAMPLING ORDER	01	01	02	02	02	02
12SW/SD25	LOCATION	12SW/SD25	12SW/SD25	12SW/SD27	12SW/SD27	12SW/SD25	12SW/SD25
12SW2501-D	SAMPLE NUMBER	12SW2501-F	12SW2501-F-D	12SW2702	12SW2702-F	12SW2502	12SW2502-F
DUP	SAMPLE CODE	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
10/11/2004	SAMPLE DATE	10/11/2004	10/11/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005
	Semivolatile Organics (ug/L)						
	1,2,4,5-TETRACHLOROBENZENE						
	1,2,4-TRICHLOROBENZENE						
	1,2-DICHLOROBENZENE						
	1,3-DICHLOROBENZENE						
	1,4-DICHLOROBENZENE						
	1,4-NAPHTHOQUINONE						
	1,4-PHENYLENEDIAMINE						
	1-NAPHTHYLAMINE						
	2,2'-OXYBIS(1-CHLOROPROPANE)						
	2,3,4,6-TETRACHLOROPHENOL						
	2,4,5-TRICHLOROPHENOL						
	2,4,6-TRICHLOROPHENOL						
	2,4-DICHLOROPHENOL						
	2,4-DIMETHYLPHENOL						
	2,4-DINITROPHENOL						
	2,6-DICHLOROPHENOL						
	2-ACETYLAMINOFLUORENE						
	2-CHLORONAPHTHALENE						
	2-CHLOROPHENOL						
	2-METHYLNAPHTHALENE						
	2-METHYLPHENOL						
	2-NAPHTHYLAMINE						
	2-NITROANILINE						
	2-NITROPHENOL						
	2-PICOLINE						
	3&4-METHYLPHENOL						
	3,3'-DICHLOROBENZIDINE						
	3,3'-DIMETHYLBENZIDINE						
	3-METHYLCHOLANTHRENE						
	3-NITROANILINE						
	4,6-DINITRO-2-METHYLPHENOL						
	4-AMINOBIPHENYL						
	4-BROMOPHENYL PHENYL ETHER						
	4-CHLORO-3-METHYLPHENOL						
	4-CHLOROANILINE						
	4-CHLOROPHENYL PHENYL ETHER						
	4-NITROANILINE						
	4-NITROPHENOL						
	4-NITROQUINOLINE-1-OXIDE						
	5-NITRO-O-TOLUIDINE						

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD	CLASSIFICATION	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD
TURKEYCREEK	STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
01	SAMPLING ORDER	01	01	02	02	02	02
12SW/SD25	LOCATION	12SW/SD25	12SW/SD25	12SW/SD27	12SW/SD27	12SW/SD25	12SW/SD25
12SW2501-D	SAMPLE NUMBER	12SW2501-F	12SW2501-F-D	12SW2702	12SW2702-F	12SW2502	12SW2502-F
DUP	SAMPLE CODE	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
10/11/2004	SAMPLE DATE	10/11/2004	10/11/2004	3/5/2005	3/5/2005	3/5/2005	3/5/2005
	7,12-DIMETHYLBENZ(A)ANTHRACENE						
	A,A-DIMETHYLPHENETHYLAMINE						
	ACENAPHTHENE						
	ACENAPHTHYLENE						
	ACETOPHENONE						
	ANILINE						
	ANTHRACENE						
	ARAMITE						
	BENZO(A)ANTHRACENE						
	BENZO(A)PYRENE						
	BENZO(B)FLUORANTHENE						
	BENZO(G,H,I)PERYLENE						
	BENZO(K)FLUORANTHENE						
	BENZYL ALCOHOL						
	BIS(2-CHLOROETHOXY)METHANE						
	BIS(2-CHLOROETHYL)ETHER						
	BIS(2-ETHYLHEXYL)PHTHALATE						
	BUTYL BENZYL PHTHALATE						
	CHLOROBENZILATE						
	CHRYSENE						
	DI-N-BUTYL PHTHALATE						
	DI-N-OCTYL PHTHALATE						
	DIALLATE						
	DIBENZO(A,H)ANTHRACENE						
	DIBENZOFURAN						
	DIETHYL PHTHALATE						
	DIMETHYL PHTHALATE						
	DIPHENYLAMINE						
	ETHYL METHANE SULFONATE						
	FLUORANTHENE						
	FLUORENE						
	HEXACHLOROBENZENE						
	HEXACHLOROBUTADIENE						
	HEXACHLOROCYCLOPENTADIENE						
	HEXACHLOROETHANE						
	HEXACHLOROPROPENE						
	INDENO(1,2,3-CD)PYRENE						
	ISODRIN						
	ISOPHORONE						
	ISOSAFROLE						
	KEPONE						

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-D DUP 10/11/2004	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-F ORIG 10/11/2004	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-F-D DUP 10/11/2004	DOWNGRAD TURKEYCREEK 02 12SW/SD27 12SW2702 NORMAL 3/5/2005	DOWNGRAD TURKEYCREEK 02 12SW/SD27 12SW2702-F NORMAL 3/5/2005	UPGRAD TURKEYCREEK 02 12SW/SD25 12SW2502 NORMAL 3/5/2005	UPGRAD TURKEYCREEK 02 12SW/SD25 12SW2502-F NORMAL 3/5/2005
	METHAPYRILENE						
	METHYL METHANE SULFONATE						
	N-NITROSO-DI-N-BUTYLAMINE						
	N-NITROSO-DI-N-PROPYLAMINE						
	N-NITROSODIETHYLAMINE						
	N-NITROSODIMETHYLAMINE						
	N-NITROSODIPHENYLAMINE						
	N-NITROSOMETHYLETHYLAMINE						
	N-NITROSOMORPHOLINE						
	N-NITROSOPIPERIDINE						
	N-NITROSOPYRROLIDINE						
	NAPHTHALENE						
	O,O,O-TRIETHYL PHOSPHOROTHIOATE						
	O-TOLUIDINE						
	P-(DIMETHYLAMINO)AZOBENZENE						
	PENTACHLOROBENZENE						
	PENTACHLOROETHANE						
	PENTACHLORONITROBENZENE						
	PHENACETIN						
	PHENANTHRENE						
	PHENOL						
	PRONAMIDE						
	PYRENE						
	PYRIDINE						
	SAFROLE						
	Energetics (ug/L)						
0.242 U	1,3,5-TRINITROBENZENE			0.25 U		0.26 U	
0.242 U	1,3-DINITROBENZENE			0.25 U		0.26 U	
0.242 U	2,4,6-TRINITROTOLUENE			0.25 U		0.26 U	
0.242 U	2,4-DIAMINO-6-NITROTOLUENE			0.25 U		0.26 U	
0.242 U	2,4-DINITROTOLUENE			0.25 U		0.26 U	
0.242 U	2,6-DIAMINO-4-NITROTOLUENE			0.25 U		0.26 U	
0.242 U	2,6-DINITROTOLUENE			0.25 U		0.26 U	
0.242 U	2-AMINO-4,6-DINITROTOLUENE			0.25 U		0.26 U	
0.242 U	2-NITROTOLUENE			0.25 U		0.26 U	
0.242 U	3,5-DINITROANILINE			0.25 U		0.26 U	
0.242 U	3-NITROTOLUENE			0.25 U		0.26 U	
0.485 U	4,4'-TN-AZOXY			0.5 U		0.52 U	
0.242 U	4-AMINO-2,6-DINITROTOLUENE			0.25 U		0.26 U	
0.242 U	4-NITROTOLUENE			0.25 U		0.26 U	
0.242 U	DNX			0.25 U		0.26 U	

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-D DUP 10/11/2004	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-F ORIG 10/11/2004	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-F-D DUP 10/11/2004	DOWNGRAD TURKEYCREEK 02 12SW/SD27 12SW2702 NORMAL 3/5/2005	DOWNGRAD TURKEYCREEK 02 12SW/SD27 12SW2702-F NORMAL 3/5/2005	UPGRAD TURKEYCREEK 02 12SW/SD25 12SW2502 NORMAL 3/5/2005	UPGRAD TURKEYCREEK 02 12SW/SD25 12SW2502-F NORMAL 3/5/2005
0.242 U	HMX			0.25 U		0.26 U	
0.242 U	MNX			0.25 U		0.26 U	
0.242 U	NITROBENZENE			0.25 U		0.26 U	
0.242 U	RDX			0.25 U		0.26 U	
0.242 U	TETRYL			0.25 U		0.26 U	
0.242 U	TNX			0.25 U		0.26 U	
	Herbicides (ug/L)						
	HEXACHLOROPHENE						
	PENTACHLOROPHENOL						
	Total Metals (ug/L)						
45.1 J	ALUMINUM			49.7 U		98.6 U	
0.44 U	ANTIMONY			0.085 U		0.085 U	
0.28 U	ARSENIC			0.047 U		0.047 U	
71.5 J	BARIUM			41 J		35.4 J	
0.04 J	BERYLLIUM			0.02 U		0.02 U	
0.06 U	CADMIUM			0.039 U		0.039 U	
63500 J	CALCIUM			34800 J		31100 J	
0.79 U	CHROMIUM			1.5 U		1.1 U	
0.28 U	COBALT			0.22 J		0.15 J	
0.69 U	COPPER			0.34 U		0.15 U	
471 J	IRON			275 J		230 J	
0.16 U	LEAD			0.07 U		0.069 U	
9360 J	MAGNESIUM			5120 J		4260 J	
72.6 J	MANGANESE			43.1 J		22 J	
0.03 U	MERCURY			0.03 U		0.03 U	
1.9 J	NICKEL			0.1 UJ		0.1 UJ	
1690 J	POTASSIUM			915 J		663 J	
0.22 U	SELENIUM			0.25 U		0.16 U	
0.1 U	SILVER			0.028 U		0.028 U	
10200 J	SODIUM			4630 J		3570 J	
0.05 J	THALLIUM			0.043 U		0.043 U	
0.23 U	TIN			0.048 U		0.048 U	
1.14 U	VANADIUM			1.14 U		1.14 U	
9.6 U	ZINC			0.714 UJ		0.714 UJ	
	Dissolved Metals (ug/L)						
	ALUMINUM, FILTERED	8.6 U	8.6 U		8.35 U		9.9 J
	ANTIMONY, FILTERED	0.085 U	0.32 U		0.085 U		0.085 U

APPENDIX TABLE G-4

RESULTS FOR CHEMICALS ANALYZED IN ALL SURFACE WATER SAMPLES, ROUNDS 1 AND 2
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-D DUP 10/11/2004	CLASSIFICATION STREAM ORDER SAMPLING ORDER LOCATION SAMPLE NUMBER SAMPLE CODE SAMPLE DATE	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-F ORIG 10/11/2004	UPGRAD TURKEYCREEK 01 12SW/SD25 12SW2501-F-D DUP 10/11/2004	DOWNGRAD TURKEYCREEK 02 12SW/SD27 12SW2702 NORMAL 3/5/2005	DOWNGRAD TURKEYCREEK 02 12SW/SD27 12SW2702-F NORMAL 3/5/2005	UPGRAD TURKEYCREEK 02 12SW/SD25 12SW2502 NORMAL 3/5/2005	UPGRAD TURKEYCREEK 02 12SW/SD25 12SW2502-F NORMAL 3/5/2005
	ARSENIC, FILTERED	0.15 U	0.2 U		0.07 U		0.08 U
	BARIUM, FILTERED	59.5 J	60.6 J		36.9 J		34.7 J
	BERYLLIUM, FILTERED	0.02 U	0.02 U		0.02 U		0.02 U
	CADMIUM, FILTERED	0.039 U	0.05 U		0.039 U		0.039 U
	CALCIUM, FILTERED	57700 J	58600 J		25500 J		23900 J
	CHROMIUM, FILTERED	0.31 U	0.45 U		0.48 U		0.44 U
	COBALT, FILTERED	0.15 U	0.16 U		0.18 J		0.14 U
	COPPER, FILTERED	0.49 U	0.57 U		0.41 J		0.3 J
	IRON, FILTERED	249 J	264 J		172 J		149 J
	LEAD, FILTERED	0.08 U	0.069 U		0.181 U		0.173 U
	MAGNESIUM, FILTERED	8210 J	8420 J		5800 J		5250 J
	MANGANESE, FILTERED	49.2 J	30.1 U		33.5 J		18 J
	MERCURY, FILTERED	0.03 U	0.03 U		0.03 U		0.03 U
	NICKEL, FILTERED	1.5 U	1.6 U		1.8 J		1.5 J
	POTASSIUM, FILTERED	1490 J	1570 J		875 J		741 J
	SELENIUM, FILTERED	0.32 U	0.33 U		0.24 U		0.19 U
	SILVER, FILTERED	0.028 U	0.09 U		0.028 U		0.028 U
	SODIUM, FILTERED	9090 J	9340 J		5240 J		4640 J
	THALLIUM, FILTERED	0.043 U	0.06 J		0.043 U		0.043 U
	TIN, FILTERED	0.08 U	0.17 U		0.36 U		0.048 U
	VANADIUM, FILTERED	1.14 U	1.14 U		1.14 U		1.14 U
	ZINC, FILTERED	3.3 U	5.8 U		1.9 J		3.9 J
	Field Parameters						
	DISSOLVED OXYGEN (mg/L)			1.95		2.97	
	OXIDATION REDUCTION POTENTIAL (MV)			113		116	
	PH (S.U.)			6.76		7.13	
	SPECIFIC CONDUCTANCE (MS/CM)			0.092		0.078	
	TEMPERATURE (C)			5.21		5.25	
	TURBIDITY (NTU)			9.15		3.76	
	Miscellaneous Parameters (mg/L)						
0.17 J	AMMONIA-N			0.005 U		0.005 U	
0.025 U	NITRITE/NITRATE-N			0.025 UJ		0.025 UJ	

Data qualifiers (e.g., U, J) are defined in section 3 of the text.
ug/L - micrograms per liter
mg/L - milligrams per liter
MV - millivolts
S.U. - standard units
MS/CM - milliSiemens per centimeter
C - Celsius
NTU - nephelometric turbidity units

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD23	12SW/SD24	12SW/SD16	12SW/SD01	12SW/SD02	12SW/SD03	12SW/SD04	12SW/SD05	12SW/SD06	12SW/SD07	12SW/SD07
SAMPLE NUMBER	12SD230004	12SD240004	12SD160004	12SD010004	12SD020004	12SD030004	12SD040004	12SD050004	12SD060004	12SD070004	12SD070004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/13/2004	10/11/2004	10/13/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/11/2004	10/11/2004
Semivolatile Organics (ug/kg)											
1,2,4,5-TETRACHLOROBENZENE						85.7 U				86.9 U	88 U
1,2,4-TRICHLOROBENZENE						85.7 U				86.9 U	88 U
1,2-DICHLOROBENZENE						85.7 U				86.9 U	88 U
1,3-DICHLOROBENZENE						85.7 U				86.9 U	88 U
1,4-DICHLOROBENZENE						85.7 U				86.9 U	88 U
1,4-NAPHTHOQUINONE						85.7 U				86.9 U	88 U
1,4-PHENYLENEDIAMINE						85.7 U				86.9 U	88 U
1-NAPHTHYLAMINE						85.7 U				86.9 U	88 U
2,2'-OXYBIS(1-CHLOROPROPANE)						85.7 U				86.9 U	88 U
2,3,4,6-TETRACHLOROPHENOL						85.7 U				86.9 U	88 U
2,4,5-TRICHLOROPHENOL						85.7 U				86.9 U	88 U
2,4,6-TRICHLOROPHENOL						85.7 U				86.9 U	88 U
2,4-DICHLOROPHENOL						85.7 U				86.9 U	88 U
2,4-DIMETHYLPHENOL						85.7 U				86.9 U	88 U
2,4-DINITROPHENOL						85.7 U				86.9 U	88 U
2,6-DICHLOROPHENOL						85.7 U				86.9 U	88 U
2-ACETYLAMINOFLUORENE						85.7 U				86.9 U	88 U
2-CHLORONAPHTHALENE						85.7 U				86.9 U	88 U
2-CHLOROPHENOL						85.7 U				86.9 U	88 U
2-METHYLNAPHTHALENE						4.22 U				4.28 U	4.34 U
2-METHYLPHENOL						85.7 U				86.9 U	88 U
2-NAPHTHYLAMINE						85.7 U				86.9 U	88 U
2-NITROANILINE						85.7 U				86.9 U	88 U
2-NITROPHENOL						85.7 U				86.9 U	88 U
2-PICOLINE						85.7 U				86.9 U	88 U
3&4-METHYLPHENOL						85.7 U				86.9 U	88 U
3,3'-DICHLOROBENZIDINE						85.7 U				86.9 UR	88 U
3,3'-DIMETHYLBENZIDINE						85.7 U				86.9 U	88 U
3-METHYLCHOLANTHRENE						85.7 U				86.9 U	88 U
3-NITROANILINE						85.7 U				86.9 UR	88 U
4,6-DINITRO-2-METHYLPHENOL						85.7 U				86.9 U	88 U
4-AMINOBIPHENYL						85.7 U				86.9 U	88 U
4-BROMOPHENYL PHENYL ETHER						85.7 U				86.9 U	88 U
4-CHLORO-3-METHYLPHENOL						85.7 U				86.9 U	88 U
4-CHLOROANILINE						85.7 U				86.9 UR	88 U
4-CHLOROPHENYL PHENYL ETHER						85.7 U				86.9 U	88 U
4-NITROANILINE						85.7 U				86.9 UJ	88 U
4-NITROPHENOL						85.7 U				86.9 U	88 U
4-NITROQUINOLINE-1-OXIDE						85.7 UR				86.9 UR	88 UR
5-NITRO-O-TOLUIDINE						85.7 U				86.9 U	88 U
7,12-DIMETHYLBENZ(A)ANTHRACENE						85.7 U				86.9 U	88 U
A,A-DIMETHYLPHENETHYLAMINE						85.7 U				86.9 U	88 U

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD23	12SW/SD24	12SW/SD16	12SW/SD01	12SW/SD02	12SW/SD03	12SW/SD04	12SW/SD05	12SW/SD06	12SW/SD07	12SW/SD07
SAMPLE NUMBER	12SD230004	12SD240004	12SD160004	12SD010004	12SD020004	12SD030004	12SD040004	12SD050004	12SD060004	12SD070004	12SD070004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/13/2004	10/11/2004	10/13/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/11/2004	10/11/2004
ACENAPHTHENE						4.22 U				4.28 U	4.34 U
ACENAPHTHYLENE						4.22 U				4.28 U	4.34 U
ACETOPHENONE						85.7 U				86.9 U	88 U
ANILINE						85.7 U				86.9 U	88 U
ANTHRACENE						4.22 U				4.28 U	4.34 U
ARAMITE						85.7 U				86.9 U	88 U
BENZO(A)ANTHRACENE						9				4.28 U	4.34 U
BENZO(A)PYRENE						10				4.28 U	4.34 U
BENZO(B)FLUORANTHENE						15				4.28 U	4.34 U
BENZO(G,H,I)PERYLENE						4.22 U				4.28 U	4.34 U
BENZO(K)FLUORANTHENE						7 J				4.28 U	4.34 U
BENZYL ALCOHOL						85.7 U				86.9 U	88 U
BIS(2-CHLOROETHOXY)METHANE						85.7 U				86.9 U	88 U
BIS(2-CHLOROETHYL)ETHER						85.7 U				86.9 U	88 U
BIS(2-ETHYLHEXYL)PHTHALATE						85.7 U				340 J	240 J
BUTYL BENZYL PHTHALATE						85.7 U				86.9 U	88 U
CHLOROBENZILATE						85.7 U				86.9 U	88 U
CHRYSENE						11				4.28 U	4.34 U
DI-N-BUTYL PHTHALATE						85.7 U				86.9 U	88 U
DI-N-OCTYL PHTHALATE						85.7 U				86.9 U	88 U
DIALLATE						85.7 U				86.9 U	88 U
DIBENZO(A,H)ANTHRACENE						4.22 U				4.28 U	4.34 U
DIBENZOFURAN						85.7 U				86.9 U	88 U
DIETHYL PHTHALATE						85.7 U				86.9 U	88 U
DIMETHYL PHTHALATE						85.7 U				86.9 U	88 U
DIPHENYLAMINE						85.7 U				86.9 U	88 U
ETHYL METHANE SULFONATE						85.7 U				86.9 U	88 U
FLUORANTHENE						15				7 J	4.34 J
FLUORENE						4.22 U				4.28 U	4.34 U
HEXACHLOROBENZENE						85.7 U				86.9 U	88 U
HEXACHLOROBUTADIENE						85.7 U				86.9 U	88 U
HEXACHLOROCYCLOPENTADIENE						85.7 UJ				86.9 UJ	88 UJ
HEXACHLOROETHANE						85.7 U				86.9 U	88 U
HEXACHLOROPROPENE						85.7 U				86.9 U	88 U
INDENO(1,2,3-CD)PYRENE						4.22 U				4.28 U	4.34 U
ISODRIN						85.7 U				86.9 U	88 U
ISOPHORONE						85.7 U				86.9 U	88 U
ISOSAFROLE						85.7 U				86.9 U	88 U
KEPONE						85.7 UJ				86.9 UJ	88 UJ
METHAPYRILENE						85.7 U				86.9 U	88 U
METHYL METHANE SULFONATE						85.7 U				86.9 U	88 U
N-NITROSO-DI-N-BUTYLAMINE						85.7 U				86.9 U	88 U
N-NITROSO-DI-N-PROPYLAMINE						85.7 U				86.9 U	88 U

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD23	12SW/SD24	12SW/SD16	12SW/SD01	12SW/SD02	12SW/SD03	12SW/SD04	12SW/SD05	12SW/SD06	12SW/SD07	12SW/SD07
SAMPLE NUMBER	12SD230004	12SD240004	12SD160004	12SD010004	12SD020004	12SD030004	12SD040004	12SD050004	12SD060004	12SD070004	12SD070004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/13/2004	10/11/2004	10/13/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/11/2004	10/11/2004
N-NITROSODIETHYLAMINE						85.7 U				86.9 U	88 U
N-NITROSODIMETHYLAMINE						85.7 U				86.9 U	88 U
N-NITROSODIPHENYLAMINE						85.7 U				86.9 U	88 U
N-NITROSOMETHYLETHYLAMINE						85.7 U				86.9 U	88 U
N-NITROSOMORPHOLINE						85.7 U				86.9 U	88 U
N-NITROSOPIPERIDINE						85.7 U				86.9 U	88 U
N-NITROSOPYRROLIDINE						85.7 U				86.9 U	88 U
NAPHTHALENE						4.22 U				7 J	4.34 U
O,O,O-TRIETHYL PHOSPHOROTHIOATE						85.7 U				86.9 U	88 U
O-TOLUIDINE						85.7 U				86.9 U	88 U
P-(DIMETHYLAMINO)AZOBENZENE						85.7 U				86.9 U	88 U
PENTACHLOROBENZENE						85.7 U				86.9 U	88 U
PENTACHLOROETHANE						85.7 U				86.9 U	88 U
PENTACHLORONITROBENZENE						85.7 U				86.9 U	88 U
PHENACETIN						85.7 U				86.9 U	88 U
PHENANTHRENE						10				6 J	5 J
PHENOL						85.7 U				86.9 U	88 U
PRONAMIDE						85.7 U				86.9 U	88 U
PYRENE						18				6 J	5 J
PYRIDINE						85.7 U				86.9 U	88 U
SAFROLE						85.7 U				86.9 U	88 U
Energetics (mg/kg)											
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	2.4 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DIAMINO-6-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DIAMINO-4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3,5-DINITROANILINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4,4'-TN-AZOXY	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
DNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
MNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	EASTTRIB	EASTTRIB	EASTTRIB	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD23	12SW/SD24	12SW/SD16	12SW/SD01	12SW/SD02	12SW/SD03	12SW/SD04	12SW/SD05	12SW/SD06	12SW/SD07	12SW/SD07
SAMPLE NUMBER	12SD230004	12SD240004	12SD160004	12SD010004	12SD020004	12SD030004	12SD040004	12SD050004	12SD060004	12SD070004	12SD070004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/13/2004	10/11/2004	10/13/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/11/2004	10/11/2004
Herbicides (ug/kg)											
HEXACHLOROPHENE						1.09 U				1.1 U	1.12 U
PENTACHLOROPHENOL						0.575 U				0.584 U	0.591 U
Inorganics (mg/kg)											
ALUMINUM	17200 J	8080 J	10900 J	10300 J	18200 J	17300 J	14600 J	12000 J	12100 J	15400 J	15500 J
ANTIMONY	1.2 J	1.5 U	0.81 J	1 U	0.45 U	0.5 U	0.51 U	0.84 U	0.24 U	0.42 U	0.44 U
ARSENIC	10.9 J	15.5 U	15.3 J	9.6 U	9.4 U	15.5 U	12.6 U	9.5 U	5.2 U	5.1 U	6.6 U
BARIUM	177 U	65 J	108 J	149 J	108 J	69.7 J	150 J	81 J	103 J	153 J	153 J
BERYLLIUM	1.1 U	1.2 U	1.2 U	0.53 U	0.71 U	0.64 U	1.2 U	1.2 U	0.67 U	0.9 U	1 U
CADMIUM	0.56 U	0.86 U	0.57 U	1.7 U	0.74 U	0.71 U	0.4 U	0.37 U	0.38 U	0.6 U	0.68 U
CALCIUM	1920 J	897 J	9270 J	3900 J	3880 J	65300 J	1580 J	1040 J	2860 J	1730 J	1670 J
CHROMIUM	26.8 J	32.8 J	29 J	17.8 U	23.6 J	41 J	19.1 J	25 J	14.7 U	16.8 U	16.9 U
COBALT	40.4 J	19.4 J	28.3 J	17.3 U	8.9 U	6.9 U	32.5 J	20.8 J	15.7 U	13.3 U	13.9 U
COPPER	13 J	29.4 J	11.5 J	11.3 U	17.7 J	11.3 U	11.8 U	10.5 U	13.9 U	18.3 J	18.1 J
IRON	31900 J	70700 J	44600 J	24800 J	24200 J	39800 J	34000 J	61300 J	14100 J	15700 J	14300 J
LEAD	22.8 J	58.2 J	25.2 J	14.2 J	17.3 J	24.6 J	20.3 J	22.6 J	12.6 J	17.3 J	16.7 J
MAGNESIUM	1340 J	710 J	2090 J	1300 J	1790 J	2150 J	1210 J	1290 J	1320 J	1330 J	1370 J
MANGANESE	2910 J	1480 J	2060 J	2610 J	545 U	473 U	3000 J	2270 J	972 J	1250 J	1250 J
MERCURY	0.038 J	0.012 J	0.027 J	0.029 J	0.037 J	0.035 J	0.043 J	0.019 J	0.036 J	0.04 J	0.041 J
NICKEL	32.1 J	26 J	31.3 J	11.7 U	13.5 U	12.2 U	27.5 J	22.9 J	16.6 J	16.9 J	18 J
POTASSIUM	1210 J	838 J	1200 J	1140 J	2360 J	1270 J	1230 J	1730 J	1770 J	1370 J	1360 J
SELENIUM	0.58 U	0.39 U	0.61 U	0.32 U	0.54 U	0.35 U	0.71 U	0.38 U	0.33 U	0.48 U	0.54 U
SILVER	0.042 U	0.047 U	0.05 U	0.054 U	0.043 U	0.06 U	0.047 U	0.043 U	0.051 U	0.05 U	0.15 U
SODIUM	35.6 U	24.9 U	60.9 U	46.2 U	102 J	89.7 J	28.9 U	41.2 U	37.2 U	42.6 U	46.8 U
THALLIUM	0.21 U	0.16 U	0.13 U	0.14 U	0.15 U	0.17 U	0.17 U	0.15 U	0.17 U	0.27 U	0.22 U
TIN	0.42 U	3.1 U	0.61 U	0.48 U	0.53 U	0.63 U	0.43 U	0.33 U	0.45 U	0.5 U	0.64 U
VANADIUM	31 J	36 J	30.7 J	23.4 J	34.3 J	55.8 J	28.2 J	33.5 J	19.3 U	24.3 J	23.3 J
ZINC	75.7 J	158 U	71.2 J	73.8 J	70.7 J	61.9 J	70.5 J	61.9 J	46.1 J	46.6 J	47.5 J
AVS/SEM (UMO/G)											
ACID VOLATILE SULFIDE			0.26 UJ	3.08 J			0.41 U			0.26 U	0.48 U
CADMIUM			0.023 U	0.0016 U			0.0014 U			0.0025	0.0027
COPPER			0.067	0.14			0.035			0.14	0.16
LEAD			0.068 J	0.058			0.04			0.044 J	0.05 J
MERCURY			0.00016	0.00028			0.00017			0.00016 U	0.00016 U
NICKEL			0.14 J	0.1			0.094			0.084	0.092
SILVER			0.0028 UJ	0.0072 U			0.0028 U			0.0381 J	0.0029 U
ZINC			0.32 J	1.1 J			0.23 J			0.17 U	0.19 U
Miscellaneous Parameters											
CATION EXCHANGE CAPACITY (MEQ/1)			6.6 J							22 J	21 J
PH (S.U.)			8.1							6.1	5.9
TOTAL ORGANIC CARBON (mg/kg)			10900							31000 J	26000 J

APPENDIX G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD09	12SW/SD10	12SW/SD11	12SW/SD12	12SW/SD13	12SW/SD14	12SW/SD15	12SW/SD17	12SW/SD18	12SW/SD19	12SW/SD20
SAMPLE NUMBER	12SD090004	12SD100004	12SD110004	12SD120004	12SD130004	12SD140004	12SD150004	12SD170004	12SD180004	12SD190004	12SD200004
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/11/2004	10/11/2004	10/12/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/12/2004	10/13/2004
Semivolatile Organics (ug/kg)											
1,2,4,5-TETRACHLOROBENZENE	74.1 U										
1,2,4-TRICHLOROBENZENE	74.1 U										
1,2-DICHLOROBENZENE	74.1 U										
1,3-DICHLOROBENZENE	74.1 U										
1,4-DICHLOROBENZENE	74.1 U										
1,4-NAPHTHOQUINONE	74.1 U										
1,4-PHENYLENEDIAMINE	74.1 U										
1-NAPHTHYLAMINE	74.1 U										
2,2'-OXYBIS(1-CHLOROPROPANE)	74.1 U										
2,3,4,6-TETRACHLOROPHENOL	74.1 U										
2,4,5-TRICHLOROPHENOL	74.1 U										
2,4,6-TRICHLOROPHENOL	74.1 U										
2,4-DICHLOROPHENOL	74.1 U										
2,4-DIMETHYLPHENOL	74.1 U										
2,4-DINITROPHENOL	74.1 U										
2,6-DICHLOROPHENOL	74.1 U										
2-ACETYLAMINOFLUORENE	74.1 U										
2-CHLORONAPHTHALENE	74.1 U										
2-CHLOROPHENOL	74.1 U										
2-METHYLNAPHTHALENE	3.65 U										
2-METHYLPHENOL	74.1 U										
2-NAPHTHYLAMINE	74.1 U										
2-NITROANILINE	74.1 U										
2-NITROPHENOL	74.1 U										
2-PICOLINE	74.1 U										
3&4-METHYLPHENOL	74.1 U										
3,3'-DICHLOROBENZIDINE	74.1 U										
3,3'-DIMETHYLBENZIDINE	74.1 U										
3-METHYLCHOLANTHRENE	74.1 U										
3-NITROANILINE	74.1 U										
4,6-DINITRO-2-METHYLPHENOL	74.1 U										
4-AMINOBIPHENYL	74.1 U										
4-BROMOPHENYL PHENYL ETHER	74.1 U										
4-CHLORO-3-METHYLPHENOL	74.1 U										
4-CHLOROANILINE	74.1 U										
4-CHLOROPHENYL PHENYL ETHER	74.1 U										
4-NITROANILINE	74.1 U										
4-NITROPHENOL	74.1 U										
4-NITROQUINOLINE-1-OXIDE	74.1 UR										
5-NITRO-O-TOLUIDINE	74.1 U										
7,12-DIMETHYLBENZ(A)ANTHRACENE	74.1 U										
A,A-DIMETHYLPHENETHYLAMINE	74.1 U										

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD09	12SW/SD10	12SW/SD11	12SW/SD12	12SW/SD13	12SW/SD14	12SW/SD15	12SW/SD17	12SW/SD18	12SW/SD19	12SW/SD20
SAMPLE NUMBER	12SD090004	12SD100004	12SD110004	12SD120004	12SD130004	12SD140004	12SD150004	12SD170004	12SD180004	12SD190004	12SD200004
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/11/2004	10/11/2004	10/12/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/12/2004	10/13/2004
ACENAPHTHENE	3.65 U										
ACENAPHTHYLENE	3.65 U										
ACETOPHENONE	74.1 U										
ANILINE	74.1 U										
ANTHRACENE	3.65 U										
ARAMITE	74.1 U										
BENZO(A)ANTHRACENE	3.65 U										
BENZO(A)PYRENE	3.65 U										
BENZO(B)FLUORANTHENE	3.65 U										
BENZO(G,H,I)PERYLENE	3.65 U										
BENZO(K)FLUORANTHENE	3.65 U										
BENZYL ALCOHOL	74.1 U										
BIS(2-CHLOROETHOXY)METHANE	74.1 U										
BIS(2-CHLOROETHYL)ETHER	74.1 U										
BIS(2-ETHYLHEXYL)PHTHALATE	74.1 U										
BUTYL BENZYL PHTHALATE	74.1 U										
CHLOROBENZILATE	74.1 U										
CHRYSENE	3.65 U										
DI-N-BUTYL PHTHALATE	74.1 U										
DI-N-OCTYL PHTHALATE	74.1 U										
DIALLATE	74.1 U										
DIBENZO(A,H)ANTHRACENE	3.65 U										
DIBENZOFURAN	74.1 U										
DIETHYL PHTHALATE	74.1 U										
DIMETHYL PHTHALATE	74.1 U										
DIPHENYLAMINE	74.1 U										
ETHYL METHANE SULFONATE	74.1 U										
FLUORANTHENE	4 J										
FLUORENE	3.65 U										
HEXACHLOROBENZENE	74.1 U										
HEXACHLOROBUTADIENE	74.1 U										
HEXACHLOROCYCLOPENTADIENE	74.1 UJ										
HEXACHLOROETHANE	74.1 U										
HEXACHLOROPROPENE	74.1 U										
INDENO(1,2,3-CD)PYRENE	3.65 U										
ISODRIN	74.1 U										
ISOPHORONE	74.1 U										
ISOSAFROLE	74.1 U										
KEPONE	74.1 UJ										
METHAPYRILENE	74.1 U										
METHYL METHANE SULFONATE	74.1 U										
N-NITROSO-DI-N-BUTYLAMINE	74.1 U										
N-NITROSO-DI-N-PROPYLAMINE	74.1 U										

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD09	12SW/SD10	12SW/SD11	12SW/SD12	12SW/SD13	12SW/SD14	12SW/SD15	12SW/SD17	12SW/SD18	12SW/SD19	12SW/SD20
SAMPLE NUMBER	12SD090004	12SD100004	12SD110004	12SD120004	12SD130004	12SD140004	12SD150004	12SD170004	12SD180004	12SD190004	12SD200004
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/11/2004	10/11/2004	10/12/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/12/2004	10/13/2004
N-NITROSODIETHYLAMINE	74.1 U										
N-NITROSODIMETHYLAMINE	74.1 U										
N-NITROSODIPHENYLAMINE	74.1 U										
N-NITROSOMETHYLETHYLAMINE	74.1 U										
N-NITROSOMORPHOLINE	74.1 U										
N-NITROSOPIPERIDINE	74.1 U										
N-NITROSOPYRROLIDINE	74.1 U										
NAPHTHALENE	3.65 U										
O,O,O-TRIETHYL PHOSPHOROTHIOATE	74.1 U										
O-TOLUIDINE	74.1 U										
P-(DIMETHYLAMINO)AZOBENZENE	74.1 U										
PENTACHLOROBENZENE	74.1 U										
PENTACHLOROETHANE	74.1 U										
PENTACHLORONITROBENZENE	74.1 U										
PHENACETIN	74.1 U										
PHENANTHRENE	3.65 U										
PHENOL	74.1 U										
PRONAMIDE	74.1 U										
PYRENE	3.65 U										
PYRIDINE	74.1 U										
SAFROLE	74.1 U										
Energetics (mg/kg)											
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.4 J	0.44 J	0.6	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DIAMINO-6-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DIAMINO-4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3,5-DINITROANILINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4,4'-TN-AZOXY	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
DNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
MNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01	01	01	01
LOCATION	12SW/SD09	12SW/SD10	12SW/SD11	12SW/SD12	12SW/SD13	12SW/SD14	12SW/SD15	12SW/SD17	12SW/SD18	12SW/SD19	12SW/SD20
SAMPLE NUMBER	12SD090004	12SD100004	12SD110004	12SD120004	12SD130004	12SD140004	12SD150004	12SD170004	12SD180004	12SD190004	12SD200004
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/11/2004	10/11/2004	10/12/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/13/2004	10/12/2004	10/13/2004
Herbicides (ug/kg)											
HEXACHLOROPHENE	0.94 U										
PENTACHLOROPHENOL	0.498 U										
Inorganics (mg/kg)											
ALUMINUM	13700 J	12800 J	13400 J	25700 J	17200 J	23400 J	24500 J	14500 J	24700 J	12900 J	14800 J
ANTIMONY	1.8 U	2.3 U	0.93 U	2.2 J	4.2 J	0.58 U	0.49 U	1.6 J	0.85 J	1.3 U	0.55 U
ARSENIC	32.6 J	30.6 J	23.6 J	16.1 J	25.7 J	12.2 J	11.1 J	36 J	9.3 J	25.6 J	21.1 J
BARIUM	182 J	73.1 J	143 J	183 U	220 U	88.5 J	85.3 J	138 U	138 J	82.3 J	64.6 J
BERYLLIUM	2.4 U	2.3 U	1.8 U	1.5 U	2.7 U	0.81 U	0.74 U	1.5 U	0.88 U	1.5 U	0.98 U
CADMIUM	0.66 U	0.64 U	0.59 U	1.1 U	1.2 U	0.87 U	7.4 J	6.2 J	4.9 U	0.77 U	0.63 U
CALCIUM	897 J	1330 J	1470 J	2030 J	1130 J	40700 J	19600 J	3060 J	9630 J	893 J	14300 J
CHROMIUM	82 J	84 J	39.6 J	34.4 J	41.5 J	35.9 J	29.9 J	83.9 J	24.5 J	45.4 J	36.7 J
COBALT	32.6 J	25.2 J	24.1 J	98.6 J	108 J	10.2 J	5.5 J	29.7 J	13.6 J	15.9 J	12.2 J
COPPER	16.9 J	15.2 J	15.5 J	17.1 J	16.9 J	22.5 J	18.6 J	22.5 J	15.9 J	17.1 J	10.6 J
IRON	171000 J	217000 J	95700 J	51800 J	100000 J	30000 J	28700 J	88700 J	24400 J	77700 J	67300 J
LEAD	44.7 J	36.5 J	23.8 J	38.4 J	39.5 J	42.3 J	25.9 J	178 J	19.8 J	26.7 J	25.4 J
MAGNESIUM	937 J	670 J	1130 J	1920 J	956 J	8190 J	2520 J	1310 J	2670 J	803 J	2330 J
MANGANESE	3130 J	2400 J	1620 J	5730 J	6780 J	1090 J	217 J	2690 J	1200 J	1310 J	366 J
MERCURY	0.044 J	0.029 J	0.021 J	0.053 J	0.049 J	0.063 J	0.034 J	0.048 J	0.038 J	0.051 J	0.022 J
NICKEL	39.7 J	43.1 J	40.3 J	35.6 J	80.9 J	16 J	14.9 J	32.7 J	15.9 J	32.9 J	17.9 J
POTASSIUM	1150 J	969 J	1640 J	1680 J	1120 J	2440 J	1630 J	1300 J	1880 J	1250 J	1160 J
SELENIUM	1.1 U	0.52 U	0.59 U	0.92 U	1.5 U	0.62 U	0.42 U	0.81 U	0.46 U	0.89 U	0.49 U
SILVER	0.04 U	0.044 U	0.051 U	0.054 U	0.044 U	0.06 U	0.13 U	0.05 U	0.051 U	0.041 U	0.05 U
SODIUM	28.6 U	32.3 U	39.7 U	62.8 U	27.5 U	154 U	52.8 U	49.3 U	49.9 U	25.5 U	66.6 U
THALLIUM	0.18 U	0.17 U	0.11 U	0.28 U	0.28 U	0.2 U	0.26 U	0.26 U	0.25 U	0.13 U	0.12 U
TIN	0.38 U	3.1 J	0.5 U	2.6 J	0.47 U	0.59 U	0.57 U	2.7 J	0.59 U	0.41 U	0.41 U
VANADIUM	71 J	67 J	41.7 J	48.7 J	47.3 J	42.1 J	38.1 J	63.2 J	39.6 J	43.8 J	49.2 J
ZINC	121 U	138 U	95.8 J	263 J	175 J	261 J	87.6 J	528 U	79.7 J	71.7 J	78.9 J
AVS/SEM (UMO/G)											
ACID VOLATILE SULFIDE		0.46 U			0.47 J					0.46 U	
CADMIUM		0.0013 U			0.0044					0.0027	
COPPER		0.088			0.059					0.035	
LEAD		0.038 J			0.058 J					0.03	
MERCURY		0.00026 U			0.00018					0.00014	
NICKEL		0.16			0.49 J					0.042	
SILVER		0.0025 U			0.0098 U					0.0025 U	
ZINC		0.22 J			0.75 J					0.12 J	
Miscellaneous Parameters											
CATION EXCHANGE CAPACITY (MEQ/1)		8.2 J			7.6 J					6.9 J	
PH (S.U.)		8.1			7.4					7.2	
TOTAL ORGANIC CARBON (mg/kg)		2600 J			12300					5500 J	

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01
LOCATION	12SW/SD21	12SW/SD08	12SW/SD22	12SW/SD26	12SW/SD28	12SW/SD29	12SW/SD30	12SW/SD30
SAMPLE NUMBER	12SD210004	12SD080004	12SD220004	12SD260004	12SD280004	12SD290004	12SD300004	12SD300004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	10/12/2004	10/11/2004	10/14/2004	10/13/2004	10/13/2004	10/13/2004
Semivolatile Organics (ug/kg)								
1,2,4,5-TETRACHLOROBENZENE								
1,2,4-TRICHLOROBENZENE								
1,2-DICHLOROBENZENE								
1,3-DICHLOROBENZENE								
1,4-DICHLOROBENZENE								
1,4-NAPHTHOQUINONE								
1,4-PHENYLENEDIAMINE								
1-NAPHTHYLAMINE								
2,2'-OXYBIS(1-CHLOROPROPANE)								
2,3,4,6-TETRACHLOROPHENOL								
2,4,5-TRICHLOROPHENOL								
2,4,6-TRICHLOROPHENOL								
2,4-DICHLOROPHENOL								
2,4-DIMETHYLPHENOL								
2,4-DINITROPHENOL								
2,6-DICHLOROPHENOL								
2-ACETYLAMINOFLUORENE								
2-CHLORONAPHTHALENE								
2-CHLOROPHENOL								
2-METHYLNAPHTHALENE								
2-METHYLPHENOL								
2-NAPHTHYLAMINE								
2-NITROANILINE								
2-NITROPHENOL								
2-PICOLINE								
3&4-METHYLPHENOL								
3,3'-DICHLOROBENZIDINE								
3,3'-DIMETHYLBENZIDINE								
3-METHYLCHOLANTHRENE								
3-NITROANILINE								
4,6-DINITRO-2-METHYLPHENOL								
4-AMINOBIPHENYL								
4-BROMOPHENYL PHENYL ETHER								
4-CHLORO-3-METHYLPHENOL								
4-CHLOROANILINE								
4-CHLOROPHENYL PHENYL ETHER								
4-NITROANILINE								
4-NITROPHENOL								
4-NITROQUINOLINE-1-OXIDE								
5-NITRO-O-TOLUIDINE								
7,12-DIMETHYLBENZ(A)ANTHRACENE								
A,A-DIMETHYLPHENETHYLAMINE								

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01
LOCATION	12SW/SD21	12SW/SD08	12SW/SD22	12SW/SD26	12SW/SD28	12SW/SD29	12SW/SD30	12SW/SD30
SAMPLE NUMBER	12SD210004	12SD080004	12SD220004	12SD260004	12SD280004	12SD290004	12SD300004	12SD300004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	10/12/2004	10/11/2004	10/14/2004	10/13/2004	10/13/2004	10/13/2004
ACENAPHTHENE								
ACENAPHTHYLENE								
ACETOPHENONE								
ANILINE								
ANTHRACENE								
ARAMITE								
BENZO(A)ANTHRACENE								
BENZO(A)PYRENE								
BENZO(B)FLUORANTHENE								
BENZO(G,H,I)PERYLENE								
BENZO(K)FLUORANTHENE								
BENZYL ALCOHOL								
BIS(2-CHLOROETHOXY)METHANE								
BIS(2-CHLOROETHYL)ETHER								
BIS(2-ETHYLHEXYL)PHTHALATE								
BUTYL BENZYL PHTHALATE								
CHLOROBENZILATE								
CHRYSENE								
DI-N-BUTYL PHTHALATE								
DI-N-OCTYL PHTHALATE								
DIALLATE								
DIBENZO(A,H)ANTHRACENE								
DIBENZOFURAN								
DIETHYL PHTHALATE								
DIMETHYL PHTHALATE								
DIPHENYLAMINE								
ETHYL METHANE SULFONATE								
FLUORANTHENE								
FLUORENE								
HEXACHLOROBENZENE								
HEXACHLOROBUTADIENE								
HEXACHLOROCYCLOPENTADIENE								
HEXACHLOROETHANE								
HEXACHLOROPROPENE								
INDENO(1,2,3-CD)PYRENE								
ISODRIN								
ISOPHORONE								
ISOSAFROLE								
KEPONE								
METHAPYRILENE								
METHYL METHANE SULFONATE								
N-NITROSO-DI-N-BUTYLAMINE								
N-NITROSO-DI-N-PROPYLAMINE								

APPEND. .BLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01
LOCATION	12SW/SD21	12SW/SD08	12SW/SD22	12SW/SD26	12SW/SD28	12SW/SD29	12SW/SD30	12SW/SD30
SAMPLE NUMBER	12SD210004	12SD080004	12SD220004	12SD260004	12SD280004	12SD290004	12SD300004	12SD300004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	10/12/2004	10/11/2004	10/14/2004	10/13/2004	10/13/2004	10/13/2004
N-NITROSODIETHYLAMINE								
N-NITROSODIMETHYLAMINE								
N-NITROSODIPHENYLAMINE								
N-NITROSOMETHYLETHYLAMINE								
N-NITROSOMORPHOLINE								
N-NITROSOPIPERIDINE								
N-NITROSOPYRROLIDINE								
NAPHTHALENE								
O,O,O-TRIETHYL PHOSPHOROTHIOATE								
O-TOLUIDINE								
P-(DIMETHYLAMINO)AZOBENZENE								
PENTACHLOROBENZENE								
PENTACHLOROETHANE								
PENTACHLORONITROBENZENE								
PHENACETIN								
PHENANTHRENE								
PHENOL								
PRONAMIDE								
PYRENE								
PYRIDINE								
SAFROLE								
Energetics (mg/kg)								
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DIAMINO-6-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DIAMINO-4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3,5-DINITROANILINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4,4'-TN-AZOXY	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
DNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
MNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TNX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD
STREAM ORDER	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY	GULLY
SAMPLING ROUND	01	01	01	01	01	01	01	01
LOCATION	12SW/SD21	12SW/SD08	12SW/SD22	12SW/SD26	12SW/SD28	12SW/SD29	12SW/SD30	12SW/SD30
SAMPLE NUMBER	12SD210004	12SD080004	12SD220004	12SD260004	12SD280004	12SD290004	12SD300004	12SD300004-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	10/12/2004	10/11/2004	10/14/2004	10/13/2004	10/13/2004	10/13/2004
Herbicides (ug/kg)								
HEXACHLOROPHENE								
PENTACHLOROPHENOL								
Inorganics (mg/kg)								
ALUMINUM	17200 J	17000 J	15500 J	12900 J	14200 J	23800 J	17800 J	16100 J
ANTIMONY	1.2 U	1 U	1.1 U	1.5 U	0.57 U	0.69 U	0.56 U	0.67 J
ARSENIC	29.3 J	21.6 J	21.9 J	34.5 J	26.2 J	20.2 J	12.2 J	13.2 J
BARIUM	160 J	196 J	83.8 J	129 J	138 J	172 J	70.1 J	80.6 J
BERYLLIUM	2.3 U	1.9 U	2.1 U	2.8 U	2.2 U	1.4 U	0.72 U	0.74 U
CADMIUM	0.87 U	0.7 U	0.58 U	0.77 U	1 U	0.61 U	1.3 U	1.3 U
CALCIUM	1180 J	1610 J	2930 J	3360 J	3490 J	3650 J	46900 J	46400 J
CHROMIUM	141 J	59.7 J	60.3 J	72.6 J	64.7 J	22.8 J	22.1 J	21.6 J
COBALT	35.1 J	65.9 J	23.3 J	41 J	31.7 J	15.7 J	7.9 J	8.1 J
COPPER	17.1 J	14.8 J	15.4 J	41.9 J	15.4 J	17.9 J	15.3 J	15.4 J
IRON	163000 J	87000 J	104000 J	210000 J	121000 J	30700 J	22900 J	24500 J
LEAD	60.3 J	43.9 J	35.7 J	30.5 J	41.5 J	23.9 J	30.2 J	27.7 J
MAGNESIUM	977 J	1230 J	1830 J	1960 J	1130 J	3050 J	4670 J	5120 J
MANGANESE	2690 J	4430 J	2000 J	3310 J	2470 J	1080 J	253 J	283 J
MERCURY	0.042 J	0.039 J	0.059 J	0.037 J	0.039 J	0.034 J	0.029 J	0.022 J
NICKEL	45.4 J	50.5 J	34.1 J	63.9 J	48.1 J	27.2 J	16.1 J	17 J
POTASSIUM	1160 J	1370 J	1680 J	866 J	1340 J	2200 J	1540 J	1490 J
SELENIUM	1 U	0.83 U	0.98 U	0.91 U	0.75 U	0.38 U	0.36 U	0.35 U
SILVER	0.06 U	0.05 U	0.043 U	0.045 U	0.049 U	0.058 U	0.052 U	0.051 U
SODIUM	28.6 U	58.4 U	31.4 U	27.2 U	37.7 U	53.1 U	118 U	109 U
THALLIUM	0.15 U	0.3 U	0.13 U	0.19 U	0.16 U	0.19 U	0.16 U	0.17 U
TIN	0.37 U	0.56 U	0.43 U	0.49 U	0.43 U	0.69 U	0.81 U	0.98 U
VANADIUM	133 U	54.4 J	54.3 J	62.4 J	53.2 J	29.6 J	30.4 J	29.2 J
ZINC	84.1 J	84.9 J	57.6 J	188 U	154 U	85.2 J	363 J	346 J
AVS/SEM (UMO/G)								
ACID VOLATILE SULFIDE			0.54 U					
CADMIUM			0.0012 U					
COPPER			0.043					
LEAD			0.079					
MERCURY			0.0019					
NICKEL			0.18					
SILVER			0.0235 U					
ZINC			0.21 J					
Miscellaneous Parameters								
CATION EXCHANGE CAPACITY (MEQ/1)			8.2 J					
PH (S.U.)			7.3					
TOTAL ORGANIC CARBON (mg/kg)			10000 J					

APPENDIX G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
SAMPLING ROUND	01	01	---	---
LOCATION	12SW/SD27	12SW/SD25	13SW/SD44	13SW/SD45
SAMPLE NUMBER	12SD270004	12SD250004	13SD4401	13SD4501
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	5/17/2005	5/17/2005
Semivolatile Organics (ug/kg)				
1,2,4,5-TETRACHLOROBENZENE				
1,2,4-TRICHLOROBENZENE				
1,2-DICHLOROBENZENE				
1,3-DICHLOROBENZENE				
1,4-DICHLOROBENZENE				
1,4-NAPHTHOQUINONE				
1,4-PHENYLENEDIAMINE				
1-NAPHTHYLAMINE				
2,2'-OXYBIS(1-CHLOROPROPANE)				
2,3,4,6-TETRACHLOROPHENOL				
2,4,5-TRICHLOROPHENOL				
2,4,6-TRICHLOROPHENOL				
2,4-DICHLOROPHENOL				
2,4-DIMETHYLPHENOL				
2,4-DINITROPHENOL				
2,6-DICHLOROPHENOL				
2-ACETYLAMINOFLUORENE				
2-CHLORONAPHTHALENE				
2-CHLOROPHENOL				
2-METHYLNAPHTHALENE				
2-METHYLPHENOL				
2-NAPHTHYLAMINE				
2-NITROANILINE				
2-NITROPHENOL				
2-PICOLINE				
3&4-METHYLPHENOL				
3,3'-DICHLOROBENZIDINE				
3,3'-DIMETHYLBENZIDINE				
3-METHYLCHOLANTHRENE				
3-NITROANILINE				
4,6-DINITRO-2-METHYLPHENOL				
4-AMINOBIPHENYL				
4-BROMOPHENYL PHENYL ETHER				
4-CHLORO-3-METHYLPHENOL				
4-CHLOROANILINE				
4-CHLOROPHENYL PHENYL ETHER				
4-NITROANILINE				
4-NITROPHENOL				
4-NITROQUINOLINE-1-OXIDE				
5-NITRO-O-TOLUIDINE				
7,12-DIMETHYLBENZ(A)ANTHRACENE				
A,A-DIMETHYLPHENETHYLAMINE				

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
SAMPLING ROUND	01	01	---	---
LOCATION	12SW/SD27	12SW/SD25	13SW/SD44	13SW/SD45
SAMPLE NUMBER	12SD270004	12SD250004	13SD4401	13SD4501
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	5/17/2005	5/17/2005
ACENAPHTHENE				
ACENAPHTHYLENE				
ACETOPHENONE				
ANILINE				
ANTHRACENE				
ARAMITE				
BENZO(A)ANTHRACENE				
BENZO(A)PYRENE				
BENZO(B)FLUORANTHENE				
BENZO(G,H,I)PERYLENE				
BENZO(K)FLUORANTHENE				
BENZYL ALCOHOL				
BIS(2-CHLOROETHOXY)METHANE				
BIS(2-CHLOROETHYL)ETHER				
BIS(2-ETHYLHEXYL)PHTHALATE				
BUTYL BENZYL PHTHALATE				
CHLOROBENZILATE				
CHRYSENE				
DI-N-BUTYL PHTHALATE				
DI-N-OCTYL PHTHALATE				
DIALLATE				
DIBENZO(A,H)ANTHRACENE				
DIBENZOFURAN				
DIETHYL PHTHALATE				
DIMETHYL PHTHALATE				
DIPHENYLAMINE				
ETHYL METHANE SULFONATE				
FLUORANTHENE				
FLUORENE				
HEXACHLOROBENZENE				
HEXACHLOROBUTADIENE				
HEXACHLOROCYCLOPENTADIENE				
HEXACHLOROETHANE				
HEXACHLOROPROPENE				
INDENO(1,2,3-CD)PYRENE				
ISODRIN				
ISOPHORONE				
ISOSAFROLE				
KEPONE				
METHAPYRILENE				
METHYL METHANE SULFONATE				
N-NITROSO-DI-N-BUTYLAMINE				
N-NITROSO-DI-N-PROPYLAMINE				

APPENL 8LE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
SAMPLING ROUND	01	01	---	---
LOCATION	12SW/SD27	12SW/SD25	13SW/SD44	13SW/SD45
SAMPLE NUMBER	12SD270004	12SD250004	13SD4401	13SD4501
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	5/17/2005	5/17/2005
N-NITROSODIETHYLAMINE				
N-NITROSODIMETHYLAMINE				
N-NITROSODIPHENYLAMINE				
N-NITROSOMETHYLETHYLAMINE				
N-NITROSOMORPHOLINE				
N-NITROSOPIPERIDINE				
N-NITROSOPYRROLIDINE				
NAPHTHALENE				
O,O,O-TRIETHYL PHOSPHOROTHIOATE				
O-TOLUIDINE				
P-(DIMETHYLAMINO)AZOBENZENE				
PENTACHLOROBENZENE				
PENTACHLOROETHANE				
PENTACHLORONITROBENZENE				
PHENACETIN				
PHENANTHRENE				
PHENOL				
PRONAMIDE				
PYRENE				
PYRIDINE				
SAFROLE				
Energetics (mg/kg)				
1,3,5-TRINITROBENZENE	0.25 U	0.25 U		
1,3-DINITROBENZENE	0.25 U	0.25 U		
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U		
2,4-DIAMINO-6-NITROTOLUENE	0.25 U	0.25 U		
2,4-DINITROTOLUENE	0.25 U	0.25 U		
2,6-DIAMINO-4-NITROTOLUENE	0.25 U	0.25 U		
2,6-DINITROTOLUENE	0.25 U	0.25 U		
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U		
2-NITROTOLUENE	0.25 U	0.25 U		
3,5-DINITROANILINE	0.25 U	0.25 U		
3-NITROTOLUENE	0.25 U	0.25 U		
4,4'-TN-AZOXY	0.5 U	0.5 U		
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U		
4-NITROTOLUENE	0.25 U	0.25 U		
DNX	0.25 U	0.25 U		
HMX	0.25 U	0.25 U		
MNX	0.25 U	0.25 U		
NITROBENZENE	0.25 U	0.25 U		
RDX	0.25 U	0.25 U		
TETRYL	0.25 U	0.25 U		
TNX	0.25 U	0.25 U		

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
SAMPLING ROUND	01	01	---	---
LOCATION	12SW/SD27	12SW/SD25	13SW/SD44	13SW/SD45
SAMPLE NUMBER	12SD270004	12SD250004	13SD4401	13SD4501
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	5/17/2005	5/17/2005
Herbicides (ug/kg)				
HEXACHLOROPHENE				
PENTACHLOROPHENOL				
Inorganics (mg/kg)				
ALUMINUM	11400 J	6760 J	5520 J	5360 J
ANTIMONY	1.7 U	0.84 U	0.2 U	0.18 U
ARSENIC	27.8 J	14.4 U	5 J	4.5 J
BARIUM	82.4 J	45.1 J	51.6 J	52.1 J
BERYLLIUM	2.6 U	0.87 U	0.49 J	0.43 J
CADMIUM	0.81 U	0.43 U	0.19 J	0.17 J
CALCIUM	1830 J	64000 J	835 J	703 J
CHROMIUM	70.4 J	26.4 J	12.1 J	11.8 J
COBALT	27.1 J	10.4 U	11.3 J	7 J
COPPER	19.8 J	6.8 U	7.5 J	6.3 J
IRON	157000 J	40000 J	15700 J	14100 J
LEAD	39.6 J	12.4 J	10.6 J	9.4 J
MAGNESIUM	748 J	6620 J	612 J	565 J
MANGANESE	1760 J	708 J	564	444
MERCURY	0.01 J	0.007 U		
NICKEL	52.1 J	22.8 J	13.7 J	10.7 J
POTASSIUM	810 J	903 J	788 J	748 J
SELENIUM	0.54 U	0.26 U	0.16 J	0.13 J
SILVER	0.044 U	0.047 U	0.053 U	0.052 U
SODIUM	23.6 U	69.3 U	4.1 U	3.97 U
THALLIUM	0.12 U	0.22 U	0.09 U	0.1 U
TIN	0.41 U	0.45 U	0.38 U	0.35 U
VANADIUM	57.8 J	24.8 J	14.5 J	14 J
ZINC	204 U	55.6 J	32 J	27.2 J
AVS/SEM (UMO/G)				
ACID VOLATILE SULFIDE				
CADMIUM				
COPPER				
LEAD				
MERCURY				
NICKEL				
SILVER				
ZINC				
Miscellaneous Parameters				
CATION EXCHANGE CAPACITY (MEQ/1)				
PH (S.U.)				
TOTAL ORGANIC CARBON (mg/kg)				

DOWNGRAD - downgradient well

APPENDIX TABLE G-5

RESULTS FOR CHEMICALS ANALYZED IN ALL SEDIMENT SAMPLES, ROUND 1 ONLY
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK	TURKEYCREEK
SAMPLING ROUND	01	01	---	---
LOCATION	12SW/SD27	12SW/SD25	13SW/SD44	13SW/SD45
SAMPLE NUMBER	12SD270004	12SD250004	13SD4401	13SD4501
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
SAMPLE DATE	10/12/2004	10/11/2004	5/17/2005	5/17/2005

UPGRAD - upgradient well
Data qualifiers (e.g., U, J) are defined in section 3 of the text.
ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
AVS - acid volatile sulfide
SEM - simultaneously extracted metals
UMO/G - micromoles per gram
MEQ/1 - milliequivalents per 100 grams
S.U. - standard units

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD
WATER BEARING ZONE	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD
SAMPLING ROUND	01	02	01	01	02	02	02	01	01	02	02
LOCATION	12MWT41	12MWT41	12MWT44	12MWT44	12MWT44	12MWT49	12MWT49	12MWT43	12MWT43	12MWT43	12MWT43
SAMPLE NUMBER	12GWT4101	12GWT4102	12GWT4401	12GWT4401-F	12GWT4402	12GWT4901	12GWT4901-F	12GWT4301	12GWT4301-F	12GWT4302	12GWT4302-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	11/10/2004	2/19/2005	11/10/2004	11/10/2004	2/19/2005	2/15/2005	2/15/2005	11/16/2004	11/17/2004	3/3/2005	3/4/2005
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
1,3-DINITROBENZENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
2,4,6-TRINITROTOLUENE	0.266 U	0.255 U	4.2		0.26 U	0.24 U		0.258 U		0.25 U	
2,4-DIAMINO-6-NITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
2,4-DINITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
2,6-DIAMINO-4-NITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
2,6-DINITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
2-AMINO-4,6-DINITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
2-NITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
3,5-DINITROANILINE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
3-NITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
4,4'-TN-AZOXY	0.532 U	0.51 U	0.515 U		0.52 U	0.48 U		0.515 U		0.5 U	
4-AMINO-2,6-DINITROTOLUENE	0.266 U	0.255 U	0.65		0.26 U	0.24 U		0.258 U		0.25 U	
4-NITROTOLUENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
DNX	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
HMX	0.266 U	0.255 U	0.28 J		0.26 U	0.24 U		0.258 U		0.25 U	
MNX	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
NITROBENZENE	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
RDX	0.266 U	0.255 U	3.9		0.26 U	0.24 U		0.258 U		0.25 U	
TETRYL	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
TNX	0.266 U	0.255 U	0.258 U		0.26 U	0.24 U		0.258 U		0.25 U	
Total Metals (ug/L)											
ALUMINUM	55.4 U	8.35 UJ	377 J		165 J	2540 J		18000 J		31600 J	
ANTIMONY	3.1 J	0.085 U	0.9 U		0.085 U	0.085 U		1.4 U		0.68 U	
ARSENIC	3.8 J	9.5 J	1.7 J		2.1 U	3 J		17.6 J		19.7	
BARIUM	24.8 J	20.5 U	63.4 J		36 J	79.3 J		1360 J		1950 J	
BERYLLIUM	0.02 U	0.02 U	0.06 U		0.03 U	0.21 U		1.6 J		2.2 J	
CADMIUM	0.68 U	0.1 U	0.95 U		0.15 U	0.33 U		1.4 U		0.71 J	
CALCIUM	136000	106000 J	138000		201000 J	154000 J		27200		33100	
CHROMIUM	0.64 U	0.58 U	2 U		1.3 U	6.6 J		28.4 J		78.9 J	
COBALT	5.3 J	1.2 U	12.1 J		14.7 J	8.7 J		39.1 J		54.3	
COPPER	1.2 J	1.4 U	3.8 J		4.1 J	6.4 J		45.1 J		58.5	
IRON	914 J	2900 J	2290 J		5980 J	7150 J		46100 J		84200 J	
LEAD	0.35 U	0.069 U	0.53 J		0.295 U	10.5 J		35.6 J		39.5	
MAGNESIUM	77700 J	59900 J	101000 J		171000 J	13000 J		7580 J		17300	
MANGANESE	1220	885 J	531		2190 J	1470 J		1340		1790	
MERCURY	0.03 U	0.03 U	0.03 U		0.03 U	0.03 U		0.03 U		0.056 J	
NICKEL	17.9 J	6.3 J	44.2 J		22.7 J	37 J		92.1 J		132	
POTASSIUM	5510 J	4230 J	7530 J		9660 J	2550 J		6290 J		10800 J	
SELENIUM	1.3 J	0.77 U	2 J		1.2 J	1.2 J		1.5 J		2.2 J	
SILVER	0.028 U	0.028 U	0.04 U		0.028 U	0.028 U		0.05 U		0.15 U	
SODIUM	69000 J	54200 J	158000 J		16800 J	6380 J		152000 J		208000 J	
THALLIUM	0.043 U	0.043 U	0.043 U		0.05 U	0.14 U		0.21 J		0.42 J	
TIN	0.26 U	0.1 U	0.73 U		0.36 U	4.2 J		1.9 J		2.4 J	
VANADIUM	1.14 U	1.14 U	1.14 U		1.14 U	4.9		39.9 J		58.5	
ZINC	7.5 U	10 J	9.1 J		10.1 J	40 J		158 J		244	
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED				126 U			18 U		861 J		8.35 U
ANTIMONY, FILTERED				0.44 U			0.33 U		3.5 J		3.5 J

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD
WATER BEARING ZONE	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD	PLZMGD
SAMPLING ROUND	01	02	01	01	02	02	02	01	01	02	02
LOCATION	12MWT41	12MWT41	12MWT44	12MWT44	12MWT44	12MWT49	12MWT49	12MWT43	12MWT43	12MWT43	12MWT43
SAMPLE NUMBER	12GWT4101	12GWT4102	12GWT4401	12GWT4401-F	12GWT4402	12GWT4901	12GWT4901-F	12GWT4301	12GWT4301-F	12GWT4302	12GWT4302-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	11/10/2004	2/19/2005	11/10/2004	11/10/2004	2/19/2005	2/15/2005	2/15/2005	11/16/2004	11/17/2004	3/3/2005	3/4/2005
ARSENIC, FILTERED				1.8 J			0.6 U		5.3 J		3.4
BARIUM, FILTERED				56.4 J			65 J		552 J		735 J
BERYLLIUM, FILTERED				0.02 U			0.04 U		0.07 U		0.02 U
CADMIUM, FILTERED				1.3 U			0.13 U		0.97 U		0.039 U
CALCIUM, FILTERED				150000 J			168000 J		12600 J		8860
CHROMIUM, FILTERED				0.65 U			0.23 U		2.7 J		0.21 U
COBALT, FILTERED				15.5			5.5 J		1.8		0.64 J
COPPER, FILTERED				3.6 J			0.3 U		5 J		2.4
IRON, FILTERED				1130 J			10.6 U		1870 J		6.15 U
LEAD, FILTERED				0.18 U			0.27 U		1.5 J		0.274 J
MAGNESIUM, FILTERED				112000 J			14600 J		3960 J		3240 J
MANGANESE, FILTERED				580 J			1240 J		65.6 J		134
MERCURY, FILTERED				0.03 U			0.03 U		0.03 U		0.03 U
NICKEL, FILTERED				73.9 J			21.8 J		6 J		3.4
POTASSIUM, FILTERED				7940 J			2260 J		3970 J		2910 J
SELENIUM, FILTERED				1.9 J			0.45 U		0.94 J		0.68 J
SILVER, FILTERED				0.028 U			0.028 U		0.09 U		0.028 U
SODIUM, FILTERED				172000 J			8390 J		171000 J		207000 J
THALLIUM, FILTERED				0.043 U			0.07 U		0.043 U		0.043 U
TIN, FILTERED				1 J			1.6 U		1.1 J		0.048 U
VANADIUM, FILTERED				1.14 U			1.14 U		2.3 J		1.14 U
ZINC, FILTERED				8 J			7.1 U		29 J		3.8 J
Field Parameters											
DISSOLVED OXYGEN (mg/L)	2.8	1.26	3.62		1.24	2.92		6.84		6.64	
OXIDATION REDUCTION POTENTIAL (MV)	71	-39	92		-60	188		85		-7	
PH (S.U.)	6.85	6.78	6.94		6.73	6.78		8.07		7.66	
SPECIFIC CONDUCTANCE (MS/CM)	0.922	0.754	1.475		1.668	0.652		0.422		0.471	
TEMPERATURE (C)	14.12	10.02	15.27		8.99	13.87		12.3		11.96	
TURBIDITY (NTU)	4	3.6	44		16	380		1000		1000 >	
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.16 J	0.46 J	0.28 J		0.5 J	0.32		0.83 J		0.9	
NITRITE/NITRATE-N	0.025 U	0.05 U	0.025 U		0.05 U	0.05 U		0.025 U		0.05 U	
TOTAL ORGANIC CARBON											

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ
SAMPLING ROUND	01	01	02	02	01	01	02	02	01	01	02
LOCATION	12MWT29	12MWT29	12MWT29	12MWT29	12MWT31	12MWT31	12MWT31	12MWT31	12MWT32	12MWT32	12MWT32
SAMPLE NUMBER	12GWT2901	12GWT2901-F	12GWT2902	12GWT2902-F	12GWT3101	12GWT3101-F	12GWT3102	12GWT3102-F	12GWT3201	12GWT3201-F	12GWT3202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/28/2004	9/28/2004	2/20/2005	2/20/2005	9/27/2004	9/27/2004	2/7/2005	2/7/2005	9/28/2004	9/28/2004	2/8/2005
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
1,3-DINITROBENZENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2,4,6-TRINITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2,4-DIAMINO-6-NITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2,4-DINITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2,6-DIAMINO-4-NITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2,6-DINITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2-AMINO-4,6-DINITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
2-NITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
3,5-DINITROANILINE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
3-NITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
4,4'-TN-AZOXY	0.55 U		0.528 U		0.532 U		0.55 U		0.495 U		0.485 U
4-AMINO-2,6-DINITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
4-NITROTOLUENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
DNX	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
HMX	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
MNX	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
NITROBENZENE	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
RDX	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
TETRYL	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
TNX	0.275 U		0.264 U		0.27 U		0.275 U		0.248 U		0.242 U
Total Metals (ug/L)											
ALUMINUM	2010 J		9940 J		1550 J		1490 J		3080 J		2880 J
ANTIMONY	2 J		0.085 U		2.9 J		0.41 U		2.2 J		0.085 U
ARSENIC	2.4 J		8.6 J		4 J		3.3 J		7.3 J		5.4 J
BARIUM	59 J		139 J		54.6 J		55.3 J		95.1 J		43.1 J
BERYLLIUM	0.2 J		0.69 U		0.09 U		0.13 U		0.33 J		0.28 U
CADMIUM	0.039 U		0.39 U		0.039 U		0.05 U		0.18 J		0.2 U
CALCIUM	61500		60900 J		13800 J		12300 J		182000		194000 J
CHROMIUM	6.6 J		21.5 J		4.7 J		3.9 J		9.1 J		7 J
COBALT	5.1		12.8 J		1.8 U		1.8 U		30		15.8 J
COPPER	8.3		20.5 J		3 J		6.9 J		7.3		5.1 J
IRON	5910		31500 J		2190 J		2630 J		9920		7110 J
LEAD	3.8		14.8 J		1.4 J		1.8 U		7.5		4.9 J
MAGNESIUM	27600		23800 J		4210 J		4080 J		112000		121000 J
MANGANESE	265		966 J		44.6 J		70.3 J		1260		926 J
MERCURY	0.03 U		0.03 U		0.034 U		0.03 U		0.033 U		0.03 U
NICKEL	15.8 J		37.1 J		5.5 U		5.8 J		108 J		43 J
POTASSIUM	5080 J		6200 J		3680 J		2840 J		10400 J		11200 J
SELENIUM	1.5 U		1.1 J		2.1 U		0.54 U		7.7 J		1.1 J
SILVER	0.028 U		0.08 U		0.028 U		0.03 U		0.028 U		0.028 U
SODIUM	161000 J		143000 J		139000 J		116000 J		19900 J		29900 J
THALLIUM	0.043 U		0.14 U		0.043 U		0.05 U		0.09 J		0.16 U
TIN	0.88 J		0.91 U		0.72 U		0.48 U		0.45 J		0.25 U
VANADIUM	4.8		16.7		4		3.4		9.9		6.8
ZINC	31.5 J		75.5 J		15.4 J		19.3 J		47.8 J		27.5 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED		25.9 U		9.1 J		62.5 U		19 U		9.1 U	
ANTIMONY, FILTERED		0.25 U		0.37 U		3.2 J		0.76 U		2.3 J	

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ
SAMPLING ROUND	01	01	02	02	01	01	02	02	01	01	02
LOCATION	12MWT29	12MWT29	12MWT29	12MWT29	12MWT31	12MWT31	12MWT31	12MWT31	12MWT32	12MWT32	12MWT32
SAMPLE NUMBER	12GWT2901	12GWT2901-F	12GWT2902	12GWT2902-F	12GWT3101	12GWT3101-F	12GWT3102	12GWT3102-F	12GWT3201	12GWT3201-F	12GWT3202
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/28/2004	9/28/2004	2/20/2005	2/20/2005	9/27/2004	9/27/2004	2/7/2005	2/7/2005	9/28/2004	9/28/2004	2/8/2005
ARSENIC, FILTERED		0.75 J		1.6 U		3.7 J		3 J		3.6 J	
BARIUM, FILTERED		31.7 J		40.7 J		35.6 J		43.4 J		68 J	
BERYLLIUM, FILTERED		0.02 U		0.02 U		0.02 U		0.02 U		0.02 U	
CADMIUM, FILTERED		0.15 J		0.039 U		0.039 U		0.039 U		0.11 J	
CALCIUM, FILTERED		62600		54100 J		13400 J		12600 J		237000	
CHROMIUM, FILTERED		0.67 U		0.15 U		0.81 J		0.28 U		0.78 U	
COBALT, FILTERED		1.9		0.8 U		0.24 U		0.13 U		29.2	
COPPER, FILTERED		3.5		0.16 U		1.1 J		0.3 U		2.2	
IRON, FILTERED		301		6.2 U		120 U		11.1 U		1250	
LEAD, FILTERED		0.069 U		0.27 U		0.09 U		0.26 U		0.12 J	
MAGNESIUM, FILTERED		27500 J		24800 J		4040 J		3650 J		139000 J	
MANGANESE, FILTERED		110 J		169		33.5 J		27.2 J		1310	
MERCURY, FILTERED		0.039 U		0.03 U		0.042 U		0.03 U		0.041 U	
NICKEL, FILTERED		6.8 J		2.1 U		0.88 U		0.68 U		102 J	
POTASSIUM, FILTERED		5040 J		4870 J		3400 J		2350 J		11900 J	
SELENIUM, FILTERED		1.3 U		0.41 U		2.4 U		0.17 U		7.6 J	
SILVER, FILTERED		0.028 U		0.028 U		0.028 U		0.028 U		0.028 U	
SODIUM, FILTERED		171000 J		165000 J		144000 J		129000 J		30900 J	
THALLIUM, FILTERED		0.043 U		0.043 U		0.043 U		0.05 U		0.043 U	
TIN, FILTERED		0.048 U		0.14 U		0.21 U		0.18 U		0.048 U	
VANADIUM, FILTERED		1.14 U		1.14 U		1.14 U		1.14 U		1.14 U	
ZINC, FILTERED		4.2 J		3.1 U		1.7 U		16.2 J		9.7 J	
Field Parameters											
DISSOLVED OXYGEN (mg/L)	3.71		0.21		6.45		1.16		11.72		1.06
OXIDATION REDUCTION POTENTIAL (MV)	207.3		72		301.900000		70.7		121.2		-7.1
PH (S.U.)	7.64		8.05		7.05		8.09		6.57		6.7
SPECIFIC CONDUCTANCE (MS/CM)	0.871		0.791		0.507		0.431		1.257		1.355
TEMPERATURE (C)	15.67		10.72		16.87		10.99		14.28		11.67
TURBIDITY (NTU)	28		1000 >		25		75		315		360
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.5		0.62 J		0.37 J		0.45		1		1.7
NITRITE/NITRATE-N	0.18		0.15		0.05 U		0.05 U		0.025 U		0.05 U
TOTAL ORGANIC CARBON											

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ
SAMPLING ROUND	02	01	02	01	02	02	01	02	02	01	01
LOCATION	12MWT32	12MWT34	12MWT34	12MWT45	12MWT45	12MWT45	12MWT46	12MWT46	12MWT46	12MWT47	12MWT47
SAMPLE NUMBER	12GWT3202-F	12GWT3401	12GWT3402	12GWT4501	12GWT4502	12GWT4502-F	12GWT4601	12GWT4602	12GWT4602-F	12GWT4701	12GWT4701-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	2/8/2005	10/30/2004	2/15/2005	11/13/2004	3/3/2005	3/3/2005	11/13/2004	3/3/2005	3/3/2005	11/13/2004	11/13/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
1,3-DINITROBENZENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2,4,6-TRINITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2,4-DIAMINO-6-NITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2,4-DINITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2,6-DIAMINO-4-NITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2,6-DINITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2-AMINO-4,6-DINITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
2-NITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
3,5-DINITROANILINE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
3-NITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
4,4'-TN-AZOXY		0.892 UJ	0.5 U	0.51 U	0.48 U		0.51 U	0.52 U		0.51 U	0.528 U
4-AMINO-2,6-DINITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
4-NITROTOLUENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
DNX		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
HMX		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
MNX		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
NITROBENZENE		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
RDX		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
TETRYL		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
TNX		0.446 UJ	0.25 U	0.255 U	0.24 U		0.255 U	0.26 U		0.255 U	0.264 U
Total Metals (ug/L)											
ALUMINUM				198 J	235 J		72.9 U	50.2 U		376 J	304 J
ANTIMONY				0.085 U	0.085 U		0.085 U	0.085 U		0.085 U	0.085 U
ARSENIC				0.64 J	0.2 J		0.59 J	0.49 J		0.38 J	0.39 J
BARIUM				18.1 J	11.2 J		27.9 J	34.4 J		10.6 J	45 J
BERYLLIUM				0.25 J	0.24 U		0.02 U	0.04 U		0.02 U	0.02 U
CADMIUM				1.8 J	0.79 J		1.3 U	0.07 J		0.91 U	0.83 U
CALCIUM				53100	71400		12900	18200		35300	35900
CHROMIUM				0.74 U	0.39 U		0.64 U	0.27 U		0.91 U	1 U
COBALT				7 J	10.7		26.2 J	27.5		0.26 J	0.26 J
COPPER				2.1 J	2.4		0.83 J	1.5 J		1.4 J	1.4 J
IRON				546 J	693 J		21600 J	2220 J		575 J	601 J
LEAD				0.36 J	0.342 J		0.11 U	0.455 J		0.3 U	0.28 U
MAGNESIUM				94300 J	105000		16300 J	20700		53100 J	54400 J
MANGANESE				770	1680		7570	3270		5.4 J	5.7 J
MERCURY				0.03 U	0.03 U		0.03 U	0.03 U		0.03 U	0.03 U
NICKEL				141 J	178		7.8 J	11.5		3.2 J	3.3 J
POTASSIUM				3590 J	4210 J		1720 J	1380 J		1550 J	1640 J
SELENIUM				0.98 J	0.99 J		1.4 J	1.9 J		0.69 U	0.82 U
SILVER				0.028 U	0.028 UJ		0.028 U	0.028 UJ		0.028 U	0.028 U
SODIUM				42600 J	47000 J		12400 J	27000 J		20100 J	17500 J
THALLIUM				0.043 U	0.06 J		0.043 U	0.043 U		0.043 U	0.043 U
TIN				0.3 U	0.08 J		0.28 U	0.048 U		0.08 U	0.25 U
VANADIUM				1.14 U	1.14 U		1.14 U	1.14 U		1.14 U	1.14 U
ZINC				183 J	262		4.8 U	4 J		3.4 U	6.3 U
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED	9.8 U					210 J			9.6 U		
ANTIMONY, FILTERED	0.09 U					0.085 U			0.085 U		

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ
SAMPLING ROUND	02	01	02	01	02	02	01	02	02	01	01
LOCATION	12MWT32	12MWT34	12MWT34	12MWT45	12MWT45	12MWT45	12MWT46	12MWT46	12MWT46	12MWT47	12MWT47
SAMPLE NUMBER	12GWT3202-F	12GWT3401	12GWT3402	12GWT4501	12GWT4502	12GWT4502-F	12GWT4601	12GWT4602	12GWT4602-F	12GWT4701	12GWT4701-D
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP
SAMPLE DATE	2/8/2005	10/30/2004	2/15/2005	11/13/2004	3/3/2005	3/3/2005	11/13/2004	3/3/2005	3/3/2005	11/13/2004	11/13/2004
ARSENIC, FILTERED	2.6 J					0.15 J			0.4 J		
BARIUM, FILTERED	22.6 J					11.2 J			37.6 J		
BERYLLIUM, FILTERED	0.02 U					0.15 U			0.02 U		
CADMIUM, FILTERED	0.06 U					0.75 J			0.06 J		
CALCIUM, FILTERED	234000 J					64900			18400		
CHROMIUM, FILTERED	0.27 U					0.23 U			0.14 U		
COBALT, FILTERED	11.8 J					10.5			23.3		
COPPER, FILTERED	0.19 U					2.3			1.3 J		
IRON, FILTERED	859 J					104 U			1000 J		
LEAD, FILTERED	0.28 U					0.315 J			0.181 J		
MAGNESIUM, FILTERED	126000 J					108000 J			21700 J		
MANGANESE, FILTERED	745 J					1600			3300		
MERCURY, FILTERED	0.03 U					0.03 U			0.03 U		
NICKEL, FILTERED	23.1 J					178			9.9		
POTASSIUM, FILTERED	10800 J					3470 J			1310 J		
SELENIUM, FILTERED	0.21 U					0.99 J			1.6 J		
SILVER, FILTERED	0.028 U					0.028 U			0.028 U		
SODIUM, FILTERED	31800 J					51400 J			28500 J		
THALLIUM, FILTERED	0.05 U					0.06 J			0.043 U		
TIN, FILTERED	0.09 U					0.048 U			0.048 U		
VANADIUM, FILTERED	1.14 U					1.14 U			1.14 U		
ZINC, FILTERED	6.1 U					234			4.7 J		
Field Parameters											
DISSOLVED OXYGEN (mg/L)				6.14	1.66		5.42	0.64		7.16	
OXIDATION REDUCTION POTENTIAL (MV)				92	116		101	-10		83	
PH (S.U.)				6.03	5.72		5.68	6.02		6.66	
SPECIFIC CONDUCTANCE (MS/CM)				0.98	0.755		0.382	0.296		0.491	
TEMPERATURE (C)				13.95	12.39		14.99	12.99		14.67	
TURBIDITY (NTU)				32.4	10.2		23	4.61		8	
Miscellaneous Parameters (mg/L)											
AMMONIA-N				0.047 J	0.01 U		1.8 J	0.82		0.047 J	0.09 J
NITRITE/NITRATE-N				0.49	0.05 U		0.025 U	0.05 U		0.16	0.17
TOTAL ORGANIC CARBON											

APPENDI. ..LE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	01	01	02	02	01	01	02	01	01	02
LOCATION	12MWT47	12MWT48	12MWT48	12MWT48	12MWT48	12MWT33	12MWT33	12MWT33	12MWT01	12MWT01	12MWT01
SAMPLE NUMBER	12GWT4702	12GWT4801	12GWT4801-F	12GWT4802	12GWT4802-F	12GWT3301	12GWT3301-D	12GWT3302	12GWT0101	12GWT0101-D	12GWT0102
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	ORIG	DUP	NORMAL
SAMPLE DATE	3/2/2005	11/14/2004	11/15/2004	2/15/2005	2/15/2005	9/26/2004	9/26/2004	2/18/2005	9/11/2004	9/11/2004	2/6/2005
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
1,3-DINITROBENZENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2,4,6-TRINITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2,4-DIAMINO-6-NITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2,4-DINITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2,6-DIAMINO-4-NITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2,6-DINITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2-AMINO-4,6-DINITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
2-NITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
3,5-DINITROANILINE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
3-NITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
4,4'-TN-AZOXY	0.528 U	0.61 U		0.485 U		0.538 U	0.51 U	0.575 U	0.5 U	0.5 U	0.48 U
4-AMINO-2,6-DINITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
4-NITROTOLUENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
DNX	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
HMX	0.264 U	0.305 U		0.52		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
MNX	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
NITROBENZENE	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
RDX	0.264 U	1.3 J		4.2 J		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
TETRYL	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
TNX	0.264 U	0.305 U		0.242 U		0.27 U	0.26 U	0.288 U	0.25 U	0.25 U	0.24 U
Total Metals (ug/L)											
ALUMINUM	95.6 J	31000 J		25700 J		37.1 U	34.5 U	200 J	1550 J	1590 J	2620 J
ANTIMONY	0.085 U	0.085 U		0.085 U		0.52 U	0.49 U	0.085 U	0.12 U	0.14 U	0.085 U
ARSENIC	0.17 J	11.4 J		9.6 J		2.7 J	2.7 J	1.2 U	66 J	66.9 J	37.7 J
BARIUM	11.6 J	173 J		214 J		13.2 J	12.6 J	15.6 U	10.8 J	11.3 J	9.1 J
BERYLLIUM	0.02 U	1.2 J		1.5 U		1.3 J	1.3 J	2.2 J	1.6 J	1.7 J	2 U
CADMIUM	0.039 U	2.3 J		0.8 U		0.039 U	0.06 U	0.18 U	0.39 U	0.37 U	0.28 U
CALCIUM	53800	17800		24800 J		61100 J	60700 J	56400 J	127000 J	126000 J	118000 J
CHROMIUM	0.86 U	34.1 J		47.9 J		0.52 U	0.48 U	0.76 U	1.1 J	1.2 J	1.1 U
COBALT	0.14 J	79.7 J		74.9 J		44.4 J	44.2 J	40 J	95.1 J	94.7 J	64.2 J
COPPER	0.68 J	24.3 J		23.4 J		0.7 J	0.62 J	2.5 J	0.17 U	0.57 U	2.2 J
IRON	424 J	48900 J		46200 J		41800 J	41300 J	41700 J	77400 J	76000 J	80800 J
LEAD	0.089 J	23.4 J		24.7 J		0.34 U	0.29 U	1 U	9 J	9.5 J	3.6 U
MAGNESIUM	71400	9870 J		14600 J		33500 J	32800 J	27200 J	96700 J	95400 J	92200 J
MANGANESE	1.5 J	1310		971 J		3010 J	2990 J	1680 J	4310 J	4360 J	4360 J
MERCURY	0.03 U	0.03 U		0.057 J		0.043 U	0.077 U	0.05 U	0.03 UJ	0.03 UJ	0.03 U
NICKEL	5.1	139 J		106 J		131 J	128 J	110 J	394 J	394 J	250 J
POTASSIUM	1780 J	3860 J		4610 J		4520 J	4510 J	4770 J	3110 J	3200 J	3330 J
SELENIUM	0.98 J	1.2 J		0.84 U		0.094 U	0.094 U	0.31 U	0.14 U	0.14 U	0.85 U
SILVER	0.028 UJ	0.06 U		0.04 U		0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U
SODIUM	26000 J	10000 J		13100 J		40300 J	40600 J	32200 J	69300 J	69600 J	60700 J
THALLIUM	0.043 U	0.32 J		0.5 U		0.043 U	0.043 U	0.043 U	0.1 U	0.09 U	0.09 U
TIN	0.048 U	1.1 J		1.6 U		0.048 U	0.048 U	0.38 U	0.048 U	0.048 U	0.048 U
VANADIUM	1.14 U	49.4 J		38		1.14 U	1.14 U	1.14 U	1.4 J	1.4 J	1.8 J
ZINC	2.5 J	168 J		110 J		96 J	93.9 J	128 J	192 J	195 J	281 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED			140 U		10.1 U						
ANTIMONY, FILTERED			1.6 U		0.4 U						

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PMZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	01	01	02	02	01	01	02	01	01	02
LOCATION	12MWT47	12MWT48	12MWT48	12MWT48	12MWT48	12MWT33	12MWT33	12MWT33	12MWT01	12MWT01	12MWT01
SAMPLE NUMBER	12GWT4702	12GWT4801	12GWT4801-F	12GWT4802	12GWT4802-F	12GWT3301	12GWT3301-D	12GWT3302	12GWT0101	12GWT0101-D	12GWT0102
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	ORIG	DUP	NORMAL
SAMPLE DATE	3/2/2005	11/14/2004	11/15/2004	2/15/2005	2/15/2005	9/26/2004	9/26/2004	2/18/2005	9/11/2004	9/11/2004	2/6/2005
ARSENIC, FILTERED			0.22 J		0.28 U						
BARIUM, FILTERED			15.7 J		26.8 J						
BERYLLIUM, FILTERED			0.02 U		0.14 U						
CADMIUM, FILTERED			1.7 J		0.17 U						
CALCIUM, FILTERED			20200 J		19900 J						
CHROMIUM, FILTERED			0.77 U		0.64 U						
COBALT, FILTERED			11.2		0.98 U						
COPPER, FILTERED			0.99 J		0.33 U						
IRON, FILTERED			295 J		12 U						
LEAD, FILTERED			0.3 U		0.45 U						
MAGNESIUM, FILTERED			9190 J		12600 J						
MANGANESE, FILTERED			259 J		25.4 U						
MERCURY, FILTERED			0.03 U		0.03 U						
NICKEL, FILTERED			38.2		20.1 J						
POTASSIUM, FILTERED			1160 J		908 J						
SELENIUM, FILTERED			0.83 U		0.22 U						
SILVER, FILTERED			0.028 U		0.028 U						
SODIUM, FILTERED			12600 J		15000 J						
THALLIUM, FILTERED			0.043 U		0.13 U						
TIN, FILTERED			0.32 U		0.22 U						
VANADIUM, FILTERED			1.14 U		1.14 U						
ZINC, FILTERED			19.6 J		6.4 U						
Field Parameters											
DISSOLVED OXYGEN (mg/L)	8.92	12.82		3.23		2.35		0.57	0 99		1.23
OXIDATION REDUCTION POTENTIAL (MV)	166	49		193		187.3		44	1000		158.700000
PH (S.U.)	6.33	7.71		6.8		4.72		5.28	5.34		4.62
SPECIFIC CONDUCTANCE (MS/CM)	0.454	0.219		0.206		0.646		0.634	1.394		1.062
TEMPERATURE (C)	10.25	11.84		12.91		15.89		13.49	17.95		14.48
TURBIDITY (NTU)	4.87	1000		1100 >		2.6		10	3.76		1.09
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.01 U	0.08 J		0.16		0.35 J	0.37 J	0.54 J	0.36	0.37	0.56
NITRITE/NITRATE-N	0.05 U	1		2		0.05 U	0.05 U	0.05 U	0.025 U	0.025 U	0.05 U
TOTAL ORGANIC CARBON						1 U	1 U	2			

APPENDI, ,LE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	02	01	02	01	02	02	01	02	01
LOCATION	12MWT02	12MWT02	12MWT02	12MWT03	12MWT03	12MWT04	12MWT04	12MWT04	12MWT05	12MWT05	12MWT06
SAMPLE NUMBER	12GWT0201	12GWT0202	12GWT0202-D	12GWT0301	12GWT0302	12GWT0401	12GWT0402	12GWT0402-D	12GWT0501	12GWT0502	12GWT0601
SAMPLE CODE	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/12/2004	2/17/2005	2/17/2005	9/27/2004	3/3/2005	9/28/2004	3/3/2005	3/3/2005	9/14/2004	2/3/2005	9/14/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	16
1,3-DINITROBENZENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	8
2,4,6-TRINITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	160
2,4-DIAMINO-6-NITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	4.9 J
2,4-DINITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	2.4 J
2,6-DIAMINO-4-NITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
2,6-DINITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	9.8 J
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	32 J
2-NITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
3,5-DINITROANILINE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	4.6
3-NITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
4,4'-TN-AZOXY	0.5 UJ	0.528 U	0.542 U	0.532 U	0.568 U	0.505 U	0.568 U	0.5 U	0.528 U	0.515 U	0.51 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	34
4-NITROTOLUENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
DNX	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	1.6 J
HMX	0.68	0.45 J	0.42 J	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.32 J	400
MNX	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.33 J	0.28 J	0.264 U	0.258 U	23
NITROBENZENE	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
RDX	3.4 J	1.2	1	0.27 U	0.284 U	0.252 U	2.7	3.1	0.264 U	2.4	6300 J
TETRYL	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
TNX	0.25 U	0.264 U	0.271 U	0.27 U	0.284 U	0.252 U	0.284 U	0.25 U	0.264 U	0.258 U	0.255 U
Total Metals (ug/L)											
ALUMINUM	4130 J	4040 J	4030 J	162 J	153 J	36.1 U	21.2 U	44.8 U	4540 J	3450 J	34 U
ANTIMONY	0.085 U	0.085 U	0.085 U	0.51 U	0.085 U	0.085 UJ	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U
ARSENIC	22.7 J	9.1 J	9.2 J	2.6 J	1.3	1.1 J	0.97 J	0.96 J	91.2 J	16.8 J	0.14 U
BARIUM	24.5 J	18.8 U	19.6 U	20.5 J	15.6 J	9.1 J	9.5 J	10 J	24.8 J	16.5 J	50.9 J
BERYLLIUM	2.3 J	2.2 J	2.3 J	0.18 U	0.17 U	0.14 J	0.13 U	0.18 U	1.8 J	1.5 U	0.11 U
CADMIUM	4.9 J	2.5 J	2.5 J	0.1 U	0.11 J	0.14 J	0.04 J	0.039 U	7.7 J	1.8 U	0.22 U
CALCIUM	10400 J	13300 J	13300 J	129000 J	144000	149000	141000	137000	28500 J	24500 J	17400 J
CHROMIUM	3.3 J	2.5 J	2.6 J	0.67 U	0.42 U	0.43 U	0.22 U	0.35 U	2.7 J	1.6 U	0.42 U
COBALT	66.9 J	56.5 J	57.9 J	16.4 J	12.4	20.1	18.5	19.4	138 J	64.3 J	25.2 J
COPPER	0.56 U	1.1 U	1.1 U	0.35 U	1.9 J	1.6 J	1.7 J	1.9 J	2.9 J	0.69 U	1.1 J
IRON	10000 J	10100 J	9930 J	14300 J	18000 J	36100	37100 J	38800 J	22100 J	19800 J	14.5 U
LEAD	12.8 J	11.3 J	11.8 J	0.26 U	0.296 J	0.07 J	0.069 U	0.069 U	51.2 J	22.7 J	0.2 U
MAGNESIUM	10400 J	7850 J	8190 J	118000 J	117000	130000	112000	120000	26400 J	20420 J	11600 J
MANGANESE	1180 J	1220 J	1410 J	3440 J	3440	5110	4760	5060	1700 J	1420 J	80.8 J
MERCURY	0.03 UJ	0.056 U	0.057 U	0.04 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UJ	0.03 U	1.2 J
NICKEL	124 J	109 J	111 J	55.3 J	39.6	54.2 J	49.9	51.7	235 J	117 J	41.5 J
POTASSIUM	1390 J	1730 J	1710 J	3130 J	3260 J	2710 J	2560 J	2970 J	2230 J	1640 J	1220 J
SELENIUM	0.094 U	0.57 U	0.62 U	0.19 U	3.2 J	2.3 J	3.1 J	3.1 J	0.14 U	0.53 U	0.17 U
SILVER	0.028 U	0.028 U	0.028 U	0.028 U	0.028 UJ	0.028 U	0.028 UJ	0.028 UJ	0.028 U	0.028 U	0.028 U
SODIUM	12800 J	13200 J	9790 J	102000 J	82100 J	83500 J	68200 J	74600 J	31700 J	19400 J	31200 J
THALLIUM	0.58 U	0.46 U	0.5 U	0.043 U	0.06 J	0.043 U	0.06 J	0.06 J	0.67 J	0.71 U	0.07 U
TIN	0.05 U	0.14 U	0.048 U	0.11 U	0.37 J	0.048 U	0.048 U	0.048 U	0.048 U	0.048 U	0.048 U
VANADIUM	4.6	2.1	2.2	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	5.8	3	1.14 U
ZINC	254 J	199	180	20.7 J	23.5 J	60.2 J	52.6 J	53 J	237 J	189 J	43.9 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED											
ANTIMONY, FILTERED											

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	02	01	02	01	02	02	01	02	01
LOCATION	12MWT02	12MWT02	12MWT02	12MWT03	12MWT03	12MWT04	12MWT04	12MWT04	12MWT05	12MWT05	12MWT06
SAMPLE NUMBER	12GWT0201	12GWT0202	12GWT0202-D	12GWT0301	12GWT0302	12GWT0401	12GWT0402	12GWT0402-D	12GWT0501	12GWT0502	12GWT0601
SAMPLE CODE	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/12/2004	2/17/2005	2/17/2005	9/27/2004	3/3/2005	9/28/2004	3/3/2005	3/3/2005	9/14/2004	2/3/2005	9/14/2004
ARSENIC, FILTERED											
BARIUM, FILTERED											
BERYLLIUM, FILTERED											
CADMIUM, FILTERED											
CALCIUM, FILTERED											
CHROMIUM, FILTERED											
COBALT, FILTERED											
COPPER, FILTERED											
IRON, FILTERED											
LEAD, FILTERED											
MAGNESIUM, FILTERED											
MANGANESE, FILTERED											
MERCURY, FILTERED											
NICKEL, FILTERED											
POTASSIUM, FILTERED											
SELENIUM, FILTERED											
SILVER, FILTERED											
SODIUM, FILTERED											
THALLIUM, FILTERED											
TIN, FILTERED											
VANADIUM, FILTERED											
ZINC, FILTERED											
Field Parameters											
DISSOLVED OXYGEN (mg/L)	0.84	0.73		2.66	12.29	0.64	9.61		2.03	3.88	5.67
OXIDATION REDUCTION POTENTIAL (MV)	151	355		13.9	26	27.3	32.7		295	276.1	65
PH (S.U.)	3.78	3.62		7.25	6.32	6.73	5.96		3.65	3.73	5.85
SPECIFIC CONDUCTANCE (MS/CM)	0.288	0.277		1.638	1.425	1.428	1.27		0.51	0.413	0.282
TEMPERATURE (C)	17.95	11.44		14.58	12.55	16	11.7		17.1	11.98	17.35
TURBIDITY (NTU)	0.99	1.7		303	7.71	3	3.41		0.5	0.3	0.75
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.11	0.19 J	0.07 J	0.11 J	0.15	0.19	0.23	0.27	0.22	0.32	0.005 U
NITRITE/NITRATE-N	0.025 U	0.05 U	0.05 U	0.05 U	0.05 U	0.025 U	0.05 U	0.05 U	0.025 U	0.36	3.3 J
TOTAL ORGANIC CARBON	1	1 U	1 U								

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	01	02	01	02	01	02	01	02	01	02
LOCATION	12MWT06	12MWT07	12MWT07	12MWT08	12MWT08	12MWT09	12MWT09	12MWT10	12MWT10	12MWT11	12MWT11
SAMPLE NUMBER	12GWT0602	12GWT0701	12GWT0702	12GWT0801	12GWT0802	12GWT0901	12GWT0902	12GWT1001	12GWT1002	12GWT1101	12GWT1102
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/21/2005	9/9/2004	2/21/2005	8/30/2004	2/21/2005	9/10/2004	3/2/2005	9/25/2004	2/7/2005	9/13/2004	2/22/2005
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	19	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	110	110
1,3-DINITROBENZENE	8.9	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	4	6.3
2,4,6-TRINITROTOLUENE	170	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	110	110
2,4-DIAMINO-6-NITROTOLUENE	7.8 J	0.242 U	0.264 U	0.275 U	0.42 J	0.264 U	0.271 U	0.27 U	0.264 U	69 J	75 J
2,4-DINITROTOLUENE	0.24 U	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	2.8 J	0.24 U
2,6-DIAMINO-4-NITROTOLUENE	0.24 U	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	0.24 U
2,6-DINITROTOLUENE	0.24 U	0.242 U	0.264 U	0.35 J	0.27 J	0.264 U	0.34 J	0.27 U	0.264 U	8.1 J	0.24 U
2-AMINO-4,6-DINITROTOLUENE	40 J	0.242 U	0.264 U	5.1 J	3.7 J	5.4 J	4 J	0.27 U	0.264 U	39 J	31 J
2-NITROTOLUENE	0.24 U	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.45 J	0.24 U
3,5-DINITROANILINE	9.4	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	11	12 J
3-NITROTOLUENE	0.24 U	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	0.24 U
4,4'-TN-AZOXY	0.48 U	0.485 U	0.528 U	0.55 U	0.48 U	0.528 U	0.542 U	0.538 U	0.528 U	0.532 U	0.48 U
4-AMINO-2,6-DINITROTOLUENE	53	0.242 U	0.264 U	4.4	3.3	7.3	5.2	0.27 U	0.264 U	78 J	43
4-NITROTOLUENE	5.8 J	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	0.24 U
DNX	1.9 J	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	1.9 J
HMX	530	0.242 U	1.1 J	61	58	65	64	6.6	7.6 J	490	530
MNX	30	0.242 U	0.264 U	0.5 J	0.38 J	0.264 U	0.33 J	0.39 J	0.33 J	10 J	2.4 J
NITROBENZENE	0.24 U	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	0.24 U
RDX	7200	17 J	13	360	340	480 J	510	22	30	3900 J	4900
TETRYL	0.24 U	0.242 U	0.264 U	0.275 UJ	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	0.24 U
TNX	0.74 J	0.242 U	0.264 U	0.275 U	0.24 U	0.264 U	0.271 U	0.27 U	0.264 U	0.266 U	11 J
Total Metals (ug/L)											
ALUMINUM	27.6 J	56300 J	39500 J	452 J	388 J	1280 J	745 J	1950 J	2460 J	2280 J	2550 J
ANTIMONY	0.085 U	0.61 U	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U
ARSENIC	0.34 U	11.6 J	2.4 J	0.63 U	0.21 U	0.57 U	0.17 J	0.92 J	0.38 U	0.76 U	0.48 U
BARIUM	73.7 J	13.3 J	9 U	69.6 J	25.5 J	37.7 J	25.7 J	25.6 J	11.7 J	36.2 J	32.6 J
BERYLLIUM	0.14 U	28.4 J	29.4 J	1.5 U	1.3 J	2.4 J	1.9 J	3.7 J	3.2 U	2.9 J	2.4 U
CADMIUM	0.48 U	16.5 J	11.9 J	1.2 U	1.1 J	0.64 U	0.62 J	1.3 J	0.99 U	0.63 U	0.57 U
CALCIUM	28500 J	396000 J	589000 J	30400 J	22000 J	25400 J	21100	43700 J	39200 J	11100 J	12300 J
CHROMIUM	0.63 U	5.2 J	3.4 J	1.3 U	0.6 U	0.75 J	0.72 U	1.3 J	1.1 U	0.84 J	0.14 U
COBALT	30.9 J	1680 J	3160 J	95.2 J	87.5 J	111 J	89.3	226 J	225 J	115 J	112 J
COPPER	1.7 J	29.4 J	39.4 J	3.1 J	3.2 J	4.5 J	3.5	27.5 J	32 J	2.7 J	1.9 J
IRON	134 J	14300 J	136000 J	144 U	103 U	356 J	266 J	2860 J	4510 J	728 J	612 J
LEAD	0.252 U	18.3 J	15.8 J	1 U	2.1 J	3.7 J	2.8	3 J	6.3 J	0.38 U	0.25 U
MAGNESIUM	18800 J	342000 J	1160000 J	25500 J	18300 J	19000 J	14300	34900 J	35100 J	13000 J	15300 J
MANGANESE	91.5 J	8360 J	46600 J	837 J	580 J	294 J	238	787 J	494 J	5250 J	4610 J
MERCURY	7.3	0.03 UJ	0.03 U	0.06 U	0.03 U	0.73 J	0.88	0.03 U	0.03 U	0.87 J	1.2 J
NICKEL	54 J	3800 J	6010 J	242 J	183 J	210 J	172	398 J	350 J	115 J	107 J
POTASSIUM	1290 J	6480 J	6470 J	2200 J	1570 J	917 J	774 J	1080 J	413 J	1280 J	1170 J
SELENIUM	1.1 J	3.6 J	7.1 J	0.094 U	0.61 U	0.17 U	0.78 J	0.26 U	1.1 J	0.15 U	0.1 U
SILVER	0.04 U	0.46 U	0.04 U	0.028 U	0.028 U	0.028 U	0.028 UJ	0.028 U	0.028 U	0.028 U	0.07 U
SODIUM	31400 J	308000 J	789000 J	45600 J	31900 J	34300 J	25900 J	79500 J	70100 J	11300 J	12600 J
THALLIUM	0.22 U	0.85 J	1.5 J	0.16 U	0.24 U	0.21 U	0.14 J	0.043 U	0.22 U	0.043 U	0.14 U
TIN	0.17 U	0.59 U	0.12 U	0.18 U	0.2 U	0.048 U	0.048 U	0.048 U	0.048 U	0.048 U	0.048 U
VANADIUM	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U
ZINC	55.2 J	5560 J	9880 J	134 J	113 J	147 J	141	736 J	1020 J	177 J	280 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED											
ANTIMONY, FILTERED											

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	01	02	01	02	01	02	01	02	01	02
LOCATION	12MWT06	12MWT07	12MWT07	12MWT08	12MWT08	12MWT09	12MWT09	12MWT10	12MWT10	12MWT11	12MWT11
SAMPLE NUMBER	12GWT0602	12GWT0701	12GWT0702	12GWT0801	12GWT0802	12GWT0901	12GWT0902	12GWT1001	12GWT1002	12GWT1101	12GWT1102
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/21/2005	9/9/2004	2/21/2005	8/30/2004	2/21/2005	9/10/2004	3/2/2005	9/25/2004	2/7/2005	9/13/2004	2/22/2005
ARSENIC, FILTERED											
BARIUM, FILTERED											
BERYLLIUM, FILTERED											
CADMIUM, FILTERED											
CALCIUM, FILTERED											
CHROMIUM, FILTERED											
COBALT, FILTERED											
COPPER, FILTERED											
IRON, FILTERED											
LEAD, FILTERED											
MAGNESIUM, FILTERED											
MANGANESE, FILTERED											
MERCURY, FILTERED											
NICKEL, FILTERED											
POTASSIUM, FILTERED											
SELENIUM, FILTERED											
SILVER, FILTERED											
SODIUM, FILTERED											
THALLIUM, FILTERED											
TIN, FILTERED											
VANADIUM, FILTERED											
ZINC, FILTERED											
Field Parameters											
DISSOLVED OXYGEN (mg/L)	3.51	6.07	1.17	2.81	6.06	4.61	5.57	4.78	5.26	1.63	1.71
OXIDATION REDUCTION POTENTIAL (MV)	91	370	365	318.900000	201.700000	140	370.200000	149	387	190	243.700000
PH (S.U.)	5.2	2.66	3.23	4.64	4.6	5.04	4.25	4.64	4.5	3.08	3.89
SPECIFIC CONDUCTANCE (MS/CM)	0.265	4.497	3.631	0.415	0.253	0.403	0.313	0.724	0.57	0.299	0.197
TEMPERATURE (C)	11.39	20.41	10.3	18.57	11.49	18.78	10.31	17.5	12.1	20.89	10.33
TURBIDITY (NTU)	0.28	9.08	4.42	5.17	0.39	6.99	2.31	4.1	2	0.5	0.21
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.01 UJ	0.53	2 J	0.005 U	0.01 UJ	0.005 U	0.01 U	0.06 U	0.13	0.04	0.11
NITRITE/NITRATE-N	1.8	4.1 J	0.48	0.43	0.85	1.8 J	0.3	0.05	0.05 U	10 J	4.8
TOTAL ORGANIC CARBON											

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	01	02	01	01	02	02	01	02	01
LOCATION	12MWT12	12MWT12	12MWT13	12MWT13	12MWT14	12MWT14	12MWT14	12MWT14	12MWT15	12MWT15	12MWT16
SAMPLE NUMBER	12GWT1201	12GWT1202	12GWT1301	12GWT1302	12GWT1401	12GWT1401-F	12GWT1402	12GWT1402-F	12GWT1501	12GWT1502	12GWT1601
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/14/2004	2/22/2005	8/30/2004	3/4/2005	9/25/2004	9/24/2004	3/2/2005	3/2/2005	9/27/2004	2/8/2005	9/12/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.26 U	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	1.1 J
1,3-DINITROBENZENE	0.26 U	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
2,4,6-TRINITROTOLUENE	1.4	2.9	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
2,4-DIAMINO-6-NITROTOLUENE	0.67 J	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	1.6 J
2,4-DINITROTOLUENE	0.26 U	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
2,6-DIAMINO-4-NITROTOLUENE	0.26 U	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
2,6-DINITROTOLUENE	0.29 J	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	1.8
2-AMINO-4,6-DINITROTOLUENE	6.1 J	5.3 J	0.61 J	0.47 J	0.27 U		0.305 U		0.25 U	0.238 U	76
2-NITROTOLUENE	0.26 U	0.24 U	0.266 U	0.278 U	0.3 J		0.305 U		0.25 U	0.238 U	0.271 U
3,5-DINITROANILINE	0.91 J	0.92 J	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
3-NITROTOLUENE	0.26 U	1.6 J	1.7 J	0.88 J	0.27 U		0.305 U		0.25 U	0.238 U	0.68 J
4,4'-TN-AZOXY	0.52 U	0.48 U	0.532 U	0.555 U	0.538 U		0.61 U		0.495 U	0.475 U	0.542 U
4-AMINO-2,6-DINITROTOLUENE	6.9	6.4	0.266 U	0.51 J	0.27 U		0.305 U		0.25 U	0.238 U	160
4-NITROTOLUENE	0.26 U	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
DNX	1.3 J	0.36 J	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	22
HMX	120	89 J	13	14 J	0.27 U		0.305 U		0.25 U	0.238 U	370
MNX	7.8	4.8	0.266 U	0.53 J	0.27 U		0.305 U		0.25 U	0.238 U	250
NITROBENZENE	0.26 U	0.24 U	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
RDX	480 J	380	87	79	0.27 U		0.305 U		0.25 U	0.238 U	6300 J
TETRYL	0.26 U	0.24 U	0.266 UJ	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	0.271 U
TNX	0.26 U	0.54 J	0.266 U	0.278 U	0.27 U		0.305 U		0.25 U	0.238 U	7.8
Total Metals (ug/L)											
ALUMINUM	9.4 U	24.4 U	293 J	172 U	8830 J		928 J		128 U	793 J	615 J
ANTIMONY	0.085 U	0.51 U	0.66 U	0.085 U	0.21 U		0.085 U		0.085 U	0.085 U	0.15 U
ARSENIC	0.34 U	0.65 U	2.2 J	0.76 J	8.3 J		1.2		1.6 J	1.2 U	0.79 U
BARIUM	139 J	174 J	24.2 J	24 J	140 J		19.8 J		16 J	10.4 J	51.5 J
BERYLLIUM	0.02 UJ	0.26 U	0.65 U	0.14 J	1.6 J		1.3 J		0.68 U	6.4 J	0.19 U
CADMIUM	0.06 U	0.039 UJ	0.47 U	0.039 U	1.6 J		0.67 J		3.5 J	3.4 U	0.66 U
CALCIUM	66400 J	83500 J	3180 J	3190 J	278000 J		274000		175000 J	213000 J	81200 J
CHROMIUM	0.57 U	0.2 U	1.1 U	0.8 U	25.6 J		2.4 J		0.85 J	0.68 U	1.3 J
COBALT	5.5 J	9.1 J	6.7 J	5.4 J	504 J		474		248 J	377 J	62 J
COPPER	1.2 J	2.3 J	1.4 J	1 J	16.9 J		7		1.1 J	9.4 J	1.6 J
IRON	45.3 U	1230 J	13000 J	9260 J	108000 J		54400 J		1500 J	1670 J	946 J
LEAD	0.069 U	0.47 U	0.98 U	0.3 J	18.4 J		2.8		0.59 U	1.7 U	1.1 J
MAGNESIUM	40500 J	46300 J	2870 J	2530 J	209000 J		211000		123000 J	155000 J	47600 J
MANGANESE	409 J	609 J	41.8 U	31.6 J	22700 J		28000		2630 J	2950 J	480 J
MERCURY	3.4 J	0.88 J	0.066 U	0.03 U	0.036 U		0.03 U		0.057 U	0.03 U	0.03 UJ
NICKEL	8.9 J	12.6 J	16.6 J	10.6 J	1170 J		1160		602 J	868 J	116 J
POTASSIUM	5220 J	12600 J	5080 J	5730 J	12800 J		11700 J		5740 J	7220 J	3620 J
SELENIUM	0.31 U	0.38 U	0.23 U	0.13 U	3 U		4.7 J		4.7 J	5.7 J	0.63 U
SILVER	0.028 U	0.43 U	0.63 U	0.04 U	0.028 U		0.028 UJ		0.028 U	0.028 U	0.028 U
SODIUM	50600 J	58400 J	37500 J	38200 J	190000 J		132000 J		213000 J	190000 J	57900 J
THALLIUM	0.043 U	0.29 U	0.78 U	0.29 J	0.21 U		0.16 J		0.12 U	0.33 U	0.07 U
TIN	0.048 U	0.26 U	0.48 U	0.18 U	0.57 U		0.39 J		0.05 U	0.048 U	0.29 U
VANADIUM	1.14 U	1.14 U	1.14 U	1.14 U	19.8		1.4 J		1.14 U	1.14 U	1.14 U
ZINC	3.1 U	4.9 J	11.2 U	4.2 U	860 J		753		577 J	1280 J	128 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED						443 J		590 J			
ANTIMONY, FILTERED						0.085 U		0.085 U			

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	01	02	01	01	02	02	01	02	01
LOCATION	12MWT12	12MWT12	12MWT13	12MWT13	12MWT14	12MWT14	12MWT14	12MWT14	12MWT15	12MWT15	12MWT16
SAMPLE NUMBER	12GWT1201	12GWT1202	12GWT1301	12GWT1302	12GWT1401	12GWT1401-F	12GWT1402	12GWT1402-F	12GWT1501	12GWT1502	12GWT1601
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/14/2004	2/22/2005	8/30/2004	3/4/2005	9/25/2004	9/24/2004	3/2/2005	3/2/2005	9/27/2004	2/8/2005	9/12/2004
ARSENIC, FILTERED						1.5 J		1.3			
BARIUM, FILTERED						29.1 J		17.2 J			
BERYLLIUM, FILTERED						0.77 U		1.1 U			
CADMIUM, FILTERED						0.96 U		0.7 J			
CALCIUM, FILTERED						303000 J		284000			
CHROMIUM, FILTERED						1.5 J		1.9 J			
COBALT, FILTERED						563 J		464			
COPPER, FILTERED						3.8 J		6.9			
IRON, FILTERED						99700 J		46600 J			
LEAD, FILTERED						1.8 J		2.2			
MAGNESIUM, FILTERED						228000 J		237000 J			
MANGANESE, FILTERED						25000 J		29700			
MERCURY, FILTERED						0.041 U		0.03 U			
NICKEL, FILTERED						1320 J		1180			
POTASSIUM, FILTERED						13600 J		11400 J			
SELENIUM, FILTERED						2.6 U		5.7 J			
SILVER, FILTERED						0.028 U		0.028 U			
SODIUM, FILTERED						185000 J		162000 J			
THALLIUM, FILTERED						0.1 U		0.16 J			
TIN, FILTERED						0.32 U		0.1 J			
VANADIUM, FILTERED						1.14 U		1.2 J			
ZINC, FILTERED						960 J		715			
Field Parameters											
DISSOLVED OXYGEN (mg/L)	0.97	1.76	0.45	0.95	6.06		18.27		1.99	2.01	4.79
OXIDATION REDUCTION POTENTIAL (MV)	72	56	425.8	247.8	249.3		125.8		49.5	335.8	54
PH (S.U.)	6.12	6.08	3.85	4.14	4.98		5.27		5.99	4.55	6.05
SPECIFIC CONDUCTANCE (MS/CM)	0.683	0.607	0.3	2.19	2.385		2.23		2.015	1.701	0.616
TEMPERATURE (C)	18.58	10.82	21.96	11.07	18.45		10.3		19.2	12.26	15.52
TURBIDITY (NTU)	0.35	0.71	7.16	7.84	1000		1000 >		4	1.57	512
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.03	0.1	0.42	0.3	0.45 J		0.69		0.08 U	0.2	0.07
NITRITE/NITRATE-N	2.9 J	4.7	0.025 U	0.025 UJ	0.62		0.05 U		0.05 U	0.09	5.7 J
TOTAL ORGANIC CARBON											

APPEN BLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	02	01	01	02	02	01	02	02	01
LOCATION	12MWT16	12MWT16	12MWT16	12MWT17	12MWT17	12MWT17	12MWT17	12MWT18	12MWT18	12MWT18	12MWT19
SAMPLE NUMBER	12GWT1601-F	12GWT1602	12GWT1602-F	12GWT1701	12GWT1701-F	12GWT1702	12GWT1702-F	12GWT1801	12GWT1802	12GWT1802-F	12GWT1901
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/12/2004	2/16/2005	2/16/2005	9/11/2004	9/11/2004	2/17/2005	2/17/2005	9/26/2004	3/3/2005	3/3/2005	9/25/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE		1.3 J		0.66 J		0.82 J		0.27 U	0.25 U		0.271 U
1,3-DINITROBENZENE		0.245 U		0.43 J		0.34 J		0.27 U	0.28 J		0.271 U
2,4,6-TRINITROTOLUENE		8.2		0.255 UJ		2.3		0.27 U	0.25 U		0.271 U
2,4-DIAMINO-6-NITROTOLUENE		1.8 J		0.57 J		1.4 J		0.27 U	0.25 U		0.271 U
2,4-DINITROTOLUENE		0.3 J		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
2,6-DIAMINO-4-NITROTOLUENE		0.245 U		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
2,6-DINITROTOLUENE		1.7 J		0.82 J		1.6		0.27 U	0.25 U		0.271 U
2-AMINO-4,6-DINITROTOLUENE		100 J		14 J		30 J		0.27 U	0.25 U		0.271 U
2-NITROTOLUENE		0.245 U		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
3,5-DINITROANILINE		5.8		0.78 J		1.6		0.27 U	0.25 U		0.271 U
3-NITROTOLUENE		0.245 U		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
4,4'-TN-AZOXY		0.49 U		0.51 UJ		0.515 U		0.538 U	0.5 U		0.542 U
4-AMINO-2,6-DINITROTOLUENE		190		25 J		43		0.27 U	0.25 U		0.271 U
4-NITROTOLUENE		0.245 U		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
DNX		18		3.7 J		6.1		0.27 U	0.25 U		0.271 U
HMX		400		76 J		130		0.48 J	1 J		0.271 U
MNX		200		44 J		79		0.27 U	0.25 U		0.271 U
NITROBENZENE		0.245 U		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
RDX		7400		1600 J		2600		20	32		0.75
TETRYL		0.245 U		0.255 UJ		0.258 U		0.27 U	0.25 U		0.271 U
TNX		6.2		1.3 J		2		0.27 U	0.25 U		0.271 U
Total Metals (ug/L)											
ALUMINUM		1390 J		5410 J		1530 J		5330 J	9060 J		419 J
ANTIMONY		0.085 U		0.12 U		0.085 U		0.085 U	0.085 U		0.085 U
ARSENIC		0.78 U		3.7 J		1.3 U		2.5 J	0.93 J		0.77 U
BARIUM		52.5 J		45.1 J		37.2 J		18.5 J	7.9 J		26.7 J
BERYLLIUM		0.19 U		3.7 J		0.53 U		3.5 J	4.3 J		0.06 U
CADMIUM		0.13 U		3.9 J		1 J		5 J	6.7		0.23 U
CALCIUM		33200 J		209000 J		69100 J		265000 J	292000		203000 J
CHROMIUM		2.1 J		2.1 J		1.7 U		1.2 J	0.78 U		1.5 J
COBALT		10.1 J		333 J		84.9 J		200 J	320		38.1 J
COPPER		3.4 J		4.9 J		5.3 J		5.2 J	8.6		2.5 J
IRON		1360 J		1520 J		1290 J		116 U	2090 J		529 J
LEAD		1.6 U		6 J		2.5 J		5.2 J	8		1.2 J
MAGNESIUM		31000 J		142000 J		50600 J		223000 J	210000		221000 J
MANGANESE		145 J		1850 J		635 J		1960 J	2420		1800 J
MERCURY		0.071 J		0.065 J		1.8 J		0.38 J	0.043 J		0.03 U
NICKEL		22.4 J		643 J		172 J		758 J	799		95.1 J
POTASSIUM		2090 J		4570 J		3380 J		5290 J	5010 J		5290 J
SELENIUM		1.1 J		1.6 U		1.5 J		5.1 J	6.3 J		0.61 U
SILVER		0.028 U		0.028 U		0.028 U		0.028 U	0.028 UJ		0.028 U
SODIUM		30400 J		126000 J		81800 J		189000 J	157000 J		196000 J
THALLIUM		0.15 U		0.42 U		0.33 U		0.41 U	0.62 J		0.28 U
TIN		0.25 U		0.13 U		0.32 U		0.14 U	0.048 U		0.42 U
VANADIUM		1.3 J		1.3 J		1.14 U		1.14 U	1.14 U		1.14 U
ZINC		28.1 J		1030 J		254 J		1030 J	1190		24.7 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED	105 U		10.6 U		488 J		145			8580 J	
ANTIMONY, FILTERED	0.13 U		0.13 U		0.17 U		0.085 U			0.085 U	

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	02	01	01	02	02	01	02	02	01
LOCATION	12MWT16	12MWT16	12MWT16	12MWT17	12MWT17	12MWT17	12MWT17	12MWT18	12MWT18	12MWT18	12MWT19
SAMPLE NUMBER	12GWT1601-F	12GWT1602	12GWT1602-F	12GWT1701	12GWT1701-F	12GWT1702	12GWT1702-F	12GWT1801	12GWT1802	12GWT1802-F	12GWT1901
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	9/12/2004	2/16/2005	2/16/2005	9/11/2004	9/11/2004	2/17/2005	2/17/2005	9/26/2004	3/3/2005	3/3/2005	9/25/2004
ARSENIC, FILTERED	0.41 U		0.28 U		0.87 J		0.73 U			0.87 J	
BARIUM, FILTERED	45.9 J		48 J		19.2 J		16.3 J			8.2 J	
BERYLLIUM, FILTERED	0.11 U		0.04 U		0.91 U		0.45 U			5.1 J	
CADMIUM, FILTERED	0.47 U		0.06 U		2 J		1.1 J			6.6	
CALCIUM, FILTERED	64300 J		35700 J		111000 J		72400 J			283000	
CHROMIUM, FILTERED	0.99 J		0.23 U		0.88 J		0.2 U			0.86 U	
COBALT, FILTERED	42.6 J		7 J		183 J		102 J			322	
COPPER, FILTERED	2.6 J		0.59 U		3.4 J		0.96 U			8.2	
IRON, FILTERED	509 J		6.15 U		282 J		7.5 U			99.3 U	
LEAD, FILTERED	0.21 U		0.2 U		1.1 J		0.75 U			8.5	
MAGNESIUM, FILTERED	40200 J		32400 J		80800 J		59800 J			184300 J	
MANGANESE, FILTERED	370 J		84.9 J		1210 J		634			2370	
MERCURY, FILTERED	0.03 U		0.03 U		0.22		0.063 U			0.03 U	
NICKEL, FILTERED	82.9 J		14.1 J		362 J		186 J			789	
POTASSIUM, FILTERED	3260 J		2120 J		3770 J		3210 J			5530 J	
SELENIUM, FILTERED	0.58 U		0.33 U		0.87 U		0.52 U			6.2 J	
SILVER, FILTERED	0.028 U		0.028 U		0.028 U		0.028 U			0.028 U	
SODIUM, FILTERED	51200 J		34100 J		107000 J		91800 J			167000 J	
THALLIUM, FILTERED	0.043 U		0.1 U		0.28 U		0.22 U			0.63 J	
TIN, FILTERED	0.06 U		0.15 U		0.048 U		0.07 U			0.048 U	
VANADIUM, FILTERED	1.14 U		1.14 U		1.14 U		1.14 U			1.14 U	
ZINC, FILTERED	90 J		11.4 J		498 J		323 J			1180	
Field Parameters											
DISSOLVED OXYGEN (mg/L)		4.49		6.05		8.3		2.38	19.36		8.99
OXIDATION REDUCTION POTENTIAL (MV)		101.4		144		131		41	376.6		329.700000
PH (S.U.)		6.25		5.43		5.88		4.95	4.13		5.54
SPECIFIC CONDUCTANCE (MS/CM)		0.336		1.212		0.592		2.472	2.132		2.404
TEMPERATURE (C)		15.02		19.24		13.02		17	12.75		18.01
TURBIDITY (NTU)		144		226		131		15	26.4		7.6
Miscellaneous Parameters (mg/L)											
AMMONIA-N		0.11		0.04		0.18 J		0.18 J	0.34		0.06 U
NITRITE/NITRATE-N		4.2		4.6 J		1.7		0.71	0.05 U		0.32
TOTAL ORGANIC CARBON											

APPENDI.. .BLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	02	01	02	01	02	01	02	01	02	01
LOCATION	12MWT19	12MWT19	12MWT20	12MWT20	12MWT21	12MWT21	12MWT22	12MWT22	12MWT23	12MWT23	12MWT24A
SAMPLE NUMBER	12GWT1902	12GWT1902-F	12GWT2001	12GWT2002	12GWT2101	12GWT2102	12GWT2201	12GWT2202	12GWT2301	12GWT2302	12GWT24A01
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/18/2005	2/19/2005	9/27/2004	2/7/2005	10/9/2004	3/4/2005	10/10/2004	2/21/2005	9/10/2004	2/20/2005	9/23/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	2.6	0.24 U	0.258 U	0.24 U	0.264 U
1,3-DINITROBENZENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.49 J	0.24 U	0.258 U	0.24 U	0.264 U
2,4,6-TRINITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	96	0.26 J	0.258 U	0.24 U	0.264 U
2,4-DIAMINO-6-NITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	2.3 J	0.48 J	0.258 U	0.24 U	0.264 U
2,4-DINITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.73	0.24 U	0.258 U	0.24 U	0.264 U
2,6-DIAMINO-4-NITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
2,6-DINITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	2	0.24 U	0.258 U	0.24 U	0.264 U
2-AMINO-4,6-DINITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	5.9	0.24 U	0.258 U	0.24 U	0.264 U
2-NITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
3,5-DINITROANILINE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.63 J	0.24 U	0.258 U	0.24 U	0.264 U
3-NITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
4,4'-TN-AZOXY	0.505 U		0.49 U	0.475 U	0.532 U	0.528 U	0.532 U	0.48 U	0.515 U	0.48 U	0.528 U
4-AMINO-2,6-DINITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	9.6	0.62	0.258 U	0.24 U	0.264 U
4-NITROTOLUENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
DNX	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
HMX	0.252 U		0.245 U	0.238 U	12	22	32	5	0.258 U	0.24 U	0.264 U
MNX	0.252 U		0.245 U	0.238 U	0.34 J	0.264 U	0.81	0.43 J	0.258 U	0.24 U	0.264 U
NITROBENZENE	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
RDX	3		1.4	3.1	61	130	590	34	0.258 U	0.24 U	2
TETRYL	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
TNX	0.252 U		0.245 U	0.238 U	0.266 U	0.264 U	0.266 U	0.24 U	0.258 U	0.24 U	0.264 U
Total Metals (ug/L)											
ALUMINUM	336 J		2200 J	2790 J	1700	5250 J	172	361 J	146000 J	167000 J	187000 J
ANTIMONY	0.085 U		0.085 UJ	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U	0.17 U	0.085 U	1.7 J
ARSENIC	1.3 U		1.7 J	2 U	7.8 J	0.07 J	0.75 J	0.67 U	24.5 J	7 J	18.2 J
BARIUM	18.7 U		16 J	13.5 J	22.3 J	19.9 J	32 J	27.9 J	13.1 J	16.1 U	8.3 J
BERYLLIUM	0.07 U		2.2	2.5 U	2.3	2.5 J	0.11 J	0.05 U	97.4 J	88.9 J	90.3 J
CADMIUM	1.4 J		3.5	2.8 U	0.45 J	0.53 J	0.45 J	0.27 U	67.2 J	83.4 J	50.9 J
CALCIUM	243000 J		294000	242000 J	19600 J	32900	12200 J	8900 J	393000 J	417000 J	25300 U
CHROMIUM	1.6 U		0.7 U	0.78 U	1.1 U	1.1 U	1.3 U	1.2 U	10.8 J	9.7 J	4.6 J
COBALT	51.5 J		280	214 J	78.8 J	76.8	19.3 J	7.9 J	5460 J	6060 J	44 U
COPPER	6.3 J		5.5	6.6 J	6.2 J	5.1	1.9 J	2.4 J	90.8 J	93.3 J	38.7 J
IRON	1440 J		1160	1280 J	16100 J	3210 J	236 J	268 J	29200 J	6550 J	191000 J
LEAD	0.967 U		2.2	2 U	4.5 J	2.7	0.39 U	0.477 U	31.5 J	104 J	22.1 J
MAGNESIUM	1140000 J		249000	239000 J	12600 J	14200	5050 J	5860 J	796000 J	995000 J	948000 J
MANGANESE	1790 J		2230	1770 J	2540 J	1780	351 J	81.1 J	65700 J	66700 J	130000 J
MERCURY	0.32 J		1.1 J	0.34	0.043 U	0.03 J	0.036 U	0.03 U	0.03 UJ	0.03 U	0.03 U
NICKEL	166 J		657	470 J	141 J	132	50.3 J	21.5 J	14000 J	14600 J	57.8 U
POTASSIUM	6360 J		5410 J	5810 J	2230 J	1490 J	2830 J	1430 J	10200 J	8550 J	11000 J
SELENIUM	4.2 J		10.6 J	12.1 J	0.62 U	0.62 J	2.3 J	1.6 J	9.6 J	24.7 J	3.3 J
SILVER	0.028 U		0.13 U	0.028 U	0.03 U	0.028 UJ	0.028 U	0.028 U	0.17 U	0.16 U	0.21 U
SODIUM	211000 J		6.79 U	212000 J	14700 J	15800 J	61200 J	307 U	366000 J	379000 J	195000 J
THALLIUM	0.49 U		0.34 J	0.69 U	0.11 J	0.11 J	0.11 J	0.09 U	1.5 J	6 J	0.84 U
TIN	0.56 U		0.28 J	0.21 U	0.08 U	0.048 U	0.4 U	0.32 U	0.09 U	0.63 U	0.18 U
VANADIUM	1.14 U		1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	2.4
ZINC	54.9 J		665 J	803 J	320 J	336	38.3 J	23.6 J	17500 J	18000	357 U
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED		42.8 J									
ANTIMONY, FILTERED		0.09 U									

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	02	01	02	01	02	01	02	01	02	01
LOCATION	12MWT19	12MWT19	12MWT20	12MWT20	12MWT21	12MWT21	12MWT22	12MWT22	12MWT23	12MWT23	12MWT24A
SAMPLE NUMBER	12GWT1902	12GWT1902-F	12GWT2001	12GWT2002	12GWT2101	12GWT2102	12GWT2201	12GWT2202	12GWT2301	12GWT2302	12GWT24A01
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/18/2005	2/19/2005	9/27/2004	2/7/2005	10/9/2004	3/4/2005	10/10/2004	2/21/2005	9/10/2004	2/20/2005	9/23/2004
ARSENIC, FILTERED		0.42 U									
BARIUM, FILTERED		13.9 J									
BERYLLIUM, FILTERED		0.07 U									
CADMIUM, FILTERED		0.44 U									
CALCIUM, FILTERED		253000 J									
CHROMIUM, FILTERED		0.36 U									
COBALT, FILTERED		54.6 J									
COPPER, FILTERED		1 U									
IRON, FILTERED		65.2 U									
LEAD, FILTERED		0.7 U									
MAGNESIUM, FILTERED		281000 J									
MANGANESE, FILTERED		1800									
MERCURY, FILTERED		0.04 J									
NICKEL, FILTERED		163 J									
POTASSIUM, FILTERED		6140 J									
SELENIUM, FILTERED		1.2 J									
SILVER, FILTERED		0.028 U									
SODIUM, FILTERED		220000 J									
THALLIUM, FILTERED		0.46 U									
TIN, FILTERED		0.15 U									
VANADIUM, FILTERED		1.14 U									
ZINC, FILTERED		42.8 J									
Field Parameters											
DISSOLVED OXYGEN (mg/L)	6.28		2.5	4.26	0.35	2.72	6.02	6.1	5.08	1.79	11.75
OXIDATION REDUCTION POTENTIAL (MV)	81.6		89.5	45.4	293.6	401.900000	365.3	182.100000	301	504.6	214.700000
PH (S.U.)	5.92		5.35	5.25	3.44	3.37	5.27	5.61	2.94	3.33	3.13
SPECIFIC CONDUCTANCE (MS/CM)	1.497		2.095	1.696	0.419	0.423	0.448	0.186	6.359	4.644	6.861
TEMPERATURE (C)	9.78		18.4	12.07	15.64	11.22	15.13	12.51	18.14	12.66	18.02
TURBIDITY (NTU)	35.2		1	0.8	6.94	3.15	7.79	9.66	218	6.8	2.3
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.01 UJ		0.18	0.2	0.005 UJ	0.06	0.005 UJ	0.01 UJ	8.9 J	4 J	5.9 J
NITRITE/NITRATE-N	0.94		0.67	0.97	0.48	0.05 U	0.63	0.19	2.3 J	0.22	0.05 U
TOTAL ORGANIC CARBON											

APPEN. .BLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	01	02	01	01	02	01	02	02	01	01
LOCATION	12MWT24A	12MWT27	12MWT27	12MWT35	12MWT35	12MWT35	12MWT36	12MWT36	12MWT36	12MWT37	12MWT37
SAMPLE NUMBER	12GWT24A02	12GWT2701	12GWT2702	12GWT3501	12GWT3501-F	12GWT3502	12GWT3601	12GWT3602	12GWT3602-D	12GWT3701	12GWT3701-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL
SAMPLE DATE	2/16/2005	9/25/2004	2/7/2005	9/22/2004	9/22/2004	2/16/2005	9/24/2004	3/4/2005	3/4/2005	9/26/2004	9/28/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
1,3-DINITROBENZENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2,4,6-TRINITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2,4-DIAMINO-6-NITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2,4-DINITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2,6-DIAMINO-4-NITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2,6-DINITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2-AMINO-4,6-DINITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
2-NITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
3,5-DINITROANILINE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
3-NITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
4,4'-TN-AZOXY	0.515 U	0.5 U	0.48 U	0.528 U		0.49 U	0.505 U	0.48 U		0.55 U	
4-AMINO-2,6-DINITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.26 J		0.275 U	
4-NITROTOLUENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
DNX	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.39 J	0.24 U		0.275 U	
HMX	0.258 U	0.25 U	0.32 J	8.4		8.2	6.1	6.9		0.275 U	
MNX	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	1.1	1.1		0.275 U	
NITROBENZENE	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
RDX	2.7	0.91 J	0.81	9.2		6.5	41	42		0.275 U	
TETRYL	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
TNX	0.258 U	0.25 U	0.24 U	0.264 U		0.245 U	0.252 U	0.24 U		0.275 U	
Total Metals (ug/L)											
ALUMINUM	190000 J	323 J	205 J	338 J		246 J	8.35 U	8.35 U		3140 J	
ANTIMONY	0.085 U	0.22 U	0.1 U	0.15 U		0.085 U	0.085 U	0.085 U		0.17 U	
ARSENIC	4.8 J	0.58 U	0.22 U	0.48 U		0.31 U	0.32 U	0.21 J		3.9 J	
BARIUM	9.9 J	39.1 J	20.6 J	51.6 J		55.4 J	40.3 J	38.7 J		48.8 J	
BERYLLIUM	64.3 J	0.03 U	0.02 U	0.44 U		1 U	0.02 U	0.02 U		0.32 U	
CADMIUM	40.7 J	0.05 U	0.04 U	0.42 U		0.16 U	0.039 U	0.039 U		0.41 U	
CALCIUM	427000 J	21200 J	16300 J	7170 J		2100 J	46900 J	51300		27800 J	
CHROMIUM	4.6 J	1.2 J	0.62 U	1.2 J		0.42 U	0.53 U	0.28 U		12.4 J	
COBALT	4640 J	11.2 J	1.2 U	27.5 J		14.8 J	9 J	1		18.2 J	
COPPER	30.3 J	0.67 J	2 J	3 J		3.1 J	0.53 U	1.1 J		16.9 J	
IRON	209000 J	482 J	396 J	583 J		1280 J	19.3 U	23.8 U		5410 J	
LEAD	18.6 J	0.37 U	0.42 U	0.97 J		0.781 U	0.21 U	0.069 U		6.6 J	
MAGNESIUM	985000 J	16400 J	16500 J	5670 J		4340 J	21600 J	21300		14600 J	
MANGANESE	138000 J	701 J	160 J	400 J		102 J	197 J	33.5		335 J	
MERCURY	0.03 U	0.03 U	0.03 U	0.03 U		0.11 J	0.03 U	0.03 U		0.042 U	
NICKEL	12100 J	30.7 J	7.3 J	47.4 J		27.6 J	16.6 J	3.3		55.5 J	
POTASSIUM	11900 J	3710 J	1080 J	994 J		352 J	1570 J	958 J		2890 J	
SELENIUM	7.9 J	0.61 U	0.37 U	0.38 U		0.38 U	0.77 U	1.8 J		1.3 U	
SILVER	0.03 U	0.028 U	0.028 U	0.028 U		0.028 U	0.028 U	0.028 UJ		0.028 U	
SODIUM	164000 J	53600 J	39200 J	31900 J		31600 J	91500 J	64400 J		74600 J	
THALLIUM	1.5 U	0.043 U	0.043 U	0.043 U		0.12 U	0.043 U	0.09 J		0.17 U	
TIN	0.048 U	0.69 U	0.15 U	0.33 U		0.048 U	0.33 U	0.08 J		1.1 U	
VANADIUM	4.3	1.14 U	1.14 U	1.14 U		1.14 U	1.14 U	1.14 U		6.1	
ZINC	17600 J	11.3 J	3.3 U	73.6 J		61.3 J	5.6 U	2.8 J		82.2 J	
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED					57.5 U						356 J
ANTIMONY, FILTERED					0.1 U						0.085 UJ

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	02	01	02	01	01	02	01	02	02	01	01
LOCATION	12MWT24A	12MWT27	12MWT27	12MWT35	12MWT35	12MWT35	12MWT36	12MWT36	12MWT36	12MWT37	12MWT37
SAMPLE NUMBER	12GWT24A02	12GWT2701	12GWT2702	12GWT3501	12GWT3501-F	12GWT3502	12GWT3601	12GWT3602	12GWT3602-D	12GWT3701	12GWT3701-F
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL
SAMPLE DATE	2/16/2005	9/25/2004	2/7/2005	9/22/2004	9/22/2004	2/16/2005	9/24/2004	3/4/2005	3/4/2005	9/26/2004	9/28/2004
ARSENIC, FILTERED					0.44 U						1.1 J
BARIUM, FILTERED					48.9 J						29 J
BERYLLIUM, FILTERED					0.25 U						0.09 J
CADMIUM, FILTERED					0.27 U						0.43 J
CALCIUM, FILTERED					8590 J						29400
CHROMIUM, FILTERED					0.5 U						1.7 U
COBALT, FILTERED					26.1 J						16.8
COPPER, FILTERED					1.3 J						8.6
IRON, FILTERED					682 J						757
LEAD, FILTERED					0.21 U						1
MAGNESIUM, FILTERED					5290 J						12800 J
MANGANESE, FILTERED					543 J						343
MERCURY, FILTERED					0.03 U						0.045 U
NICKEL, FILTERED					46.9 J						52 J
POTASSIUM, FILTERED					1080 J						1840 J
SELENIUM, FILTERED					0.31 U						3.6 J
SILVER, FILTERED					0.028 U						0.07 U
SODIUM, FILTERED					34000 J						77900 J
THALLIUM, FILTERED					0.043 U						0.1 J
TIN, FILTERED					0.048 U						0.21 J
VANADIUM, FILTERED					1.14 U						1.14 U
ZINC, FILTERED					57.9 J						53.2 J
Field Parameters											
DISSOLVED OXYGEN (mg/L)	1.77	7.33	1.71	1.33		1.23	3.69	2.63		6.87	
OXIDATION REDUCTION POTENTIAL (MV)	249	297.3	4.4	609.7		121.9	332.5	222.700000		381.700000	
PH (S.U.)	3.77	6.21	6.4	3.77		4.91	6.02	6.29		4.97	
SPECIFIC CONDUCTANCE (MS/CM)	5.982	0.389	0.234	0.206		0.155	0.65	0.55		0.586	
TEMPERATURE (C)	12.18	19.14	11.39	19.64		12.65	19.94	13.02		20.85	
TURBIDITY (NTU)	3.2	8.47	9.1	15		5.93	0.82	0.22		8.7	
Miscellaneous Parameters (mg/L)											
AMMONIA-N	10	0.05 U	0.1	0.1 J		0.01 U	0.1 J	0.01 U	0.01 U	0.05	
NITRITE/NITRATE-N	0.05 U	0.08	0.08	1		0.77	5.4	6.1	6	0.12	
TOTAL ORGANIC CARBON											

APPEN LE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	01	01	02	02	01	01	02	02	01
LOCATION	12MWT38	12MWT38	12MWT39	12MWT39	12MWT39	12MWT39	12MWT40	12MWT40	12MWT40	12MWT40	12MWT42
SAMPLE NUMBER	12GWT3801	12GWT3802	12GWT3901	12GWT3901-F	12GWT3902	12GWT3902-F	12GWT4001	12GWT4001-F	12GWT4002	12GWT4002-F	12GWT4201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/9/2004	2/20/2005	9/24/2004	9/24/2004	2/15/2005	2/17/2005	9/27/2004	9/27/2004	2/18/2005	2/18/2005	9/28/2004
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
1,3-DINITROBENZENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2,4,6-TRINITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2,4-DIAMINO-6-NITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2,4-DINITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2,6-DIAMINO-4-NITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2,6-DINITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
2-NITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
3,5-DINITROANILINE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
3-NITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
4,4'-TN-AZOXY	0.5 U	0.485 U	0.528 U		0.49 U		0.528 U		0.51 U		0.532 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
4-NITROTOLUENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
DNX	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
HMX	0.35 J	0.71 J	0.264 U		0.245 U		0.264 U		0.255 U		18
MNX	0.25 U	0.36 J	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
NITROBENZENE	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
RDX	42	52 J	0.264 U		0.245 U		0.264 U		0.255 U		11
TETRYL	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
TNX	0.25 U	0.242 U	0.264 U		0.245 U		0.264 U		0.255 U		0.266 U
Total Metals (ug/L)											
ALUMINUM	2220	4120 J	12200 J		3280 J		556 J		635 J		1290 J
ANTIMONY	0.63 U	0.085 U	0.97 U		2.7 U		0.085 U		0.085 U		0.085 UJ
ARSENIC	0.85 J	0.33 U	14.9 J		4.7 J		1.1 J		1.9 U		2.1 J
BARIUM	30.3 J	18.4 U	212 J		88.6 J		18.9 J		15.1 U		33.8 J
BERYLLIUM	4.3	2.8 J	1.6 J		0.39 U		2.7 J		2.8 J		2.8
CADMIUM	2.8 J	2 J	0.6 U		0.32 U		0.58 U		0.72 U		1.4
CALCIUM	30500 J	20400 J	18400 J		16700 J		30000 J		31800 J		46700
CHROMIUM	1.1 U	1.2 U	35.2 J		8.9 J		1.8 J		1.8 U		0.3 U
COBALT	261 J	186 J	54 J		17.6 J		132 J		115 J		307
COPPER	17 J	8.9 J	25.8 J		9.8 J		4.3 J		7.3 J		17.2
IRON	1810 J	3320 J	39500 J		8700 J		492 J		657 J		307
LEAD	3.6 J	2.8 J	19.8 J		4.4 U		2.1 J		2.9 J		1.8
MAGNESIUM	30200 J	18900 J	15100 J		9550 J		45000 J		39100 J		31200
MANGANESE	1500 J	1240 J	972 J		354 J		434 J		451 J		1370
MERCURY	0.03 U	0.03 U	4.5 J		1.5		0.094 U		0.03 U		0.038 U
NICKEL	556 J	353 J	86.5 J		37.4 J		170 J		162 J		627
POTASSIUM	3530 J	3190 J	17800 J		11600 J		1440 J		1490 J		2930 J
SELENIUM	2 J	0.93 J	0.76 U		5.8 J		0.26 U		5.7 J		3.6 J
SILVER	0.15 U	0.03 U	0.08 U		0.03 U		0.028 U		0.028 U		0.028 U
SODIUM	53500 J	34200 J	76900 J		65900 J		167000 J		134000 J		56500 J
THALLIUM	0.27 J	0.43 U	0.41 U		0.25 U		0.043 U		0.17 U		0.05 J
TIN	0.25 U	0.14 U	1.4 J		0.52 U		0.048 U		0.28 U		0.16 J
VANADIUM	1.14 U	1.14 U	22.9		5.1		1.14 U		1.14 U		1.14 U
ZINC	1150 J	689	132 J		50.8 J		78.8 J		105 J		724 J
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED				50.2 U		401		259 J		239	
ANTIMONY, FILTERED				1.9 J		1.1 U		0.085 U		0.25 U	

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
SAMPLING ROUND	01	02	01	01	02	02	01	01	02	02	01
LOCATION	12MWT38	12MWT38	12MWT39	12MWT39	12MWT39	12MWT39	12MWT40	12MWT40	12MWT40	12MWT40	12MWT42
SAMPLE NUMBER	12GWT3801	12GWT3802	12GWT3901	12GWT3901-F	12GWT3902	12GWT3902-F	12GWT4001	12GWT4001-F	12GWT4002	12GWT4002-F	12GWT4201
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	10/9/2004	2/20/2005	9/24/2004	9/24/2004	2/15/2005	2/17/2005	9/27/2004	9/27/2004	2/18/2005	2/18/2005	9/28/2004
ARSENIC, FILTERED				0.35 U		1.1 U		0.69 U		1.1 U	
BARIUM, FILTERED				79.5 J		65 J		16.1 J		11.4 J	
BERYLLIUM, FILTERED				0.06 U		0.13 U		2.7 J		2.9 J	
CADMIUM, FILTERED				0.18 U		0.15 U		0.54 U		0.61 U	
CALCIUM, FILTERED				18500 J		14800 J		28600 J		29200 J	
CHROMIUM, FILTERED				1.4 J		2.6 J		1.1 J		0.81 U	
COBALT, FILTERED				23.2 J		12.3 J		133 J		127 J	
COPPER, FILTERED				3.1 J		4.1 J		6.4 J		3.7 J	
IRON, FILTERED				34.2 U		1290 J		47.3 U		74.1 U	
LEAD, FILTERED				0.26 U		1.6 J		1.4 J		2.4 J	
MAGNESIUM, FILTERED				11200 J		9510 J		42500 J		43300 J	
MANGANESE, FILTERED				461 J		210		415 J		415	
MERCURY, FILTERED				2.9 J		0.13 U		0.089 U		0.03 U	
NICKEL, FILTERED				33.1 J		26.3 J		168 J		173 J	
POTASSIUM, FILTERED				18300 J		5220 J		1380 J		1480 J	
SELENIUM, FILTERED				0.44 U		0.45 U		0.24 U		0.48 U	
SILVER, FILTERED				0.05 U		0.028 U		0.028 U		0.14 U	
SODIUM, FILTERED				77700 J		68000 J		154000 J		142000 J	
THALLIUM, FILTERED				0.07 U		0.07 U		0.043 U		0.2 U	
TIN, FILTERED				0.05 U		0.37 U		0.048 U		0.15 U	
VANADIUM, FILTERED				1.14 U		1.14 U		1.14 U		1.14 U	
ZINC, FILTERED				26.5 J		30.3 J		78.4 J		81.6 J	
Field Parameters											
DISSOLVED OXYGEN (mg/L)	6.88	3.67	6.4		5.15		5.92		2.95		0.18
OXIDATION REDUCTION POTENTIAL (MV)	171.3	399.700000	373.400000		135		202.700000		169		523
PH (S.U.)	4.2	3.6	6.34		6.88		4.48		4.45		4
SPECIFIC CONDUCTANCE (MS/CM)	0.607	0.33	0.581		0.472		0.937		0.726		0.625
TEMPERATURE (C)	17.61	10.48	16.14		16.59		16		12.3		17.5
TURBIDITY (NTU)	5	1.21	1000		330		15		28.4		1.01
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.005 UJ	0.08 J	0.06 U		0.01 UJ		0.04 U		0.01 UJ		0.005 U
NITRITE/NITRATE-N	0.07	0.05 U	0.12		0.29		0.05 U		0.05 U		0.4
TOTAL ORGANIC CARBON											

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	OVERBURDEN	OVERBURDEN	OVERBURDEN
SAMPLING ROUND	02	01	02	01	01	02	01	02	ES/DI	ES/DI	ES/DI
LOCATION	12MWT42	12MWT25	12MWT25	12MWT26	12MWT26	12MWT26	12MWT28	12MWT28	12TW001	12TW002	12TW003
SAMPLE NUMBER	12GWT4202	12GWT2501	12GWT2502	12GWT2601	12GWT2601-F	12GWT2602	12GWT2801	12GWT2802	12GWTW001	12GWTW002	12GWTW003
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/19/2005	10/10/2004	2/4/2005	9/26/2004	9/26/2004	2/17/2005	9/13/2004	2/15/2005	2/18/2006	2/18/2006	2/19/2006
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
1,3-DINITROBENZENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
2,4,6-TRINITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	1.6	27 J
2,4-DIAMINO-6-NITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U			
2,4-DINITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
2,6-DIAMINO-4-NITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U			
2,6-DINITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
2-AMINO-4,6-DINITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	2.6 J	38 J
2-NITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
3,5-DINITROANILINE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U			
3-NITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	16 R	0.284 UJ
4,4'-TN-AZOXY	0.49 U	0.515 U	0.48 U	0.55 U		0.48 U	0.538 U	0.485 U			
4-AMINO-2,6-DINITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	5.2	160 J
4-NITROTOLUENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
DNX	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U			
HMX	27	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	40 J	33	110 J
MNX	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U			
NITROBENZENE	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
RDX	19	0.258 U	0.49	0.275 U		0.24 U	0.269 U	0.242 U	27 J	170	720 J
TETRYL	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U	0.291 UJ	0.269 U	0.284 UJ
TNX	0.245 U	0.258 U	0.24 U	0.275 U		0.24 U	0.269 U	0.242 U			
Total Metals (ug/L)											
ALUMINUM	3140 J	479	192 J	565 J		126 J	57.9 U	356 J			
ANTIMONY	0.15 U	0.085 U	0.085 U	0.24 U		0.54 U	0.085 U	0.085 U			
ARSENIC	0.38 U	1.1 J	0.27 U	2.3 J		0.67 U	0.42 U	0.15 U			
BARIUM	18.4 U	26.2 J	21.8 J	38.4 J		12.8 U	25.2 J	17.5 J			
BERYLLIUM	4.5 J	0.1 J	0.04 U	0.07 U		0.03 U	0.02 U	0.03 U			
CADMIUM	0.5 U	0.14 U	0.04 U	0.11 U		0.13 U	0.22 U	0.05 U			
CALCIUM	31800 J	216000 J	125000 J	92600 J		77900 J	201000 J	104000 J			
CHROMIUM	0.66 U	1.4 U	0.74 U	1.7 J		0.72 U	0.51 U	0.92 U			
COBALT	93.2 J	53.2 J	12.9 J	31.3 J		5.6 J	19.8 J	1.4 U			
COPPER	3.9 J	3 J	3.4 J	0.84 J		3.5 J	0.59 U	4 J			
IRON	805 J	1920 J	1110 J	2990 J		2010 J	307 J	1280 J			
LEAD	2.5 J	0.66 U	0.425 U	0.53 U		0.157 U	0.08 J	0.585 U			
MAGNESIUM	28000 J	229000 J	153000 J	70000 J		50000 J	233000 J	113000 J			
MANGANESE	286 J	4910 J	2200 J	2520 J		1020 J	6000 J	287 J			
MERCURY	0.05 J	0.042 U	0.03 U	0.14 U		0.051 U	0.03 UJ	0.03 U			
NICKEL	200 J	103 J	32 J	60.1 J		12.8 J	38.2 J	12.4 J			
POTASSIUM	553 J	5320 J	3320 J	3740 J		1630 J	3940 J	2110 J			
SELENIUM	1.2 J	3.4 J	1.9 J	0.28 U		0.99 J	0.65 U	1.1 J			
SILVER	0.028 U	0.03 U	0.028 U	0.028 U		0.028 U	0.028 U	0.028 U			
SODIUM	39500 J	152000 J	116000 J	165000 J		143000 J	167000 J	122000 J			
THALLIUM	0.07 U	0.08 J	0.08 U	0.043 U		0.06 U	0.043 U	0.043 U			
TIN	0.27 U	0.24 U	0.09 U	0.06 U		0.33 U	0.23 U	0.1 U			
VANADIUM	1.14 U	1.14 U	1.14 U	1.14 U		1.14 U	1.14 U	1.14 U			
ZINC	255 J	20.8 J	26.1 J	12.1 J		8 J	9.5 J	5.1 U			
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED					20.4 U						
ANTIMONY, FILTERED					0.37 U						

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	OVERBURDEN	OVERBURDEN	OVERBURDEN
SAMPLING ROUND	02	01	02	01	01	02	01	02	ES/DI	ES/DI	ES/DI
LOCATION	12MWT42	12MWT25	12MWT25	12MWT26	12MWT26	12MWT26	12MWT28	12MWT28	12TW001	12TW002	12TW003
SAMPLE NUMBER	12GWT4202	12GWT2501	12GWT2502	12GWT2601	12GWT2601-F	12GWT2602	12GWT2801	12GWT2802	12GTW001	12GTW002	12GTW003
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/19/2005	10/10/2004	2/4/2005	9/26/2004	9/26/2004	2/17/2005	9/13/2004	2/15/2005	2/18/2006	2/18/2006	2/19/2006
ARSENIC, FILTERED					2.5 J						
BARIUM, FILTERED					38.8 J						
BERYLLIUM, FILTERED					0.06 U						
CADMIUM, FILTERED					0.05 U						
CALCIUM, FILTERED					107000 J						
CHROMIUM, FILTERED					0.73 U						
COBALT, FILTERED					41.4 J						
COPPER, FILTERED					1.3 J						
IRON, FILTERED					2830 J						
LEAD, FILTERED					0.069 U						
MAGNESIUM, FILTERED					80600 J						
MANGANESE, FILTERED					3350 J						
MERCURY, FILTERED					0.035 U						
NICKEL, FILTERED					76.1 J						
POTASSIUM, FILTERED					4130 J						
SELENIUM, FILTERED					0.32 U						
SILVER, FILTERED					0.028 U						
SODIUM, FILTERED					170000 J						
THALLIUM, FILTERED					0.043 U						
TIN, FILTERED					0.048 U						
VANADIUM, FILTERED					1.14 U						
ZINC, FILTERED					12.9 J						
Field Parameters											
DISSOLVED OXYGEN (mg/L)	1.25	1.72	0.84	3.38		1.7	7.29	4.17		4.27	
OXIDATION REDUCTION POTENTIAL (MV)	279.900000	46.4	38.9	38.3		38.5	75	82.7		-68.5	
PH (S.U.)	4.24	5.92	6.28	7.22		6.18	6.33	6.41		6.62	
SPECIFIC CONDUCTANCE (MS/CM)	0.303	2.265	1.952	1.4888		0.774	1.937	1.208		1.87	
TEMPERATURE (C)	11.27	16.35	14.57	17.98		11.54	16.31	16.17		7.39	
TURBIDITY (NTU)	0.55	3	13.8	13.3		9.81	10.83	9.03		25	
Miscellaneous Parameters (mg/L)											
AMMONIA-N	0.01 UJ	0.005 UJ	0.16	0.17 J		0.12 J	0.005 U	0.01 U			
NITRITE/NITRATE-N	0.21	0.18	0.05 U	0.05 U		0.05 U	0.81 J	0.25			
TOTAL ORGANIC CARBON				1.8		1.7					

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN
SAMPLING ROUND	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI
LOCATION	12TW004	12TW006	12TW007	12TW008	12TW009	12TW010	12TW011	12TW012	12TW013	12TW014	12TW015
SAMPLE NUMBER	12GWTW004	12GWTW006	12GWTW007	12GWTW008	12GWTW009	12GWTW010	12GWTW011	12GWTW012	12GWTW013	12GWTW014	12GWTW015
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/18/2006	2/18/2006	2/18/2006	2/28/2006	2/19/2006	2/19/2006	2/20/2006	2/28/2006	2/28/2006	2/28/2006	2/28/2006
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.271 UJ	2.3 J	0.294 UJ	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
1,3-DINITROBENZENE	0.271 UJ	0.301 UJ	0.294 UJ	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
2,4,6-TRINITROTOLUENE	0.271 UJ	30 J	0.294 UJ	0.79	0.248 UJ	0.294 UJ	0.24 U	0.76	0.281 U	0.325 U	0.271 U
2,4-DIAMINO-6-NITROTOLUENE											
2,4-DINITROTOLUENE	0.271 UJ	0.301 UJ	0.294 UJ	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
2,6-DIAMINO-4-NITROTOLUENE											
2,6-DINITROTOLUENE	0.271 UJ	0.301 UJ	0.294 UJ	0.76 J	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
2-AMINO-4,6-DINITROTOLUENE	1.3 J	6.7 J	1.7 J	4.7 J	1.2 J	0.294 UJ	0.24 U	2.1 J	0.281 U	0.325 U	0.271 U
2-NITROTOLUENE	0.271 UJ	0.301 UJ	0.294 UJ	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
3,5-DINITROANILINE											
3-NITROTOLUENE	0.271 UJ	0.301 UJ	3.9 J	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
4,4'-TN-AZOXY											
4-AMINO-2,6-DINITROTOLUENE	2 J	19 J	3.9 J	12	3.6 J	0.294 UJ	0.24 U	5.5	0.281 U	0.325 U	0.271 U
4-NITROTOLUENE	0.271 UJ	0.301 UJ	0.294 UJ	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
DNX											
HMX	1.2 J	92 J	120 J	16	280	11 J	0.24 U	870	0.281 U	3	8.2
MNX											
NITROBENZENE	0.271 UJ	0.301 UJ	0.294 UJ	0.27 U	0.248 UJ	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
RDX	1.5 J	370 J	530 J	1.7	730 J	36 J	0.7	12000	0.281 U	2.4 J	9.2
TETRYL	0.271 UJ	0.301 UJ	0.294 UJ	0.27 U	0.248 U	0.294 UJ	0.24 U	0.29 U	0.281 U	0.325 U	0.271 U
TNX											
Total Metals (ug/L)											
ALUMINUM											
ANTIMONY											
ARSENIC											
BARIUM											
BERYLLIUM											
CADMIUM											
CALCIUM											
CHROMIUM											
COBALT											
COPPER											
IRON											
LEAD											
MAGNESIUM											
MANGANESE											
MERCURY											
NICKEL											
POTASSIUM											
SELENIUM											
SILVER											
SODIUM											
THALLIUM											
TIN											
VANADIUM											
ZINC											

APPENDIX TABLE G-6

RESULTS FOR CHEMICALS ANALYZED IN ALL GROUNDWATER SAMPLES, ROUNDS 1, 2 AND EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
WATER BEARING ZONE	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN	OVERBURDEN
SAMPLING ROUND	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI
LOCATION	12TW004	12TW006	12TW007	12TW008	12TW009	12TW010	12TW011	12TW012	12TW013	12TW014	12TW015
SAMPLE NUMBER	12GWTW004	12GWTW006	12GWTW007	12GWTW008	12GWTW009	12GWTW010	12GWTW011	12GWTW012	12GWTW013	12GWTW014	12GWTW015
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/18/2006	2/18/2006	2/18/2006	2/28/2006	2/19/2006	2/19/2006	2/20/2006	2/28/2006	2/28/2006	2/28/2006	2/28/2006
Dissolved Metals (ug/L)											
ALUMINUM, FILTERED											
ANTIMONY, FILTERED											
ARSENIC, FILTERED											
BARIUM, FILTERED											
BERYLLIUM, FILTERED											
CADMIUM, FILTERED											
CALCIUM, FILTERED											
CHROMIUM, FILTERED											
COBALT, FILTERED											
COPPER, FILTERED											
IRON, FILTERED											
LEAD, FILTERED											
MAGNESIUM, FILTERED											
MANGANESE, FILTERED											
MERCURY, FILTERED											
NICKEL, FILTERED											
POTASSIUM, FILTERED											
SELENIUM, FILTERED											
SILVER, FILTERED											
SODIUM, FILTERED											
THALLIUM, FILTERED											
TIN, FILTERED											
VANADIUM, FILTERED											
ZINC, FILTERED											
Field Parameters											
DISSOLVED OXYGEN (mg/L)					0		11.02				
OXIDATION REDUCTION POTENTIAL (MV)					0		159				
PH (S.U.)					0		7.53				
SPECIFIC CONDUCTANCE (MS/CM)					0		0.184				
TEMPERATURE (C)					0		3.40				
TURBIDITY (NTU)					277		150				
Miscellaneous Parameters (mg/L)											
AMMONIA-N											
NITRITE/NITRATE-N											
TOTAL ORGANIC CARBON											

DOWNGRAD - downgradient well
UPGRAD - upgradient well
PLZMGD - Pennsylvania lower and mississippian glen dean aquifer
PMZ - Pennsylvania middle aquifer
PUZ - Pennsylvania upper aquifer
Data qualifiers (e.g., U, J) are defined in section 3 of the text.
ug/L - micrograms per liter
mg/L - milligrams per liter
MV - millivolts
S.U. - standard units
MS/CM - milliSiemens per centimeter
C - Celsius
NTU - nephelometric turbidity units

APPENDIX TABLE G-7

RESULTS FOR CHEMICALS ANALYZED IN ALL SUMP WATER
SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	SUMP WATER	SUMP WATER	SUMP WATER	SUMP WATER	SUMP WATER	SUMP WATER
STREAM ORDER	--	--	--	--	--	--
SAMPLING ORDER	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI
LOCATION	12SU/SL001	12SU/SL002	12SU/SL003	12SU/SL004	12SU/SL005	12SU/SL006
SAMPLE NUMBER	12SU00101	12SU00201	12SU00301	12SU00401	12SU00501	12SU00601
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/19/2006	DRY	DRY	DRY	2/19/2006	DRY
Energetics (ug/L)						
1,3,5-TRINITROBENZENE	0.264 U				0.242 U	
1,3-DINITROBENZENE	0.264 U				0.242 U	
2,4,6-TRINITROTOLUENE	0.264 U				0.242 U	
2,4-DINITROTOLUENE	0.264 U				0.242 U	
2,6-DINITROTOLUENE	0.264 U				0.242 U	
2-AMINO-4,6-DINITROTOLUENE	0.264 U				0.242 U	
2-NITROTOLUENE	0.264 U				0.242 U	
3-NITROTOLUENE	0.264 U				0.242 U	
4-AMINO-2,6-DINITROTOLUENE	0.264 U				0.242 U	
4-NITROTOLUENE	0.264 U				0.242 U	
HMX	4.7				15 J	
NITROBENZENE	0.264 U				0.242 U	
RDX	13				18	
TETRYL	0.264 U				0.242 U	

APPENDIX TABLE G-7

RESULTS FOR CHEMICALS ANALYZED IN ALL SUMP WATER
SAMPLES, EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	SUMP WATER	SUMP WATER	SUMP WATER	SUMP WATER	SUMP WATER
STREAM ORDER	--	--	--	--	--
SAMPLING ORDER	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI
LOCATION	12SU/SL007	12SU/SL008	12SU/SL009	12SU/SL010	12SU/SL011
SAMPLE NUMBER	12SU00701	12SU00801	12SU00901	12SU01001	12SU001101
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	DRY	2/19/2006	DRY	DRY	DRY
Energetics (ug/L)					
1,3,5-TRINITROBENZENE		0.25 U			
1,3-DINITROBENZENE		0.25 U			
2,4,6-TRINITROTOLUENE		7.7			
2,4-DINITROTOLUENE		0.25 U			
2,6-DINITROTOLUENE		0.25 U			
2-AMINO-4,6-DINITROTOLUENE		9.4 J			
2-NITROTOLUENE		0.25 U			
3-NITROTOLUENE		0.25 U			
4-AMINO-2,6-DINITROTOLUENE		18			
4-NITROTOLUENE		0.25 U			
HMX		19			
NITROBENZENE		0.25 U			
RDX		95			
TETRYL		0.25 U			

APPENDIX TABLE G-8

RESULTS FOR CHEMICALS ANALYZED IN SEDIMENT SLUDGE SAMPLES
DURING EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	--	--	--	--	--	--
SAMPLING ROUND	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI
LOCATION	12SU/SL001	12SU/SL002	12SU/SL003	12SU/SL004	12SU/SL005	12SU/SL006
SAMPLE NUMBER	12SL001010006	12SL002010006	12SL003010006	12SL004010006	12SL005010006	12SL006010006
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	-9999 - -9999	-9999 - -9999	-9999 - -9999	-9999 - -9999	-9999 - -9999	-9999 - -9999
SAMPLE DATE	2/19/2006	2/19/2006	2/19/2006	2/19/2006	2/19/2006	2/19/2006
Energetics (mg/kg)						
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.38 R	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 J	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	11	0.94	160	39	0.47 J	1.4
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	2.3	0.79 J	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	1.2 J	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	1	0.25 U	4	2.5	0.25 U	0.47 J
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	3.6	0.25 U	16	6.1	0.25 U	1.9
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

APPENDIX TABLE G-8

RESULTS FOR CHEMICALS ANALYZED IN SEDIMENT SLUDGE SAMPLES
DURING EXTERNAL SUMP/DRAINAGE INVESTIGATION
SWMU 12 (MINE FILL A)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
STREAM ORDER	--	--	--	--	--
SAMPLING ROUND	ES/DI	ES/DI	ES/DI	ES/DI	ES/DI
LOCATION	12SU/SL007	12SU/SL008	12SU/SL009	12SU/SL010	12SU/SL010
SAMPLE NUMBER	12SL007010006	12SL008010006	12SL009010006	12SL010010006	12SL011010006
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
DEPTH RANGE	-9999 - -9999	-9999 - -9999	-9999 - -9999	-9999 - -9999	-9999 - -9999
SAMPLE DATE	2/19/2006	2/19/2006	2/19/2006	2/19/2006	2/19/2006
Energetics (mg/kg)					
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	22	0.61 J	7.5	2.1	0.55
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.49 J	0.27 J	0.25 U	0.25 U	0.31 J
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.98 J
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.86	0.25 U	2.4 J	0.86	0.94 J
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	2.4	0.25 U	7.5	1.5	0.39 J
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U

APPENDIX H

ANALYTICAL DATA QUALITY REVIEW

APPENDIX H. DATA QUALITY REVIEW

This appendix contains a description of the data review processes used to determine whether analytical laboratory data were of acceptable technical quality for use in decision making. The review began with data validation, which is a comparison of data quality indicators (DQIs) against prescribed acceptance criteria. The DQIs used are measures to assess the bias and precision of the analytical calibrations and sample analyses. The output of this review was a set of alphabetic flags such as "U," "J," "R," or combinations thereof, that may have been assigned to individual results based on the validation effort. These flags were used to infer the general quality of the data. The data validation was followed by a summary of quantitative data quality measures to provide the user with a more quantitative estimate of any bias or imprecision associated with the data. Also evaluated were the measures of data completeness, sensitivity, comparability and representativeness.

Sections H.1 and H.2 provide an overview of the data validation process, Sections H.3 and H.4 present an evaluation of the data quality beyond data validation. Appendix G contains a printout of all data and the applicable qualifier flags assigned during data validation.

Quality of data collected during the bioremediation effort at Mine Fill A is summarized briefly in the descriptions below. Additional detail of the data quality for that operation is provided in Section 6.0 of MK, 2000.

H.1 DATA VALIDATION PROCESS

Data generated during the SMWU 12 composting operations that occurred between early 1997 and early 2000 were validated in association with those operations. Approximately ten percent of the data were validated (MK, 2000). The data were found to be acceptable to support the bioremediation effort. While a small number of VOC surrogate compounds had recoveries outside of acceptance limits, most recoveries outside of limits were greater than the upper limit, which indicated a tendency for results to be biased high. Exceptions included select metals and, for one matrix spike, RDX that had a recovery of 16 percent. The 16 percent recovery indicates a tendency for the three samples in the associated analytical batch to have results that are biased low. Given the number of samples analyzed and the fact that the associated samples were from initial characterization samples collected prior to soil excavation, this is insignificant. Precision was generally acceptable. In general, the descriptions of data quality during the Interim Measures are similar to those for data quality of RFI Rounds 1 and 2 described below. Therefore, the data are usable to support the RFI. Metals data were generated through the Toxicity Characteristic

Leaching Procedure (TCLP), however, and do not represent native soil concentrations. In addition, only data that are associated with IMR initial characterization samples located outside the area of excavation, data from post excavation samples, and data from the last sampling round of the composted soil are usable for the RFI. All other IMR results are irrelevant to the RFI.

Data were generated for this RFI report in two rounds, Rounds 1 and 2. Field analytical data and sampling location coordinates for Rounds 1 and 2 were reviewed both in the field and after completing the field event to assure data users that the results and sampling location coordinates were accurate. Calibration logs and QC check sample results were reviewed for accuracy. In addition, field data were reviewed for comparability among sampling locations and consistency with theoretical expectations. For example, low pH values would not be expected if alkalinity values were high. These evaluations were based, in part, on professional judgment. Well stabilization parameters were required to represent stable sampling conditions (manifested as reproducible measurements) prior to sample collection but were not required to compare well to field test kit results.

All of the TtNUS results from analytical laboratory samples (Rounds 1 and 2) were validated by TtNUS according to several specifications. Assignment of data qualification flags by TtNUS conformed to U.S. EPA Region 5 Standard Operating Procedures for Validation of Contract Laboratory Program Organic Data (U.S. EPA, 1993c); to Region 5 Standard Operating Procedures for Validation of Contract Laboratory Program Inorganic Data (U.S. EPA, 1993d); to the U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (U.S. EPA, 1994a); and to U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (U.S. EPA, 1994b) to the greatest extent practicable for non-contract laboratory program data.

Data validation specifications require that various data qualifiers be assigned when a deficiency is detected or when a result is less than its detection limit. If no qualifier is assigned to a result that has been validated, the data user is assured that no technical deficiencies were identified during validation. The qualification flags used are defined below:

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

UJ – Indicates that the chemical was not detected; however, the detection limit (sample-specific detection limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.

J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration non-compliances, and extremely low analyte recoveries).

R – Indicates that the chemical may or may not be present. The positive analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies.

BU - Indicates that the associated organic chemical was detected in the affected sample as well as the associated laboratory method blank, but has been qualified as non-detected because the concentration was less than the blank level after adjustment for uncertainties (i.e., the blank action level) per the validation guidelines.

BJ - Indicates that the associated organic chemical was detected in the affected sample as well as the associated method blank and rather than being considered a non-detect, is considered to be an estimate because the concentration is in excess of the blank action level. The use of "B" qualifiers is a U.S. EPA Region 5-specific requirement.

> - Indicates that the true value is probably greater than the reported value. This "qualifier flag" is used to identify reported values that exceed the calibration range of field measurements but could not be re-analyzed for various reasons.

The preceding data qualifiers may be categorized as indicative of major or minor problems. Major problems are defined as deficiencies that result in the rejection of data and qualification with UR or R data validation qualifiers. These data are not used for risk assessment decision making purposes unless they are used in a qualitative way and the use is justified and documented. Minor problems are defined as deficiencies resulting in the estimation of data, and qualification with U, J, B, BJ, BU, and UJ data

validation qualifiers. Estimated analytical results are considered to be suitable for all decision-making purposes unless the data use requirements are very stringent and the qualifier indicates a deficiency that is incompatible with the intended data use. It is noteworthy that a U qualifier does not necessarily indicate that a data deficiency exists because all non-detect values are flagged with the U qualifier regardless of whether a quality deficiency has been detected.

H.2 DATA VALIDATION OUTPUTS

After data were validated, a list was developed of non-conformities requiring data qualifier flags that were used to alert the data user to inaccurate or imprecise data. For situations in which several QC criteria were out of specification, the data validator made professional judgements and or comments on the validity of the overall data package. The reviewer then prepared a technical memorandum presenting qualification of the data, if necessary, and the rationale for making such qualifications. The net result was a data package that had been carefully reviewed for its adherence to prescribed technical requirements. Validators incorporated data qualifiers into the electronic database and submitted the information to the TtNUS data management group. A complete printout of the Round 1 and Round 2 with validation flags is presented in Appendix G. Pertinent quality estimates are summarized in a more quantitative format in the following section.

H.3 GENERAL DATA QUALITY

DQIs are parameters that are monitored to help establish the quality of data generated during an investigation. Some of the DQIs are generated from analysis of field samples (e.g., field duplicates) and some are generated from the analysis of laboratory samples (e.g., laboratory duplicates and matrix spikes). Individually, field and laboratory DQIs provide measures of the performance of the respective investigative operations (field or laboratory). During data validation, individual QC results were evaluated. If individual QC results were acceptable, no validation flag was assigned to an analytical result, otherwise a flag indicating the type of QC deficiency was assigned to the result. The data quality review provided in this section, which was implemented after the data validation process was completed, is not designed to identify data that are acceptable or unacceptable according to data QC criteria. Instead, it is designed to provide an overall quantitative measure of analytical performance not provided by data validation. These quantitative evaluations are frequently analyte-specific. They reflect, for example, biases associated with the quantification of particular analytes in a particular sample matrix. Many of the summary tables referenced in the sections below reflect this and the data user must be aware that even chemicals in the same analytical fraction (e.g. VOCs) may exhibit different data quality. Taken together, the DQIs provide a measure of overall analytical performance.

At the same time that samples were collected at SWMU 12, samples were also collected at NSWC Crane SWMU 25. Samples of similar matrix from both SWMUs may have been grouped together for analysis. Consequently, the QC data may be common to samples from different SWMUs. This is a benefit when compiling accuracy and precision statistics because a more robust estimate of these characteristics is obtained when using larger data sets. Generally speaking, aqueous samples are expected to yield similar laboratory performance; and soil and sediment samples are expected to yield similar laboratory performance. Because data sets were combined, data quality may be presented and discussed below for the combined data sets. The majority of QC and normal samples, however, were derived from Mind Fill A

The RFI data for the Mine Fill A were of generally acceptable quality. Comparability, Representativeness, and sensitivity, in particular, were typical of environmental investigations and do not indicate any particular problems although any samples that were not collected must be considered data voids relative to the sampling and analysis plan. In addition, disparities between total and dissolved metal concentrations must be considered because some dissolved metal concentrations were more than 25 percent greater than total metal concentrations (See Section H3.6). Data quality exceptions are summarized briefly immediately below for each round of sampling. After the brief summary, a more detailed data quality analyses is presented.

Explosives, Rounds 1 and 2

The 90 percent completeness goal was satisfied for explosives analyses. However, some samples, which are not considered when computing the percent complete could not be collected as planned. This typically occurred for soil and surface water samples that could not be collected because refusal was encountered or no surface water was present at or near the selected sampling location. Some groundwater monitoring wells were also dry and no seeps were located during the seep search conducted in Round 1. A slight but insignificant high bias was observed for all explosives in solid sample matrices and virtually no bias was observed in aqueous samples. This is evident in the percent recoveries of explosive analytes that had average values in the range of 75 to 135 percent, with very few exceptions. The RDX degradation product, 4,4'-TN-AZOXY in aqueous samples, is a notable exception with average LCS and MS/MSD recoveries of approximately 40 percent in aqueous samples. There was no significant bias for this compound in solid matrices. If any non-detect concentration exceeded the laboratory threshold value, it did not exceed by more than 50 percent. Most exceedances were within 20 percent of the target TV and most non-detect values were comparable to the target TV. Precision measures were also within expectations with very few exceptions. The energetic compounds, in general, exhibited good to excellent analytical performance in solid and aqueous matrices for Rounds 1 and 2.

Herbicides, Rounds 1 and 2

Hexachlorophene and pentachlorophenol are not herbicides but these compounds were analyzed by an herbicide analytical method to obtain lower detection limits than could be obtained with the normally used SVOC analytical method. The sample collection completeness was 100 percent for all matrices. One surface water sample was analyzed for these compounds in Rounds 1 and 2 but no groundwater samples were analyzed for these chemicals. Sensitivity goals were achieved, although the goals consistently did not permit the attainment of ecological risk-based target levels (RBTLs) for soil and surface water. This is not an analytical deficiency but should be considered when evaluating data relative to RBTLs. The hexachlorophene and pentachlorophenol results exhibit a severe low bias (approximately 10 to 90 percent recoveries in MS and MSD) in solid samples and a moderate to severe low bias (approximately 20 to 107 percent recoveries in MS/MSD) in surface water samples. Precision for pentachlorophenol was erratic in solid samples and the hexachlorophene precision (55 percent RPD) exceeded the target range of 0 to 30 percent in the Round 1 surface water sample. Generally, the analytical performance for these two compounds was poor with erratic precision and moderate to severe low biases.

Metals (including simultaneously extracted metals), Rounds 1 and 2

The sample collection goal (90 percent complete) was attained. Thirteen samples were analyzed for filtered metals when turbidity values exceeded 10 nephelometic turbidity units to yield a completeness of 100 percent. Solid matrices were not analyzed for metals in Round 2 and no results were rejected in either round in any matrix, except for eight dissolved thallium (surface water) and three total mercury results (subsurface soil). Some percent recoveries (bias indicators) were unusually high or low for a few isolated samples but the metals results, overall, exhibit no significant bias. Several soil and sediment RPD results exceeded the reference point of 50 percent, however, the laboratory precision was equal to or better than field duplicate precision, as expected. This indicates that the greater proportion of uncertainty is associated with natural sample heterogeneity. Nevertheless, several metals exhibited some high RPD values (e.g., greater than 100 percent) and sporadically high or low bias indicators that represents an occasional large degree of heterogeneity or infiltration of laboratory contamination. Attempts were made during data validation to account for laboratory contamination by qualifying samples that have metal concentrations within 5 times the associated blank concentration as non-detect.

Miscellaneous Parameters (Ammonia, AVS, Cation Exchange Capacity, Nitrite/Nitrate and TOC), Rounds 1 and 2

Two sediment samples scheduled for cation exchange capacity (CEC) and total organic carbon (TOC) determinations were not collected and no substitutions were made. Therefore, the percent completeness (75 percent for CEC; 62 percent for TOC) was less than the targeted 90 percent for these parameters. Otherwise, the data for these parameters are generally of acceptable quality with the exception of the ammonia nitrogen results which exhibit a slight low bias and occasionally exhibit an uncertainty that is greater than expected. Failure to meet the target of 90 percent had little negative impact to the project.

Semivolatile Organic Compounds, Rounds 1 and 2

Recoveries in LCSs and MSs, and MSDs were generally biased low, especially for solid matrix samples. Some recoveries were zero. A low bias indicates that the affected analytes are not completely extracted from the sample matrix during sample preparation, hence the reported results are less than actual concentrations in the samples. This is typical for environmental samples and is generally acceptable if the low biases do not significantly affect the ability to accurately quantitate critical compounds. Sixty-seven results for select compounds in field samples were rejected for low LCS/LCSD recoveries, low MS/MSD recoveries, and calibration non-compliances. The results rejected in soil were for the compounds 2,4-dinitrophenol, 2,4-dimethylhenol , 3,3'-dichlorobenzidine, 3-nitroaniline, 4-chloroaniline, 4-nitroquinoline-1-oxide, 4,6-dinitro-2-methylphenol, diphenylamine, and N-nitrosodiphenylamine. For aqueous samples, the rejections were for 4-nitroquinoline-1-oxide (2 samples) and kepone (one sample). Calibration non-compliances usually occur for target compounds that have poor analytical responses and these cases were no exceptions. The compounds that were rejected are, as a group, of minor importance to the project. Overall, the semivolatile compounds, including PAHs, generally show a slight to moderate low bias in solid matrices, with results for compounds identified above having been rejected in some samples. In soils, a high degree of uncertainty exists for 4-chloroaniline but uncertainty for other compounds is not indicated even though low matrix spikes were observed for compounds other than 4-chloroaniline. In aqueous matrices a slight to moderate low bias also exists, but there were very few rejections and no notable precision problems. No compounds that are of primary importance to this project had rejected results but the rejections and low biases must be considered when using the data.

Volatile Organic Compounds, Round 1 Only

VOCs were analyzed in select surface and subsurface samples during Round 1 only. Sample collection completeness was 100 percent for VOCs. Sensitivities and accuracies were generally acceptable with a few minor exceptions that are described in more detail below, although a select number of results were

rejected. The compounds acrolein, 2-butanone, acetone, acrylonitrile, and methacrylonitrile constitute all of the results rejected for the volatile analyses for Round 1. The data were rejected because these compounds yield poor analytical responses. This is a systematic problem that occurs for one or more of these compounds in the majority of the samples analyzed from the Mine Fill A. These compounds are not of particular importance to this project, hence the overall VOC data quality is judged to be acceptable for the intended data uses.

Overall Sample and Data Comparability , Completeness, and Representativeness

The intended sample collection and data analysis methods were used. The methods were selected to yield data that are comparable to previously generated data, therefore comparability of this data to previously collected data (from the Interim Measures) is acceptable.

Sample collection deviated somewhat from the proposed sampling strategy in Rounds 1 and 2 for solid and aqueous samples. If a sample was not collected, it was usually because there was no groundwater of surface water at or near the intended sampling location, or because refusal was encountered during installation of a soil boring. The lack of data from the planned locations as well as locations where data have been rejected for quality reasons should be considered when interpreting the results of the investigation. Sample 12SD070004 was an unscheduled sample that was collected to better define contamination in surface channel sediments.

All samples appear to be representative of the intended environmental matrices. Lack of data where samples could not be collected or where data have been rejected, however, should be considered when evaluating representativeness of the areas or volumes of environmental media that were characterized. Inability to achieve target detection limits or RBTLs in several cases should also be considered (See Section H.4.2). In addition, disparities between total and dissolved metal concentrations must be considered when interpreting the data (See Section H3.6).

The various DQIs are discussed in detail below. In addition to the DQIs discussed below, temperature blanks that accompanied each cooler containing samples were used to assess whether the samples had been stored at the appropriate temperature during shipping. All temperature blanks were less than or equal to 4 °C, indicating no deficiencies with regard to shipping temperature.

Whereas, individual analytes may have exhibited quality problems for particular sample batches and QC type (e.g., MS or LCS), overall data quality was acceptable for the intended uses (i.e., completion of the RFI, including human health and ecological risk assessments). Each section below addresses data

quality in more detail for a particular DQI for samples of a given matrix (solid or aqueous) and analytical fraction (e.g., metals or VOCs).

H.4 DETAILED DATA QUALITY REVIEW

This section embellishes the previous section by describing in more detail any problems that were identified during the data quality review. Tables H-1 through H-13 provide a wealth of detail concerning data quality down to the level of analytical performance for particular analytes in particular samples or sample matrices. These tables are referenced liberally throughout the text below.

H.4.1 Completeness

Completeness is a measure of the number of valid samples or measurements that are available relative to the number of samples or measurements that were intended to be generated. For this project, completeness was measured on three different bases: samples collected, field measurements, and laboratory measurements.

- Sample collection completeness was a measure of the usable samples collected as compared to those intended to be collected.

- Field measurement completeness was a measure of the usable field measurements made relative to those intended to be made.

- Laboratory measurement completeness was a measure of the amount of usable, valid laboratory measurements per matrix obtained for each target analyte.

Usable, valid samples (or results) were those judged, after data assessment, to represent the sampling populations and to have not been disqualified for use through data validation or additional data review. The total number of samples (or results) planned to be collected or generated are those listed in the Mine Fill A QAPP (TtNUS, 2003a) for Round 1 and QAPP addendum Number 1 (TtNUS, 2003b) for Round 2. Completeness was determined using the following equation:

$$\%C = \frac{V}{T} \times 100$$

where %C = percent completeness

V	=	number of samples (or results) determined to be valid
T	=	total number of planned samples (or results)

H.4.1.1 Sample Collection Completeness

Table H-1 compares the samples collected to the samples proposed in Rounds 1 and 2. Discretionary samples and provisional wells were not included in the estimates of total planned samples. Also not included are samples that could not be collected because the target matrix was unavailable. This may have occurred, for example, when refusal was encountered in a soil boring that prevented collection of a particular subsurface soil sample at that location. Samples that were filtered because turbidity exceeded 10 nephelometric turbidity units (NTUs) were included in the collected samples tally. Because these samples were only collected when the turbidity was greater than 10 NTUs, by definition the percent complete is 100. The 90 percent sample completeness goal was met for all sample matrices in Rounds 1 and 2 with the following exceptions. Two scheduled sediment samples were not collected for CEC and TOC analyses (See Table 2-4) and the completeness goal was not achieved. Unscheduled sample collections and samples that could not be collected in Rounds 1 and 2 are discussed in the field report (Section 2.0 of the RFI report text) with explanations for the observed deviations from the QAPP.

H.4.1.2 Field Measurement Completeness

The percent completeness for field measurements in Rounds 1 and 2, including natural attenuation parameter measurements, and well stabilization measurements was 100.

H.4.1.3 Laboratory Measurement Completeness

Under ideal conditions, the laboratory completeness objective would be 100 percent. However, samples can be rendered unusable during shipping and preparation (e.g., bottles broken or extracts accidentally destroyed) or analysis (e.g., loss of instrument sensitivity, strong matrix effects). Laboratory completeness objectives were 90 percent for each critical target analyte per sample matrix. It is possible for individual analytes to exhibit very low completeness values while achieving the overall completeness goals on the basis of analytical fraction. Relatively few rejections, however, were identified and the completeness goal was met for all analytes in all matrices (soil, sediment, surface water and groundwater and fractions, despite several rejections. Quantitative completeness tallies are not shown. Table H-2 lists all rejected results and the reasons for rejection.

H.4.2 Sensitivity

Tables H-3, H-4, H-5, and H-6 compare the observed minimum and maximum non-detect values during laboratory analyses to the target laboratory reporting limits contained in Table 1-7 of the Mine Fill A QAPP (TtNUS, 2003a) for soils, ground water, sediments, and surface water, respectively. The data in Tables H-3 through H-6 represent data for SWMUs 12 (Mine Fill A) and 25 (Dump Site A) for Rounds 1 and 2. The reason data were consolidated for SWMUs 12 and 25 is that the analytical methods, laboratories, and sensitivities were similar for those rounds and data sets.

At the outset of the project, it was known that the concentrations of several chemicals could not be measured at concentrations that were as low as the RBTLs; however, the analytical methods selected are standard methods used throughout the environmental industry. Furthermore, the chemicals of primary interest for this project, or related chemicals, could generally be detected at adequate sensitivities. Development of methods with greater sensitivity was not practicable nor was it required for the chemicals of primary interest (e.g., explosives, PCBs, and chlorinated VOCs). Yellow (or gray, if printed in black and white) highlight in Tables H-3 through H-6 indicates those parameters for which at least one non-detect value exceeded the RBTL. Although many analytical fractions had at least one such exceedance, most nondetected results were less than the target limits for critical parameters. Otherwise, the exceedances typically occurred for parameters that have very low and unattainable RBTLs when using routine analytical methods or the affected results reflect a sample dilution that was required, for example, to circumvent chemical interferences during chemical analysis.

To understand the impact of not having achieved RBTLs, it is important to understand the convention used for reporting non-detect values. Concentrations of organic analytes that were less than their MDLs were reported as the threshold value (not the MDL) followed by a "U" qualifier. The threshold values were generally less than typical laboratory reporting limits, but were typically greater than MDLs. This convention was used in response to the need to try to measure concentrations as low as the RBTLs, when practicable. If a measured organic analyte concentration exceeded the MDL but was less than the reporting limit, the reported concentration was the measured concentration followed by a "J" qualifier. The "J" qualifier signified that the reported concentration had a high degree of uncertainty even though there was a high level of confidence that the analyte had been detected in the sample. Concentrations less than the TV for inorganic chemicals were reported as the TV with a "U" qualifier. Inorganic chemical concentrations between the TV and RL were reported with no qualifier. Concentrations of organic and inorganic chemicals that exceeded reporting limits were not qualified unless a data quality deficiency was identified. These reporting conventions are summarized below:

Analyte Non-Detect Reporting

Measured Concentration	Reported Concentration	Qualifier*
<MDL	TV (inorganics)	U
<TV	TV (organics)	U
>MDL and <RL	Measured concentration (organics)	J
>TV and <RL	Measured concentration (inorganics)	No qualifier
>RL	Measured concentration	No qualifier

The TVs in Tables H-3 through H-6 represent TVs as estimated by the laboratory without any adjustments for sample-specific conditions such as moisture content or sample dilutions. In some cases (e.g., when samples are diluted), the tabulated TV may be less than the RBTL whereas the actual non-detect value exceeds the RBTL.

The elevated detection limits that were incurred are viewed to be the consequence of uncontrollable, sample-specific factors and reflect normal laboratory performance. They did not prevent the use of the data for decision making, however, the inability to achieve RBTLs must be considered when using the data for risk screening and risk assessment.

H.4.3 Laboratory Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy measurements are designed to detect biases resulting from sample handling and analysis. This parameter is assessed by measuring spiked samples (e.g., MSs) or well-characterized samples of certified analyte concentrations (e.g., LCSs) and by measuring blanks.

Accuracy requirements for field measurements are typically ensured through control over the sample collection and handling and through routine instrument calibration. Field accuracies were monitored through the use of blanks to detect cross-contamination and by monitoring adherence to procedures that prevent sample contamination or degradation. Source water blanks were collected from analyte-free water and potable water sources to assess the water sources used for decontaminating sampling equipment. Equipment rinsate blanks were collected for this investigation to assess cross-contamination via sample collection equipment. These blanks were obtained under representative field conditions by collecting the rinse water generated by running analyte-free water through sample collection equipment after decontamination and before use. Rinsate blanks were obtained for each type of sampling

equipment for each day that the sampling equipment was decontaminated. Where pre-cleaned, dedicated sampling equipment was used, one rinsate blank was collected as a "batch blank". Rinsate blanks were analyzed for the same chemical constituents as the associated environmental samples.

Accuracy in the laboratory is measured through the comparison of a spiked sample or LCS result to a known or calculated value and is expressed as a percent recovery (percent R). It was also assessed by monitoring the analytical recovery of select surrogate compounds added to samples that are analyzed by organic chromatographic methods. LCSs were used to assess the accuracy of laboratory operations with minimal sample matrix effects. MS and surrogate compound analyses measure the combined accuracy effects of the sample matrix, sample preparation, and sample measurement. Spiking concentrations equaled or approximated the default concentrations detailed in the applicable sample preparation or analysis SOPs. LCS and MS analyses were performed at a frequency of one per 20 associated samples of like matrix as required by the Mine Fill A QAPP (TtNUS, 2003a and 2003b). Laboratory accuracy was assessed by comparing calculated percent R values to accuracy control limits specified in the Mine Fill A QAPP (TtNUS, 2003a and 2003b).

Percent recovery is calculated using the following equation:

$$\%R = \frac{Ss - So}{S} \times 100$$

where	%R	=	percent recovery
	Ss	=	result of spiked sample
	So	=	result of non-spiked sample
	S	=	concentration of spiked amount.

Absence of bias is represented as a recovery of 100 percent. Mean recovery values less than 100 percent indicate a low bias, and recovery values greater than 100 percent indicate a high bias. Because measurement uncertainty exists in all bias estimates, a bias is not considered to be significant unless it falls outside the range of 100 percent ± 25 percent. The more extreme the bias value, the more significant the bias.

Accuracy data for Rounds 1 and 2 are compiled in Table H-7. Unless otherwise specified, each percent R value cited in the discussions below refers to the mean percent R value. Only mean percent recoveries that fall outside the range of 100 percent ±25 percent are discussed below. Percent recoveries that are invalid due to concentrations greater than 4 times the spike amount in the native sample have been

removed from the mean percent recovery calculations. Data qualifiers assigned during data validation because of non-compliant bias indicators are presented in Appendix G.

All compounds were reported as 0 percent recovery in the MSD of sample 12SS130002. According to the laboratory data package Case Narrative, the spiking compounds and surrogates were not added to the MSD. No qualifications were made on this basis because all target compounds percent recoveries were compliant in the MS.

Explosives in Soil and Sediment, Rounds 1 and 2

The mean LCS, MS, and MSD target compound percent recoveries ranged from 69.8 percent to 134 percent (Table H-7). The relatively tight precision and the recovery range essentially centered on 100 percent demonstrates that there is no bias in solid matrix explosives data.

Explosives in Ground Water and Surface Water, Rounds 1 and 2

The mean LCS, MS, and MSD target compound percent recoveries ranged from 72.4 percent to 122.8 percent, except for 4,4'-TN-AZOXY. This compound had average LCS and MS/MSD recoveries of 43.8 and 36.3, respectively. Overall, the quality control data indicate that explosives results yielded good performance in aqueous samples with the exception of 4,4'-TN-AZOXY, which was less precise than the rest of the explosives compounds. The explosives of primary interest (i.e., 2,4,6-TNT, HMX, and RDX) exhibited good to excellent analytical performance in aqueous samples.

Herbicides in Soil and Sediment, Round 1 Only

Mean recoveries for hexachlorophene and pentachlorophenol were well below the reference range of 75 to 125 percent. The hexachlorophene and pentachlorophenol recoveries ranged from approximately 10 to 90 percent recoveries in MS and MSD in solid samples. Herbicides were not analyzed in any matrix during Round 2. Generally, the analytical performance for these two compounds was poor with erratic precision and moderate to severe low biases.

Herbicides in Surface Water, Round 1 Only

The hexachlorophene and pentachlorophenol results exhibit a moderate to severe low bias (approximately 20 to 100 percent recoveries in MS/MSD) in surface water samples. In general, analytical performance was poor but slightly better than it was in the solid matrices.

Miscellaneous Parameters, All Media, Rounds 1 and 2

Mean LCS, MS, and MSD percent recoveries were within the expected range of 75 to 125 in most cases. The exceptions were two ammonia and nitrate/nitrite recoveries within the range of 44 to 57 percent, two nitrate/nitrite recoveries of 26 and 133, and three TOC recoveries in the range of 134 to 211 percent. All other recoveries for these three analytes ranged from 78 to 114 percent. Mean percent recoveries across all LCSs, MS, and MSD samples were 98, 100, and 107 percent for ammonia, nitrate/nitrite, and TOC, respectively. Table H-7 shows statistics for parameters for which at least one excursion outside the reference range of 75 to 125 percent occurred. Recoveries are not measured for cation exchange capacity.

These data indicate that most recoveries for LCSs, MSs, and MSDs fell within the reference range and that an occasional excursion outside of this range occurred. Because the frequency of excursions was relatively low for each type of QC sample (LCS, MS, and MDS), this is not viewed to be problematic, although ammonia results should be viewed as being slightly to moderately lower than the true site concentrations. The excursion rates were:

	Ammonia	Nitrate/Nitrite	Total Organic Carbon
LCS	0	0/28	0/11
MS	1/17 low	2/18 low and high	1/7 high
MSD	1/16 low	1/18 low	2/7 high

where high and low indicate whether the excursions were outside the low or high end of the 75 to 125 reference range.

Semivolatile Organic Compounds in Soil and Sediment, Round 1

This group of compounds excludes the PAHS, which are discussed separately below. The majority of semivolatile compound mean LCS, MS, and MSD recoveries were within the expected ranges (Table H-7) or were moderately outside the range on the low side. The compounds 3,3'-dichlorobenzidine, 4-chloroaniline were notable exceptions with markedly low recoveries as compared to the rest of the group. Fro example, the recoveries of 4-chloroaniline in samples S082104MSVSLG, 12SD070004MS, 12SD070004MSD, and 12SS230002MS and the recoveries of 3,3'-dichlorobenzidine in samples 12SD070004MS, 12SD070004MSD, 12SS190002MSD, 12SD230004MS, and 12SD230004MSD were zero percent. The following chemicals had at least one recovery less than 15 percent (number of values

less than 15 percent are shown in parentheses): 2,4-dimethylphenol (5), 3,3'-dichlorobenzidine (5), 3-nitroaniline (3), 4,6-dinitro-2-methylphenol (1), 4-chloroaniline (7), 4-nitroaniline (2), diphenylamine (2), isophorone (1), and n-nitrosodiphenylamine (2). Several results were rejected because of these low recoveries (See Table H-2)

In summary, the semivolatile compounds generally show a slight to moderate low bias, with 3,3'-dichlorobenzidene, and 4-chloroaniline, exhibiting a severe low bias. The other compounds specifically identified above also exhibited very low biases in some solid matrix samples.

Semivolatile Organic Compounds in Ground Water and Surface Water, Rounds 1 and 2

This group of compounds excludes the PAHS, which are discussed separately below. Percent recoveries for LCSs, MSs, and MSDs were generally higher for aqueous samples than for solid samples. Mean recoveries ranged from 23 to 85 percent across these samples with performance being very similar in LCSs and MS/MSDs. The minimum individual MS recovery across all compounds and samples was 20 percent. Four separate compounds were rejected in four samples because of poor spike recoveries or calibration non-compliances (see Table H-2). Overall, the SVOC data indicate a moderate low bias for most compounds in aqueous samples. All but one aqueous sample were analyzed in Round 1.

Polycyclic Aromatic Hydrocarbons (PAHs) in Soil and Sediment, Rounds 1 and 2

Mean LCS, MS, and MSD target compound percent recoveries were slightly less than expected, indicating a low bias for PAH data for Round 2. The minimum PAH recovery was 48 percent whereas the maximum PAH target analyte recovery was 105 percent. Mean MS/MSD recoveries ranged from 53.2 percent for acenaphthylene to 90 percent for pyrene whereas the LCS recoveries were slightly greater (67 to 91 percent). Overall, the PAH bias is slightly to moderately low.

Polycyclic Aromatic Hydrocarbons (PAHs) in Ground Water and Surface Water, Rounds 1 and 2

The mean LCS, MS, and MSD target compound percent recoveries ranged from 31 percent to 91.3 percent. This indicates that a slight to moderately low bias exists for PAHs for ground water and surface water in Rounds 1 and 2. The mean LCS recovery ranged from 41.5 percent for 2-methylnaphthalene to 91.3 percent for pyrene. The mean MS/MSD recovery ranged from 31 percent for naphthalene to 85 percent for fluoranthene. Overall, the bias for PAHs is slightly to moderately low in aqueous samples.

Total Metals in Soil and Sediment, Rounds 1, 2, and 3

If a matrix spike did not increase the native sample concentration by at least 25 percent, the spike was considered to be invalid and is not discussed in this section.

The mean soil and sediment LCS percent recoveries across all Round 1 and 2 sample groups ranged from 96.2 to 108.8 percent (Table H-7). Table H-7 displays only metals for which the LCS, the MS, or both had values outside the reference range of 75 to 100 percent. The narrow LCS recovery range nearly that was nearly centered on the theoretically perfect value of 100 percent indicates that there was no significant laboratory bias associated with the metals analysis process.

Whereas the LCS recoveries were acceptable, the soil and sediment sample matrix recoveries were more erratic. Barium (-59.2 percent), mercury (1.76 percent), and silver (26.9 percent), in particular, exhibited some exceptionally poor recoveries There is no explanation for the negative barium and silver recoveries. The single low mercury recovery appears to have resulted from failure to spike the mercury MS, but this could not be verified. All other recoveries ranged from 80.8 to 102 percent, which casts suspicion on the validity of the low matrix spike recovery as an indicator of data quality. The mean recoveries indicate no significant bias, on average, but individual recoveries indicate a relatively high degree of variability in the analyte recoveries. When using data for groups of samples, the random uncertainties tend to cancel but any single result may be significantly different than the true concentration, especially for barium, and silver.

Total and Dissolved Metals in Ground Water and Surface Water, Rounds 2 and 3

If a matrix spike did not increase the native sample concentration by at least 25 percent, the spike was considered to be invalid and is not discussed in this section.

The mean groundwater and surface water LCS percent recoveries across all Round 1 and 2 sample groups ranged from 99.8 to 110.6 percent for all metals (Table H-7). Table H-7 displays only metals for which the LCS, the MS, or both had values outside the reference range of 75 to 100 percent. The narrow LCS recovery range was biased slightly high but is within the 75 to 125 reference range. This indicates that there was no significant laboratory bias associated with the metals analysis process. Out of at least 25 LCS results for each of 24 different metals, one individual LCS value for zinc (166.6 percent) did exceed 125 percent. A similar effect was not observed in the total zinc matrix spikes but aluminum did have one high MS recovery of 162.9. An occasional excursion outside the reference range of 75 to 125 percent is expected. Total thallium also exhibited a single high MS value (141.5 percent) but all other

total aluminum and thallium MS recoveries values were within the 75 to 125 percent reference range. The post digestion spikes of spurious matrix spikes were within expected limits, indicating that the observed high results were probably due to either a matrix effect or spurious laboratory contamination.. A single low total mercury recovery (0.9 percent) and a single low dissolved thallium recovery appear to have resulted from failure to spike the MSs, but this could not be verified. All other total mercury and dissolved thallium MS recoveries ranged from 82.9 to 112.8 percent (mercury) and 89.4 to 119.6 percent (thallium), which casts suspicion on the validity of the low matrix spike recoveries. Such low recoveries are also very unusual. The dissolved ground water and surface water matrix spike recoveries were comparable to those of the total metal analyses (Table H-7).

Because there were relatively few values outside the reference range of 75 to 125 percent, the data for total and dissolved metals are viewed to be unbiased with the potential for occasional sporadic excursions, usually toward a high bias.

Volatile Organic Compounds in Soil, Rounds 1 and 2

Most of the volatile compound recoveries were within the mean LCS percent recovery reference range of 75 percent to 125 percent and only a few were slightly outside that range. The mean recoveries falling outside the 75 to 125 percent range are highlighted in Table H-7. This table identifies all analyte that had at least on recovery outside the reference range. Analytes that had no recoveries outside of the reference range are not shown. Contrary to LCS recoveries, mean MS and MSD recoveries for VOCs were often outside the low end of the reference range (see Table H-7), however, no individual MS or MSD recovery was less than 41 percent. This indicates that the volatile compounds, on average, show no bias to a moderate low bias. VOCs were not analyzed in sediment, groundwater, or surface water in Round 1 and no matrix was analyzed for VOCs in Round 2.

H.4.4 Laboratory Precision

Precision is a measure of the degree to which two or more measurements are in agreement and describes the reproducibility of measurements of the same parameter for samples analyzed under similar conditions.

Precision for chemical parameters is expressed as a Relative Percent Difference (RPD), which is defined as the ratio of the difference to the mean for the two values being evaluated. RPDs, typically expressed

as percentages, are used to evaluate both field and laboratory duplicate precision and are calculated as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where RPD = relative percent difference

V1, V2 = two results obtained by analyzing duplicate samples

The precision estimates obtained from duplicate field samples encompass the combined uncertainty associated with sample collection, homogenization, splitting, handling, laboratory and field storage (as applicable), preparation for analysis, and analysis. In contrast, precision estimates obtained from analyzing duplicate laboratory samples incorporate only homogenization, subsampling, preparation for analysis, laboratory storage (if applicable), and analysis uncertainties.

Field duplicates for Mine Fill A soils and sediments were collected as a single sample that was sampled in duplicate for VOCs, then homogenized, split into two portions, and placed into separate sample bottles for the non-VOC analyses. Each sample bottle was assigned a unique nomenclature so as to be "blind" to the laboratory. Field duplicates were collected during a single act of sampling and were analyzed for chemical constituents to measure the precision of the sampling and analysis program, as well as the natural sample heterogeneity.

Field duplicates were to be collected at a rate of one per 20 environmental samples. The number of duplicates collected was greater than these frequencies because the analytical suite is not identical for all samples. The number of duplicates collected corresponds to the number of samples collected for a particular analytical fraction. The number of duplicates per samples collected for all analytical fractions met the 5 percent frequency criterion specified in the Mine Fill A QAPP (TtNUS, 2003and 2003b).

Laboratory precision QC samples [i.e., laboratory duplicates for inorganic chemicals and LCS/LCSD and matrix spike (MS) / matrix spike duplicate (MSD) samples for organic chemicals] were scheduled to be analyzed at a rate of one QC sample per 20 environmental samples. This 5 percent rate as specified in the Mine Fill A QAPP (TtNUS, 2003a and 2003b) was achieved for aqueous, soil, sediment, and seep samples.

Laboratory duplicates are usually analyzed during the metals and miscellaneous analyses as a check on the precision of the analyses. For organic compounds analyzed by chromatography, laboratory

duplicates are commonly supplanted with MSDs because the organic compounds do not occur naturally in samples and precision can not be estimated from non-detect values.

During Rounds 1, and 2, laboratory precision was assessed by comparing calculated RPD values from duplicate samples to precision control limits specified in the Mine Fill A QAPP (TtNUS, 2003a and 2003b).

RPD values greater than 50 percent for solid matrices and 30 percent for aqueous matrices are occasionally observed. In addition, values of this magnitude are often small compared to the concentration variability observed across site samples. This characteristic is important because it indicates that the uncertainty associated with decision making is often most affected by the overall site data variability and not as much by the local variability at any one location. Nevertheless, Tables H-8 and H-9 represent all exceedances of these reference points (aqueous 30 percent and solid 50 percent) for laboratory duplicates, field duplicates, LCS/LCSD, and MS/MSD RPDs. Field and laboratory precision values that did not exceed the reference points are not included in the discussions below. Unless otherwise specified, RPD values cited in the discussions below refer to individual RPDs of a single pair of original and duplicate samples.

Explosives in Soil and Sediment, Rounds 1 and Round 2

Field and laboratory duplicate precision was generally acceptable (i.e., <50 percent; see Tables H-8 and H-9).

Explosives in Ground Water and Surface Water, Rounds 1 and 2

Precision data are presented in Tables H-8 and H-9 and accuracy (percent recovery) data are presented in Table H-7. Performance was comparable to the performance described for explosives in soil and sediment, Rounds 1 and 2 (see above) with exceptions as described here. Three compounds (4-amino-2,6-dinitrotoluene, HMX, and RDX) exhibited RPDs for matrix spikes in the range of 44 to 48 percent recovery. These three values exceed the reference range of 0 to 30 percent. All three exceedances, however, occurred in one sample so the exceedances are an isolated occurrence and could reflect the influence of suspended solids on the result. One MS/MSD RPD value (33 percent) slightly exceeded the reference range by three percent and is not considered to be a significant exceedance.

Herbicides in Soil and Sediment, Round 1 Only

Precision for pentachlorophenol was erratic in solid samples with laboratory RPDs ranging from 0 to 122. The mean laboratory RPD value (29.8) was just slightly less than the maximum of the 0 to 30 percent reference range that is considered to represent typical performance. Generally, the analytical performance for this compound was poor with erratic precision and moderate to severe low bias. Because this compound was not detected in any samples, there are no field precision measures for pentachlorophenol.

Herbicides in Surface Water, Round 1 Only

The only available hexachlorophene precision estimate (51.0 percent mean RPD) exceeded the target range of 0 to 30 percent in the Round 1 surface water sample. Generally, the analytical performance for this compound was poor with erratic precision and moderate to severe low bias. Because this compound was not detected in any samples, there are no field precision measures for pentachlorophenol.

Metals in Soil and Sediment, Rounds 1 and 2

Comparatively few RPD values for soil and sediment samples exceeded the reference range of 0 to 50 percent (Tables H-8 and H-9). As expected, the maximum RPD values occurred in the field duplicates, which are mixed under less controlled conditions than laboratory duplicates prior to analysis and hence are probably not as well mixed as laboratory duplicates. Because of this the observed exceedances do not appear to be unusual and are interpreted to represent natural sample heterogeneity. The relatively few values in excess of 50 percent is somewhat contradictory to the high degree of imprecision observed for some metals, especially barium, mercury, and silver in the dissolved metals analyses. Therefore, although a typical level of uncertainty was demonstrated for metals in sediment and soil replicate samples, the potential for occasional erratic results must be considered as evident from the matrix spike results.

Total and Dissolved Metals in Ground Water and Surface Water, Rounds 1 and 2

Comparatively few RPD values for groundwater and surface water samples exceeded the reference range of 0 to 30 percent (Tables H-8 and H-9). As expected, the maximum RPD values occurred in the field duplicates, which are mixed under less controlled conditions than laboratory duplicates prior to analysis and hence are probably not as well mixed as laboratory duplicates. However, the data suggest that field and laboratory performance is more similar for aqueous sample precision and solid matrix

precision. This is expected because the degree of heterogeneity is less for aqueous samples than for solid matrices.

In general, the degree of heterogeneity observed for total and dissolved metals in aqueous samples appears to be normal.

Semivolatiles (Including PAHs) in Soil and Sediment, Round 1 and Round 2

RPDs for many different target compounds in MS/MSDs exceeded the 50 percent reference point (Table H-9). However, the mean RPD values are generally less than 25 percent, indicating that the majority of RPD values are within the target range. The exceedances were therefore evidently not widespread and do not indicate the existence of widespread precision problems. Instead, they indicate that precision is generally acceptable for soil sample SVOC analyses. The 4-chloroaniline RPD for sample 12SS230002 (a MSD) had an RPD of 200. This compound has a poor analytical response and had a 0 percent recovery in the MS and an 8 percent recovery in the MSD See Section H.4.4. This compound is not likely to be detected at Mine Fill A. The possibility for a typical to slightly greater than typical level of uncertainty exists for the SVOC compounds listed on Table H-9. 4-chloroaniline results are viewed to be especially uncertain.

All PAH concentrations were either less than threshold values which precluded the calculation of RPD values or the RPD values were within the reference range of 0 to 30 percent. This indicates that there were no particular precision problems identified for PAH analyses.

Semivolatiles (Including PAHs) Surface Water, Rounds 1 and 2

One surface water sample was analyzed for SVOCs and PAHs in Round 1 and one surface water sample was analyzed for SVOCs (excluding PAHs) in Round 2. No precision problems were identified for PAHs in aqueous samples in either round.

Volatiles in Soil, Round 1 Only

No VOC compounds had RPDs in excess of the 50 percent reference point for Round 1, except for a single RPD value of 103 percent for acetone in the sole MS/MSD pair. This is considered to be insignificant because acetone is not an important site contaminant, the observed acetone concentrations were low, and acetone is a commonly detected laboratory contaminant. Therefore, no precisions problems have been identified for VOCs in solid samples.

No VOC analyses were conducted on aqueous samples in Round 1 or 2.

Miscellaneous Parameters in All Media, Rounds 1 and 2

Ammonia was analyzed in soil, groundwater, and surface water in Round 1 and in just groundwater and surface water in Round2. Nitrate/Nitrite was analyzed in groundwater and surface water in Rounds 1 and 2. Cyanide was analyzed in soil during Round 1 only. Total organic carbon was analyzed in soil, sediment, and groundwater in Round 1 and in groundwater only in Round 2. Cation exchange capacity was analyzed in soil and sediment only in Round 1 only. Acid volatile sulfides were analyzed in Round 1 sediment only.

RPDs for all of these parameters were generally within the reference ranges. However, ammonia nitrogen in one out of two groundwater field duplicates (RPD = 92.3) exceeded the 30 percent reference point and nitrite/nitrite (RPD = 47.8) exceeded the 30 percent reference point for one surface water sample (Table H-8). This is an indication that the ammonia and nitrate/nitrite data were more variable than expected. These are not parameters of primary interest for this project, however, they should be monitored for precision problems in future analyses.

H.4.5 Comparability

Comparability is defined as the confidence with which one data set can be compared with another (e.g., among sampling points and among sampling events). Comparability was achieved by using standardized sampling and analysis methods, as well as standardized data reporting formats. Comparability of field data was ensured by following the Mine Fill A QAPP (TtNUS, 2003a and 2003b). Comparability of laboratory measurements was achieved primarily through the use and documentation of standard sampling and analytical methods. Results were reported in units that ensured comparability with previous data and with current state and federal standards and guidelines. Comparability of laboratory measurements was assessed primarily through the use of QC samples and through adherence to the QA plan. No comparability problems were detected.

The laboratory analyzed various QC samples along with the environmental samples to allow data users to assess the quality of the data. Tables H-10 through H-13 show the rates of data qualification that resulted from application of the data validation process for aqueous and solid samples, respectively. The numerical qualification rates presented in the table represents the percentage of data qualified as indicated for the indicated reason. An example is the best way to explain how to interpret the table:

Parameter	Code	Validation Qualifier[)]						
		BJ	BU	J	R	U	UJ	UR
2-AMINO-4,6-DINITROTOLUENE	PU	0.0	0.0	33.3	0.0	0.0	0.0	0.0
	U	0.0	0.0	66.7	0.0	0.0	0.0	0.0

Round	Fraction	Parameter	Code	Validation Qualifier		
				J	U	UJ
		4,4'-TN-AZOXY	D	0.0	0.0	33.3
			H	0.0	0.0	33.3
			R	0.0	0.0	33.3

The 33.3 in the "UJ" Validation Qualifier column indicates that 33.3 percent of the UJ-qualified data for 4,4'-TN-AZOXY were qualified that way because of reasons "D" (Code = D) and "H" (Code = H) and "R" (Code = R) . The "D" definition at the bottom of the table indicates that a matrix spike non-compliance was noted. Reason "H" is defined at the bottom of the table as a holding time exceedance. The "R" code is defined as a surrogate recovery non-compliance. These three reasons combined to yield a qualifier of "UJ" (estimated nondetected).

All other values in the table are to be interpreted in a similar manner. Quantitative summaries of accuracy and precision are provided in Sections H.4.3 and H.4.4. Inability to achieve target detection limits or RBTLs in several cases should also be considered (See Section H.4.2).

H.4.6 Representativeness

Representativeness is an expression of the degree to which data accurately and precisely depict the actual characteristics of a population or environmental condition existing at an individual sampling point and is contingent on a good design for the sampling program. For each environmental medium investigated, there were two general populations - site and background. The site population(s) is the portion of a medium potentially contaminated as a result of site operations. Sampling of the site population was designed to directly support the project objectives of determining the nature and extent of contamination and evaluating human and ecological risks. The background population is that portion of a medium that is similar to the site population but expected or known not to be contaminated through site operations. A background population is a point of reference for understanding whether or not site chemical concentrations represent site-related contamination. For mobile media (sediment, surface water

and ground water) the term upgradient, rather than background, is generally used to refer to locations unaffected by site operations.

Data were collected from the locations specified in the Mine Fill A QAPP with only minor modifications that reflect uncertainty in marking the locations in the field. The Mine Fill A QAPP and the use of standardized sampling, sample handling, sample analysis, and data reporting procedures were designed so that the final data would be accurate representations of actual site conditions. It is believed that all reported data are adequately representative of site conditions with exceptions as noted below.

Theoretically, the dissolved analyte concentration can not exceed the total metal concentration. Allowing for uncertainties in collecting, storing, preparing, and analyzing a sample, it is reasonable to expect that a dissolved metal concentration could be reported to be as much as 25 percent greater than the total metal concentration without cause for concern. Any exceedance of 25 percent difference, though, is an indication of an actual or potential data quality problem. Some dissolved metal results were much more than 25 percent greater than the total metal concentrations and this is not expected. The observed disparities were investigated but no cause could be found so the data have been reported as received from the laboratory. The data user is cautioned, however, that the following metals suffer from this condition in the indicated surface water and groundwater samples:

Sample Number	Metal	Total Concentration, ug/L	Dissolved Concentration, ug/L	Ratio (Dissolved/Total) (1)
12SW1701	Arsenic	0.68	16.20	23.82
12SW3301	Barium	33.90	47.80	1.41
12SW0402	Zinc	1.60	16.60	10.38
12SW1402	Zinc	19.40	25.10	1.29
12GWT4401	Cobalt	12.10	15.50	1.28
12GWT2601	Cobalt	31.30	41.40	1.32
12GWT4001	Copper	4.30	6.40	1.49
12GWT2601	Manganese	2520.00	3350.00	1.33
12GWT3501	Manganese	400.00	543.00	1.36
12GWT4401	Nickel	44.20	73.90	1.67
12GWT1702	Zinc	254.00	323.00	1.27

1 Ratios greater than 1.25 indicate a potential data quality problem.

Macronutrients, calcium, magnesium, potassium, and sodium, are not included in this tally. These metals suffer from a greater potential of laboratory contamination and hence a greater probability of violating this "rule of thumb" than the other metals. Also not included are results that represent concentrations within 5

times the minimum non-detect value (See Tables H-4 and H-5). Concentrations in that range suffer from greater uncertainties than results that are greater than 5 times the detection limit. Hence, there is a greater chance of obtaining an violation of the "rule of thumb" by random chance that would not indicate the presence of an data quality problem.

References for Appendix H

MK, 2000. Interim Measures Report Removal and Bioremediation of Mine Fill A Material, NSWC Crane, Crane Indiana, prepared for Southern Division Naval Facilities Engineering Command by Morrison Knudsen Corporation, October 27.

TtNUS, 2003a. Quality Assurance Project Plan for Mine Fill A (SWMU 12), Mine Fill B (SWMU 13), Cast High Explosives Fill/ B146 Incinerator (SWMU 16), and Pyrotechnic Test Area (SWMU 19), RCRA Facility Investigation, Naval Surface Warfare Center Crane, Crane, Indiana, February.

TtNUS, 2003b. Quality Assurance Project Plan Addendum No. 1 for Mine Fill A (SWMU 12), Mine Fill B (SWMU 13), Cast High Explosives Fill/ B146 Incinerator (SWMU 16), and Pyrotechnic Test Area (SWMU 19), RCRA Facility Investigation, Naval Surface Warfare Center Crane, Crane, Indiana, October.

TABLE H-1

SAMPLES COLLECTED VERSUS SAMPLES PROPOSED IN THE QAPP, ROUNDS 1 AND 2 [1,2]

SWMU 12

NSWC CRANE

CRANE, INDIANA

Analytical Fraction	SOIL (collected/ proposed)[3]	SD (collected/ proposed)	GW (collected/ proposed)	SW (collected/ proposed)
Round 1				
MNA	NA	NA	23/23 (100%)	NA
Acid Volatile Sulfides	NA	7/7 (100%)	NA	NA
Simultanheously Extracted Metals	NA	7/7 (100%)	NA	NA
Cation Exchange Capacity	4/4 (100%)	6/8 (75%)	NA	NA
Explosives	49/49 (100%)	30/30 (100%)	47/47 (100%)	30/30 (100%)
Total Metals	49/49 (100%)	30/30 (100%)	41/41 (100%)	30/30 (100%)
Filtered Metals[4]	NA	NA	13/13 (100%)	30/30 (100%)
Ammonia	4/4 (100%)	NA	46/46 (100%)	30/30 (100%)
Nitrate/Nitrate	NA	NA	46/46 (100%)	30/30 (100%)
Semivolatiles except PAHs	25/25 (100%)	3/3 (100%)[5]	NA	1/1 (100%)
Polycyclic Aromatic Hydrocarbons	25/25 (100%)	3/3 (100%)[5]	NA	1/1 (100%)
8260 Volatile Organic Compounds	25/25 (100%)	NA	NA	NA
8015B Volatile Organic Compounds	25/25 (100%)	NA	NA	NA
Herbicides	25/25 (100%)	3/3 (100%)[5]	NA	1/1 (100%)
Cyanide	2/2 (100%)	NA	NA	NA
Total Organic Carbon	4/4 (100%)	5/8 (62%)	3/3 (100%)	NA

Analytical Fraction	SOIL[3] (collected/ proposed)	SD (collected/ proposed)	GW (collected/ proposed)	SW (collected/ proposed)
Round 2				
Explosives	NA	NA	47/47 (100%)	29/29 (100%)
Total Metals	NA	NA	41/41 (100%)	29/29 (100%)
Filtered Metals[4]	NA	NA	15/15 (100%)	29/29 (100%)
Ammonia	NA	NA	46/46 (100%)	29/29 (100%)
Nitrate/Nitrate	NA	NA	46/46 (100%)	29/29 (100%)
Semivolatiles except PAHs	NA	NA	NA	1/1 (100%)
Total Organic Carbon	NA	NA	3/3 (100%)	NA

GW - Ground water samples

NA - Not applicable

SD - Sediment samples

SP - Seep samples

SW - Surface water samples

1 Tallies exclude field duplicates, rinsate blanks, source water blanks, and trip blanks.

2 The completeness estimate for the composting operation was 100 percent for each fraction. Yellow or gray (if printed in black and white) highlight indicates that the completness does not meet the goal of 90%; heavy outline indicates that the number of samples collected exceeds the number proposed. Reasons for not collecting particular samples are provided in Section 2.0.

3 Includes both surface and subsurface soil samples.

TABLE H-1
SAMPLES COLLECTED VERSUS SAMPLES PROPOSED IN THE QAPP, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

4 Some aqueous samples were filtered to allow for determining whether or not the observed metals concentrations were associated with turbidity.

5 One of three proposed samples was collected and an unscheduled sample was collected from a new sampling location.

TABLE H-2
REJECTED RESULTS FOR ALL SAMPLE MATRICES
ROUNDS 1 AND 2 [1,2]
SWMU-12
NSWC CRANE
CRANE, INDIANA

Round	Sample	Fraction	Parameter	Reason for Rejection
1	12SB050509	M	MERCURY	H
1	12SB060509	M	MERCURY	H
1	12SB180204	M	MERCURY	D
1	12SW0201-F	MF	THALLIUM	D
1	12SW0301-F	MF	THALLIUM	D
1	12SW0501-F	MF	THALLIUM	D
1	12SW0601-F	MF	THALLIUM	D
1	12SW1701-F	MF	THALLIUM	D
1	12SW1901-F	MF	THALLIUM	D
1	12SW2101-F	MF	THALLIUM	D
1	12SW2201-F	MF	THALLIUM	D
1	12SS190002	SVOC	2,4-DIMETHYLPHENOL	D
1	12SB120204	SVOC	2,4-DINITROPHENOL	E
1	12SB130204	SVOC	2,4-DINITROPHENOL	E
1	12SB130607	SVOC	2,4-DINITROPHENOL	E
1	12SB140204	SVOC	2,4-DINITROPHENOL	E
1	12SB140607	SVOC	2,4-DINITROPHENOL	E
1	12SB150204	SVOC	2,4-DINITROPHENOL	E
1	12SB150607	SVOC	2,4-DINITROPHENOL	E
1	12SS120002	SVOC	2,4-DINITROPHENOL	E
1	12SS130002	SVOC	2,4-DINITROPHENOL	E
1	12SS140002	SVOC	2,4-DINITROPHENOL	E
1	12SS150002	SVOC	2,4-DINITROPHENOL	E
1	12SD070004	SVOC	3,3'-DICHLOROBENZIDINE	D
1	12SS190002	SVOC	3,3'-DICHLOROBENZIDINE	D
1	12SD070004	SVOC	3-NITROANILINE	D
1	12SS190002	SVOC	3-NITROANILINE	D
1	12SB120204	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SB130204	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SB130607	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SB140204	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SB140607	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SB150204	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SB150607	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SS120002	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SS130002	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SS140002	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SS150002	SVOC	4,6-DINITRO-2-METHYLPHENOL	E
1	12SD070004	SVOC	4-CHLOROANILINE	D
1	12SB120204	SVOC	4-CHLOROANILINE	E
1	12SB130204	SVOC	4-CHLOROANILINE	E
1	12SB130607	SVOC	4-CHLOROANILINE	E
1	12SB140204	SVOC	4-CHLOROANILINE	E
1	12SB140607	SVOC	4-CHLOROANILINE	E
1	12SB150204	SVOC	4-CHLOROANILINE	E

TABLE H-2
REJECTED RESULTS FOR ALL SAMPLE MATRICES
ROUNDS 1 AND 2 [1,2]
SWMU-12
NSWC CRANE
CRANE, INDIANA

1	12SB150607	SVOC	4-CHLOROANILINE	E
1	12SS120002	SVOC	4-CHLOROANILINE	E
1	12SS130002	SVOC	4-CHLOROANILINE	E
1	12SS140002	SVOC	4-CHLOROANILINE	E
1	12SS150002	SVOC	4-CHLOROANILINE	E
1	12SD030004	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SD070004	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SD070004-D	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SD090004	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB010609	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB120204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB130204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB130607	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB140204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB140607	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB150204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB150607	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB180204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB180608	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB180608-D	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB190204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB200204	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SB200608	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS010002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS120002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS130002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS140002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS150002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS180002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS190002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS200002	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SW0301	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SW0301-D	SVOC	4-NITROQUINOLINE-1-OXIDE	C
1	12SS190002	SVOC	DIPHENYLAMINE	D
1	12SW0301	SVOC	KEPONE	C
1	12SS190002	SVOC	N-NITROSODIPHENYLAMINE	D
1	12SB010609	VOC	ACROLEIN	C
1	12SB120204	VOC	ACROLEIN	C
1	12SB130204	VOC	ACROLEIN	C
1	12SB130607	VOC	ACROLEIN	C
1	12SB140204	VOC	ACROLEIN	C
1	12SB140607	VOC	ACROLEIN	C
1	12SB150204	VOC	ACROLEIN	C
1	12SB150607	VOC	ACROLEIN	C
1	12SB180204	VOC	ACROLEIN	C
1	12SB180608	VOC	ACROLEIN	C
1	12SB180608-D	VOC	ACROLEIN	C

TABLE H-2
REJECTED RESULTS FOR ALL SAMPLE MATRICES
ROUNDS 1 AND 2 [1,2]
SWMU-12
NSWC CRANE
CRANE, INDIANA

1	12SB190204	VOC	ACROLEIN	C
1	12SB200204	VOC	ACROLEIN	C
1	12SB200608	VOC	ACROLEIN	C
1	12SS010002	VOC	ACROLEIN	C
1	12SS120002	VOC	ACROLEIN	C
1	12SS130002	VOC	ACROLEIN	C
1	12SS140002	VOC	ACROLEIN	C
1	12SS150002	VOC	ACROLEIN	C
1	12SS180002	VOC	ACROLEIN	C
1	12SS190002	VOC	ACROLEIN	C
1	12SS200002	VOC	ACROLEIN	C
1	12SB140204	VOC	ACRYLONITRILE	C
1	12SB180204	VOC	ACRYLONITRILE	C
1	12SB180608	VOC	ACRYLONITRILE	C
1	12SB180608-D	VOC	ACRYLONITRILE	C
1	12SB190204	VOC	ACRYLONITRILE	C
1	12SB200608	VOC	ACRYLONITRILE	C
1	12SS180002	VOC	ACRYLONITRILE	C
1	12SS190002	VOC	ACRYLONITRILE	C
2	12SW0302	SVOC	KEPONE	C
2	12SW0302-D	SVOC	KEPONE	C

1 Table includes field duplicate, Normal environmental sample, rinsate blank, source water blank, and trip blank sample types.

2 Only rejected laboratory data are shown; data with the following validation qualifiers are excluded: BU, J, U, UJ, no qualifi

No field data were rejected.

12GW indicates a groundwater sample.
12SB indicates a subsurface soil sample.
12SD indicates a sediment sample.
12SW indicates a surface water sample.

C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
EXP = Explosives
H = Holding Time Exceedance
M = Metals, total
MF = Metals, dissolved
Q = Other problems (can encompass a number of issues; i.e.chromatography, interferences, etc.)
SD = Sediment
SO = Soil
SVOC = Semivolatile organic compounds
SW = Surface water
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
VOC = Volatile organic compounds

TABLE H-3
SOIL MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Data		Reference Values		
Round	Fraction	Parameter	units	Minimum Non-detect Concentration	Maximum Non-detect Concentration	Laboratory TV	Laboratory RL	Risk-Based Target Level[3]
1	EXP	1,3,5-TRINITROBENZENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		1,3-DINITROBENZENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		2,4,6-TRINITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		2,4-DINITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		2,6-DINITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		2-AMINO-4,6-DINITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		2-NITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		3-NITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		4-AMINO-2,6-DINITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		4-NITROTOLUENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		HMX	MG/KG	0.25	0.333	0.25	0.25	0.5
		NITROBENZENE	MG/KG	0.25	0.333	0.25	0.25	0.5
		RDX	MG/KG	0.25	0.333	0.25	0.25	0.5
		TETRYL	MG/KG	0.25	0.333	0.25	0.25	0.5
	HERB	HEXACHLOROPHENE	UG/KG	0.893	1.02	1.3	0.0067	0.017
		PENTACHLOROPHENOL	UG/KG	0.473	0.542	0.66	0.00034	0.00068
	M	ANTIMONY	MG/KG	0.1	1.2	3.6	0.01	0.5
		BERYLLIUM	MG/KG	0.35	1	0.64	0.015	0.5
		CADMIUM	MG/KG	0.12	0.81	0.66	0.02	0.5
		MERCURY	MG/KG	0.007	0.007	0.021	0.002	0.02
		SELENIUM	MG/KG	0.04	0.88	0.54	0.02	0.5
		SILVER	MG/KG	0.04	0.72	0.26	0.015	0.5
		SODIUM	MG/KG	20.5	246	84.9	2.32	50
		THALLIUM	MG/KG	0.13	0.42	0.26	0.02	0.5
		TIN	MG/KG	0.26	2.3	2.4	0.045	5
	MISC	CYANIDE	MG/KG	0.283	0.301	--	--	1.33
		TOTAL ORGANIC CARBON	MG/KG	1000	1000	1000	--	--
	SVOC	1,2,4,5-TETRACHLOROBENZENE	UG/KG	70.4	80.7	150	67	333
		1,2,4-TRICHLOROBENZENE	UG/KG	70.4	80.7	150	67	333
		1,2-DICHLOROBENZENE	UG/KG	70.4	80.7	150	67	333
		1,3-DICHLOROBENZENE	UG/KG	70.4	80.7	150	67	333
		1,4-DICHLOROBENZENE	UG/KG	70.4	80.7	150	67	130
		1,4-NAPHTHOQUINONE	UG/KG	70.4	80.7	67	333	44
		1,4-PHENYLENEDIAMINE	UG/KG	70.4	80.7	150	67	333
		1-NAPHTHYLAMINE	UG/KG	70.4	80.7	67	333	670
		2,2'-OXYBIS(1-CHLOROPROPANE)	UG/KG	70.4	80.7	150	67	200
		2,3,4,6-TETRACHLOROPHENOL	UG/KG	70.4	80.7	150	67	333
		2,4,5-TRICHLOROPHENOL	UG/KG	70.4	80.7	150	67	333
		2,4,6-TRICHLOROPHENOL	UG/KG	70.4	80.7	150	67	200
		2,4-DICHLOROPHENOL	UG/KG	70.4	80.7	150	67	333
		2,4-DIMETHYLPHENOL	UG/KG	70.4	80.7	150	67	333
		2,4-DINITROPHENOL	UG/KG	70.4	80.7	150	67	670
		2,6-DICHLOROPHENOL	UG/KG	70.4	80.7	150	67	333
		2-ACETYLAMINOFLUORENE	UG/KG	70.4	80.7	150	67	333
		2-CHLORONAPHTHALENE	UG/KG	70.4	80.7	67	130	12.18
		2-CHLOROPHENOL	UG/KG	70.4	80.7	150	67	200
		2-METHYLNAPHTHALENE	UG/KG	3.47	3.98	3.3	6.7	700
		2-METHYLPHENOL	UG/KG	70.4	80.7	150	67	333
		2-NAPHTHYLAMINE	UG/KG	70.4	80.7	67	333	--
		2-NITROANILINE	UG/KG	70.4	80.7	150	67	130
		2-NITROPHENOL	UG/KG	70.4	80.7	150	67	333
		2-PICOLINE	UG/KG	70.4	80.7	150	67	333
		3&4-METHYLPHENOL	UG/KG	70.4	80.7	150	67	333
		3,3'-DICHLOROBENZIDINE	UG/KG	70.4	80.7	150	67	333

TABLE H-3
SOIL MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		3,3'-DIMETHYLBENZIDINE	UG/KG	70.4	80.7	150	67	333
		3-METHYLCHOLANTHRENE	UG/KG	70.4	80.7	150	67	333
		3-NITROANILINE	UG/KG	70.4	80.7	150	67	333
		4,6-DINITRO-2-METHYLPHENOL	UG/KG	70.4	80.7	150	67	333
		4-AMINOBIPHENYL	UG/KG	70.4	80.7	150	67	333
		4-BROMOPHENYL PHENYL ETHER	UG/KG	70.4	80.7	150	67	130
		4-CHLORO-3-METHYLPHENOL	UG/KG	70.4	80.7	150	67	333
		4-CHLOROANILINE	UG/KG	70.4	80.7	150	67	333
		4-CHLOROPHENYL PHENYL ETHER	UG/KG	70.4	80.7	150	67	333
		4-NITROANILINE	UG/KG	70.4	80.7	150	67	333
		4-NITROPHENOL	UG/KG	70.4	80.7	150	67	333
		4-NITROQUINOLINE-1-OXIDE	UG/KG	70.4	80.7	150	67	333
		5-NITRO-O-TOLUIDINE	UG/KG	70.4	80.7	150	67	333
		7,12-DIMETHYLBENZ(A)ANTHRACENE	UG/KG	70.4	80.7	150	67	333
		A,A-DIMETHYLPHENETHYLAMINE	UG/KG	70.4	80.7	150	67	670
		ACENAPHTHENE	UG/KG	3.47	3.98	3.3	6.7	29000
		ACENAPHTHYLENE	UG/KG	3.47	3.98	3.3	6.7	130000
		ACETOPHENONE	UG/KG	70.4	80.7	150	67	333
		ANILINE	UG/KG	70.4	80.7	150	67	333
		ANTHRACENE	UG/KG	3.47	3.98	4.9	3.3	6.7
		ARAMITE	UG/KG	70.4	80.7	150	67	333
		BENZO(A)ANTHRACENE	UG/KG	3.56	3.98	4.9	3.3	6.7
		BENZO(A)PYRENE	UG/KG	3.47	3.98	4.9	3.3	6.7
		BENZO(B)FLUORANTHENE	UG/KG	3.56	3.98	4.3	3.3	6.7
		BENZO(G,H,I)PERYLENE	UG/KG	3.56	3.98	4.9	3.3	6.7
		BENZO(K)FLUORANTHENE	UG/KG	3.56	3.98	4.3	3.3	6.7
		BENZYL ALCOHOL	UG/KG	70.4	80.7	150	67	333
		BIS(2-CHLOROETHOXY)METHANE	UG/KG	70.4	80.7	150	67	333
		BIS(2-CHLOROETHYL)ETHER	UG/KG	70.4	80.7	150	67	130
		BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	70.4	80.7	1000	67	130
		BUTYL BENZYL PHTHALATE	UG/KG	70.4	80.7	150	67	333
		CHLOROBENZILATE	UG/KG	70.4	80.7	150	67	333
		CHRYSENE	UG/KG	3.56	3.98	4.3	3.3	6.7
		DIALLATE	UG/KG	70.4	80.7	150	67	333
		DIBENZO(A,H)ANTHRACENE	UG/KG	3.47	3.98	4.9	3.3	6.7
		DIBENZOFURAN	UG/KG	70.4	80.7	99	67	333
		DIETHYL PHTHALATE	UG/KG	70.4	80.7	150	67	130
		DIMETHYL PHTHALATE	UG/KG	70.4	80.7	150	67	333
		DI-N-BUTYL PHTHALATE	UG/KG	72.4	80.7	150	67	333
		DI-N-OCTYL PHTHALATE	UG/KG	70.4	80.7	150	67	333
		DIPHENYLAMINE	UG/KG	70.4	80.7	150	67	333
		ETHYL METHANE SULFONATE	UG/KG	70.4	80.7	67	333	--
		FLUORANTHENE	UG/KG	3.56	3.98	4.3	3.3	6.7
		FLUORENE	UG/KG	3.47	3.98	4.9	3.3	6.7
		HEXACHLOROBENZENE	UG/KG	70.4	80.7	150	67	130
		HEXACHLOROBUTADIENE	UG/KG	70.4	80.7	150	67	67
		HEXACHLOROCYCLOPENTADIENE	UG/KG	70.4	80.7	150	67	130
		HEXACHLOROETHANE	UG/KG	70.4	80.7	150	67	130
		HEXACHLOROPROPENE	UG/KG	70.4	80.7	150	67	333
		INDENO(1,2,3-CD)PYRENE	UG/KG	3.56	3.98	4.9	3.3	6.7
		ISODRIN	UG/KG	70.4	80.7	150	67	333
		ISOPHORONE	UG/KG	70.4	80.7	150	67	333
		ISOSAFROLE	UG/KG	70.4	80.7	150	67	333
		KEPONE	UG/KG	70.4	80.7	150	67	333
		METHAPYRILENE	UG/KG	70.4	80.7	150	67	333
		METHYL METHANE SULFONATE	UG/KG	70.4	80.7	67	333	315.49
		NAPHTHALENE	UG/KG	3.56	3.98	3.3	6.7	99.39
		N-NITROSODIETHYLAMINE	UG/KG	70.4	80.7	150	67	333
		N-NITROSODIMETHYLAMINE	UG/KG	70.4	80.7	150	67	333
		N-NITROSO-DI-N-BUTYLAMINE	UG/KG	70.4	80.7	150	67	333

TABLE H-3
SOIL MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		N-NITROSO-DI-N-PROPYLAMINE	UG/KG	70.4	80.7	150	67	130
		N-NITROSODIPHENYLAMINE	UG/KG	70.4	80.7	--	--	--
		N-NITROSOMETHYLETHYLAMINE	UG/KG	70.4	80.7	150	67	333
		N-NITROSOMORPHOLINE	UG/KG	70.4	80.7	150	67	333
		N-NITROSOPIPERIDINE	UG/KG	70.4	80.7	150	67	333
		N-NITROSOPYRROLIDINE	UG/KG	70.4	80.7	150	67	333
		O,O,O-TRIETHYL PHOSPHOROTHIOATE	UG/KG	70.4	80.7	150	67	333
		O-TOLUIDINE	UG/KG	70.4	80.7	150	67	333
		P-(DIMETHYLAMINO)AZOBENZENE	UG/KG	70.4	80.7	150	67	333
		PENTACHLOROBENZENE	UG/KG	70.4	80.7	150	67	333
		PENTACHLOROETHANE	UG/KG	70.4	80.7	150	67	333
		PENTACHLORONITROBENZENE	UG/KG	70.4	80.7	150	67	333
		PHENACETIN	UG/KG	70.4	80.7	67	333	11700
		PHENANTHRENE	UG/KG	3.56	3.98	3.3	6.7	45700
		PHENOL	UG/KG	70.4	80.7	150	67	333
		PRONAMIDE	UG/KG	70.4	80.7	67	333	13.6
		PYRENE	UG/KG	3.56	3.98	4.3	3.3	6.7
		PYRIDINE	UG/KG	70.4	80.7	150	67	333
		SAFROLE	UG/KG	70.4	80.7	150	67	333
	VOC	1,1,1,2-TETRACHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,1,1-TRICHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,1,2,2-TETRACHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,1,2-TRICHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,1-DICHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,1-DICHLOROETHENE	UG/KG	0.865	1.6	1.4	1	3
		1,2,3-TRICHLOROPROPANE	UG/KG	0.865	1.6	1.4	1	3
		1,2-DIBROMO-3-CHLOROPROPANE	UG/KG	0.865	1.6	1.4	1	3
		1,2-DIBROMOETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,2-DICHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		1,2-DICHLOROPROPANE	UG/KG	0.865	1.6	1.4	1	3
		1,4-DIOXANE	UG/KG	76.7	151	140	100	200
		2-BUTANONE	UG/KG	0.865	1.6	1.4	1	15
		2-HEXANONE	UG/KG	0.865	1.6	1.4	1	15
		3-CHLOROPROPENE	UG/KG	0.865	1.6	1.4	1	10
		4-METHYL-2-PENTANONE	UG/KG	0.865	1.6	1.4	1	15
		ACETONE	UG/KG	0.865	21	8	1	15
		ACETONITRILE	UG/KG	30.7	60.2	56	40	80
		ACROLEIN	UG/KG	0.865	1.6	1.4	1	50
		ACRYLONITRILE	UG/KG	0.865	1.6	1.4	1	10
		BENZENE	UG/KG	0.865	1.6	1.4	1	3
		BROMODICHLOROMETHANE	UG/KG	0.865	1.6	1.4	1	3
		BROMOFORM	UG/KG	0.865	1.6	1.4	1	3
		BROMOMETHANE	UG/KG	0.865	1.6	1.4	1	3
		CARBON DISULFIDE	UG/KG	0.865	1.6	1.4	1	3
		CARBON TETRACHLORIDE	UG/KG	0.865	1.6	1.4	1	3
		CHLOROBENZENE	UG/KG	0.865	1.6	1.4	1	3
		CHLORODIBROMOMETHANE	UG/KG	0.865	1.6	1.4	1	3
		CHLOROETHANE	UG/KG	0.865	1.6	1.4	1	3
		CHLOROFORM	UG/KG	0.865	1.6	1.4	1	3
		CHLOROMETHANE	UG/KG	0.865	1.6	1.4	1	3
		CHLOROPRENE	UG/KG	0.865	1.6	1.4	1	3
		CIS-1,2-DICHLOROETHENE	UG/KG	0.865	1.6	1.4	1	3
		CIS-1,3-DICHLOROPROPENE	UG/KG	0.865	1.6	1.4	1	3
		DIBROMOMETHANE	UG/KG	0.865	1.6	1.4	1	3
		DICHLORODIFLUOROMETHANE	UG/KG	0.865	1.25	1.4	1	3
		ETHYL METHACRYLATE	UG/KG	0.865	1.6	1.4	1	3
		ETHYLBENZENE	UG/KG	0.865	1.6	1.4	1	3
		ISOBUTANOL	UG/KG	30.7	60.2	56	40	80
		METHACRYLONITRILE	UG/KG	0.865	1.6	1.4	1	3
		METHYL IODIDE	UG/KG	0.865	1.6	1.4	1	3

TABLE H-3
SOIL MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		METHYL METHACRYLATE	UG/KG	0.865	1.6	1.4	1	30
		METHYLENE CHLORIDE	UG/KG	0.865	1.6	13	1	3
		PROPIONITRILE	UG/KG	30.7	60.2	56	40	80
		STYRENE	UG/KG	0.865	1.6	1.4	1	3
		TETRACHLOROETHENE	UG/KG	0.865	1.6	1.4	1	3
		TOLUENE	UG/KG	0.865	1.6	1.4	1	3
		TOTAL XYLENES	UG/KG	0.865	1.6	1.4	1	10
		TRANS-1,2-DICHLOROETHENE	UG/KG	0.865	1.6	1.4	1	3
		TRANS-1,3-DICHLOROPROPENE	UG/KG	0.865	1.6	1.4	1	3
		TRANS-1,4-DICHLORO-2-BUTENE	UG/KG	0.865	1.6	1.4	1	10
		TRICHLOROETHENE	UG/KG	0.865	1.6	1.4	1	3
		TRICHLOROFLUOROMETHANE	UG/KG	0.865	1.6	1.3	1	3
		VINYL ACETATE	UG/KG	0.865	1.6	1.4	1	30
		VINYL CHLORIDE	UG/KG	0.865	1.6	1.4	1	3

1 Only results with validation qualifiers that contain a "U" are tallied.
2 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) exceed laboratory RBTLs.
3 Risk-based target levels are taken from Table 1-7 of the SWMU 12 QAPP (TtNUS, 2003) and are subject to change.

EXP = Explosives
HERB = Herbicides
M = Metals, total
MG/KG = Milligrams per kilogram
MISC = Miscellaneous parameters
QAPP = Quality Assurance Project Plan
RBTL = Risk-based target level
RL = Reporting limit
SVOC = Semivolatile organic compounds
TV = Treshold value (i.e., method detection limit that is estimated to be routinely achievable)
UG/KG = Micrograms per kilogram
VOC = Volatile organic compounds

TABLE H-4
GROUNDWATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

Round	Fraction	Parameter	units	Minimum Non-detect Concentration	Maximum Non-detect Concentration	Laboratory TV	Laboratory RL	Risk-Based Target Level[3]
1	EXP	1,3,5-TRINITROBENZENE	UG/L	0.242	0.446	0.35	0.65	1100
		1,3-DINITROBENZENE	UG/L	0.242	0.446	0.35	0.65	2.36
		2,4,6-TRINITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	2.2
		2,4-DIAMINO-6-NITROTOLUENE	UG/L	0.242	0.446	--	--	--
		2,4-DINITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	1.3
		2,6-DIAMINO-4-NITROTOLUENE	UG/L	0.242	0.446	--	--	--
		2,6-DINITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	1.3
		2-AMINO-4,6-DINITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	2.2
		2-NITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	61
		3,5-DINITROANILINE	UG/L	0.242	0.446	--	--	--
		3-NITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	61
		4,4'-TN-AZOXY	UG/L	0.485	0.892	--	--	--
		4-AMINO-2,6-DINITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	--
		4-NITROTOLUENE	UG/L	0.242	0.446	0.35	0.65	61
		DNX	UG/L	0.242	0.446	--	--	--
		HMX	UG/L	0.242	0.446	0.35	0.65	1800
		MNX	UG/L	0.242	0.446	--	--	--
		NITROBENZENE	UG/L	0.242	0.446	0.35	0.65	3.4
		RDX	UG/L	0.248	0.446	0.35	0.61	0.61
		TETRYL	UG/L	0.242	0.446	0.35	0.65	360
		TNX	UG/L	0.242	0.446	--	--	--
	M	ALUMINUM	UG/L	8.35	128	2.6	200	50
		ANTIMONY	UG/L	0.085	1.4	0.1	1	6
		ARSENIC	UG/L	0.14	0.79	0.2	1	0.045
		BERYLLIUM	UG/L	0.02	1.5	0.1	1	4
		CADMIUM	UG/L	0.039	1.4	0.7	1	0.66
		CALCIUM	UG/L	25300	25300	2.7	300	--
		CHROMIUM	UG/L	0.3	2	0.1	2	11
		COBALT	UG/L	1.8	44	0.1	2	5
		COPPER	UG/L	0.17	0.59	0.1	2	5
		IRON	UG/L	14.5	144	3.9	20	300
		LEAD	UG/L	0.069	1	0.1	1	1.3
		MANGANESE	UG/L	41.8	41.8	0.1	3	50
		MERCURY	UG/L	0.03	0.14	0.1	0.2	0.0013
		NICKEL	UG/L	5.5	57.8	0.1	2	29
		SELENIUM	UG/L	0.094	3	0.4	2	5
		SILVER	UG/L	0.028	0.63	0.1	2	1
		SODIUM	UG/L	6.79	6.79	1.6	300	--
		THALLIUM	UG/L	0.043	0.84	0.1	1	0.56
		TIN	UG/L	0.048	1.1	0.1	10	73
		VANADIUM	UG/L	1.14	1.14	0.1	2	19
		ZINC	UG/L	3.1	357	0.5	10	58.9
	MF	ALUMINUM	UG/L	9.1	140	2.6	200	50
		ANTIMONY	UG/L	0.085	1.6	0.1	1	6
		ARSENIC	UG/L	0.35	0.69	0.2	1	0.045
		BERYLLIUM	UG/L	0.02	0.91	0.1	1	4
		CADMIUM	UG/L	0.039	1.3	0.7	1	0.66
		CHROMIUM	UG/L	0.5	1.7	0.1	2	11
		COBALT	UG/L	0.24	0.24	0.1	2	5
		IRON	UG/L	34.2	120	3.9	20	300
		LEAD	UG/L	0.069	0.3	0.1	1	1.3
		MERCURY	UG/L	0.03	0.089	0.1	0.2	0.0013
		NICKEL	UG/L	0.88	0.88	0.1	2	29
		SELENIUM	UG/L	0.24	2.6	0.4	2	5
		SILVER	UG/L	0.028	0.09	0.1	2	1

TABLE H-4
GROUNDWATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		THALLIUM	UG/L	0.043	0.28	0.1	1	0.56
		TIN	UG/L	0.048	0.32	0.1	10	73
		VANADIUM	UG/L	1.14	1.14	0.1	2	19
		ZINC	UG/L	1.7	1.7	0.5	10	58.9
	MISC	AMMONIA-N	MG/L	0.005	0.08	50	50	--
		NITRITE/NITRATE-N	MG/L	0.025	0.05	20	20	1000
		TOTAL ORGANIC CARBON	MG/L	1	1	--	--	--
2	EXP	1,3,5-TRINITROBENZENE	UG/L	0.238	0.305	0.35	0.65	1100
		1,3-DINITROBENZENE	UG/L	0.238	0.305	0.35	0.65	2.36
		2,4,6-TRINITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	2.2
		2,4-DIAMINO-6-NITROTOLUENE	UG/L	0.238	0.305	--	--	--
		2,4-DINITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	1.3
		2,6-DIAMINO-4-NITROTOLUENE	UG/L	0.238	0.305	--	--	--
		2,6-DINITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	1.3
		2-AMINO-4,6-DINITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	2.2
		2-NITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	61
		3,5-DINITROANILINE	UG/L	0.238	0.305	--	--	--
		3-NITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	61
		4,4'-TN-AZOXY	UG/L	0.475	0.61	--	--	--
		4-AMINO-2,6-DINITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	--
		4-NITROTOLUENE	UG/L	0.238	0.305	0.35	0.65	61
		DNX	UG/L	0.238	0.305	--	--	--
		HMX	UG/L	0.238	0.305	0.35	0.65	1800
		MNX	UG/L	0.238	0.305	--	--	--
		NITROBENZENE	UG/L	0.238	0.305	0.35	0.65	3.4
		RDX	UG/L	0.238	0.305	0.35	0.61	0.61
		TETRYL	UG/L	0.238	0.305	0.35	0.65	360
		TNX	UG/L	0.238	0.305	--	--	--
	M	ALUMINUM	UG/L	8.35	172	2.6	200	50
		ANTIMONY	UG/L	0.085	2.7	0.1	1	6
		ARSENIC	UG/L	0.15	2.1	0.2	1	0.045
		BARIUM	UG/L	9	20.5	0.1	1	2000
		BERYLLIUM	UG/L	0.02	3.2	0.1	1	4
		CADMIUM	UG/L	0.039	3.4	0.7	1	0.66
		CHROMIUM	UG/L	0.14	1.8	0.1	2	11
		COBALT	UG/L	1.2	1.8	0.1	2	5
		COPPER	UG/L	0.69	1.4	0.1	2	5
		IRON	UG/L	23.8	103	3.9	20	300
		LEAD	UG/L	0.069	4.4	0.1	1	1.3
		MERCURY	UG/L	0.03	0.057	0.1	0.2	0.0013
		SELENIUM	UG/L	0.1	0.85	0.4	2	5
		SILVER	UG/L	0.028	0.43	0.1	2	1
		SODIUM	UG/L	307	307	1.6	300	--
		THALLIUM	UG/L	0.043	1.5	0.1	1	0.56
		TIN	UG/L	0.048	1.6	0.1	10	73
		VANADIUM	UG/L	1.14	1.14	0.1	2	19
		ZINC	UG/L	3.3	5.1	0.5	10	58.9
	MF	ALUMINUM	UG/L	8.35	19	2.6	200	50
		ANTIMONY	UG/L	0.085	1.1	0.1	1	6
		ARSENIC	UG/L	0.28	1.6	0.2	1	0.045
		BERYLLIUM	UG/L	0.02	1.1	0.1	1	4
		CADMIUM	UG/L	0.039	0.61	0.7	1	0.66
		CHROMIUM	UG/L	0.14	0.86	0.1	2	11
		COBALT	UG/L	0.13	0.98	0.1	2	5
		COPPER	UG/L	0.16	1	0.1	2	5
		IRON	UG/L	6.15	104	3.9	20	300
		LEAD	UG/L	0.2	0.75	0.1	1	1.3
		MANGANESE	UG/L	25.4	25.4	0.1	3	50
		MERCURY	UG/L	0.03	0.13	0.1	0.2	0.0013
		NICKEL	UG/L	0.68	2.1	0.1	2	29

TABLE H-4

GROUNDWATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]

SWMU 12

NSWC CRANE

CRANE, INDIANA

		SELENIUM	UG/L	0.17	0.52	0.4	2	5
		SILVER	UG/L	0.028	0.14	0.1	2	1
		THALLIUM	UG/L	0.043	0.46	0.1	1	0.56
		TIN	UG/L	0.048	1.6	0.1	10	73
		VANADIUM	UG/L	1.14	1.14	0.1	2	19
		ZINC	UG/L	3.1	7.1	0.5	10	58.9
	MISC	AMMONIA-N	MG/L	0.01	0.01	50	50	--
		NITRITE/NITRATE-N	MG/L	0.025	0.05	20	20	1000
		TOTAL ORGANIC CARBON	MG/L	1	1	--	--	--

1 Only results with validation qualifiers that contain a "U" are tallied.

2 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) exceed laboratory RBTLs.

3 Risk-based target levels are taken from Table 1-7 of the SWMU 12 QAPP (TINUS, 2003) and are subject to change.

EXP = Explosives

M = Metals, total

MF = Metals, dissolved

MG/L = Milligrams per Liter

MISC = Miscellaneous parameters

QAPP = Quality Assurance Project Plan

RBTL = Risk-based target level

RL = Reporting limt

TV = Treshold value (i.e., method detection limit that is estimated to be routinely achievable)

UG/L = Micrograms per Liter

TABLE H-5
SURFACE WATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Data		Reference Values		
Round	Fraction	Parameter	units	Minimum Non-detect Concentration	Maximum Non-detect Concentration	Laboratory TV, (ug/L)	Laboratory RL, (ug/L)	Risk-Based Target Level[3], (ug/L)
1	EXP	1,3,5-TRINITROBENZENE	UG/L	0.24	0.264	0.25	0.5	1100
		1,3-DINITROBENZENE	UG/L	0.24	0.264	0.25	0.5	2.36
		2,4,6-TRINITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	2.2
		2,4-DIAMINO-6-NITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	2.2
		2,4-DINITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	73
		2,6-DIAMINO-4-NITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	--
		2,6-DINITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	36
		2-AMINO-4,6-DINITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	--
		2-NITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	61
		3,5-DINITROANILINE	UG/L	0.24	0.264	0.25	0.5	--
		3-NITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	61
		4,4'-TN-AZOXY	UG/L	0.48	0.528	0.65	1	--
		4-AMINO-2,6-DINITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	--
		4-NITROTOLUENE	UG/L	0.24	0.264	0.25	0.5	61
		DNX	UG/L	0.24	0.264	0.25	0.5	--
		HMX	UG/L	0.24	0.264	0.25	0.5	1800
		MNX	UG/L	0.24	0.264	0.25	0.5	--
		NITROBENZENE	UG/L	0.24	0.264	0.25	0.5	3.4
		RDX	UG/L	0.24	0.264	0.25	0.5	0.61
		TETRYL	UG/L	0.24	0.264	0.25	0.5	360
		TNX	UG/L	0.24	0.264	0.25	0.5	--
	HERB	HEXACHLOROPHENE	UG/L	0.025	0.025	0.85	1.7	0.19878
		PENTACHLOROPHENOL	UG/L	0.013	0.013	0.45	0.9	0.001
	M	ALUMINUM	UG/L	107	107	3.4	25	76000
		ANTIMONY	UG/L	0.085	0.95	0.01	0.5	0.1423
		ARSENIC	UG/L	0.15	0.32	0.015	0.5	0.39
		BERYLLIUM	UG/L	0.02	0.45	0.015	0.5	0.1
		CADMIUM	UG/L	0.039	1.5	0.02	0.5	0.00222
		CHROMIUM	UG/L	0.39	2	0.01	0.5	0.4
		COBALT	UG/L	0.2	0.31	0.01	0.5	0.14033
		COPPER	UG/L	0.69	2.1	0.03	1	2.96
		LEAD	UG/L	0.15	0.77	0.01	0.5	0.05373
		MERCURY	UG/L	0.03	0.03	0.002	0.1	0.073
		SELENIUM	UG/L	0.12	0.92	0.02	0.5	0.02765
		SILVER	UG/L	0.028	0.18	0.015	0.5	2
		SODIUM	UG/L	897	28100	1.6	300	--
		THALLIUM	UG/L	0.043	0.043	0.02	0.5	0.04
		TIN	UG/L	0.08	0.75	0.045	5	7.62
		VANADIUM	UG/L	1.14	1.14	0.025	1	1.59
		ZINC	UG/L	1.4	9.6	0.16	5	6.62
	MF	ALUMINUM	UG/L	8.6	137	3.4	25	--
		ANTIMONY	UG/L	0.085	0.8	0.01	0.5	--
		ARSENIC	UG/L	0.1	0.32	0.015	0.5	--
		BERYLLIUM	UG/L	0.02	0.09	0.015	0.5	0.1
		CADMIUM	UG/L	0.039	0.64	0.02	0.5	0.00222
		CHROMIUM	UG/L	0.26	1.6	0.01	0.5	--
		COBALT	UG/L	0.15	0.28	0.01	0.5	0.14033
		COPPER	UG/L	0.49	2.3	0.03	1	2.96
		LEAD	UG/L	0.069	0.39	0.01	0.5	0.05373
		MANGANESE	UG/L	0.752	30.1	0.02	2.5	1800
		MERCURY	UG/L	0.03	0.03	0.002	0.1	0.073
		NICKEL	UG/L	1.5	1.6	0.03	0.5	7
		SELENIUM	UG/L	0.1	0.82	0.02	0.5	0.02765
		SILVER	UG/L	0.028	0.14	0.015	0.5	2
		SODIUM	UG/L	948	28400	1.6	300	--

TABLE H-5
SURFACE WATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		THALLIUM	UG/L	0.043	0.043	0.02	0.5	--
		TIN	UG/L	0.08	0.26	0.045	5	7.62
		VANADIUM	UG/L	1.14	1.14	0.025	1	1.59
		ZINC	UG/L	2.1	16.6	0.16	5	6.62
	MISC	AMMONIA-N	MG/L	0.005	0.005	0.01	0.02	--
		NITRITE/NITRATE-N	MG/L	0.025	0.025	0.025	0.05	--
	SVOC	1,2,4,5-TETRACHLOROBENZENE	UG/L	0.94	0.98	1	5	2.02
		1,2,4-TRICHLOROBENZENE	UG/L	0.94	0.98	1	5	0.3
		1,2-DICHLOROBENZENE	UG/L	0.94	0.98	1	5	0.9
		1,3-DICHLOROBENZENE	UG/L	0.94	0.98	1	5	0.13
		1,4-DICHLOROBENZENE	UG/L	0.94	0.98	1	2	0.1
		1,4-NAPHTHOQUINONE	UG/L	0.94	0.98	1	5	--
		1,4-PHENYLENEDIAMINE	UG/L	0.94	0.98	1	5	12000
		1-NAPHTHYLAMINE	UG/L	0.94	0.98	1	5	--
		2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	0.94	0.98	1	3	--
		2,3,4,6-TETRACHLOROPHENOL	UG/L	0.94	0.98	1	5	0.19878
		2,4,5-TRICHLOROPHENOL	UG/L	0.94	0.98	1	5	14
		2,4,6-TRICHLOROPHENOL	UG/L	0.94	0.98	1	3	0.008
		2,4-DICHLOROPHENOL	UG/L	0.94	0.98	1	5	0.05
		2,4-DIMETHYLPHENOL	UG/L	0.94	0.98	1	5	0.01
		2,4-DINITROPHENOL	UG/L	0.94	0.98	1	10	0.01
		2,6-DICHLOROPHENOL	UG/L	0.94	0.98	1	5	1.17
		2-ACETYLAMINOFLUORENE	UG/L	0.94	0.98	1	5	0.59634
		2-CHLORONAPHTHALENE	UG/L	0.94	0.98	1	2	0.01218
		2-CHLOROPHENOL	UG/L	0.94	0.98	1	3	0.2
		2-METHYLNAPHTHALENE	UG/L	0.05	0.05	0.05	0.1	--
		2-METHYLPHENOL	UG/L	0.94	0.98	1	5	0.8
		2-NAPHTHYLAMINE	UG/L	0.94	0.98	1	10	--
		2-NITROANILINE	UG/L	0.94	0.98	1	2	3.5
		2-NITROPHENOL	UG/L	0.94	0.98	1	5	1.6
		2-PICOLINE	UG/L	0.94	0.98	1	5	9.9
		3&4-METHYLPHENOL	UG/L	0.94	0.98	1	5	--
		3,3'-DICHLOROBENZIDINE	UG/L	0.94	0.98	1	5	0.0003
		3,3'-DIMETHYLBENZIDINE	UG/L	0.94	0.98	1	5	0.053
		3-METHYLCHOLANTHRENE	UG/L	0.94	0.98	1	5	0.07794
		3-NITROANILINE	UG/L	0.94	0.98	1	5	3.5
		4,6-DINITRO-2-METHYLPHENOL	UG/L	0.94	0.98	1	5	0.14408
		4-AMINOBIPHENYL	UG/L	0.94	0.98	1	5	--
		4-BROMOPHENYL PHENYL ETHER	UG/L	0.94	0.98	1	2	--
		4-CHLORO-3-METHYLPHENOL	UG/L	0.94	0.98	1	5	7.95
		4-CHLOROANILINE	UG/L	0.94	0.98	1	5	0.03
		4-CHLOROPHENYL PHENYL ETHER	UG/L	0.94	0.98	1	5	--
		4-NITROANILINE	UG/L	0.94	0.98	1	5	3.5
		4-NITROPHENOL	UG/L	0.94	0.98	1	5	5.12
		4-NITROQUINOLINE-1-OXIDE	UG/L	0.94	0.98	1	5	--
		5-NITRO-O-TOLUIDINE	UG/L	0.94	0.98	1	5	15
		7,12-DIMETHYLBENZ(A)ANTHRACENE	UG/L	0.94	0.98	1	5	16.3
		A,A-DIMETHYLPHENETHYLAMINE	UG/L	0.94	0.98	1	10	--
		ACENAPHTHENE	UG/L	0.05	0.05	0.05	0.1	--
		ACENAPHTHYLENE	UG/L	0.05	0.05	0.05	0.1	130
		ACETOPHENONE	UG/L	0.94	0.98	1	5	0.49
		ANILINE	UG/L	0.94	0.98	1	5	0.05678
		ANTHRACENE	UG/L	0.05	0.05	0.05	0.1	--
		ARAMITE	UG/L	0.94	0.98	1	5	19
		BENZO(A)ANTHRACENE	UG/L	0.05	0.05	0.05	0.1	--
		BENZO(A)PYRENE	UG/L	0.05	0.05	0.05	0.1	--
		BENZO(B)FLUORANTHENE	UG/L	0.05	0.05	0.05	0.1	0.2
		BENZO(G,H,I)PERYLENE	UG/L	0.05	0.05	0.05	0.1	--
		BENZO(K)FLUORANTHENE	UG/L	0.05	0.05	0.05	0.1	--
		BENZYL ALCOHOL	UG/L	0.94	0.98	1	5	65.8
		BIS(2-CHLOROETHOXY)METHANE	UG/L	0.94	0.98	1	5	0.30209

TABLE H-5
SURFACE WATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		BIS(2-CHLOROETHYL)ETHER	UG/L	0.94	0.98	1	2	0.00002
		BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	0.94	0.98	1	1	0.92594
		BUTYL BENZYL PHTHALATE	UG/L	0.94	0.98	1	5	0.23889
		CHLOROBENZILATE	UG/L	0.94	0.98	1	5	1.8
		CHRYSENE	UG/L	0.05	0.05	0.05	0.1	4.73
		DIALLATE	UG/L	0.94	0.94	1	5	0.45214
		DIBENZO(A,H)ANTHRACENE	UG/L	0.05	0.05	0.05	0.1	--
		DIBENZOFURAN	UG/L	0.94	0.98	1	5	290
		DIETHYL PHTHALATE	UG/L	0.94	0.98	1	2	23
		DIMETHYL PHTHALATE	UG/L	0.94	0.98	1	5	734
		DI-N-BUTYL PHTHALATE	UG/L	0.94	0.98	1	2	0.14979
		DI-N-OCTYL PHTHALATE	UG/L	0.94	0.98	1	5	709
		DIPHENYLAMINE	UG/L	0.94	0.98	1	5	--
		ETHYL METHANE SULFONATE	UG/L	0.94	0.98	1	5	--
		FLUORANTHENE	UG/L	0.05	0.05	0.05	0.1	--
		FLUORENE	UG/L	0.05	0.05	0.05	0.1	--
		HEXACHLOROBENZENE	UG/L	0.94	0.98	1	2	0.1
		HEXACHLOROBUTADIENE	UG/L	0.94	0.98	1	1	0.03976
		HEXACHLOROCYCLOPENTADIENE	UG/L	0.94	0.98	1	2	0.75537
		HEXACHLOROETHANE	UG/L	0.94	0.98	1	2	0.02
		HEXACHLOROPROPENE	UG/L	0.94	0.98	1	5	--
		INDENO(1,2,3-CD)PYRENE	UG/L	0.05	0.05	0.05	0.1	--
		ISODRIN	UG/L	0.94	0.98	1	5	0.00332
		ISOPHORONE	UG/L	0.94	0.98	1	5	0.03
		ISOSAFROLE	UG/L	0.94	0.98	1	5	9.94
		KEPONE	UG/L	0.94	0.98	1	5	0.027
		METHAPYRILENE	UG/L	0.94	0.98	1	5	2.78
		METHYL METHANE SULFONATE	UG/L	0.94	0.98	1	5	0.31549
		NAPHTHALENE	UG/L	0.05	0.05	0.05	0.1	--
		N-NITROSODIETHYLAMINE	UG/L	0.94	0.98	1	5	0.0032
		N-NITROSODIMETHYLAMINE	UG/L	0.94	0.98	1	5	0.0000321
		N-NITROSO-DI-N-BUTYLAMINE	UG/L	0.94	0.98	1	5	--
		N-NITROSO-DI-N-PROPYLAMINE	UG/L	0.94	0.98	1	2	--
		N-NITROSODIPHENYLAMINE	UG/L	0.94	0.98	--	--	--
		N-NITROSOMETHYLETHYLAMINE	UG/L	0.94	0.98	1	5	0.00166
		N-NITROSOMORPHOLINE	UG/L	0.94	0.98	1	5	0.07057
		N-NITROSOPIPERIDINE	UG/L	0.94	0.98	1	5	0.00665
		N-NITROSOPYRROLIDINE	UG/L	0.94	0.98	1	5	0.01258
		O,O,O-TRIETHYL PHOSPHOROTHIOATE	UG/L	0.94	0.98	1	5	--
		O-TOLUIDINE	UG/L	0.94	0.98	1	5	2
		P-(DIMETHYLAMINO)AZOBENZENE	UG/L	0.94	0.98	1	5	--
		PENTACHLOROBENZENE	UG/L	0.94	0.98	1	5	0.49695
		PENTACHLOROETHANE	UG/L	0.94	0.98	1	5	10.7
		PENTACHLORONITROBENZENE	UG/L	0.94	0.98	1	5	1.9
		PHENACETIN	UG/L	0.94	0.98	1	5	11.7
		PHENANTHRENE	UG/L	0.05	0.05	0.05	0.1	45.7
		PHENOL	UG/L	0.94	0.98	1	5	5
		PRONAMIDE	UG/L	0.94	0.98	1	5	0.0136
		PYRENE	UG/L	0.05	0.05	0.05	0.1	--
		PYRIDINE	UG/L	0.94	0.98	1	5	1.03
		SAFROLE	UG/L	0.94	0.98	1	5	0.40398
2	EXP	1,3,5-TRINITROBENZENE	UG/L	0.238	0.278	0.25	0.5	1100
		1,3-DINITROBENZENE	UG/L	0.238	0.278	0.25	0.5	2.36
		2,4,6-TRINITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	2.2
		2,4-DIAMINO-6-NITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	2.2
		2,4-DINITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	73
		2,6-DIAMINO-4-NITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	--
		2,6-DINITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	36
		2-AMINO-4,6-DINITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	--
		2-NITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	61
		3,5-DINITROANILINE	UG/L	0.238	0.278	0.25	0.5	--

TABLE H-5
SURFACE WATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		3-NITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	61
		4,4'-TN-AZOXY	UG/L	0.475	0.555	0.65	1	--
		4-AMINO-2,6-DINITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	--
		4-NITROTOLUENE	UG/L	0.238	0.278	0.25	0.5	61
		DNX	UG/L	0.238	0.278	0.25	0.5	--
		HMX	UG/L	0.25	0.278	0.25	0.5	1800
		MNX	UG/L	0.238	0.278	0.25	0.5	--
		NITROBENZENE	UG/L	0.238	0.278	0.25	0.5	3.4
		RDX	UG/L	0.25	0.278	0.25	0.5	0.61
		TETRYL	UG/L	0.238	0.278	0.25	0.5	360
		TNX	UG/L	0.238	0.278	0.25	0.5	--
	HERB	HEXACHLOROPHENE	UG/L	0.025	0.025	0.85	1.7	0.19878
		PENTACHLOROPHENOL	UG/L	0.013	0.013	0.45	0.9	0.001
	M	ALUMINUM	UG/L	32	169	3.4	25	76000
		ANTIMONY	UG/L	0.085	1	0.01	0.5	0.1423
		ARSENIC	UG/L	0.047	0.21	0.015	0.5	0.39
		BARIUM	UG/L	0.37	0.37	0.1	1	2000
		BERYLLIUM	UG/L	0.02	0.02	0.015	0.5	0.1
		CADMIUM	UG/L	0.039	0.34	0.02	0.5	0.00222
		CHROMIUM	UG/L	0.08	2	0.01	0.5	0.4
		COPPER	UG/L	0.15	0.58	0.03	1	2.96
		LEAD	UG/L	0.069	0.07	0.01	0.5	0.05373
		MERCURY	UG/L	0.03	0.03	0.002	0.1	0.073
		NICKEL	UG/L	0.1	0.1	0.03	0.5	7
		POTASSIUM	UG/L	5.55	5.55	7.4	300	--
		SELENIUM	UG/L	0.11	0.91	0.02	0.5	0.02765
		SILVER	UG/L	0.028	0.05	0.015	0.5	2
		THALLIUM	UG/L	0.043	0.043	0.02	0.5	0.04
		TIN	UG/L	0.048	0.56	0.045	5	7.62
		VANADIUM	UG/L	1.14	1.14	0.025	1	1.59
		ZINC	UG/L	0.714	3.6	0.16	5	6.62
	MF	ALUMINUM	UG/L	8.35	8.35	3.4	25	--
		ANTIMONY	UG/L	0.085	0.18	0.01	0.5	--
		ARSENIC	UG/L	0.047	0.56	0.015	0.5	--
		BERYLLIUM	UG/L	0.02	0.03	0.015	0.5	0.1
		CADMIUM	UG/L	0.039	0.14	0.02	0.5	0.00222
		CHROMIUM	UG/L	0.44	1.9	0.01	0.5	--
		COBALT	UG/L	0.088	0.14	0.01	0.5	0.14033
		COPPER	UG/L	0.71	0.71	0.03	1	2.96
		LEAD	UG/L	0.069	0.198	0.01	0.5	0.05373
		MANGANESE	UG/L	0.752	0.752	0.02	2.5	1800
		MERCURY	UG/L	0.03	0.03	0.002	0.1	0.073
		SELENIUM	UG/L	0.094	0.84	0.02	0.5	0.02765
		SILVER	UG/L	0.028	0.09	0.015	0.5	2
		THALLIUM	UG/L	0.043	0.11	0.02	0.5	--
		TIN	UG/L	0.048	0.52	0.045	5	7.62
		VANADIUM	UG/L	1.14	1.14	0.025	1	1.59
	MISC	AMMONIA-N	MG/L	0.005	0.01	0.01	0.02	--
		NITRITE/NITRATE-N	MG/L	0.025	0.05	0.025	0.05	--
	SVOC	1,2,4,5-TETRACHLOROBENZENE	UG/L	1	1	1	5	2.02
		1,2,4-TRICHLOROBENZENE	UG/L	1	1	1	5	0.3
		1,2-DICHLOROBENZENE	UG/L	1	1	1	5	0.9
		1,3-DICHLOROBENZENE	UG/L	1	1	1	5	0.13
		1,4-DICHLOROBENZENE	UG/L	1	1	1	2	0.1
		1,4-NAPHTHOQUINONE	UG/L	1	1	1	5	--
		1,4-PHENYLENEDIAMINE	UG/L	1	1	1	5	12000
		1-NAPHTHYLAMINE	UG/L	1	1	1	5	--
		2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	1	1	1	3	--
		2,3,4,6-TETRACHLOROPHENOL	UG/L	1	1	1	5	0.19878
		2,4,5-TRICHLOROPHENOL	UG/L	1	1	1	5	14
		2,4,6-TRICHLOROPHENOL	UG/L	1	1	1	3	0.008

TABLE H-5
SURFACE WATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		2,4-DICHLOROPHENOL	UG/L	1	1	1	5	0.05
		2,4-DIMETHYLPHENOL	UG/L	1	1	1	5	0.01
		2,4-DINITROPHENOL	UG/L	1	1	1	10	0.01
		2,6-DICHLOROPHENOL	UG/L	1	1	1	5	1.17
		2-ACETYLAMINOFLUORENE	UG/L	1	1	1	5	0.59634
		2-CHLORONAPHTHALENE	UG/L	1	1	1	2	0.01218
		2-CHLOROPHENOL	UG/L	1	1	1	3	0.2
		2-METHYLNAPHTHALENE	UG/L	0.049	0.05	0.05	0.1	--
		2-METHYLPHENOL	UG/L	1	1	1	5	0.8
		2-NAPHTHYLAMINE	UG/L	1	1	1	10	--
		2-NITROANILINE	UG/L	1	1	1	2	3.5
		2-NITROPHENOL	UG/L	1	1	1	5	1.6
		2-PICOLINE	UG/L	1	1	1	5	9.9
		3&4-METHYLPHENOL	UG/L	1	1	1	5	--
		3,3'-DICHLOROBENZIDINE	UG/L	1	1	1	5	0.0003
		3,3'-DIMETHYLBENZIDINE	UG/L	1	1	1	5	0.053
		3-METHYLCHOLANTHRENE	UG/L	1	1	1	5	0.07794
		3-NITROANILINE	UG/L	1	1	1	5	3.5
		4,6-DINITRO-2-METHYLPHENOL	UG/L	1	1	1	5	0.14408
		4-AMINOBIPHENYL	UG/L	1	1	1	5	--
		4-BROMOPHENYL PHENYL ETHER	UG/L	1	1	1	2	--
		4-CHLORO-3-METHYLPHENOL	UG/L	1	1	1	5	7.95
		4-CHLOROANILINE	UG/L	1	1	1	5	0.03
		4-CHLOROPHENYL PHENYL ETHER	UG/L	1	1	1	5	--
		4-NITROANILINE	UG/L	1	1	1	5	3.5
		4-NITROPHENOL	UG/L	1	1	1	5	5.12
		4-NITROQUINOLINE-1-OXIDE	UG/L	1	1	1	5	--
		5-NITRO-O-TOLUIDINE	UG/L	1	1	1	5	15
		7,12-DIMETHYLBENZ(A)ANTHRACENE	UG/L	1	1	1	5	16.3
		A,A-DIMETHYLPHENETHYLAMINE	UG/L	1	1	1	10	--
		ACENAPHTHENE	UG/L	0.049	0.05	0.05	0.1	--
		ACENAPHTHYLENE	UG/L	0.049	0.05	0.05	0.1	130
		ACETOPHENONE	UG/L	1	1	1	5	0.49
		ANILINE	UG/L	1	1	1	5	0.05678
		ANTHRACENE	UG/L	0.049	0.05	0.05	0.1	--
		ARAMITE	UG/L	1	1	1	5	19
		BENZO(A)ANTHRACENE	UG/L	0.049	0.05	0.05	0.1	--
		BENZO(A)PYRENE	UG/L	0.049	0.05	0.05	0.1	--
		BENZO(B)FLUORANTHENE	UG/L	0.049	0.05	0.05	0.1	0.2
		BENZO(G,H,I)PERYLENE	UG/L	0.049	0.05	0.05	0.1	--
		BENZO(K)FLUORANTHENE	UG/L	0.049	0.05	0.05	0.1	--
		BENZYL ALCOHOL	UG/L	1	1	1	5	65.8
		BIS(2-CHLOROETHOXY)METHANE	UG/L	1	1	1	5	0.30209
		BIS(2-CHLOROETHYL)ETHER	UG/L	1	1	1	2	0.00002
		BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	1	1	1	1	0.92594
		BUTYL BENZYL PHTHALATE	UG/L	1	1	1	5	0.23889
		CHLOROBENZILATE	UG/L	1	1	1	5	1.8
		CHRYSENE	UG/L	0.049	0.05	0.05	0.1	4.73
		DIALLATE	UG/L	1	1	1	5	0.45214
		DIBENZO(A,H)ANTHRACENE	UG/L	0.049	0.05	0.05	0.1	--
		DIBENZOFURAN	UG/L	1	1	1	5	290
		DIETHYL PHTHALATE	UG/L	1	1	1	2	23
		DIMETHYL PHTHALATE	UG/L	1	1	1	5	734
		DI-N-BUTYL PHTHALATE	UG/L	1	1	1	2	0.14979
		DI-N-OCTYL PHTHALATE	UG/L	1	1	1	5	709
		DIPHENYLAMINE	UG/L	1	1	1	5	--
		ETHYL METHANE SULFONATE	UG/L	1	1	1	5	--
		FLUORANTHENE	UG/L	0.049	0.05	0.05	0.1	--
		FLUORENE	UG/L	0.049	0.05	0.05	0.1	--
		HEXACHLOROBENZENE	UG/L	1	1	1	2	0.1
		HEXACHLOROBUTADIENE	UG/L	1	1	1	1	0.03976

TABLE H-5
SURFACE WATER SAMPLE MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		HEXACHLOROCYCLOPENTADIENE	UG/L	1	1	1	2	0.75537
		HEXACHLOROETHANE	UG/L	1	1	1	2	0.02
		HEXACHLOROPROPENE	UG/L	1	1	1	5	--
		INDENO(1,2,3-CD)PYRENE	UG/L	0.049	0.05	0.05	0.1	--
		ISODRIN	UG/L	1	1	1	5	0.00332
		ISOPHORONE	UG/L	1	1	1	5	0.03
		ISOSAFROLE	UG/L	1	1	1	5	9.94
		KEPONE	UG/L	1	1	1	5	0.027
		METHAPYRILENE	UG/L	1	1	1	5	2.78
		METHYL METHANE SULFONATE	UG/L	1	1	1	5	0.31549
		NAPHTHALENE	UG/L	0.049	0.05	0.05	0.1	--
		N-NITROSODIETHYLAMINE	UG/L	1	1	1	5	0.0032
		N-NITROSODIMETHYLAMINE	UG/L	1	1	1	5	0.0000321
		N-NITROSO-DI-N-BUTYLAMINE	UG/L	1	1	1	5	--
		N-NITROSO-DI-N-PROPYLAMINE	UG/L	1	1	1	2	--
		N-NITROSODIPHENYLAMINE	UG/L	1	1	--	--	--
		N-NITROSOMETHYLETHYLAMINE	UG/L	1	1	1	5	0.00166
		N-NITROSOMORPHOLINE	UG/L	1	1	1	5	0.07057
		N-NITROSOPIPERIDINE	UG/L	1	1	1	5	0.00665
		N-NITROSOPYRROLIDINE	UG/L	1	1	1	5	0.01258
		O,O,O-TRIETHYL PHOSPHOROTHIOATE	UG/L	1	1	1	5	--
		O-TOLUIDINE	UG/L	1	1	1	5	2
		P-(DIMETHYLAMINO)AZOBENZENE	UG/L	1	1	1	5	--
		PENTACHLOROBENZENE	UG/L	1	1	1	5	0.49695
		PENTACHLOROETHANE	UG/L	1	1	1	5	10.7
		PENTACHLORONITROBENZENE	UG/L	1	1	1	5	1.9
		PHENACETIN	UG/L	1	1	1	5	11.7
		PHENANTHRENE	UG/L	0.049	0.05	0.05	0.1	45.7
		PHENOL	UG/L	1	1	1	5	5
		PRONAMIDE	UG/L	1	1	1	5	0.0136
		PYRENE	UG/L	0.049	0.05	0.05	0.1	--
		PYRIDINE	UG/L	1	1	1	5	1.03
		SAFROLE	UG/L	1	1	1	5	0.40398

1 Only results with validation qualifiers that contain a "U" are tallied.
2 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) exceed laboratory RBTLs.
3 Risk-based target levels are taken from Table 1-7 of the SWMU 12 QAPP (TtNUS, 2003) and are subject to change.

EXP = Explosives
HERB = Herbicides
M = Metals, total
MF = Metals, dissolved
MG/L = Milligrams per Liter
MISC = Miscellaneous parameters
QAPP = Quality Assurance Project Plan
RBTL = Risk-based target level
RL = Reporting limt
SVOC = Semivolatile organic compounds
TV = Treshold value (i.e., method detection limit that is estimated to be routinely achievable)
UG/L = Micrograms per Liter

TABLE H-6
SEDIMENT MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Data		Reference Values		
Round	Fraction	Parameter	units	Minimum Non-detect Concentration	Maximum Non-detect Concentration	Laboratory TV, (ug/L)	Laboratory RL, (ug/L)	Risk-Based Target Level[3], (ug/L)
1	AVS/SEM	ACID VOLATILE SULFIDE	UMO/G	0.26	0.54	--	--	--
		CADMIUM	UMO/G	0.0012	0.023	0.35	0.5	0.4
		MERCURY	UMO/G	0.00016	0.00026	0.02	0.2	0.1
		SILVER	UMO/G	0.0025	0.0235	0.05	1	0.5
		ZINC	UMO/G	0.17	0.19	0.25	5	120
	EXP	1,3,5-TRINITROBENZENE	MG/KG	0.25	0.25	0.25	0.5	1800
		1,3-DINITROBENZENE	MG/KG	0.25	0.25	0.25	0.5	0.000924
		2,4,6-TRINITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	16
		2,4-DIAMINO-6-NITROTOLUENE	MG/KG	0.25	0.25	--	--	--
		2,4-DINITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	0.00004
		2,6-DIAMINO-4-NITROTOLUENE	MG/KG	0.25	0.25	--	--	--
		2,6-DINITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	0.00003
		2-AMINO-4,6-DINITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	4.7
		2-NITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	370
		3,5-DINITROANILINE	MG/KG	0.25	0.25	--	--	--
		3-NITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	370
		4,4'-TN-AZOXY	MG/KG	0.5	0.5	--	--	--
		4-AMINO-2,6-DINITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	4.7
		4-NITROTOLUENE	MG/KG	0.25	0.25	0.25	0.5	370
		DNX	MG/KG	0.25	0.25	--	--	--
		HMX	MG/KG	0.25	0.25	0.25	0.5	3100
		MNX	MG/KG	0.25	0.25	--	--	--
		NITROBENZENE	MG/KG	0.25	0.25	0.25	0.5	0.007
		RDX	MG/KG	0.25	0.25	0.25	0.5	4.4
		TETRYL	MG/KG	0.25	0.25	0.25	0.5	780
		TNX	MG/KG	0.25	0.25	--	--	--
	HERB	HEXACHLOROPHENE	UG/KG	0.94	1.12	250	500	18000
		PENTACHLOROPHENOL	UG/KG	0.498	0.591	250	500	1
	M	ANTIMONY	MG/KG	0.24	2.3	0.05	0.5	0.3
		ARSENIC	MG/KG	5.1	15.5	0.1	0.5	5.9
		BARIUM	MG/KG	138	220	0.05	0.5	82
		BERYLLIUM	MG/KG	0.53	2.8	0.05	0.5	0.1
		CADMIUM	MG/KG	0.37	4.9	0.35	0.5	0.4
		CHROMIUM	MG/KG	14.7	17.8	0.05	1	2
		COBALT	MG/KG	6.9	17.3	0.05	1	50
		COPPER	MG/KG	6.8	13.9	0.05	1	16
		MANGANESE	MG/KG	473	545	0.05	1.5	1800
		MERCURY	MG/KG	0.007	0.007	0.02	0.2	0.1
		NICKEL	MG/KG	11.7	13.5	0.05	1	7
		SELENIUM	MG/KG	0.26	1.5	0.2	1	0.3
		SILVER	MG/KG	0.04	0.15	0.05	1	0.5
		SODIUM	MG/KG	23.6	154	0.8	150	--
		THALLIUM	MG/KG	0.11	0.3	0.05	0.5	0.04
		TIN	MG/KG	0.33	3.1	0.05	5	47000
		VANADIUM	MG/KG	19.3	133	0.05	1	300
		ZINC	MG/KG	121	528	0.25	5	120
	SVOC	1,2,4,5-TETRACHLOROBENZENE	UG/KG	74.1	88	67	670	18000
		1,2,4-TRICHLOROBENZENE	UG/KG	74.1	88	67	333	300
		1,2-DICHLOROBENZENE	UG/KG	74.1	88	67	333	231.32
		1,3-DICHLOROBENZENE	UG/KG	74.1	88	67	333	130
		1,4-DICHLOROBENZENE	UG/KG	74.1	88	67	333	100
		1,4-NAPHTHOQUINONE	UG/KG	74.1	88	67	670	--
		1,4-PHENYLENEDIAMINE	UG/KG	74.1	88	67	6700	12000000
		1-NAPHTHYLAMINE	UG/KG	74.1	88	67	3300	--
		2,2'-OXYBIS(1-CHLOROPROPANE)	UG/KG	74.1	88	67	1700	--
		2,3,4,6-TETRACHLOROPHENOL	UG/KG	74.1	88	67	1700	1510
		2,4,5-TRICHLOROPHENOL	UG/KG	74.1	88	67	333	85.56

TABLE H-6
SEDIMENT MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		2,4,6-TRICHLOROPHENOL	UG/KG	74.1	88	67	333	8
		2,4-DICHLOROPHENOL	UG/KG	74.1	88	67	333	50
		2,4-DIMETHYLPHENOL	UG/KG	74.1	88	67	333	304.53
		2,4-DINITROPHENOL	UG/KG	74.1	88	67	333	1.33
		2,6-DICHLOROPHENOL	UG/KG	74.1	88	67	1700	3.94
		2-ACETYLAMINOFLUORENE	UG/KG	74.1	88	67	670	15.32
		2-CHLORONAPHTHALENE	UG/KG	74.1	88	67	670	417.23
		2-CHLOROPHENOL	UG/KG	74.1	88	67	333	11.7
		2-METHYLNAPHTHALENE	UG/KG	3.65	4.34	250	500	20.2
		2-METHYLPHENOL	UG/KG	74.1	88	67	333	0.826
		2-NAPHTHYLAMINE	UG/KG	74.1	88	67	1700	--
		2-NITROANILINE	UG/KG	74.1	88	67	333	0.222
		2-NITROPHENOL	UG/KG	74.1	88	67	333	7.77
		2-PICOLINE	UG/KG	74.1	88	67	1300	753.05
		3&4-METHYLPHENOL	UG/KG	74.1	88	67	333	0.845
		3,3'-DICHLOROBENZIDINE	UG/KG	74.1	88	67	333	0.3
		3,3'-DIMETHYLBENZIDINE	UG/KG	74.1	88	67	3300	53
		3-METHYLCHOLANTHRENE	UG/KG	74.1	88	67	670	8190000
		3-NITROANILINE	UG/KG	74.1	88	67	333	3500
		4,6-DINITRO-2-METHYLPHENOL	UG/KG	74.1	88	67	333	10.38
		4-AMINOBIPHENYL	UG/KG	74.1	88	67	670	--
		4-BROMOPHENYL PHENYL ETHER	UG/KG	74.1	88	67	333	1550
		4-CHLORO-3-METHYLPHENOL	UG/KG	74.1	88	67	333	388.18
		4-CHLOROANILINE	UG/KG	74.1	88	67	333	30
		4-CHLOROPHENYL PHENYL ETHER	UG/KG	74.1	88	67	333	--
		4-NITROANILINE	UG/KG	74.1	88	67	333	3500
		4-NITROPHENOL	UG/KG	74.1	88	67	333	7.78
		4-NITROQUINOLINE-1-OXIDE	UG/KG	74.1	88	67	6700	--
		5-NITRO-O-TOLUIDINE	UG/KG	74.1	88	67	1700	15000
		7,12-DIMETHYLBENZ(A)ANTHRACENE	UG/KG	74.1	88	67	670	66400
		A,A-DIMETHYLPHENETHYLAMINE	UG/KG	74.1	88	67	4000	61000
		ACENAPHTHENE	UG/KG	3.65	4.34	250	500	6.71
		ACENAPHTHYLENE	UG/KG	3.65	4.34	250	500	5.87
		ACETOPHENONE	UG/KG	74.1	88	67	1300	246
		ANILINE	UG/KG	74.1	88	67	333	0.0338
		ANTHRACENE	UG/KG	3.65	4.34	250	500	46.9
		ARAMITE	UG/KG	74.1	88	67	670	0.00111
		BENZO(A)ANTHRACENE	UG/KG	3.65	4.34	250	500	31.7
		BENZO(A)PYRENE	UG/KG	3.65	4.34	250	500	31.9
		BENZO(B)FLUORANTHENE	UG/KG	3.65	4.34	250	500	200
		BENZO(G,H,I)PERYLENE	UG/KG	3.65	4.34	250	500	170
		BENZO(K)FLUORANTHENE	UG/KG	3.65	4.34	250	500	240
		BENZYL ALCOHOL	UG/KG	74.1	88	67	333	33.94
		BIS(2-CHLOROETHOXY)METHANE	UG/KG	74.1	88	67	333	349.71
		BIS(2-CHLOROETHYL)ETHER	UG/KG	74.1	88	67	333	0.02
		BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	74.1	85.7	67	333	182
		BUTYL BENZYL PHTHALATE	UG/KG	74.1	88	67	333	4190
		CHLOROBENZILATE	UG/KG	74.1	88	67	670	860.29
		CHRYSENE	UG/KG	3.65	4.34	250	500	57.1
		DIALLATE	UG/KG	74.1	88	67	670	1.51
		DIBENZO(A,H)ANTHRACENE	UG/KG	3.65	4.34	250	500	6.22
		DIBENZOFURAN	UG/KG	74.1	88	67	333	1520
		DIETHYL PHTHALATE	UG/KG	74.1	88	67	333	8.04
		DIMETHYL PHTHALATE	UG/KG	74.1	88	67	333	24.95
		DI-N-BUTYL PHTHALATE	UG/KG	74.1	88	67	333	110.5
		DI-N-OCTYL PHTHALATE	UG/KG	74.1	88	67	333	40600
		DIPHENYLAMINE	UG/KG	74.1	88	67	670	34.6
		ETHYL METHANE SULFONATE	UG/KG	74.1	88	67	1700	--
		FLUORENE	UG/KG	3.65	4.34	250	500	21.2
		HEXACHLOROBENZENE	UG/KG	74.1	88	67	333	20
		HEXACHLOROBUTADIENE	UG/KG	74.1	88	67	333	100
		HEXACHLOROCYCLOPENTADIENE	UG/KG	74.1	88	67	333	900.74
		HEXACHLOROETHANE	UG/KG	74.1	88	67	333	20
		HEXACHLOROPROPENE	UG/KG	74.1	88	67	1300	0.2

TABLE H-6
SEDIMENT MINIMUM AND MAXIMUM NON-DETECT VALUES, ROUNDS 1 AND 2 [1,2]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		INDENO(1,2,3-CD)PYRENE	UG/KG	3.65	4.34	250	500	200
		ISODRIN	UG/KG	74.1	88	67	670	55.16
		ISOPHORONE	UG/KG	74.1	88	67	333	30
		ISOSAFROLE	UG/KG	74.1	88	67	1300	4.12
		KEPONE	UG/KG	74.1	88	67	1700	3.31
		METHAPYRILENE	UG/KG	74.1	88	67	3300	0.0144
		METHYL METHANE SULFONATE	UG/KG	74.1	88	67	1300	0.00474
		NAPHTHALENE	UG/KG	3.65	4.34	250	500	34.6
		N-NITROSODIETHYLAMINE	UG/KG	74.1	88	67	670	3.2
		N-NITROSODIMETHYLAMINE	UG/KG	74.1	88	67	670	0.00275
		N-NITROSO-DI-N-BUTYLAMINE	UG/KG	74.1	88	67	670	24
		N-NITROSO-DI-N-PROPYLAMINE	UG/KG	74.1	88	67	333	0.002
		N-NITROSODIPHENYLAMINE	UG/KG	74.1	88	--	--	--
		N-NITROSOMETHYLETHYLAMINE	UG/KG	74.1	88	67	670	0.00485
		N-NITROSOMORPHOLINE	UG/KG	74.1	88	67	670	0.0037
		N-NITROSOPIPERIDINE	UG/KG	74.1	88	67	670	0.0226
		N-NITROSOPYRROLIDINE	UG/KG	74.1	88	67	670	0.000908
		O,O,O-TRIETHYL PHOSPHOROTHIOATE	UG/KG	74.1	88	67	670	--
		O-TOLUIDINE	UG/KG	74.1	88	67	670	2000
		P-(DIMETHYLAMINO)AZOBENZENE	UG/KG	74.1	88	67	1700	--
		PENTACHLOROBENZENE	UG/KG	74.1	88	67	670	1260
		PENTACHLOROETHANE	UG/KG	74.1	88	67	670	689.18
		PENTACHLORONITROBENZENE	UG/KG	74.1	88	67	670	1900
		PHENACETIN	UG/KG	74.1	88	67	670	2.25
		PHENANTHRENE	UG/KG	3.65	3.65	250	500	41.9
		PHENOL	UG/KG	74.1	88	67	333	27.26
		PRONAMIDE	UG/KG	74.1	88	67	670	1.6
		PYRENE	UG/KG	3.65	3.65	250	500	53
		PYRIDINE	UG/KG	74.1	88	1.3	333	106.17
		SAFROLE	UG/KG	74.1	88	67	333	164.86

1 Only results with validation qualifiers that contain a "U" are tallied.
2 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) exceed laboratory RBTLs.
3 Risk-based target levels are taken from Table 1-7 of the SWMU 12 QAPP (TINUS, 2003) and are subject to change.

AVS/SEM = Acid volatile sulfides/simultaneously extracted metals
EXP = Explosives
HERB = Herbicides
M = Metals, total
MG/KG = Milligrams per kilogram
QAPP = Quality Assurance Project Plan
RBTL = Risk-based target level
RL = Reporting limt
SVOC = Semivolatile organic compounds
TV = Treshold value (i.e., method detection limit that is estimated to be routinely achievable)
UG/KG = Micrograms per kilogram
UMO/G = Micromoles per gram

TABLE H-7
LABORATORY CONTROL SAMPLE, MATRIX SPIKE, AND MATRIX SPIKE DUPLICATE PERCENT RECOVERY REFERENCE RANGE EXCEEDANCES
ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

			LCS				FD and NM				MS and MSD			
Matrix	Fraction	Parameter	Min	Avg	Max	Count	Min	Avg	Max	Count	Min	Avg	Max	Count
SOLID	AVS/SEM	ACID VOLATILE SULFIDE									74.4	74.4	74.4	1
SOLID	AVS/SEM	COPPER									134	134.0	134	1
SOLID	EXP	1,3,5-TRINITROBENZENE	103	109.2	116	5					104	119.5	132	14
SOLID	EXP	1,3-DINITROBENZENE	105	111.8	116	5					102	118.7	134	14
SOLID	EXP	2,4,6-TRINITROTOLUENE	101	106.6	112	5					100	116.1	129	14
SOLID	EXP	2,4-DIAMINO-6-NITROTOLUENE	105	105.0	105	1					40	69.8	98	4
SOLID	EXP	2,4-DINITROTOLUENE	101	107.0	112	5					70	106.4	129	14
SOLID	EXP	2,6-DIAMINO-4-NITROTOLUENE	103	103.0	103	1					67	88.3	99	4
SOLID	EXP	2,6-DINITROTOLUENE	106	110.8	115	5					104	119.6	134	14
SOLID	EXP	2-NITROTOLUENE	101	106.6	113	5					98	113.6	129	14
SOLID	EXP	3,4-DINITROTOLUENE (SURR)	106	111.7	119	10	98	112.5	129	116	106	116.8	131	22
SOLID	EXP	3,5-DINITROANILINE	120	120.0	120	1					122	125.3	130	4
SOLID	EXP	3-NITROTOLUENE	102	107.0	113	5					100	114.4	129	14
SOLID	EXP	4,4'-TN-AZOXY	117	117.0	117	1					91	109.0	129	4
SOLID	EXP	4-AMINO-2,6-DINITROTOLUENE	108	119.2	144	5					104	118.4	130	14
SOLID	EXP	4-NITROTOLUENE	107	112.4	118	5					105	120.4	134	14
SOLID	EXP	NITROBENZENE	107	113.0	120	5					65	108.0	128	14
SOLID	EXP	TETRYL	50	75.2	89	5					90	100.1	114	14
SOLID	HERB	2,4-DICHLOROPHENYLACETIC ACID (SURR)	87	116.6	144	5	88	135.2	339	30	94	184.9	371	10
SOLID	HERB	HEXACHLOROPHENE	19	54.5	79	4					12	23.1	36	8
SOLID	HERB	PENTACHLOROPHENOL	8	77.6	106	5					8	51.8	94	10
SOLID	M	ANTIMONY	101.6	108.8	114	6					96.3	105.1	131.2	6
SOLID	M	ARSENIC	94.4	97.7	101	6					72	95.1	143.4	7
SOLID	M	BARIUM	90.8	99.9	114	6					-59.2	94.2	149.9	6
SOLID	M	CALCIUM	96.7	104.5	112	6					64.9	81.8	94	7
SOLID	M	COPPER	96.8	100.6	105	6					52.9	84.5	97.6	6
SOLID	M	LEAD	90	98.3	110	6					97.7	112.6	128	6
SOLID	M	MERCURY	94	99.3	104	10					1.7	81.1	102	8
SOLID	M	NICKEL	98.4	103.4	109	6					69.7	97.3	120	7
SOLID	M	POTASSIUM	95.4	104.1	112	6					57.3	86.1	104.2	7
SOLID	M	SELENIUM	87.6	96.2	102.4	6					62.8	86.2	106	7
SOLID	M	SILVER	84	97.1	115	6					26.9	86.9	109	7
SOLID	M	VANADIUM	95.6	99.6	107	6					66.2	91.5	112.4	7
SOLID	M	ZINC	94.8	101.4	108.8	6					69.3	80.4	98.9	3
SOLID	MISC	AMMONIA-N	110	110.0	110	1					48	52.5	57	2
SOLID	MISC	TOTAL ORGANIC CARBON	96	100.5	107	4					107	150.0	211	4
SOLID	SVOC	1,2,4-TRICHLOROBENZENE	21	70.8	92	6					27	70.9	99	11
SOLID	SVOC	1,2-DICHLOROBENZENE	22	72.2	100	6					27	67.0	94	11
SOLID	SVOC	1,3-DICHLOROBENZENE	20	67.8	92	6					24	62.7	91	11
SOLID	SVOC	1,4-DICHLOROBENZENE	20	67.7	92	6					24	62.6	91	11
SOLID	SVOC	2,2'-OXYBIS(1-CHLOROPROPANE)	18	75.2	100	6					28	71.7	103	11
SOLID	SVOC	2,4,5-TRICHLOROPHENOL	23	75.8	100	6					29	77.9	101	11
SOLID	SVOC	2,4,6-TRIBROMOPHENOL (SURR)	65	81.3	109	6	32	58.2	99	46	27	69.6	101	11
SOLID	SVOC	2,4,6-TRICHLOROPHENOL	22	75.7	100	6					27	72.5	103	11
SOLID	SVOC	2,4-DICHLOROPHENOL	20	72.5	100	6					27	71.0	97	11
SOLID	SVOC	2,4-DIMETHYLPHENOL	10	52.5	70	6					0	27.5	67	11
SOLID	SVOC	2,4-DINITROPHENOL	18	55.0	85	6					23	56.1	75	11
SOLID	SVOC	2-CHLORONAPHTHALENE	19	60.2	77	6					25	63.0	86	11
SOLID	SVOC	2-CHLOROPHENOL	20	74.5	100	6					28	71.1	98	11
SOLID	SVOC	2-FLUOROBIPHENYL (SURR)	57	73.5	93	6	37	58.9	93	46	26	69.4	95	11
SOLID	SVOC	2-FLUOROPHENOL (SURR)	53	78.2	108	6	29	53.5	98	46	23	64.5	95	11
SOLID	SVOC	2-METHYLPHENOL	18	69.0	92	6					23	55.5	87	11
SOLID	SVOC	2-NITROANILINE	19	76.8	108	6					29	77.5	103	11
SOLID	SVOC	2-NITROPHENOL	15	68.8	92	6					24	69.8	94	11
SOLID	SVOC	3&4-METHYLPHENOL	18	64.6	92	5					20	56.7	88	9
SOLID	SVOC	3,3'-DICHLOROBENZIDINE	12	41.8	67	6					0	13.9	44	11
SOLID	SVOC	3-NITROANILINE	15	55.8	85	6					7	35.2	74	11
SOLID	SVOC	4,6-DINITRO-2-METHYLPHENOL	8	62.3	92	6					19	62.3	87	11
SOLID	SVOC	4-BROMOPHENYL PHENYL ETHER	30	78.5	100	6					31	81.7	107	11
SOLID	SVOC	4-CHLORO-3-METHYLPHENOL	21	75.3	100	6					28	76.5	102	11
SOLID	SVOC	4-CHLOROANILINE	0	37.2	77	6					0	16.8	41	11
SOLID	SVOC	4-CHLOROPHENYL PHENYL ETHER	28	79.3	100	6					33	82.0	104	11
SOLID	SVOC	4-NITROANILINE	20	67.2	92	6					12	45.0	84	11
SOLID	SVOC	4-NITROPHENOL	17	63.7	85	6					26	70.1	90	11
SOLID	SVOC	BENZYL ALCOHOL	15	72.7	100	6					25	74.6	98	11
SOLID	SVOC	BIS(2-CHLOROETHOXY)METHANE	15	59.2	85	6					24	58.3	81	11

TABLE H-7
LABORATORY CONTROL SAMPLE, MATRIX SPIKE, AND MATRIX SPIKE DUPLICATE PERCENT RECOVERY REFERENCE RANGE EXCEEDANCES
ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

SOLID	SVOC	BIS(2-CHLOROETHYL)ETHER	19	71.8	100	6					28	70.0	97	11
SOLID	SVOC	BIS(2-ETHYLHEXYL)PHTHALATE	36	79.2	100	6					31	97.8	126	11
SOLID	SVOC	BUTYL BENZYL PHTHALATE	31	78.2	92	6					33	93.9	118	11
SOLID	SVOC	DIBENZOFURAN	26	76.7	100	6					32	80.5	105	11
SOLID	SVOC	DIETHYL PHTHALATE	28	79.8	108	6					32	81.3	98	11
SOLID	SVOC	DIMETHYL PHTHALATE	27	75.2	100	6					30	77.6	96	11
SOLID	SVOC	DI-N-BUTYL PHTHALATE	29	78.8	108	6					32	81.8	97	11
SOLID	SVOC	DI-N-OCTYL PHTHALATE	43	87.8	108	6					41	102.2	119	11
SOLID	SVOC	DIPHENYLAMINE	23	60.2	85	5					5	46.8	80	9
SOLID	SVOC	HEXACHLOROBENZENE	34	82.7	108	6					35	87.0	115	11
SOLID	SVOC	HEXACHLOROBUTADIENE	21	69.2	92	6					26	68.7	94	11
SOLID	SVOC	HEXACHLOROCYCLOPENTADIENE	22	57.3	92	6					24	41.6	57	11
SOLID	SVOC	HEXACHLOROETHANE	19	72.7	100	6					25	64.3	94	11
SOLID	SVOC	ISOPHORONE	11	58.5	108	6					15	57.2	102	11
SOLID	SVOC	NITROBENZENE-D5 (SURR)	58	74.5	97	6	33	54.4	94	46	24	66.5	101	11
SOLID	SVOC	N-NITROSODIMETHYLAMINE	15	72.7	108	6					23	69.8	109	11
SOLID	SVOC	N-NITROSO-DI-N-PROPYLAMINE	20	75.0	100	6					28	75.7	102	11
SOLID	SVOC	N-NITROSODIPHENYLAMINE	23	62.7	85	6					5	46.4	80	11
SOLID	SVOC	PHENOL	19	70.8	92	6					28	70.2	93	11
SOLID	SVOC	PHENOL-D5 (SURR)	56	76.7	98	6	37	57.5	98	46	23	68.2	96	11
SOLID	SVOC	TERPHENYL-D14 (SURR)	75	96.0	144	6	49	87.4	168	46	41	108.5	208	11
SOLID	VOC	1,1,1,2-TETRACHLOROETHANE	96	100.0	106	5					71	76.0	81	2
SOLID	VOC	1,1,2,2-TETRACHLOROETHANE	96	100.0	108	5					55	60.5	66	2
SOLID	VOC	1,1,2-TRICHLOROETHANE	96	98.4	102	5					60	65.5	71	2
SOLID	VOC	1,2,3-TRICHLOROPROPANE	74	82.8	110	5					42	45.5	49	2
SOLID	VOC	1,2-DIBROMO-3-CHLOROPROPANE	98	102.4	116	5					47	49.0	51	2
SOLID	VOC	1,2-DIBROMOETHANE	96	100.0	104	5					60	65.5	71	2
SOLID	VOC	1,2-DICHLOROETHANE	92	97.6	100	5					62	67.5	73	2
SOLID	VOC	1,2-DICHLOROPROPANE	96	96.8	98	5					73	75.5	78	2
SOLID	VOC	2-BUTANONE	88	92.4	98	5					63	69.5	76	2
SOLID	VOC	2-HEXANONE	94	96.0	100	5					45	53.5	62	2
SOLID	VOC	4-BROMOFLUOROBENZENE (SURR)	96	100.3	103	10	21	90.9	125	53	73	88.7	107	6
SOLID	VOC	4-METHYL-2-PENTANONE	88	92.8	104	5					55	59.0	63	2
SOLID	VOC	ACETONE	90	98.0	102	5					41	84.5	128	2
SOLID	VOC	ACETONITRILE	87	88.2	91	5					64	75.5	85	4
SOLID	VOC	BROMODICHLOROMETHANE	82	87.6	92	5					65	68.5	72	2
SOLID	VOC	BROMOFORM	106	107.6	110	5					55	61.5	68	2
SOLID	VOC	BROMOMETHANE	66	74.8	106	5					55	56.5	58	2
SOLID	VOC	CHLOROBENZENE	96	101.6	104	5					68	71.5	75	2
SOLID	VOC	CHLORODIBROMOMETHANE	94	99.2	106	5					63	69.5	76	2
SOLID	VOC	CHLOROETHANE	90	95.6	106	5					71	73.0	75	2
SOLID	VOC	CHLOROMETHANE	80	85.6	104	5					63	63.5	64	2
SOLID	VOC	CIS-1,2-DICHLOROETHENE	90	93.6	98	5					73	75.5	78	2
SOLID	VOC	CIS-1,3-DICHLOROPROPENE	102	102.8	104	5					64	67.0	70	2
SOLID	VOC	DIBROMOMETHANE	98	98.8	100	5					64	68.0	72	2
SOLID	VOC	METHYLENE CHLORIDE	78	81.2	86	5					54	58.5	63	2
SOLID	VOC	PROPIONITRILE	86	89.4	98	5					72	78.3	85	4
SOLID	VOC	STYRENE	96	98.4	102	5					59	62.5	66	2
SOLID	VOC	TOTAL XYLENES	93	97.2	100	5					73	75.5	78	2
SOLID	VOC	TRANS-1,3-DICHLOROPROPENE	100	106.4	108	5					56	61.5	67	2
SOLID	VOC	VINYL CHLORIDE	86	90.0	106	5					73	73.5	74	2
SOLID	PAH	1-FLUORONAPHTHALENE (SURR)	80	90.3	111	4	50	75.7	98	30	59	74.6	84	8
SOLID	PAH	2-METHYLNAPHTHALENE	57	70.0	86	4					49	60.3	76	8
SOLID	PAH	ACENAPHTHENE	59	73.8	87	4					56	64.6	81	8
SOLID	PAH	ACENAPHTHYLENE	60	71.5	88	4					50	57.5	81	8
SOLID	PAH	ANTHRACENE	64	72.3	93	4					57	65.1	75	8
SOLID	PAH	BENZO(A)ANTHRACENE	64	76.8	93	4					54	71.3	84	8
SOLID	PAH	BENZO(A)PYRENE	59	71.5	83	4					50	63.4	73	8
SOLID	PAH	BENZO(B)FLUORANTHENE	60	73.0	88	4					49	67.5	79	8
SOLID	PAH	BENZO(G,H,I)PERYLENE	55	66.3	84	4					58	73.8	91	8
SOLID	PAH	BENZO(K)FLUORANTHENE	60	79.8	95	4					50	68.8	87	8
SOLID	PAH	CHRYSENE	64	81.0	93	4					63	77.1	93	8
SOLID	PAH	DIBENZO(A,H)ANTHRACENE	57	64.5	83	4					52	72.9	91	8
SOLID	PAH	FLUORANTHENE	71	81.0	102	4					58	67.0	77	8
SOLID	PAH	FLUORENE	64	72.8	92	4					54	66.1	76	8
SOLID	PAH	FLUORENE-D10 (SURR)	79	86.5	107	4	58	80.8	98	30	64	79.5	93	8
SOLID	PAH	INDENO(1,2,3-CD)PYRENE	58	66.8	86	4					52	72.0	89	8
SOLID	PAH	NAPHTHALENE	60	70.8	83	4					46	57.6	79	8

TABLE H-7
LABORATORY CONTROL SAMPLE, MATRIX SPIKE, AND MATRIX SPIKE DUPLICATE PERCENT RECOVERY REFERENCE RANGE EXCEEDANCES
ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

SOLID	PAH	PHENANTHRENE	67	76.0	98	4					60	71.3	87	8
SOLID	PAH	PYRENE	66	90.0	107	4					63	89.9	105	8
SOLID	PAH	PYRENE-D10 (SURR)	77	98.5	117	4	83	101.7	126	30	68	95.3	112	8
WATER	EXP	2,4-DIAMINO-6-NITROTOLUENE	98	113.0	152	26					101	110.6	117	18
WATER	EXP	2,6-DIAMINO-4-NITROTOLUENE	102	121.8	150	26					110	122.8	139	18
WATER	EXP	3,4-DINITROTOLUENE (SURR)	78	104.6	130	78	0	94.4	139	364	85	103.9	128	54
WATER	EXP	3,5-DINITROANILINE	89	104.9	131	26					87	105.2	121	18
WATER	EXP	4,4'-TN-AZOXY	33	43.8	68	26					20	36.3	62	18
WATER	EXP	DNX	71	83.9	98	26					75	88.3	95	18
WATER	EXP	MNX	78	98.8	131	26					83	101.1	110	18
WATER	EXP	TETRYL	59	84.0	103	26					70	87.1	99	18
WATER	EXP	TNX	47	72.4	101	26					55	74.4	89	18
WATER	HERB	2,4-DICHLOROPHENYLACETIC ACID (SURR)	66	87.5	109	2	59	64.0	69	2	69	87.8	107	4
WATER	HERB	HEXACHLOROPHENE	31	65.5	100	2					22	64.8	100	4
WATER	HERB	PENTACHLOROPHENOL	41	70.5	100	2					44	75.0	100	4
WATER	M	ALUMINUM	90	105.0	112.9	25					83.4	101.2	162.9	16
WATER	M	BARIUM	94.9	106.2	117.2	25					24.5	96.5	121	16
WATER	M	IRON	98.1	109.2	120.5	26					48.5	97.3	118.2	16
WATER	M	MAGNESIUM	90.2	104.0	113.9	26					74.5	97.0	121	12
WATER	M	MERCURY	86.9	99.8	106.1	27					0.9	95.5	112.8	19
WATER	M	POTASSIUM	90.1	105.1	113.8	26					56	96.9	114.2	16
WATER	M	SILVER	84.5	106.7	119.2	26					72.6	99.9	119.6	16
WATER	M	SODIUM	90	107.2	117.2	26					72.4	94.5	109.4	10
WATER	M	THALLIUM	89.2	105.9	117	25					92.2	105.8	141.3	16
WATER	M	ZINC	91.2	107.5	166.6	25					85.3	102.0	123.9	13
WATER	MF	ANTIMONY	See Total Metals (M)								88.7	106.0	128	12
WATER	MF	BARIUM	See Total Metals (M)								83.6	109.1	143.6	12
WATER	MF	CALCIUM	See Total Metals (M)								54.8	105.5	138	12
WATER	MF	LEAD	See Total Metals (M)								0	96.9	120.4	12
WATER	MF	MAGNESIUM	See Total Metals (M)								85.6	104.2	139.4	12
WATER	MF	MANGANESE	See Total Metals (M)								50.9	97.7	117.3	7
WATER	MF	POTASSIUM	See Total Metals (M)								82.1	102.1	132.5	12
WATER	MF	THALLIUM	See Total Metals (M)								0	94.4	119.6	12
WATER	MF	ZINC	See Total Metals (M)								88.8	105.3	145.6	12
WATER	MISC	NITRITE/NITRATE-N	90	101.9	110	28					44	99.5	133	36
WATER	SVOC	1,2,4-TRICHLOROBENZENE	60	62.5	65	2					58	60.0	62	2
WATER	SVOC	1,2-DICHLOROBENZENE	50	52.5	55	2					44	48.0	52	2
WATER	SVOC	1,3-DICHLOROBENZENE	48	49.0	50	2					43	45.5	48	2
WATER	SVOC	1,4-DICHLOROBENZENE	48	49.0	50	2					44	46.5	49	2
WATER	SVOC	2,2'-OXYBIS(1-CHLOROPROPANE)	70	75.0	80	2					69	72.0	75	2
WATER	SVOC	2,4,5-TRICHLOROPHENOL	75	82.5	90	2					79	80.5	82	2
WATER	SVOC	2,4,6-TRIBROMOPHENOL (SURR)	72	82.0	92	2	55	64.5	74	2	75	77.0	79	2
WATER	SVOC	2,4-DICHLOROPHENOL	75	80.0	85	2					73	76.0	79	2
WATER	SVOC	2,4-DIMETHYLPHENOL	48	56.5	65	2					56	56.0	56	2
WATER	SVOC	2-CHLORONAPHTHALENE	55	62.5	70	2					59	59.5	60	2
WATER	SVOC	2-CHLOROPHENOL	60	70.0	80	2					54	60.5	67	2
WATER	SVOC	2-FLUOROBIPHENYL (SURR)	68	71.5	75	2	56	57.0	58	2	68	70.0	72	2
WATER	SVOC	2-FLUOROPHENOL (SURR)	40	54.5	69	2	27	29.0	31	2	32	38.5	45	2
WATER	SVOC	2-METHYLPHENOL	65	70.0	75	2					62	65.0	68	2
WATER	SVOC	2-NITROANILINE	65	75.0	85	2					65	66.0	67	2
WATER	SVOC	2-NITROPHENOL	70	75.0	80	2					67	70.0	73	2
WATER	SVOC	3&4-METHYLPHENOL	65	72.5	80	2					66	67.5	69	2
WATER	SVOC	3,3'-DICHLOROBENZIDINE	55	57.5	60	2					34	39.0	44	2
WATER	SVOC	3-NITROANILINE	75	80.0	85	2					71	73.0	75	2
WATER	SVOC	4-CHLOROANILINE	48	59.0	70	2					66	68.0	70	2
WATER	SVOC	4-NITROANILINE	80	85.0	90	2					74	74.0	74	2
WATER	SVOC	4-NITROPHENOL	70	75.0	80	2					76	77.5	79	2
WATER	SVOC	BIS(2-CHLOROETHOXY)METHANE	60	62.5	65	2					55	56.5	58	2
WATER	SVOC	BIS(2-CHLOROETHYL)ETHER	75	75.0	75	2					67	73.0	79	2
WATER	SVOC	DIPHENYLAMINE	70	72.5	75	2					61	61.0	61	2
WATER	SVOC	HEXACHLOROBUTADIENE	55	55.0	55	2					43	47.5	52	2
WATER	SVOC	HEXACHLOROCYCLOPENTADIENE	18	26.0	34	2					20	23.0	26	2
WATER	SVOC	HEXACHLOROETHANE	44	47.0	50	2					38	41.0	44	2
WATER	SVOC	ISOPHORONE	50	62.5	75	2					75	76.0	77	2
WATER	SVOC	NITROBENZENE-D5 (SURR)	75	75.5	76	2	55	56.0	57	2	66	68.5	71	2
WATER	SVOC	N-NITROSODIMETHYLAMINE	60	65.0	70	2					57	62.0	67	2
WATER	SVOC	N-NITROSO-DI-N-PROPYLAMINE	65	77.5	90	2					66	69.0	72	2
WATER	SVOC	N-NITROSODIPHENYLAMINE	70	72.5	75	2					61	61.0	61	2

TABLE H-7
LABORATORY CONTROL SAMPLE, MATRIX SPIKE, AND MATRIX SPIKE DUPLICATE PERCENT RECOVERY REFERENCE RANGE EXCEEDANCES
ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

WATER	SVOC	PHENOL	55	65.0	75	2					52	56.5	61	2
WATER	SVOC	PHENOL-D5 (SURR)	59	66.5	74	2	48	48.5	49	2	54	59.5	65	2
WATER	SVOC	TERPHENYL-D14 (SURR)	79	87.5	96	2	79	81.0	83	2	74	77.0	80	2
WATER	VOC	1,1-DICHLOROETHENE	68	78.0	88	2								
WATER	VOC	ACETONE	74	104.0	134	2								
WATER	VOC	CARBON DISULFIDE	60	70.0	80	2								
WATER	VOC	DICHLORODIFLUOROMETHANE	90	113.0	136	2								
WATER	PAH	1-FLUORONAPHTHALENE (SURR)	50	58.0	66	3	37	39.5	42	2	47	47.5	48	2
WATER	PAH	2-METHYLNAPHTHALENE	33	42.7	50	3					31	31.0	31	2
WATER	PAH	ACENAPHTHENE	43	56.0	63	3					31	34.5	38	2
WATER	PAH	ACENAPHTHYLENE	45	58.0	66	3					38	42.0	46	2
WATER	PAH	ANTHRACENE	52	57.0	65	3					46	50.0	54	2
WATER	PAH	BENZO(A)ANTHRACENE	67	74.3	80	3					69	69.0	69	2
WATER	PAH	BENZO(A)PYRENE	48	54.0	58	3					54	54.0	54	2
WATER	PAH	BENZO(B)FLUORANTHENE	66	76.0	81	3					69	69.0	69	2
WATER	PAH	BENZO(G,H,I)PERYLENE	66	79.0	92	3					46	50.0	54	2
WATER	PAH	BENZO(K)FLUORANTHENE	70	78.7	83	3					69	73.0	77	2
WATER	PAH	CHRYSENE	76	83.7	92	3					69	73.0	77	2
WATER	PAH	DIBENZO(A,H)ANTHRACENE	68	77.3	83	3					54	58.0	62	2
WATER	PAH	FLUORANTHENE	67	83.7	92	3					85	85.0	85	2
WATER	PAH	FLUORENE	55	62.7	70	3					46	50.0	54	2
WATER	PAH	FLUORENE-D10 (SURR)	75	81.0	87	3	61	67.0	73	2	70	70.0	70	2
WATER	PAH	INDENO(1,2,3-CD)PYRENE	63	76.3	83	3					54	58.0	62	2
WATER	PAH	NAPHTHALENE	34	44.3	55	3					31	31.0	31	2
WATER	PAH	PHENANTHRENE	72	75.7	83	3					69	69.0	69	2
WATER	PAH	PYRENE	74	91.3	117	3					69	69.0	69	2
WATER	PAH	PYRENE-D10 (SURR)	84	101.7	124	3	72	72.0	72	2	77	79.0	81	2

1 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) lie outside the 75 to 125 percent range.
Recoveries are shown only for analytes that had at least one value outside the reference range of 75 to 125 percent.

Avg = Average of all values.
AVS/SEM = Acid volatiel sulfides/simultaneously extracted metals
Count = Count of all values
EXP = Explosives
FD = Field duplicate samples
HERB = Herbicides
M = Metals
Max = Maximum of all values
MF= Filtered metals
Min = minimum of all values
MISC = Miscellaneous parameters
NM = Normal environmental sample
VOC = Volatile Orgnaic Compound
PEST/PCB = Pesticides and polychlorinated biphenyls
PAH = Polynuclear aromatic Hydrocarbons
RPD = Relative percent difference (See QAPP for calculation method)
SVOC = Semivoatile organic compound

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
1	AVS/SEM	12SD070004	CADMIUM	--	--	--	0.0027	0.0025	7.69	--	--	--	--	--	--
			COPPER	--	--	--	0.16	0.14	13.33	--	--	--	--	--	--
			LEAD	--	--	--	0.05	0.044	12.77	--	--	--	--	--	--
			NICKEL	--	--	--	0.092	0.084	9.09	--	--	--	--	--	--
			SILVER	--	--	--	--	0.0381	--	--	--	--	--	--	--
	EXP	12SW2001	HMX	--	--	--	--	--	--	--	--	--	1.9	2	5.13
			RDX	--	--	--	--	--	--	--	--	--	4.8	5.1	6.06
	M	12GWT0101	ALUMINUM	1590	1550	2.55	--	--	--	--	--	--	--	--	--
			ARSENIC	66.9	66	1.35	--	--	--	--	--	--	--	--	--
			BARIUM	11.3	10.8	4.52	--	--	--	--	--	--	--	--	--
			BERYLLIUM	1.7	1.6	6.06	--	--	--	--	--	--	--	--	--
			CALCIUM	126000	127000	0.79	--	--	--	--	--	--	--	--	--
			CHROMIUM	1.2	1.1	8.70	--	--	--	--	--	--	--	--	--
			COBALT	94.7	95.1	0.42	--	--	--	--	--	--	--	--	--
			IRON	76000	77400	1.83	--	--	--	--	--	--	--	--	--
			LEAD	9.5	9	5.41	--	--	--	--	--	--	--	--	--
			MAGNESIUM	95400	96700	1.35	--	--	--	--	--	--	--	--	--
			MANGANESE	4360	4310	1.15	--	--	--	--	--	--	--	--	--
			NICKEL	394	394	0.00	--	--	--	--	--	--	--	--	--
			POTASSIUM	3200	3110	2.85	--	--	--	--	--	--	--	--	--
			SODIUM	69600	69300	0.43	--	--	--	--	--	--	--	--	--
			VANADIUM	1.4	1.4	0.00	--	--	--	--	--	--	--	--	--
			ZINC	195	192	1.55	--	--	--	--	--	--	--	--	--
		12GWT3301	ARSENIC	2.7	2.7	0.00	--	--	--	--	--	--	--	--	--
			BARIUM	12.6	13.2	4.65	--	--	--	--	--	--	--	--	--
			BERYLLIUM	1.3	1.3	0.00	--	--	--	--	--	--	--	--	--
			CALCIUM	60700	61100	0.66	--	--	--	--	--	--	--	--	--
			COBALT	44.2	44.4	0.45	--	--	--	--	--	--	--	--	--
			COPPER	0.62	0.7	12.12	--	--	--	--	--	--	--	--	--
			IRON	41300	41800	1.20	--	--	--	--	--	--	--	--	--
			MAGNESIUM	32800	33500	2.11	--	--	--	--	--	--	--	--	--
			MANGANESE	2990	3010	0.67	--	--	--	--	--	--	--	--	--
			NICKEL	128	131	2.32	--	--	--	--	--	--	--	--	--
			POTASSIUM	4510	4520	0.22	--	--	--	--	--	--	--	--	--
			SODIUM	40600	40300	0.74	--	--	--	--	--	--	--	--	--
			ZINC	93.9	96	2.21	--	--	--	--	--	--	--	--	--
		12GWT4701	ALUMINUM	304	376	21.18	--	--	--	--	--	--	--	--	--
			ARSENIC	0.39	0.38	2.60	--	--	--	--	--	--	--	--	--
			BARIUM	45	10.6	123.74	--	--	--	--	--	--	--	--	--
			CALCIUM	35900	35300	1.69	--	--	--	--	--	--	--	--	--

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			COBALT	0.26	0.26	0.00	--	--	--	--	--	--	--	--	--
			COPPER	1.4	1.4	0.00	--	--	--	--	--	--	--	--	--
			IRON	601	575	4.42	--	--	--	--	--	--	--	--	--
			MAGNESIUM	54400	53100	2.42	--	--	--	--	--	--	--	--	--
			MANGANESE	5.7	5.4	5.41	--	--	--	--	--	--	--	--	--
			NICKEL	3.3	3.2	3.08	--	--	--	--	--	--	--	--	--
			POTASSIUM	1640	1550	5.64	--	--	--	--	--	--	--	--	--
			SODIUM	17500	20100	13.83	--	--	--	--	--	--	--	--	--
		12SB050204	ALUMINUM	--	--	--	--	--	--	22300	24600	9.81	--	--	--
			ANTIMONY	--	--	--	--	--	--	--	0.53	--	--	--	--
			ARSENIC	--	--	--	--	--	--	11	5.4	68.29	--	--	--
			BARIUM	--	--	--	--	--	--	95.1	138	36.81	--	--	--
			BERYLLIUM	--	--	--	--	--	--	0.7	0.99	34.32	--	--	--
			CALCIUM	--	--	--	--	--	--	2220	8100	113.95	--	--	--
			CHROMIUM	--	--	--	--	--	--	25.7	22.9	11.52	--	--	--
			COBALT	--	--	--	--	--	--	8.1	12.1	39.60	--	--	--
			COPPER	--	--	--	--	--	--	16.7	13.3	22.67	--	--	--
			IRON	--	--	--	--	--	--	32400	19100	51.65	--	--	--
			LEAD	--	--	--	--	--	--	16.1	17.5	8.33	--	--	--
			MAGNESIUM	--	--	--	--	--	--	2980	2530	16.33	--	--	--
			MANGANESE	--	--	--	--	--	--	295	1600	137.73	--	--	--
			MERCURY	--	--	--	--	--	--	0.024	0.022	8.70	--	--	--
			NICKEL	--	--	--	--	--	--	16.4	19.6	17.78	--	--	--
			POTASSIUM	--	--	--	--	--	--	1810	1880	3.79	--	--	--
			SELENIUM	--	--	--	--	--	--	--	0.3	--	--	--	--
			SODIUM	--	--	--	--	--	--	66.7	--	NA	--	--	--
			VANADIUM	--	--	--	--	--	--	46.5	42	10.17	--	--	--
			ZINC	--	--	--	--	--	--	48.1	50.4	4.67	--	--	--
		12SB110205	ALUMINUM	--	--	--	--	--	--	22700	37000	47.91	--	--	--
			ANTIMONY	--	--	--	--	--	--	--	0.47	--	--	--	--
			ARSENIC	--	--	--	--	--	--	10	6.9	36.69	--	--	--
			BARIUM	--	--	--	--	--	--	102	190	60.27	--	--	--
			BERYLLIUM	--	--	--	--	--	--	1.5	1.6	6.45	--	--	--
			CALCIUM	--	--	--	--	--	--	596	832	33.05	--	--	--
			CHROMIUM	--	--	--	--	--	--	32.2	38.7	18.34	--	--	--
			COBALT	--	--	--	--	--	--	12.6	12.5	0.80	--	--	--
			COPPER	--	--	--	--	--	--	13.1	13.3	1.52	--	--	--
			IRON	--	--	--	--	--	--	68600	41700	48.78	--	--	--
			LEAD	--	--	--	--	--	--	70.2	11.9	142.02	--	--	--
			MAGNESIUM	--	--	--	--	--	--	1400	2210	44.88	--	--	--

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			MANGANESE	--	--	--	--	--	--	518	83.6	144.41	--	--	--
			MERCURY	--	--	--	--	--	--	0.013	--	NA	--	--	--
			NICKEL	--	--	--	--	--	--	19.4	31.4	47.24	--	--	--
			POTASSIUM	--	--	--	--	--	--	1030	1850	56.94	--	--	--
			TIN	--	--	--	--	--	--	--	0.66	--	--	--	--
			VANADIUM	--	--	--	--	--	--	45	45.8	1.76	--	--	--
			ZINC	--	--	--	--	--	--	33.3	43.9	27.46	--	--	--
		12SB180608	ALUMINUM	--	--	--	--	--	--	24600	17300	34.84	--	--	--
			ARSENIC	--	--	--	--	--	--	2.4	2	18.18	--	--	--
			BARIUM	--	--	--	--	--	--	52.2	44.8	15.26	--	--	--
			BERYLLIUM	--	--	--	--	--	--	1.8	1.6	11.76	--	--	--
			CALCIUM	--	--	--	--	--	--	2980	1160	87.92	--	--	--
			CHROMIUM	--	--	--	--	--	--	39.5	30.5	25.71	--	--	--
			COBALT	--	--	--	--	--	--	12.9	13.1	1.54	--	--	--
			COPPER	--	--	--	--	--	--	18	18.7	3.81	--	--	--
			IRON	--	--	--	--	--	--	41700	34000	20.34	--	--	--
			LEAD	--	--	--	--	--	--	20	19.1	4.60	--	--	--
			MAGNESIUM	--	--	--	--	--	--	1970	1550	23.86	--	--	--
			MANGANESE	--	--	--	--	--	--	66.1	56.8	15.13	--	--	--
			MERCURY	--	--	--	--	--	--	0.013	0.008	47.62	--	--	--
			NICKEL	--	--	--	--	--	--	47.6	34.8	31.07	--	--	--
			POTASSIUM	--	--	--	--	--	--	4030	3250	21.43	--	--	--
			SELENIUM	--	--	--	--	--	--	0.72	0.67	7.19	--	--	--
			SODIUM	--	--	--	--	--	--	435	361	18.59	--	--	--
			VANADIUM	--	--	--	--	--	--	29.4	25.5	14.21	--	--	--
			ZINC	--	--	--	--	--	--	73.2	61.6	17.21	--	--	--
		12SD070004	ALUMINUM	--	--	--	15500	15400	0.65	--	--	--	--	--	--
			BARIUM	--	--	--	153	153	0.00	--	--	--	--	--	--
			CALCIUM	--	--	--	1670	1730	3.53	--	--	--	--	--	--
			COPPER	--	--	--	18.1	18.3	1.10	--	--	--	--	--	--
			IRON	--	--	--	14300	15700	9.33	--	--	--	--	--	--
			LEAD	--	--	--	16.7	17.3	3.53	--	--	--	--	--	--
			MAGNESIUM	--	--	--	1370	1330	2.96	--	--	--	--	--	--
			MANGANESE	--	--	--	1250	1250	0.00	--	--	--	--	--	--
			MERCURY	--	--	--	0.041	0.04	2.47	--	--	--	--	--	--
			NICKEL	--	--	--	18	16.9	6.30	--	--	--	--	--	--
			POTASSIUM	--	--	--	1360	1370	0.73	--	--	--	--	--	--
			VANADIUM	--	--	--	23.3	24.3	4.20	--	--	--	--	--	--
			ZINC	--	--	--	47.5	46.6	1.91	--	--	--	--	--	--
		12SD300004	ALUMINUM	--	--	--	16100	17800	10.03	--	--	--	--	--	--

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			ANTIMONY	--	--	--	0.67	--	--	--	--	--	--	--	--
			ARSENIC	--	--	--	13.2	12.2	7.87	--	--	--	--	--	--
			BARIUM	--	--	--	80.6	70.1	13.93	--	--	--	--	--	--
			CALCIUM	--	--	--	46400	46900	1.07	--	--	--	--	--	--
			CHROMIUM	--	--	--	21.6	22.1	2.29	--	--	--	--	--	--
			COBALT	--	--	--	8.1	7.9	2.50	--	--	--	--	--	--
			COPPER	--	--	--	15.4	15.3	0.65	--	--	--	--	--	--
			IRON	--	--	--	24500	22900	6.75	--	--	--	--	--	--
			LEAD	--	--	--	27.7	30.2	8.64	--	--	--	--	--	--
			MAGNESIUM	--	--	--	5120	4670	9.19	--	--	--	--	--	--
			MANGANESE	--	--	--	283	253	11.19	--	--	--	--	--	--
			MERCURY	--	--	--	0.022	0.029	27.45	--	--	--	--	--	--
			NICKEL	--	--	--	17	16.1	5.44	--	--	--	--	--	--
			POTASSIUM	--	--	--	1490	1540	3.30	--	--	--	--	--	--
			VANADIUM	--	--	--	29.2	30.4	4.03	--	--	--	--	--	--
			ZINC	--	--	--	346	363	4.80	--	--	--	--	--	--
		12SW0301	ALUMINUM	--	--	--	--	--	--	--	--	--	--	17900	--
			ARSENIC	--	--	--	--	--	--	--	--	--	--	7.3	--
			BARIUM	--	--	--	--	--	--	--	--	--	--	252	--
			BERYLLIUM	--	--	--	--	--	--	--	--	--	--	0.57	--
			CADMIUM	--	--	--	--	--	--	--	--	--	--	2.4	--
			CALCIUM	--	--	--	--	--	--	--	--	--	--	53600	--
			CHROMIUM	--	--	--	--	--	--	--	--	--	--	14.6	--
			COBALT	--	--	--	--	--	--	--	--	--	--	12.5	--
			COPPER	--	--	--	--	--	--	--	--	--	--	32.4	--
			IRON	--	--	--	--	--	--	--	--	--	--	23000	--
			LEAD	--	--	--	--	--	--	--	--	--	--	36	--
			MAGNESIUM	--	--	--	--	--	--	--	--	--	--	4680	--
			MANGANESE	--	--	--	--	--	--	--	--	--	--	1310	--
			NICKEL	--	--	--	--	--	--	--	--	--	--	20.2	--
			POTASSIUM	--	--	--	--	--	--	--	--	--	--	3240	--
			SODIUM	--	--	--	--	--	--	--	--	--	--	3450	--
			THALLIUM	--	--	--	--	--	--	--	--	--	--	0.21	--
			VANADIUM	--	--	--	--	--	--	--	--	--	--	38.1	--
			ZINC	--	--	--	--	--	--	--	--	--	--	178	--
		12SW2001	ALUMINUM	--	--	--	--	--	--	--	--	--	464	1040	76.60
			ARSENIC	--	--	--	--	--	--	--	--	--	1.2	1.2	0.00
			BARIUM	--	--	--	--	--	--	--	--	--	88	89.6	1.80
			CADMIUM	--	--	--	--	--	--	--	--	--	0.09	0.09	0.00
			CALCIUM	--	--	--	--	--	--	--	--	--	61000	60000	1.65

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			CHROMIUM	--	--	--	--	--	--	--	--	--	--	1.7	--
			COBALT	--	--	--	--	--	--	--	--	--	0.44	0.5	12.77
			COPPER	--	--	--	--	--	--	--	--	--	5.5	5.7	3.57
			IRON	--	--	--	--	--	--	--	--	--	715	925	25.61
			LEAD	--	--	--	--	--	--	--	--	--	0.51	0.66	25.64
			MAGNESIUM	--	--	--	--	--	--	--	--	--	9580	9520	0.63
			MANGANESE	--	--	--	--	--	--	--	--	--	9.9	12.9	26.32
			NICKEL	--	--	--	--	--	--	--	--	--	3.7	3.5	5.56
			POTASSIUM	--	--	--	--	--	--	--	--	--	16800	17000	1.18
			SODIUM	--	--	--	--	--	--	--	--	--	15000	14400	4.08
			THALLIUM	--	--	--	--	--	--	--	--	--	0.06	0.07	15.38
			VANADIUM	--	--	--	--	--	--	--	--	--	1.6	1.9	17.14
			ZINC	--	--	--	--	--	--	--	--	--	8	8.7	8.38
		12SW2501	ALUMINUM	--	--	--	--	--	--	--	--	--	45.1	59.3	27.20
			BARIUM	--	--	--	--	--	--	--	--	--	71.5	75	4.78
			BERYLLIUM	--	--	--	--	--	--	--	--	--	0.04	0.04	0.00
			CALCIUM	--	--	--	--	--	--	--	--	--	63500	61000	4.02
			IRON	--	--	--	--	--	--	--	--	--	471	510	7.95
			MAGNESIUM	--	--	--	--	--	--	--	--	--	9360	9410	0.53
			MANGANESE	--	--	--	--	--	--	--	--	--	72.6	77.3	6.27
			NICKEL	--	--	--	--	--	--	--	--	--	1.9	2	5.13
			POTASSIUM	--	--	--	--	--	--	--	--	--	1690	1670	1.19
			SODIUM	--	--	--	--	--	--	--	--	--	10200	10300	0.98
			THALLIUM	--	--	--	--	--	--	--	--	--	0.05	--	NA
	MF	12SW2001-F	ARSENIC	--	--	--	--	--	--	--	--	--	0.81	0.8	1.24
			BARIUM	--	--	--	--	--	--	--	--	--	86.5	88	1.72
			CADMIUM	--	--	--	--	--	--	--	--	--	0.08	0.07	13.33
			CALCIUM	--	--	--	--	--	--	--	--	--	61700	60700	1.63
			COBALT	--	--	--	--	--	--	--	--	--	0.27	0.27	0.00
			COPPER	--	--	--	--	--	--	--	--	--	4.9	5.2	5.94
			IRON	--	--	--	--	--	--	--	--	--	233	247	5.83
			LEAD	--	--	--	--	--	--	--	--	--	0.14	0.18	25.00
			MAGNESIUM	--	--	--	--	--	--	--	--	--	8690	8710	0.23
			MANGANESE	--	--	--	--	--	--	--	--	--	6.7	6.9	2.94
			NICKEL	--	--	--	--	--	--	--	--	--	3.9	4.3	9.76
			POTASSIUM	--	--	--	--	--	--	--	--	--	14300	14000	2.12
			SODIUM	--	--	--	--	--	--	--	--	--	14000	13900	0.72
			THALLIUM	--	--	--	--	--	--	--	--	--	0.06	0.05	18.18
			ZINC	--	--	--	--	--	--	--	--	--	3.7	6.4	53.47
		12SW2501-F	BARIUM	--	--	--	--	--	--	--	--	--	60.6	59.5	1.83

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			CALCIUM	--	--	--	--	--	--	--	--	--	58600	57700	1.55
			IRON	--	--	--	--	--	--	--	--	--	264	249	5.85
			MAGNESIUM	--	--	--	--	--	--	--	--	--	8420	8210	2.53
			MANGANESE	--	--	--	--	--	--	--	--	--	--	49.2	--
			POTASSIUM	--	--	--	--	--	--	--	--	--	1570	1490	5.23
			SODIUM	--	--	--	--	--	--	--	--	--	9340	9090	2.71
			THALLIUM	--	--	--	--	--	--	--	--	--	0.06	--	NA
	MISC	12GWT0101	AMMONIA-N	0.37	0.36	2.74	--	--	--	--	--	--	--	--	--
		12GWT3301	AMMONIA-N	0.37	0.35	5.56	--	--	--	--	--	--	--	--	--
		12GWT4701	AMMONIA-N	0.09	0.047	62.77	--	--	--	--	--	--	--	--	--
			NITRITE/NITRATE-N	0.17	0.16	6.06	--	--	--	--	--	--	--	--	--
		12SB020608	AMMONIA-N	--	--	--	--	--	--	0.34	0.9	90.32	--	--	--
			CATION EXCHANGE CAPACITY	--	--	--	--	--	--	10	16	46.15	--	--	--
			PH	--	--	--	--	--	--	5.92	6.05	2.17	--	--	--
		12SD070004	CATION EXCHANGE CAPACITY	--	--	--	21	22	4.65	--	--	--	--	--	--
			PH	--	--	--	5.9	6.1	3.33	--	--	--	--	--	--
			TOTAL ORGANIC CARBON	--	--	--	26000	31000	17.54	--	--	--	--	--	--
		12SW0301	AMMONIA-N	--	--	--	--	--	--	--	--	--	--	0.11	--
		12SW2001	AMMONIA-N	--	--	--	--	--	--	--	--	--	0.034	0.15	126.09
			NITRITE/NITRATE-N	--	--	--	--	--	--	--	--	--	0.07	0.08	13.33
		12SW2501	AMMONIA-N	--	--	--	--	--	--	--	--	--	0.17	--	NA
	SVOC	12SD070004	BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	240	340	34.48	--	--	--	--	--	--
			FLUORANTHENE	--	--	--	4.34	7	46.91	--	--	--	--	--	--
			NAPHTHALENE	--	--	--	--	7	--	--	--	--	--	--	--
			PHENANTHRENE	--	--	--	5	6	18.18	--	--	--	--	--	--
			PYRENE	--	--	--	5	6	18.18	--	--	--	--	--	--
2	EXP	12GWT0202	HMX	0.42	0.45	6.90	5	6	18.18	--	--	--	--	--	--
			RDX	1	1.2	18.18	5	6	18.18	--	--	--	--	--	--
		12GWT0402	MNX	0.28	0.33	16.39	5	6	18.18	--	--	--	--	--	--
			RDX	3.1	2.7	13.79	5	6	18.18	--	--	--	--	--	--
		12GWT3602	4-AMINO-2,6-DINITROTOLUENE	--	0.26	--	5	6	18.18	--	--	--	--	--	--
			HMX	--	6.9	--	5	6	18.18	--	--	--	--	--	--
			MNX	--	1.1	--	5	6	18.18	--	--	--	--	--	--
			RDX	--	42	--	5	6	18.18	--	--	--	--	--	--
		12SW0202	2-AMINO-4,6-DINITROTOLUENE	--	--	--	5	6	18.18	--	--	--	--	0.35	--
			4-AMINO-2,6-DINITROTOLUENE	--	--	--	5	6	18.18	--	--	--	0.41	0.64	43.81
			HMX	--	--	--	5	6	18.18	--	--	--	26	41	44.78
			MNX	--	--	--	5	6	18.18	--	--	--	--	0.75	--
			RDX	--	--	--	5	6	18.18	--	--	--	32	52	47.62
		12SW0502	2-AMINO-4,6-DINITROTOLUENE	--	--	--	5	6	18.18	--	--	--	0.27	0.27	0.00

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			4-AMINO-2,6-DINITROTOLUENE	--	--	--	5	6	18.18	--	--	--	0.59	0.59	0.00
			HMX	--	--	--	5	6	18.18	--	--	--	29	29	0.00
			MNX	--	--	--	5	6	18.18	--	--	--	0.51	0.52	1.94
			RDX	--	--	--	5	6	18.18	--	--	--	32	32	0.00
	M	12GWT0202	ALUMINUM	4030	4040	0.25	5	6	18.18	--	--	--	--	--	--
			ARSENIC	9.2	9.1	1.09	5	6	18.18	--	--	--	--	--	--
			BERYLLIUM	2.3	2.2	4.44	5	6	18.18	--	--	--	--	--	--
			CADMIUM	2.5	2.5	0.00	5	6	18.18	--	--	--	--	--	--
			CALCIUM	13300	13300	0.00	5	6	18.18	--	--	--	--	--	--
			CHROMIUM	2.6	2.5	3.92	5	6	18.18	--	--	--	--	--	--
			COBALT	57.9	56.5	2.45	5	6	18.18	--	--	--	--	--	--
			IRON	9930	10100	1.70	5	6	18.18	--	--	--	--	--	--
			LEAD	11.8	11.3	4.33	5	6	18.18	--	--	--	--	--	--
			MAGNESIUM	8190	7850	4.24	5	6	18.18	--	--	--	--	--	--
			MANGANESE	1410	1220	14.45	5	6	18.18	--	--	--	--	--	--
			NICKEL	111	109	1.82	5	6	18.18	--	--	--	--	--	--
			POTASSIUM	1710	1730	1.16	5	6	18.18	--	--	--	--	--	--
			SODIUM	9790	13200	29.67	5	6	18.18	--	--	--	--	--	--
			VANADIUM	2.2	2.1	4.65	5	6	18.18	--	--	--	--	--	--
			ZINC	180	199	10.03	5	6	18.18	--	--	--	--	--	--
		12GWT0402	ARSENIC	0.96	0.97	1.04	5	6	18.18	--	--	--	--	--	--
			BARIUM	10	9.5	5.13	5	6	18.18	--	--	--	--	--	--
			CADMIUM	--	0.04	--	5	6	18.18	--	--	--	--	--	--
			CALCIUM	137000	141000	2.88	5	6	18.18	--	--	--	--	--	--
			COBALT	19.4	18.5	4.75	5	6	18.18	--	--	--	--	--	--
			COPPER	1.9	1.7	11.11	5	6	18.18	--	--	--	--	--	--
			IRON	38800	37100	4.48	5	6	18.18	--	--	--	--	--	--
			MAGNESIUM	120000	112000	6.90	5	6	18.18	--	--	--	--	--	--
			MANGANESE	5060	4760	6.11	5	6	18.18	--	--	--	--	--	--
			NICKEL	51.7	49.9	3.54	5	6	18.18	--	--	--	--	--	--
			POTASSIUM	2970	2560	14.83	5	6	18.18	--	--	--	--	--	--
			SELENIUM	3.1	3.1	0.00	5	6	18.18	--	--	--	--	--	--
			SODIUM	74600	68200	8.96	5	6	18.18	--	--	--	--	--	--
			THALLIUM	0.06	0.06	0.00	5	6	18.18	--	--	--	--	--	--
			ZINC	53	52.6	0.76	5	6	18.18	--	--	--	--	--	--
		12GWT3602	ARSENIC	--	0.21	--	5	6	18.18	--	--	--	--	--	--
			BARIUM	--	38.7	--	5	6	18.18	--	--	--	--	--	--
			CALCIUM	--	51300	--	5	6	18.18	--	--	--	--	--	--
			COBALT	--	1	--	5	6	18.18	--	--	--	--	--	--
			COPPER	--	1.1	--	5	6	18.18	--	--	--	--	--	--

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			MAGNESIUM	--	21300	--	5	6	18.18	--	--	--	--	--	--
			MANGANESE	--	33.5	--	5	6	18.18	--	--	--	--	--	--
			NICKEL	--	3.3	--	5	6	18.18	--	--	--	--	--	--
			POTASSIUM	--	958	--	5	6	18.18	--	--	--	--	--	--
			SELENIUM	--	1.8	--	5	6	18.18	--	--	--	--	--	--
			SODIUM	--	64400	--	5	6	18.18	--	--	--	--	--	--
			THALLIUM	--	0.09	--	5	6	18.18	--	--	--	--	--	--
			TIN	--	0.08	--	5	6	18.18	--	--	--	--	--	--
			ZINC	--	2.8	--	5	6	18.18	--	--	--	--	--	--
		12SW0202	ALUMINUM	--	--	--	5	6	18.18	--	--	--	4130	5550	29.34
			ARSENIC	--	--	--	5	6	18.18	--	--	--	3	3.6	18.18
			BARIUM	--	--	--	5	6	18.18	--	--	--	73.1	81.5	10.87
			BERYLLIUM	--	--	--	5	6	18.18	--	--	--	0.24	0.36	40.00
			CALCIUM	--	--	--	5	6	18.18	--	--	--	38700	41500	6.98
			CHROMIUM	--	--	--	5	6	18.18	--	--	--	4.9	6.4	26.55
			COBALT	--	--	--	5	6	18.18	--	--	--	4.5	6.7	39.29
			COPPER	--	--	--	5	6	18.18	--	--	--	12.1	12.8	5.62
			IRON	--	--	--	5	6	18.18	--	--	--	4570	6580	36.05
			LEAD	--	--	--	5	6	18.18	--	--	--	5.5	8.5	42.86
			MAGNESIUM	--	--	--	5	6	18.18	--	--	--	10800	10300	4.74
			MANGANESE	--	--	--	5	6	18.18	--	--	--	171	276	46.98
			MERCURY	--	--	--	5	6	18.18	--	--	--	0.96	--	NA
			NICKEL	--	--	--	5	6	18.18	--	--	--	9.4	12.3	26.73
			POTASSIUM	--	--	--	5	6	18.18	--	--	--	31900	29200	8.84
			SODIUM	--	--	--	5	6	18.18	--	--	--	11500	10500	9.09
			THALLIUM	--	--	--	5	6	18.18	--	--	--	0.1	0.12	18.18
			VANADIUM	--	--	--	5	6	18.18	--	--	--	8.6	10.9	23.59
			ZINC	--	--	--	5	6	18.18	--	--	--	47.1	54.4	14.38
		12SW0302	ALUMINUM	--	--	--	5	6	18.18	--	--	--	--	1520	--
			ARSENIC	--	--	--	5	6	18.18	--	--	--	--	0.52	--
			BARIUM	--	--	--	5	6	18.18	--	--	--	--	52.1	--
			BERYLLIUM	--	--	--	5	6	18.18	--	--	--	--	0.05	--
			CALCIUM	--	--	--	5	6	18.18	--	--	--	--	49200	--
			COBALT	--	--	--	5	6	18.18	--	--	--	--	0.61	--
			COPPER	--	--	--	5	6	18.18	--	--	--	--	2.1	--
			IRON	--	--	--	5	6	18.18	--	--	--	--	1640	--
			LEAD	--	--	--	5	6	18.18	--	--	--	--	1	--
			MAGNESIUM	--	--	--	5	6	18.18	--	--	--	--	5450	--
			MANGANESE	--	--	--	5	6	18.18	--	--	--	--	19.3	--
			NICKEL	--	--	--	5	6	18.18	--	--	--	--	3.4	--

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
			POTASSIUM	--	--	--	5	6	18.18	--	--	--	--	902	--
			SODIUM	--	--	--	5	6	18.18	--	--	--	--	8350	--
			VANADIUM	--	--	--	5	6	18.18	--	--	--	--	2.8	--
			ZINC	--	--	--	5	6	18.18	--	--	--	--	7.6	--
		12SW0502	ALUMINUM	--	--	--	5	6	18.18	--	--	--	195	--	NA
			ARSENIC	--	--	--	5	6	18.18	--	--	--	1.7	1.8	5.71
			BARIUM	--	--	--	5	6	18.18	--	--	--	36.9	35.5	3.87
			CALCIUM	--	--	--	5	6	18.18	--	--	--	31600	49300	43.76
			COBALT	--	--	--	5	6	18.18	--	--	--	0.28	0.27	3.64
			COPPER	--	--	--	5	6	18.18	--	--	--	2.4	2.8	15.38
			IRON	--	--	--	5	6	18.18	--	--	--	398	355	11.42
			LEAD	--	--	--	5	6	18.18	--	--	--	0.201	0.17	16.71
			MAGNESIUM	--	--	--	5	6	18.18	--	--	--	10600	10500	0.95
			MANGANESE	--	--	--	5	6	18.18	--	--	--	4	2.6	42.42
			MERCURY	--	--	--	5	6	18.18	--	--	--	0.076	--	NA
			NICKEL	--	--	--	5	6	18.18	--	--	--	2.8	2.7	3.64
			POTASSIUM	--	--	--	5	6	18.18	--	--	--	30900	43800	34.54
			SODIUM	--	--	--	5	6	18.18	--	--	--	13200	13000	1.53
			THALLIUM	--	--	--	5	6	18.18	--	--	--	0.06	0.08	28.57
			VANADIUM	--	--	--	5	6	18.18	--	--	--	1.4	1.4	0.00
			ZINC	--	--	--	5	6	18.18	--	--	--	5.9	--	NA
	MF	12SW0202-F	ALUMINUM	--	--	--	5	6	18.18	--	--	--	770	966	22.58
			ARSENIC	--	--	--	5	6	18.18	--	--	--	0.94	1.2	24.30
			BARIUM	--	--	--	5	6	18.18	--	--	--	48.3	51.5	6.41
			BERYLLIUM	--	--	--	5	6	18.18	--	--	--	0.03	0.06	66.67
			CADMIUM	--	--	--	5	6	18.18	--	--	--	0.77	0.11	150.00
			CALCIUM	--	--	--	5	6	18.18	--	--	--	38700	41000	5.77
			COBALT	--	--	--	5	6	18.18	--	--	--	1.1	1.5	30.77
			COPPER	--	--	--	5	6	18.18	--	--	--	3.6	5.3	38.20
			IRON	--	--	--	5	6	18.18	--	--	--	945	1310	32.37
			LEAD	--	--	--	5	6	18.18	--	--	--	1.1	1.8	48.28
			MAGNESIUM	--	--	--	5	6	18.18	--	--	--	10300	10300	0.00
			MANGANESE	--	--	--	5	6	18.18	--	--	--	32.8	51.2	43.81
			MERCURY	--	--	--	5	6	18.18	--	--	--	--	0.056	--
			NICKEL	--	--	--	5	6	18.18	--	--	--	4	4.8	18.18
			POTASSIUM	--	--	--	5	6	18.18	--	--	--	27800	29000	4.23
			SODIUM	--	--	--	5	6	18.18	--	--	--	11300	11800	4.33
			TIN	--	--	--	5	6	18.18	--	--	--	--	0.14	--
			VANADIUM	--	--	--	5	6	18.18	--	--	--	2.3	2.6	12.24
			ZINC	--	--	--	5	6	18.18	--	--	--	11.9	34.9	98.29

TABLE H-8
FIELD DUPLICATE PRECISION SUMMARY, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				GW			SD			SO			SW		
Round	Fraction	Sample	Parameter	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD	DUP	NORMAL	RPD
		12SW0502-F	ALUMINUM	--	--	--	5	6	18.18	--	--	--	--	12.7	--
			ARSENIC	--	--	--	5	6	18.18	--	--	--	1.2	1.6	28.57
			BARIUM	--	--	--	5	6	18.18	--	--	--	33.5	35.4	5.52
			CADMIUM	--	--	--	5	6	18.18	--	--	--	0.75	--	NA
			CALCIUM	--	--	--	5	6	18.18	--	--	--	34700	32100	7.78
			CHROMIUM	--	--	--	5	6	18.18	--	--	--	--	1.1	--
			COBALT	--	--	--	5	6	18.18	--	--	--	0.11	0.19	53.33
			COPPER	--	--	--	5	6	18.18	--	--	--	5.2	2.8	60.00
			IRON	--	--	--	5	6	18.18	--	--	--	84.1	195	79.47
			LEAD	--	--	--	5	6	18.18	--	--	--	--	0.326	--
			MAGNESIUM	--	--	--	5	6	18.18	--	--	--	11700	9710	18.59
			MANGANESE	--	--	--	5	6	18.18	--	--	--	--	0.98	--
			NICKEL	--	--	--	5	6	18.18	--	--	--	2.2	3.4	42.86
			POTASSIUM	--	--	--	5	6	18.18	--	--	--	34000	29700	13.50
			SELENIUM	--	--	--	5	6	18.18	--	--	--	--	0.73	--
			SODIUM	--	--	--	5	6	18.18	--	--	--	15000	12400	18.98
			VANADIUM	--	--	--	5	6	18.18	--	--	--	1.2	--	NA
			ZINC	--	--	--	5	6	18.18	--	--	--	3.1	3.8	20.29
	MISC	12GWT0202	AMMONIA-N	0.07	0.19	92.31	5	6	18.18	--	--	--	--	--	--
		12GWT0402	AMMONIA-N	0.27	0.23	16.00	5	6	18.18	--	--	--	--	--	--
		12GWT3602	NITRITE/NITRATE-N	6	6.1	1.65	5	6	18.18	--	--	--	--	--	--
		12SW0202	AMMONIA-N	--	--	--	5	6	18.18	--	--	--	0.06	0.08	28.57
			NITRITE/NITRATE-N	--	--	--	5	6	18.18	--	--	--	0.25	--	NA
		12SW0302	AMMONIA-N	--	--	--	5	6	18.18	--	--	--	--	0.05	--
		12SW0502	NITRITE/NITRATE-N	--	--	--	5	6	18.18	--	--	--	0.43	0.7	47.79

1 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) lie outside the 0 to 35 percent range for aqueous samples or 0 to 50 percent range for solid samples.

AVS/SEM = Acid volatiel sulfides/simultaneously extracted metals
DUP = Duplicate sample result
EXP = Explosives
GW = Groundwater
M = Metals
MF= Filtered metals
MISC = Miscellaneous parameters
NORMAL = Normal environmental sample result
RPD = Relative percent difference (See QAPP for calculation method)
SD = Sediment
SO = Soils, including surface and subsurface soils
SVOC = Semivoatile organic compound
SW = Surface water

TABLE H-9
LABORATORY DUPLICATE AND MATRIX SPIKE/MATRIX SPIKE DUPLICATE PRECISION REFERENCE RANGE
EXCEEDANCES, ROUNDS 1 AND 2
SWMU 12 AND SWMU 25 [1,2]
NSWC CRANE
CRANE, INDIANA

				LAB ORIGINAL/DUP RPDs				MS/MSD RPDs			
Matrix	Fraction	Parameter	units	Min	Avg	Max	Count	Min	Avg	Max	Count
SOLID	AVS/SEM	ACID VOLATILE SULFIDE	UMO/G	64.8	64.8	64.8	1				
SOLID	AVS/SEM	SEM/AVS	S.U.	53.2	53.2	53.2	1				
SOLID	AVS/SEM	SILVER	UMO/G	130.0	130.0	130.0	1				
SOLID	HERB	PENTACHLOROPHENOL	UG/KG					0.0	29.8	122.0	5
SOLID	M	ANTIMONY	MG/KG	0.6	24.4	62.6	4				
SOLID	M	ARSENIC	MG/KG	1.3	14.8	53.0	6				
SOLID	M	BARIUM	MG/KG	0.8	15.5	57.1	6				
SOLID	M	CALCIUM	MG/KG	3.2	18.4	57.2	6				
SOLID	M	IRON	MG/KG	4.9	17.8	56.5	6				
SOLID	M	MAGNESIUM	MG/KG	4.5	19.2	63.9	6				
SOLID	SVOC	1,2,4-TRICHLOROBENZENE	UG/KG					1.0	23.2	76.0	5
SOLID	SVOC	1,2-DICHLOROBENZENE	UG/KG					5.0	21.4	79.0	5
SOLID	SVOC	1,3-DICHLOROBENZENE	UG/KG					5.0	21.6	77.0	5
SOLID	SVOC	1,4-DICHLOROBENZENE	UG/KG					5.0	21.6	80.0	5
SOLID	SVOC	2,2'-OXYBIS(1-CHLOROPROPANE)	UG/KG					2.0	22.6	80.0	5
SOLID	SVOC	2,4,5-TRICHLOROPHENOL	UG/KG					6.0	24.6	77.0	5
SOLID	SVOC	2,4,6-TRICHLOROPHENOL	UG/KG					0.0	22.0	76.0	5
SOLID	SVOC	2,4-DICHLOROPHENOL	UG/KG					1.0	27.4	79.0	5
SOLID	SVOC	2,4-DIMETHYLPHENOL	UG/KG					0.0	30.3	57.0	4
SOLID	SVOC	2,4-DINITROPHENOL	UG/KG					1.0	21.0	76.0	5
SOLID	SVOC	2-CHLORONAPHTHALENE	UG/KG					0.0	22.8	73.0	5
SOLID	SVOC	2-CHLOROPHENOL	UG/KG					2.0	24.6	78.0	5
SOLID	SVOC	2-METHYLPHENOL	UG/KG					6.0	26.4	69.0	5
SOLID	SVOC	2-NITROANILINE	UG/KG					5.0	25.0	83.0	5
SOLID	SVOC	2-NITROPHENOL	UG/KG					0.0	27.0	87.0	5
SOLID	SVOC	3&4-METHYLPHENOL	UG/KG					1.0	28.5	71.0	4
SOLID	SVOC	3-NITROANILINE	UG/KG					12.0	32.2	82.0	5
SOLID	SVOC	4,6-DINITRO-2-METHYLPHENOL	UG/KG					7.0	27.0	99.0	5
SOLID	SVOC	4-BROMOPHENYL PHENYL ETHER	UG/KG					3.0	21.8	75.0	5
SOLID	SVOC	4-CHLORO-3-METHYLPHENOL	UG/KG					5.0	26.8	86.0	5
SOLID	SVOC	4-CHLOROANILINE	UG/KG					14.0	64.3	200.0	4
SOLID	SVOC	4-CHLOROPHENYL PHENYL ETHER	UG/KG					2.0	22.2	74.0	5
SOLID	SVOC	4-NITROANILINE	UG/KG					0.0	20.8	75.0	5
SOLID	SVOC	4-NITROPHENOL	UG/KG					7.0	26.6	86.0	5
SOLID	SVOC	BENZYL ALCOHOL	UG/KG					4.0	28.0	94.0	5
SOLID	SVOC	BIS(2-CHLOROETHOXY)METHANE	UG/KG					3.0	24.0	74.0	5
SOLID	SVOC	BIS(2-CHLOROETHYL)ETHER	UG/KG					5.0	22.8	82.0	5
SOLID	SVOC	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG					1.0	23.6	80.0	5
SOLID	SVOC	BUTYL BENZYL PHTHALATE	UG/KG					1.0	24.4	82.0	5
SOLID	SVOC	DIBENZOFURAN	UG/KG					0.0	21.4	75.0	5
SOLID	SVOC	DIETHYL PHTHALATE	UG/KG					0.0	21.6	79.0	5
SOLID	SVOC	DIMETHYL PHTHALATE	UG/KG					2.0	21.8	76.0	5
SOLID	SVOC	DI-N-BUTYL PHTHALATE	UG/KG					0.0	23.6	80.0	5
SOLID	SVOC	DI-N-OCTYL PHTHALATE	UG/KG					0.0	22.2	73.0	5
SOLID	SVOC	DIPHENYLAMINE	UG/KG					3.0	26.0	59.0	3
SOLID	SVOC	HEXACHLOROBENZENE	UG/KG					3.0	22.4	70.0	5
SOLID	SVOC	HEXACHLOROBUTADIENE	UG/KG					0.0	23.6	78.0	5
SOLID	SVOC	HEXACHLOROETHANE	UG/KG					3.0	21.6	80.0	5
SOLID	SVOC	ISOPHORONE	UG/KG					2.0	27.6	80.0	5
SOLID	SVOC	N-NITROSODIMETHYLAMINE	UG/KG					4.0	27.6	95.0	5
SOLID	SVOC	N-NITROSO-DI-N-PROPYLAMINE	UG/KG					1.0	26.6	86.0	5
SOLID	SVOC	N-NITROSODIPHENYLAMINE	UG/KG					3.0	24.5	59.0	4

TABLE H-9
LABORATORY DUPLICATE AND MATRIX SPIKE/MATRIX SPIKE DUPLICATE PRECISION REFERENCE RANGE EXCEEDANCES, ROUNDS 1 AND 2
SWMU 12 AND SWMU 25 [1,2]
NSWC CRANE
CRANE, INDIANA

SOLID	SVOC	PHENOL	UG/KG					0.0	24.0	78.0	5
SOLID	VOC	ACETONE	UG/KG					103.0	103.0	103.0	1
AQUEOUS	EXP	4,4'-TN-AZOXY	UG/L					3.0	18.8	33.0	9
AQUEOUS	HERB	HEXACHLOROPHENE	UG/L					51.0	51.0	51.0	1
AQUEOUS	M	ALUMINUM	UG/L	0.8	23.7	67.3	16				
AQUEOUS	M	ARSENIC	UG/L	0.1	10.4	46.4	15				
AQUEOUS	M	BARIUM	UG/L	0.1	7.3	69.9	15				
AQUEOUS	M	CADMIUM	UG/L	1.4	39.1	130.5	13				
AQUEOUS	M	CALCIUM	UG/L	0.2	7.6	84.5	16				
AQUEOUS	M	CHROMIUM	UG/L	1.6	20.5	117.1	16				
AQUEOUS	M	COPPER	UG/L	0.4	15.1	106.7	15				
AQUEOUS	M	IRON	UG/L	1.4	12.5	120.0	16				
AQUEOUS	M	LEAD	UG/L	1.2	11.3	70.1	13				
AQUEOUS	M	MERCURY	UG/L	1.3	14.9	34.5	4				
AQUEOUS	M	SELENIUM	UG/L	0.2	14.1	31.4	13				
AQUEOUS	M	THALLIUM	UG/L	0.6	10.1	30.5	9				
AQUEOUS	M	TIN	UG/L	3.4	21.4	43.5	5				
AQUEOUS	M	ZINC	UG/L	0.4	12.1	34.3	15				
AQUEOUS	MF	ALUMINUM	UG/L	2.4	39.0	136.0	9				
AQUEOUS	MF	ARSENIC	UG/L	0.9	12.4	67.1	11				
AQUEOUS	MF	CADMIUM	UG/L	0.3	28.5	86.4	10				
AQUEOUS	MF	CHROMIUM	UG/L	0.2	23.9	90.5	12				
AQUEOUS	MF	COPPER	UG/L	0.5	14.4	92.5	12				
AQUEOUS	MF	IRON	UG/L	0.7	12.1	61.5	12				
AQUEOUS	MF	MANGANESE	UG/L	1.9	10.3	42.6	11				
AQUEOUS	MF	SELENIUM	UG/L	0.8	15.0	45.3	12				
AQUEOUS	MF	TIN	UG/L	3.2	20.8	64.3	5				
AQUEOUS	MF	ZINC	UG/L	3.6	31.6	146.7	12				

1 Highlighted values (yellow when reproduced in color and gray when reproduced in black and white) lie outside the 75 to 125 percent range.
2 Quality control samples for SWMUs 12 and 25 were combined into a single data set.

AVS/SEM = Acid volatiel sulfides/simultaneously extracted metals
EXP = Explosives
HERB = Herbicides
M = Metals
MF= Filtered metals
MISC = Miscellaneous parameters
VOC = Volatile Orgnaic Compound
PEST/PCB = Pesticides and polychlorinated biphenyls
PAH = Polynuclear aromatic Hydrocarbons
RPD = Relative percent difference (See QAPP for calculation method)
SVOC = Semivoatile organic compound

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
1	EXP	1,3,5-TRINITROBENZENE	H	50.0	0.0	0.0
			R	0.0	0.0	100.0
			U	50.0	0.0	0.0
		1,3-DINITROBENZENE	P	50.0	0.0	0.0
			PH	50.0	0.0	0.0
			R	0.0	0.0	100.0
		2,4,6-TRINITROTOLUENE	H	0.0	0.0	50.0
			R	0.0	0.0	50.0
		2,4-DIAMINO-6-NITROTOLUENE	HU	16.7	0.0	0.0
			R	0.0	0.0	100.0
			U	83.3	0.0	0.0
		2,4-DINITROTOLUENE	H	0.0	0.0	50.0
			R	0.0	0.0	50.0
			U	100.0	0.0	0.0
		2,6-DIAMINO-4-NITROTOLUENE	H	0.0	0.0	50.0
			R	0.0	0.0	50.0
		2,6-DINITROTOLUENE	HU	20.0	0.0	0.0
			P	20.0	0.0	0.0
			PU	20.0	0.0	0.0
			R	0.0	0.0	100.0
			U	40.0	0.0	0.0
		2-AMINO-4,6-DINITROTOLUENE	HU	14.3	0.0	0.0
			R	0.0	0.0	100.0
			U	85.7	0.0	0.0
		2-NITROTOLUENE	H	0.0	0.0	50.0
			PU	100.0	0.0	0.0
			R	0.0	0.0	50.0
		3,5-DINITROANILINE	H	33.3	0.0	0.0
			R	0.0	0.0	100.0
			U	66.7	0.0	0.0
		3-NITROTOLUENE	H	0.0	0.0	50.0
			R	0.0	0.0	50.0
			U	100.0	0.0	0.0
		4,4'-TN-AZOXY	D	0.0	0.0	33.3
			H	0.0	0.0	33.3
			R	0.0	0.0	33.3
		4-AMINO-2,6-DINITROTOLUENE	H	50.0	0.0	0.0
			R	0.0	0.0	100.0
			U	50.0	0.0	0.0
		4-NITROTOLUENE	H	0.0	0.0	50.0
			R	0.0	0.0	50.0
		DNX	H	25.0	0.0	0.0
			PU	25.0	0.0	0.0
			R	0.0	0.0	100.0
			U	50.0	0.0	0.0
		HMX	H	25.0	0.0	0.0
			PU	75.0	0.0	0.0
			R	0.0	0.0	100.0
		MNX	H	20.0	0.0	0.0
			P	40.0	0.0	0.0
			PU	20.0	0.0	0.0
			R	0.0	0.0	100.0

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
			U	20.0	0.0	0.0
		NITROBENZENE	H	0.0	0.0	50.0
			R	0.0	0.0	50.0
		RDX	E	70.0	0.0	0.0
			H	10.0	0.0	0.0
			R	0.0	0.0	100.0
			U	20.0	0.0	0.0
		TETRYL	E	0.0	0.0	50.0
			H	0.0	0.0	25.0
			R	0.0	0.0	25.0
		TNX	H	100.0	0.0	0.0
			R	0.0	0.0	100.0
	M	ALUMINUM	A	71.4	100.0	0.0
			AI	28.6	0.0	0.0
		ANTIMONY	A	60.0	100.0	0.0
			AK	40.0	0.0	0.0
			K	0.0	0.0	100.0
		ARSENIC	A	63.2	100.0	0.0
			AI	18.4	0.0	0.0
			AP	18.4	0.0	0.0
		BARIUM	A	42.9	0.0	0.0
			ADF	4.1	0.0	0.0
			AGI	14.3	0.0	0.0
			AI	36.7	0.0	0.0
			AIG	2.0	0.0	0.0
		BERYLLIUM	A	40.0	100.0	0.0
			AI	36.0	0.0	0.0
			AP	4.0	0.0	0.0
			CP	12.0	0.0	0.0
			I	0.0	0.0	100.0
			P	8.0	0.0	0.0
		CADMIUM	A	35.3	100.0	0.0
			AFI	11.8	0.0	0.0
			AI	29.4	0.0	0.0
			AP	11.8	0.0	0.0
			P	11.8	0.0	0.0
		CALCIUM	A	62.9	100.0	0.0
			AI	37.1	0.0	0.0
		CHROMIUM	A	88.9	100.0	0.0
			AP	11.1	0.0	0.0
		COBALT	A	81.0	100.0	0.0
			I	14.3	0.0	0.0
			IP	4.8	0.0	0.0
		COPPER	A	43.6	100.0	0.0
			AFI	10.3	0.0	0.0
			AFIP	10.3	0.0	0.0
			AI	7.7	0.0	0.0
			AIP	2.6	0.0	0.0
			AP	23.1	0.0	0.0
			P	2.6	0.0	0.0
		IRON	A	97.4	100.0	0.0
			AF	2.6	0.0	0.0

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
		LEAD	A	59.3	100.0	0.0
			AI	14.8	0.0	0.0
			AIP	7.4	0.0	0.0
			AK	7.4	0.0	0.0
			AP	7.4	0.0	0.0
			P	3.7	0.0	0.0
		MAGNESIUM	A	22.7	0.0	0.0
			AI	77.3	0.0	0.0
		MANGANESE	A	94.6	100.0	0.0
			K	5.4	0.0	0.0
		MERCURY	A	37.5	100.0	0.0
			D	50.0	0.0	100.0
			DP	12.5	0.0	0.0
		NICKEL	A	66.7	100.0	0.0
			AI	8.9	0.0	0.0
			I	2.2	0.0	0.0
			IK	15.6	0.0	0.0
			K	6.7	0.0	0.0
		POTASSIUM	A	51.0	0.0	0.0
			AI	49.0	0.0	0.0
		SELENIUM	A	94.4	100.0	0.0
			AP	5.6	0.0	0.0
		SILVER	A	0.0	100.0	0.0
		SODIUM	A	60.4	0.0	0.0
			AI	39.6	0.0	0.0
		THALLIUM	A	8.3	100.0	0.0
			AP	50.0	0.0	0.0
			P	41.7	0.0	0.0
		TIN	A	0.0	100.0	0.0
			AKP	28.6	0.0	0.0
			AP	14.3	0.0	0.0
			P	57.1	0.0	0.0
		VANADIUM	A	40.0	0.0	0.0
			P	60.0	0.0	0.0
		ZINC	A	51.2	100.0	0.0
			AI	9.8	0.0	0.0
			AIK	7.3	0.0	0.0
			AIKP	2.4	0.0	0.0
			AK	26.8	0.0	0.0
			AKP	2.4	0.0	0.0
	MF	ALUMINUM	A	80.0	100.0	0.0
			AI	20.0	0.0	0.0
		ANTIMONY	A	75.0	100.0	0.0
			AK	25.0	0.0	0.0
			K	0.0	0.0	100.0
		ARSENIC	A	70.0	100.0	0.0
			AIP	10.0	0.0	0.0
			AP	20.0	0.0	0.0
		BARIUM	A	21.4	0.0	0.0
			AI	78.6	0.0	0.0
		BERYLLIUM	A	50.0	100.0	0.0
			CP	50.0	0.0	0.0

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
		CADMIUM	A	0.0	100.0	0.0
			AI	40.0	0.0	0.0
			P	60.0	0.0	0.0
		CALCIUM	AI	72.7	0.0	0.0
			I	27.3	0.0	0.0
		CHROMIUM	A	57.1	100.0	0.0
			AP	42.9	0.0	0.0
		COBALT	A	100.0	100.0	0.0
		COPPER	A	45.5	0.0	0.0
			AI	18.2	0.0	0.0
			AIP	9.1	0.0	0.0
			AP	27.3	0.0	0.0
		IRON	A	25.0	100.0	0.0
			AI	75.0	0.0	0.0
		LEAD	A	60.0	100.0	0.0
			AI	20.0	0.0	0.0
			P	20.0	0.0	0.0
		MAGNESIUM	AI	78.6	0.0	0.0
			I	21.4	0.0	0.0
		MANGANESE	A	16.7	0.0	0.0
			AI	50.0	0.0	0.0
			I	16.7	0.0	0.0
			IK	8.3	0.0	0.0
			K	8.3	0.0	0.0
		MERCURY	A	100.0	100.0	0.0
		NICKEL	A	58.3	100.0	0.0
			K	41.7	0.0	0.0
		POTASSIUM	A	21.4	0.0	0.0
			AI	78.6	0.0	0.0
		SELENIUM	A	75.0	100.0	0.0
			AP	25.0	0.0	0.0
		SILVER	A	0.0	100.0	0.0
		SODIUM	A	64.3	0.0	0.0
			AI	35.7	0.0	0.0
		THALLIUM	A	0.0	100.0	0.0
			P	100.0	0.0	0.0
		TIN	A	0.0	100.0	0.0
			AKP	66.7	0.0	0.0
			P	33.3	0.0	0.0
		VANADIUM	A	100.0	0.0	0.0
		ZINC	A	23.1	100.0	0.0
			AI	15.4	0.0	0.0
			AIK	23.1	0.0	0.0
			AK	15.4	0.0	0.0
			AKP	23.1	0.0	0.0
	MISC	AMMONIA-N	A	52.6	100.0	0.0
			G	42.1	0.0	100.0
			H	5.3	0.0	0.0
		NITRITE/NITRATE-N	D	88.9	0.0	0.0
			DH	11.1	0.0	0.0

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
2	EXP	1,3,5-TRINITROBENZENE	U	100.0	0.0	0.0
		1,3-DINITROBENZENE	P	100.0	0.0	0.0
		2,4,6-TRINITROTOLUENE	P	100.0	0.0	0.0
		2,4-DIAMINO-6-NITROTOLUENE	PU	16.7	0.0	0.0
			U	83.3	0.0	0.0
		2,4-DINITROTOLUENE	P	100.0	0.0	0.0
		2,6-DINITROTOLUENE	P	66.7	0.0	0.0
			U	33.3	0.0	0.0
		2-AMINO-4,6-DINITROTOLUENE	PU	12.5	0.0	0.0
			U	87.5	0.0	0.0
		3,5-DINITROANILINE	U	100.0	0.0	0.0
		3-NITROTOLUENE	U	100.0	0.0	0.0
		4-AMINO-2,6-DINITROTOLUENE	P	50.0	0.0	0.0
			PU	50.0	0.0	0.0
		4-NITROTOLUENE	U	100.0	0.0	0.0
		DNX	PU	33.3	0.0	0.0
			U	66.7	0.0	0.0
		HMX	P	20.0	0.0	0.0
			PU	20.0	0.0	0.0
			U	60.0	0.0	0.0
		MNX	P	33.3	0.0	0.0
			PU	55.6	0.0	0.0
			U	11.1	0.0	0.0
		RDX	U	100.0	0.0	0.0
		TNX	U	100.0	0.0	0.0
	M	ALUMINUM	A	58.5	100.0	0.0
			AG	2.4	0.0	0.0
			DFI	36.6	0.0	0.0
			DFIP	2.4	0.0	0.0
			FI	0.0	0.0	100.0
		ANTIMONY	A	0.0	100.0	0.0
		ARSENIC	A	33.3	100.0	0.0
			AI	25.0	0.0	0.0
			AP	4.2	0.0	0.0
			P	37.5	0.0	0.0
		BARIUM	A	83.8	100.0	0.0
			AI	16.2	0.0	0.0
		BERYLLIUM	A	88.2	100.0	0.0
			AC	5.9	0.0	0.0
			CP	5.9	0.0	0.0
		CADMIUM	A	5.9	100.0	0.0
			AI	47.1	0.0	0.0
			G	0.0	0.0	100.0
			P	47.1	0.0	0.0
		CALCIUM	A	100.0	0.0	0.0
		CHROMIUM	A	100.0	100.0	0.0
		COBALT	A	93.9	100.0	0.0
			AI	3.0	0.0	0.0
			P	3.0	0.0	0.0
		COPPER	A	73.7	100.0	0.0
			AI	2.6	0.0	0.0
			AIP	2.6	0.0	0.0

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
			AP	5.3	0.0	0.0
			P	15.8	0.0	0.0
		IRON	A	58.7	100.0	0.0
			AG	4.3	0.0	0.0
			AI	37.0	0.0	0.0
		LEAD	A	0.0	100.0	0.0
			AK	76.2	0.0	0.0
			AP	4.8	0.0	0.0
			P	19.0	0.0	0.0
		MAGNESIUM	A	50.0	0.0	0.0
			ADI	47.2	0.0	0.0
			AI	2.8	0.0	0.0
		MANGANESE	A	45.9	0.0	0.0
			AI	2.7	0.0	0.0
			AK	2.7	0.0	0.0
			I	43.2	0.0	0.0
			IK	2.7	0.0	0.0
			P	2.7	0.0	0.0
		MERCURY	A	18.2	100.0	0.0
			H	18.2	0.0	0.0
			P	63.6	0.0	0.0
		NICKEL	A	55.6	0.0	0.0
			AIK	2.8	0.0	0.0
			AK	41.7	0.0	0.0
		POTASSIUM	A	97.9	0.0	0.0
			AI	2.1	0.0	0.0
		SELENIUM	A	82.4	100.0	0.0
			AP	17.6	0.0	0.0
		SILVER	A	0.0	100.0	0.0
			D	0.0	0.0	100.0
		SODIUM	A	63.8	100.0	0.0
			ADI	34.0	0.0	0.0
			AI	2.1	0.0	0.0
		THALLIUM	A	15.4	100.0	0.0
			AP	7.7	0.0	0.0
			P	76.9	0.0	0.0
		TIN	A	0.0	100.0	0.0
			AP	16.7	0.0	0.0
			P	83.3	0.0	0.0
		VANADIUM	P	100.0	0.0	0.0
		ZINC	A	11.4	100.0	0.0
			ACGIKP	2.9	0.0	0.0
			AGI	2.9	0.0	0.0
			AK	28.6	0.0	0.0
			K	42.9	0.0	0.0
			KP	11.4	0.0	0.0
	MF	ALUMINUM	A	60.0	100.0	0.0
			P	40.0	0.0	0.0
		ANTIMONY	A	0.0	100.0	0.0
			AD	100.0	0.0	0.0
		ARSENIC	A	40.0	100.0	0.0
			P	60.0	0.0	0.0

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	Fraction	Parameter	Code	J	U	UJ
		BARIUM	A	100.0	0.0	0.0
		BERYLLIUM	A	100.0	100.0	0.0
		CADMIUM	A	25.0	100.0	0.0
			P	75.0	0.0	0.0
		CALCIUM	A	50.0	0.0	0.0
			AI	50.0	0.0	0.0
		CHROMIUM	A	100.0	100.0	0.0
		COBALT	A	87.5	100.0	0.0
			P	12.5	0.0	0.0
		COPPER	A	66.7	100.0	0.0
			P	33.3	0.0	0.0
		IRON	A	100.0	100.0	0.0
		LEAD	A	0.0	100.0	0.0
			AK	40.0	0.0	0.0
			P	60.0	0.0	0.0
		MAGNESIUM	A	66.7	0.0	0.0
			I	33.3	0.0	0.0
		MANGANESE	A	75.0	100.0	0.0
			AK	25.0	0.0	0.0
		MERCURY	A	0.0	100.0	0.0
			P	100.0	0.0	0.0
		NICKEL	A	25.0	100.0	0.0
			AK	75.0	0.0	0.0
		POTASSIUM	A	66.7	0.0	0.0
			AI	33.3	0.0	0.0
		SELENIUM	A	66.7	100.0	0.0
			AP	33.3	0.0	0.0
		SILVER	A	0.0	100.0	0.0
		SODIUM	A	100.0	0.0	0.0
		THALLIUM	A	0.0	100.0	0.0
			P	100.0	0.0	0.0
		TIN	A	0.0	100.0	0.0
			P	100.0	0.0	0.0
		VANADIUM	P	100.0	0.0	0.0
		ZINC	A	0.0	100.0	0.0
			AK	75.0	0.0	0.0
			KP	25.0	0.0	0.0
	MISC	AMMONIA-N	G	100.0	0.0	100.0
		NITRITE/NITRATE-N	DG	0.0	0.0	100.0

1 The Appendix H text explains how to interpret this table.

Analytical Fraction Codes:
EXP = Explosives
M = Metals, total
MF = Metals, dissolved
MISC = Miscellaneous parameters

Data Qualifiers:
J = Result is estimated
U = Analyte was not detected at the indicated detection limit
UJ = Analyte was not detected at the indicated detection limit and result is estimated

TABLE H-10
GROUNDWATER DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier		
Round	**Fraction**	**Parameter**	**Code**	**J**	**U**	**UJ**
Codes indicating reasons for data qualifications:						
A = Lab Blank Contamination						
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)						
D = MS/MSD Recovery Noncompliance						
E = LCS/LCSD Recovery Noncompliance						
F = Lab Duplicate Imprecision						
G = Field Duplicate Imprecision						
H = Holding Time Exceedance						
I = ICP Serial Dilution Noncompliance						
K = ICP Interference - includes ICS % R Noncompliance						
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)						
R = Surrogates Recovery Noncompliance						
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC						

TABLE H-11
SEDIMENT DATA QUALIFICATION RATES, ROUND 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier			
Round	Fraction	Parameter	Code	J	U	UJ	UR
1	AVS/SEM	ACID VOLATILE SULFIDE	A	50.0	100.0	0.0	0.0
			F	50.0	0.0	100.0	0.0
		LEAD	AP	60.0	0.0	0.0	0.0
			F	40.0	0.0	0.0	0.0
		MERCURY	A	0.0	100.0	0.0	0.0
		NICKEL	F	100.0	0.0	0.0	0.0
		SILVER	A	0.0	100.0	0.0	0.0
			AP	100.0	0.0	0.0	0.0
			F	0.0	0.0	100.0	0.0
		ZINC	A	14.3	100.0	0.0	0.0
			AP	14.3	0.0	0.0	0.0
			P	71.4	0.0	0.0	0.0
	EXP	2,4,6-TRINITROTOLUENE	P	66.7	0.0	0.0	0.0
			U	33.3	0.0	0.0	0.0
	M	ALUMINUM	A	59.4	0.0	0.0	0.0
			AI	40.6	0.0	0.0	0.0
		ANTIMONY	A	0.0	100.0	0.0	0.0
			AF	100.0	0.0	0.0	0.0
		ARSENIC	A	40.9	100.0	0.0	0.0
			AI	59.1	0.0	0.0	0.0
		BARIUM	A	67.9	100.0	0.0	0.0
			AD	32.1	0.0	0.0	0.0
		BERYLLIUM	A	0.0	100.0	0.0	0.0
		CADMIUM	A	0.0	100.0	0.0	0.0
			AI	100.0	0.0	0.0	0.0
		CALCIUM	AFI	40.6	0.0	0.0	0.0
			AI	59.4	0.0	0.0	0.0
		CHROMIUM	A	0.0	100.0	0.0	0.0
			AI	100.0	0.0	0.0	0.0
		COBALT	A	0.0	100.0	0.0	0.0
			AI	100.0	0.0	0.0	0.0
		COPPER	A	0.0	100.0	0.0	0.0
			AI	100.0	0.0	0.0	0.0
		IRON	A	100.0	0.0	0.0	0.0
		LEAD	A	43.8	0.0	0.0	0.0
			AK	56.3	0.0	0.0	0.0
		MAGNESIUM	AFI	40.6	0.0	0.0	0.0
			AI	59.4	0.0	0.0	0.0
		MANGANESE	A	100.0	100.0	0.0	0.0
		MERCURY	P	100.0	0.0	0.0	0.0
		NICKEL	A	55.2	100.0	0.0	0.0
			AI	44.8	0.0	0.0	0.0
		POTASSIUM	AI	100.0	0.0	0.0	0.0
		SELENIUM	A	0.0	100.0	0.0	0.0
		SILVER	A	0.0	100.0	0.0	0.0
		SODIUM	A	100.0	100.0	0.0	0.0

TABLE H-11
SEDIMENT DATA QUALIFICATION RATES, ROUND 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		THALLIUM	A	0.0	100.0	0.0	0.0
		TIN	A	0.0	100.0	0.0	0.0
			AP	100.0	0.0	0.0	0.0
		VANADIUM	A	0.0	100.0	0.0	0.0
			AI	100.0	0.0	0.0	0.0
		ZINC	A	36.0	100.0	0.0	0.0
			AK	64.0	0.0	0.0	0.0
	MISC	CATION EXCHANGE CAPACITY	CH	28.6	0.0	0.0	0.0
			H	71.4	0.0	0.0	0.0
		TOTAL ORGANIC CARBON	D	100.0	0.0	0.0	0.0
	SVOC	3,3'-DICHLOROBENZIDINE	D	0.0	0.0	0.0	100.0
		3-NITROANILINE	D	0.0	0.0	0.0	100.0
		4-CHLOROANILINE	D	0.0	0.0	0.0	100.0
		4-NITROANILINE	D	0.0	0.0	100.0	0.0
		4-NITROQUINOLINE-1-OXIDE	C	0.0	0.0	0.0	100.0
		BENZO(K)FLUORANTHENE	P	100.0	0.0	0.0	0.0
		BIS(2-ETHYLHEXYL)PHTHALATE	P	100.0	0.0	0.0	0.0
		FLUORANTHENE	P	100.0	0.0	0.0	0.0
		HEXACHLOROCYCLOPENTADIENE	C	0.0	0.0	100.0	0.0
		KEPONE	C	0.0	0.0	100.0	0.0
		NAPHTHALENE	P	100.0	0.0	0.0	0.0
		PHENANTHRENE	P	100.0	0.0	0.0	0.0
		PYRENE	P	100.0	0.0	0.0	0.0

1 The Appendix H text explains how to interpret this table.

Analytical Fraction Codes:
AVS/SEM = Acid volatile sulfides/simultaneously extracted metals
EXP = Explosives
M = Metals, total
MISC = Miscellaneous parameters
SVOC = Semivolatile organic compounds

Data Qualifiers:
J = Result is estimated
U = Analyte was not detected at the indicated detection limit
UJ = Analyte was not detected at the indicated detection limit and result is estimated
UR = Result is not usable and was reported as not detected

Codes indicating reasons for data qualifications:
A = Lab Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
D = MS/MSD Recovery Noncompliance
F = Lab Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
1	EXP	TETRYL	E	0.0	0.0	0.0	100.0	0.0
	M	ALUMINUM	A	0.0	11.4	0.0	0.0	0.0
			AF	0.0	57.1	0.0	0.0	0.0
			AFI	0.0	31.4	0.0	0.0	0.0
		ANTIMONY	A	0.0	44.4	100.0	0.0	0.0
			AP	0.0	55.6	0.0	0.0	0.0
		ARSENIC	A	0.0	7.7	0.0	0.0	0.0
			AD	0.0	21.2	0.0	0.0	0.0
			AFGI	0.0	1.9	0.0	0.0	0.0
			AFI	0.0	36.5	0.0	0.0	0.0
			AI	0.0	30.8	0.0	0.0	0.0
			AIG	0.0	1.9	0.0	0.0	0.0
		BARIUM	A	0.0	59.6	0.0	0.0	0.0
			ADF	0.0	36.5	0.0	0.0	0.0
			ADFG	0.0	1.9	0.0	0.0	0.0
			AG	0.0	1.9	0.0	0.0	0.0
		BERYLLIUM	A	0.0	46.3	100.0	0.0	0.0
			I	0.0	24.4	0.0	0.0	0.0
			IP	0.0	2.4	0.0	0.0	0.0
			P	0.0	26.8	0.0	0.0	0.0
		CADMIUM	A	0.0	100.0	100.0	0.0	0.0
		CALCIUM	AD	0.0	7.7	0.0	0.0	0.0
			AGI	0.0	7.7	0.0	0.0	0.0
			AI	0.0	84.6	0.0	0.0	0.0
		CHROMIUM	A	0.0	7.7	0.0	0.0	0.0
			AI	0.0	92.3	0.0	0.0	0.0
		COBALT	A	0.0	7.7	0.0	0.0	0.0
			AI	0.0	92.3	0.0	0.0	0.0
		COPPER	A	0.0	30.8	0.0	0.0	0.0
			AD	0.0	38.5	0.0	0.0	0.0
			AI	0.0	30.8	0.0	0.0	0.0
		IRON	A	0.0	67.3	0.0	0.0	0.0
			AF	0.0	7.7	0.0	0.0	0.0
			AFI	0.0	21.2	0.0	0.0	0.0
			AG	0.0	3.8	0.0	0.0	0.0
		LEAD	A	0.0	36.5	0.0	0.0	0.0
			AD	0.0	21.2	0.0	0.0	0.0
			AG	0.0	1.9	0.0	0.0	0.0
			AGI	0.0	1.9	0.0	0.0	0.0
			AI	0.0	38.5	0.0	0.0	0.0
		MAGNESIUM	A	0.0	21.2	0.0	0.0	0.0
			AI	0.0	78.8	0.0	0.0	0.0
		MANGANESE	A	0.0	66.7	0.0	0.0	0.0
			AFI	0.0	22.9	0.0	0.0	0.0
			AG	0.0	8.3	0.0	0.0	0.0
			AK	0.0	2.1	0.0	0.0	0.0
		MERCURY	D	0.0	2.6	0.0	0.0	33.3
			DHP	0.0	2.6	0.0	0.0	0.0
			DP	0.0	23.7	0.0	0.0	0.0
			H	0.0	0.0	0.0	0.0	66.7
			HP	0.0	7.9	0.0	0.0	0.0
			P	0.0	63.2	0.0	0.0	0.0
		NICKEL	A	0.0	51.9	0.0	0.0	0.0
			AD	0.0	38.5	0.0	0.0	0.0

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
			AI	0.0	9.6	0.0	0.0	0.0
		POTASSIUM	A	0.0	7.7	0.0	0.0	0.0
			ADGI	0.0	1.9	0.0	0.0	0.0
			ADI	0.0	57.7	0.0	0.0	0.0
			AGI	0.0	1.9	0.0	0.0	0.0
			AI	0.0	30.8	0.0	0.0	0.0
		SELENIUM	A	0.0	87.5	100.0	0.0	0.0
			AD	0.0	12.5	0.0	0.0	0.0
		SILVER	A	0.0	50.0	100.0	0.0	0.0
			AD	0.0	50.0	0.0	0.0	0.0
		SODIUM	A	0.0	93.3	100.0	0.0	0.0
			AI	0.0	6.7	0.0	0.0	0.0
		THALLIUM	A	0.0	100.0	100.0	0.0	0.0
		TIN	A	0.0	44.4	100.0	0.0	0.0
			AP	0.0	55.6	0.0	0.0	0.0
		VANADIUM	A	0.0	7.7	0.0	0.0	0.0
			ADI	0.0	38.5	0.0	0.0	0.0
			AI	0.0	53.8	0.0	0.0	0.0
		ZINC	A	0.0	46.2	0.0	0.0	0.0
			ADI	0.0	7.7	0.0	0.0	0.0
			ADIK	0.0	1.9	0.0	0.0	0.0
			AI	0.0	15.4	0.0	0.0	0.0
			AIK	0.0	5.8	0.0	0.0	0.0
			AK	0.0	23.1	0.0	0.0	0.0
	MISC	AMMONIA-N	D	0.0	80.0	0.0	0.0	0.0
			DP	0.0	20.0	0.0	0.0	0.0
		CYANIDE	H	0.0	0.0	0.0	100.0	0.0
	SVOC	1,2,4,5-TETRACHLOROBENZENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		1,2,4-TRICHLOROBENZENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		1,2-DICHLOROBENZENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		1,3-DICHLOROBENZENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		1,4-DICHLOROBENZENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		1,4-NAPHTHOQUINONE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		1,4-PHENYLENEDIAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		1-NAPHTHYLAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		2,2'-OXYBIS(1-CHLOROPROPANE)	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2,3,4,6-TETRACHLOROPHENOL	H	0.0	0.0	0.0	30.8	0.0
			R	0.0	0.0	0.0	69.2	0.0
		2,4,5-TRICHLOROPHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
			H	0.0	0.0	0.0	26.7	0.0
		2,4,6-TRICHLOROPHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2,4-DICHLOROPHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2,4-DIMETHYLPHENOL	D	0.0	0.0	0.0	0.0	100.0
			E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2,4-DINITROPHENOL	E	0.0	0.0	0.0	0.0	100.0
			H	0.0	0.0	0.0	100.0	0.0
		2,6-DICHLOROPHENOL	H	0.0	0.0	0.0	30.8	0.0
			R	0.0	0.0	0.0	69.2	0.0
		2-ACETYLAMINOFLUORENE	C	0.0	0.0	0.0	14.3	0.0
			CR	0.0	0.0	0.0	28.6	0.0
			H	0.0	0.0	0.0	28.6	0.0
			R	0.0	0.0	0.0	28.6	0.0
		2-CHLORONAPHTHALENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2-CHLOROPHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2-METHYLPHENOL	D	0.0	0.0	0.0	6.3	0.0
			E	0.0	0.0	0.0	12.5	0.0
			ER	0.0	0.0	0.0	56.3	0.0
			H	0.0	0.0	0.0	25.0	0.0
		2-NAPHTHYLAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		2-NITROANILINE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2-NITROPHENOL	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		2-PICOLINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		3&4-METHYLPHENOL	D	0.0	0.0	0.0	6.3	0.0
			E	0.0	0.0	0.0	12.5	0.0
			ER	0.0	0.0	0.0	56.3	0.0
			H	0.0	0.0	0.0	25.0	0.0
		3,3'-DICHLOROBENZIDINE	D	0.0	0.0	0.0	0.0	100.0
			E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		3,3'-DIMETHYLBENZIDINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		3-METHYLCHOLANTHRENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		3-NITROANILINE	D	0.0	0.0	0.0	0.0	100.0
			E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
			H	0.0	0.0	0.0	26.7	0.0
		4,6-DINITRO-2-METHYLPHENOL	E	0.0	0.0	0.0	0.0	100.0
			H	0.0	0.0	0.0	100.0	0.0
		4-AMINOBIPHENYL	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		4-BROMOPHENYL PHENYL ETHER	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	46.7	0.0
			H	0.0	0.0	0.0	26.7	0.0
			RE	0.0	0.0	0.0	6.7	0.0
		4-CHLORO-3-METHYLPHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0
			H	0.0	0.0	0.0	26.7	0.0
		4-CHLOROANILINE	E	0.0	0.0	0.0	0.0	100.0
			H	0.0	0.0	0.0	100.0	0.0
		4-CHLOROPHENYL PHENYL ETHER	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		4-NITROANILINE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		4-NITROPHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
			RE	0.0	0.0	0.0	6.7	0.0
		4-NITROQUINOLINE-1-OXIDE	C	0.0	0.0	0.0	0.0	100.0
			H	0.0	0.0	0.0	100.0	0.0
		5-NITRO-O-TOLUIDINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		7,12-DIMETHYLBENZ(A)ANTHRACENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		A,A-DIMETHYLPHENETHYLAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		ACENAPHTHENE	P	0.0	100.0	0.0	0.0	0.0
		ACETOPHENONE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		ANILINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		ARAMITE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		BENZO(A)ANTHRACENE	P	0.0	100.0	0.0	0.0	0.0
		BENZO(K)FLUORANTHENE	P	0.0	100.0	0.0	0.0	0.0
		BENZYL ALCOHOL	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		BIS(2-CHLOROETHOXY)METHANE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		BIS(2-CHLOROETHYL)ETHER	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		BIS(2-ETHYLHEXYL)PHTHALATE	H	0.0	0.0	0.0	36.4	0.0
			R	0.0	100.0	0.0	63.6	0.0
		BUTYL BENZYL PHTHALATE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
			H	0.0	0.0	0.0	26.7	0.0
		CHLOROBENZILATE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		DIALLATE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		DIBENZOFURAN	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		DIETHYL PHTHALATE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		DIMETHYL PHTHALATE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		DI-N-BUTYL PHTHALATE	E	0.0	0.0	0.0	21.4	0.0
			ER	0.0	0.0	0.0	57.1	0.0
			H	0.0	0.0	0.0	21.4	0.0
			HP	0.0	100.0	0.0	0.0	0.0
		DI-N-OCTYL PHTHALATE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		DIPHENYLAMINE	D	0.0	0.0	0.0	0.0	100.0
			E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		ETHYL METHANE SULFONATE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		FLUORENE	P	0.0	100.0	0.0	0.0	0.0
		HEXACHLOROBENZENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		HEXACHLOROBUTADIENE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		HEXACHLOROCYCLOPENTADIENE	C	0.0	0.0	0.0	53.8	0.0
			CR	0.0	0.0	0.0	30.8	0.0
			H	0.0	0.0	0.0	15.4	0.0
		HEXACHLOROETHANE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		HEXACHLOROPROPENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		ISODRIN	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		ISOPHORONE	E	0.0	0.0	0.0	26.7	0.0
			ER	0.0	0.0	0.0	46.7	0.0
			H	0.0	0.0	0.0	26.7	0.0
		ISOSAFROLE	H	0.0	0.0	0.0	33.3	0.0
			P	0.0	100.0	0.0	0.0	0.0
			R	0.0	0.0	0.0	66.7	0.0
		KEPONE	C	0.0	0.0	0.0	53.8	0.0
			CR	0.0	0.0	0.0	30.8	0.0
			H	0.0	0.0	0.0	15.4	0.0
		METHAPYRILENE	C	0.0	0.0	0.0	14.3	0.0

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
			CR	0.0	0.0	0.0	35.7	0.0
			H	0.0	0.0	0.0	28.6	0.0
			R	0.0	0.0	0.0	21.4	0.0
		METHYL METHANE SULFONATE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		NAPHTHALENE	P	0.0	100.0	0.0	0.0	0.0
		N-NITROSODIETHYLAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		N-NITROSODIMETHYLAMINE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		N-NITROSO-DI-N-BUTYLAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		N-NITROSO-DI-N-PROPYLAMINE	E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		N-NITROSODIPHENYLAMINE	D	0.0	0.0	0.0	0.0	100.0
			E	0.0	0.0	0.0	20.0	0.0
			ER	0.0	0.0	0.0	53.3	0.0
			H	0.0	0.0	0.0	26.7	0.0
		N-NITROSOMETHYLETHYLAMINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		N-NITROSOMORPHOLINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		N-NITROSOPIPERIDINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		N-NITROSOPYRROLIDINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		O,O,O-TRIETHYL PHOSPHOROTHIOATE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		O-TOLUIDINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		P-(DIMETHYLAMINO)AZOBENZENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		PENTACHLOROBENZENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		PENTACHLOROETHANE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		PENTACHLORONITROBENZENE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		PHENACETIN	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		PHENANTHRENE	E	0.0	100.0	0.0	0.0	0.0
		PHENOL	E	0.0	0.0	0.0	13.3	0.0
			ER	0.0	0.0	0.0	60.0	0.0
			H	0.0	0.0	0.0	26.7	0.0
		PRONAMIDE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		PYRIDINE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
		SAFROLE	H	0.0	0.0	0.0	33.3	0.0
			R	0.0	0.0	0.0	66.7	0.0
	VOC	1,2,3-TRICHLOROPROPANE	D	0.0	0.0	0.0	100.0	0.0
		1,2-DIBROMO-3-CHLOROPROPANE	D	0.0	0.0	0.0	100.0	0.0

TABLE H-12
SOIL DATA QUALIFICATION RATES, ROUNDS 1[1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier				
Round	Fraction	Parameter	Code	BU	J	U	UJ	UR
		1,4-DIOXANE	R	0.0	0.0	0.0	100.0	0.0
		ACETONE	A	85.7	0.0	92.9	0.0	0.0
			B	0.0	0.0	7.1	0.0	0.0
			C	14.3	0.0	0.0	100.0	0.0
		ACETONITRILE	R	0.0	0.0	0.0	100.0	0.0
		ACROLEIN	C	0.0	0.0	0.0	0.0	100.0
		ACRYLONITRILE	C	0.0	0.0	0.0	0.0	100.0
		DICHLORODIFLUOROMETHANE	C	0.0	75.0	0.0	100.0	0.0
			CP	0.0	8.3	0.0	0.0	0.0
			P	0.0	16.7	0.0	0.0	0.0
		ISOBUTANOL	R	0.0	0.0	0.0	100.0	0.0
		METHYL IODIDE	C	0.0	0.0	0.0	100.0	0.0
		METHYLENE CHLORIDE	ACP	0.0	100.0	0.0	0.0	0.0
			C	0.0	0.0	0.0	100.0	0.0
		PROPIONITRILE	R	0.0	0.0	0.0	100.0	0.0

1 The Appendix H text explains how to interpret this table.

Analytical Fraction Codes:
EXP = Explosives
M = Metals, total
MISC = Miscellaneous parameters
SVOC = Semivolatile organic compounds
VOC = Volatile organic compounds

Data Qualifiers:
BU = Associated blank was contaminated and result was classified as non-detect
J = Result is estimated
U = Analyte was not detected at the indicated detection limit
UJ = Analyte was not detected at the indicated detection limit and result is estimated
UR = Result is not usable and was reported as not detected

Codes indicating reasons for data qualifications:
A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
R = Surrogates Recovery Noncompliance

TABLE H-13
SURFACE WATR DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

				Validation Qualifier			
Round	Fraction	Parameter	Code	J	U	UJ	UR
1	EXP	1,3,5-TRINITROBENZENE	R	0.0	0.0	100.0	0.0
		1,3-DINITROBENZENE	R	0.0	0.0	100.0	0.0
		2,4,6-TRINITROTOLUENE	R	0.0	0.0	100.0	0.0
		2,4-DIAMINO-6-NITROTOLUENE	R	0.0	0.0	100.0	0.0
			U	100.0	0.0	0.0	0.0
		2,4-DINITROTOLUENE	P	100.0	0.0	0.0	0.0
			R	0.0	0.0	100.0	0.0
		2,6-DIAMINO-4-NITROTOLUENE	R	0.0	0.0	100.0	0.0
		2,6-DINITROTOLUENE	PU	100.0	0.0	0.0	0.0
			R	0.0	0.0	100.0	0.0
		2-AMINO-4,6-DINITROTOLUENE	PU	25.0	0.0	0.0	0.0
			QU	25.0	0.0	0.0	0.0
			R	0.0	0.0	100.0	0.0
			U	50.0	0.0	0.0	0.0
		2-NITROTOLUENE	R	0.0	0.0	100.0	0.0
		3,5-DINITROANILINE	R	0.0	0.0	100.0	0.0
		3-NITROTOLUENE	QU	100.0	0.0	0.0	0.0
			R	0.0	0.0	100.0	0.0
		4,4'-TN-AZOXY	R	0.0	0.0	100.0	0.0
		4-AMINO-2,6-DINITROTOLUENE	P	100.0	0.0	0.0	0.0
			R	0.0	0.0	100.0	0.0
		4-NITROTOLUENE	R	0.0	0.0	100.0	0.0
		DNX	R	0.0	0.0	100.0	0.0
			U	100.0	0.0	0.0	0.0
		HMX	RU	100.0	0.0	0.0	0.0
		MNX	P	50.0	0.0	0.0	0.0
			PU	25.0	0.0	0.0	0.0
			R	0.0	0.0	100.0	0.0
			U	25.0	0.0	0.0	0.0
		NITROBENZENE	R	0.0	0.0	100.0	0.0
		RDX	P	80.0	0.0	0.0	0.0
			R	20.0	0.0	0.0	0.0
		TETRYL	R	0.0	0.0	100.0	0.0
		TNX	R	0.0	0.0	100.0	0.0
	M	ALUMINUM	A	16.7	100.0	0.0	0.0
			AF	33.3	0.0	0.0	0.0
			AFGI	37.5	0.0	0.0	0.0
			P	12.5	0.0	0.0	0.0
		ANTIMONY	A	0.0	100.0	0.0	0.0
		ARSENIC	A	33.3	100.0	0.0	0.0
			AP	55.6	0.0	0.0	0.0
			P	11.1	0.0	0.0	0.0
		BARIUM	A	84.4	0.0	0.0	0.0
			AI	15.6	0.0	0.0	0.0
		BERYLLIUM	A	0.0	100.0	0.0	0.0
			ACP	11.1	0.0	0.0	0.0
			P	88.9	0.0	0.0	0.0
		CADMIUM	A	33.3	100.0	0.0	0.0
			AP	11.1	0.0	0.0	0.0
			P	55.6	0.0	0.0	0.0
		CALCIUM	A	100.0	0.0	0.0	0.0
		CHROMIUM	A	100.0	100.0	0.0	0.0
		COBALT	A	22.2	100.0	0.0	0.0
			AP	11.1	0.0	0.0	0.0
			IP	27.8	0.0	0.0	0.0
			P	38.9	0.0	0.0	0.0

TABLE H-13
SURFACE WATR DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		COPPER	A	56.0	100.0	0.0	0.0
			AI	28.0	0.0	0.0	0.0
			AIP	4.0	0.0	0.0	0.0
			AP	12.0	0.0	0.0	0.0
		IRON	A	59.4	0.0	0.0	0.0
			AI	40.6	0.0	0.0	0.0
		LEAD	A	40.0	100.0	0.0	0.0
			AI	10.0	0.0	0.0	0.0
			AP	10.0	0.0	0.0	0.0
			P	40.0	0.0	0.0	0.0
		MAGNESIUM	A	33.3	0.0	0.0	0.0
			AI	66.7	0.0	0.0	0.0
		MANGANESE	A	36.4	0.0	0.0	0.0
			AK	9.1	0.0	0.0	0.0
			IK	22.7	0.0	0.0	0.0
			K	31.8	0.0	0.0	0.0
		NICKEL	AI	31.3	0.0	0.0	0.0
			AK	28.1	0.0	0.0	0.0
			IK	15.6	0.0	0.0	0.0
			K	25.0	0.0	0.0	0.0
		POTASSIUM	A	68.8	0.0	0.0	0.0
			AI	31.3	0.0	0.0	0.0
		SELENIUM	A	66.7	100.0	0.0	0.0
			AP	33.3	0.0	0.0	0.0
		SILVER	A	0.0	100.0	0.0	0.0
		SODIUM	A	65.5	100.0	0.0	0.0
			AI	34.5	0.0	0.0	0.0
		THALLIUM	AP	46.2	0.0	0.0	0.0
			P	53.8	0.0	0.0	0.0
		TIN	A	0.0	100.0	0.0	0.0
		VANADIUM	AP	20.0	0.0	0.0	0.0
			P	80.0	0.0	0.0	0.0
		ZINC	A	12.5	100.0	0.0	0.0
			AIK	12.5	0.0	0.0	0.0
			AK	12.5	0.0	0.0	0.0
			AKP	6.3	0.0	0.0	0.0
			E	6.3	0.0	0.0	0.0
			EK	25.0	0.0	0.0	0.0
			EKP	25.0	0.0	0.0	0.0
	MF	ALUMINUM	A	28.6	100.0	0.0	0.0
			AF	14.3	0.0	0.0	0.0
			P	57.1	0.0	0.0	0.0
		ANTIMONY	A	0.0	100.0	0.0	0.0
		ARSENIC	A	35.3	100.0	0.0	0.0
			AP	23.5	0.0	0.0	0.0
			P	41.2	0.0	0.0	0.0
		BARIUM	AD	15.6	0.0	0.0	0.0
			AI	59.4	0.0	0.0	0.0
			D	25.0	0.0	0.0	0.0
		BERYLLIUM	A	0.0	100.0	0.0	0.0
			P	100.0	0.0	0.0	0.0
		CADMIUM	A	0.0	100.0	0.0	0.0
			P	100.0	0.0	0.0	0.0
		CALCIUM	A	47.4	0.0	0.0	0.0
			AD	5.3	0.0	0.0	0.0
			AI	47.4	0.0	0.0	0.0
		CHROMIUM	A	0.0	100.0	0.0	0.0
		COBALT	A	12.5	100.0	0.0	0.0
			IP	20.8	0.0	0.0	0.0
			P	66.7	0.0	0.0	0.0

TABLE H-13
SURFACE WATR DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		COPPER	A	34.8	100.0	0.0	0.0
			AI	39.1	0.0	0.0	0.0
			AIP	21.7	0.0	0.0	0.0
			AP	4.3	0.0	0.0	0.0
		IRON	A	68.8	0.0	0.0	0.0
			AI	31.3	0.0	0.0	0.0
		LEAD	A	0.0	100.0	0.0	0.0
			AIP	23.8	0.0	0.0	0.0
			DP	38.1	0.0	0.0	0.0
			P	38.1	0.0	0.0	0.0
		MAGNESIUM	AI	46.9	0.0	0.0	0.0
			D	25.0	0.0	0.0	0.0
			I	28.1	0.0	0.0	0.0
		MANGANESE	A	0.0	100.0	0.0	0.0
			ADFGI	30.0	0.0	0.0	0.0
			IK	5.0	0.0	0.0	0.0
			IKP	20.0	0.0	0.0	0.0
			K	15.0	0.0	0.0	0.0
			KP	25.0	0.0	0.0	0.0
			P	5.0	0.0	0.0	0.0
		NICKEL	A	26.7	100.0	0.0	0.0
			AK	30.0	0.0	0.0	0.0
			K	43.3	0.0	0.0	0.0
		POTASSIUM	A	40.6	0.0	0.0	0.0
			AI	59.4	0.0	0.0	0.0
		SELENIUM	A	50.0	100.0	0.0	0.0
			AP	50.0	0.0	0.0	0.0
		SILVER	A	0.0	100.0	0.0	0.0
		SODIUM	A	20.7	100.0	0.0	0.0
			AI	79.3	0.0	0.0	0.0
		THALLIUM	AP	55.6	0.0	0.0	0.0
			D	0.0	0.0	0.0	100.0
			P	44.4	0.0	0.0	0.0
		TIN	A	0.0	100.0	0.0	0.0
			AKP	100.0	0.0	0.0	0.0
		ZINC	A	0.0	100.0	0.0	0.0
			AFK	18.2	0.0	0.0	0.0
			EK	18.2	0.0	0.0	0.0
			EKP	63.6	0.0	0.0	0.0
	MISC	AMMONIA-N	G	100.0	0.0	100.0	0.0
		NITRITE/NITRATE-N	P	100.0	0.0	0.0	0.0
	SVOC	3,3'-DICHLOROBENZIDINE	D	0.0	0.0	100.0	0.0
		4-NITROQUINOLINE-1-OXIDE	C	0.0	0.0	0.0	100.0
		A,A-DIMETHYLPHENETHYLAMINE	C	0.0	0.0	100.0	0.0
		HEXACHLOROCYCLOPENTADIENE	C	0.0	0.0	100.0	0.0
		KEPONE	C	0.0	0.0	100.0	100.0
		N-NITROSOMORPHOLINE	C	0.0	0.0	100.0	0.0
		PYRIDINE	C	0.0	0.0	100.0	0.0

TABLE H-13
SURFACE WATR DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

2	EXP	1,3,5-TRINITROBENZENE	U	100.0	0.0	0.0	0.0
		2,4-DIAMINO-6-NITROTOLUENE	U	100.0	0.0	0.0	0.0
		2,4-DINITROTOLUENE	P	100.0	0.0	0.0	0.0
		2,6-DIAMINO-4-NITROTOLUENE	PU	100.0	0.0	0.0	0.0
		2-AMINO-4,6-DINITROTOLUENE	PU	33.3	0.0	0.0	0.0
			U	66.7	0.0	0.0	0.0
		4-AMINO-2,6-DINITROTOLUENE	G	16.7	0.0	0.0	0.0
			GP	16.7	0.0	0.0	0.0
			P	66.7	0.0	0.0	0.0
		HMX	G	40.0	0.0	0.0	0.0
			P	40.0	0.0	0.0	0.0
			PU	20.0	0.0	0.0	0.0
		MNX	G	0.0	0.0	100.0	0.0
			GU	33.3	0.0	0.0	0.0
			PU	33.3	0.0	0.0	0.0
			U	33.3	0.0	0.0	0.0
		RDX	G	66.7	0.0	0.0	0.0
			P	33.3	0.0	0.0	0.0
	HERB	PENTACHLOROPHENOL	E	0.0	0.0	100.0	0.0
	M	ALUMINUM	A	100.0	100.0	0.0	0.0
		ANTIMONY	A	0.0	100.0	0.0	0.0
		ARSENIC	A	20.0	100.0	0.0	0.0
			AP	50.0	0.0	0.0	0.0
			P	30.0	0.0	0.0	0.0
		BARIUM	A	100.0	100.0	0.0	0.0
		BERYLLIUM	CP	50.0	0.0	0.0	0.0
			P	50.0	0.0	0.0	0.0
		CADMIUM	A	20.0	100.0	0.0	0.0
			AP	10.0	0.0	0.0	0.0
			P	70.0	0.0	0.0	0.0
		CALCIUM	A	58.1	0.0	0.0	0.0
			AG	3.2	0.0	0.0	0.0
			D	35.5	0.0	0.0	0.0
			DG	3.2	0.0	0.0	0.0
		CHROMIUM	A	100.0	100.0	0.0	0.0
		COBALT	AI	16.0	0.0	0.0	0.0
			AIP	60.0	0.0	0.0	0.0
			G	8.0	0.0	0.0	0.0
			P	16.0	0.0	0.0	0.0
		COPPER	A	50.0	100.0	0.0	0.0
			AP	50.0	0.0	0.0	0.0
		IRON	A	32.3	0.0	0.0	0.0
			AG	6.5	0.0	0.0	0.0
			AI	61.3	0.0	0.0	0.0
		LEAD	A	9.5	100.0	0.0	0.0
			AP	61.9	0.0	0.0	0.0
			G	9.5	0.0	0.0	0.0
			P	19.0	0.0	0.0	0.0
		MAGNESIUM	AI	100.0	0.0	0.0	0.0
		MANGANESE	AI	59.1	0.0	0.0	0.0
			AIP	22.7	0.0	0.0	0.0
			API	4.5	0.0	0.0	0.0
			G	9.1	0.0	0.0	0.0
			P	4.5	0.0	0.0	0.0
		MERCURY	P	100.0	0.0	0.0	0.0
		NICKEL	AIK	57.1	0.0	0.0	0.0
			AIKP	3.6	0.0	0.0	0.0

TABLE H-13
SURFACE WATR DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

			K	39.3	0.0	100.0	0.0
		POTASSIUM	AGI	6.7	0.0	0.0	0.0
			AI	93.3	0.0	0.0	0.0
			I	0.0	0.0	100.0	0.0
		SELENIUM	A	100.0	100.0	0.0	0.0
		SILVER	A	100.0	100.0	0.0	0.0
		SODIUM	A	38.7	0.0	0.0	0.0
			AI	61.3	0.0	0.0	0.0
		THALLIUM	AP	62.5	0.0	0.0	0.0
			P	37.5	0.0	0.0	0.0
		TIN	A	0.0	100.0	0.0	0.0
			AKP	100.0	0.0	0.0	0.0
		VANADIUM	A	20.0	0.0	0.0	0.0
			AP	40.0	0.0	0.0	0.0
			P	40.0	0.0	0.0	0.0
		ZINC	A	0.0	100.0	0.0	0.0
			AI	6.3	0.0	0.0	0.0
			AIK	25.0	0.0	0.0	0.0
			AIKP	18.8	0.0	0.0	0.0
			K	25.0	0.0	100.0	0.0
			KP	25.0	0.0	0.0	0.0
	MF	ALUMINUM	P	100.0	0.0	0.0	0.0
		ANTIMONY	A	0.0	100.0	0.0	0.0
			K	0.0	0.0	100.0	0.0
		ARSENIC	A	11.1	100.0	0.0	0.0
			AP	11.1	0.0	0.0	0.0
			P	77.8	0.0	0.0	0.0
		BARIUM	A	100.0	0.0	0.0	0.0
		BERYLLIUM	A	0.0	100.0	0.0	0.0
			AP	33.3	0.0	0.0	0.0
			CP	66.7	0.0	0.0	0.0
		CADMIUM	A	0.0	100.0	0.0	0.0
			P	100.0	0.0	0.0	0.0
		CALCIUM	A	61.3	0.0	0.0	0.0
			AD	38.7	0.0	0.0	0.0
		CHROMIUM	A	76.9	100.0	0.0	0.0
			AP	23.1	0.0	0.0	0.0
		COBALT	A	0.0	100.0	0.0	0.0
			AI	19.0	0.0	0.0	0.0
			AIP	42.9	0.0	0.0	0.0
			P	38.1	0.0	0.0	0.0
		COPPER	A	26.7	100.0	0.0	0.0
			AP	73.3	0.0	0.0	0.0
		IRON	AF	29.0	0.0	0.0	0.0
			AFG	9.7	0.0	0.0	0.0
			AG	61.3	0.0	0.0	0.0
		LEAD	A	0.0	100.0	0.0	0.0
			AP	60.0	0.0	0.0	0.0
			P	40.0	0.0	0.0	0.0
		MAGNESIUM	A	100.0	0.0	0.0	0.0
		MANGANESE	A	44.4	0.0	0.0	0.0
			AP	38.9	0.0	0.0	0.0
			G	11.1	0.0	0.0	0.0
			P	5.6	0.0	0.0	0.0
		MERCURY	P	100.0	0.0	0.0	0.0

TABLE H-13
SURFACE WATR DATA QUALIFICATION RATES, ROUNDS 1 AND 2 [1]
SWMU 12
NSWC CRANE
CRANE, INDIANA

		NICKEL	A	5.3	0.0	0.0	0.0
			AK	94.7	0.0	0.0	0.0
		POTASSIUM	A	61.3	0.0	0.0	0.0
			AI	38.7	0.0	0.0	0.0
		SELENIUM	A	0.0	100.0	0.0	0.0
			AP	100.0	0.0	0.0	0.0
		SILVER	A	0.0	100.0	0.0	0.0
			P	100.0	0.0	0.0	0.0
		SODIUM	A	61.3	0.0	0.0	0.0
			AI	38.7	0.0	0.0	0.0
		THALLIUM	A	0.0	100.0	0.0	0.0
		TIN	A	0.0	100.0	0.0	0.0
			AKP	50.0	0.0	0.0	0.0
			P	50.0	0.0	0.0	0.0
		VANADIUM	P	100.0	0.0	0.0	0.0
		ZINC	G	7.1	0.0	0.0	0.0
			I	7.1	0.0	0.0	0.0
			IK	3.6	0.0	0.0	0.0
			IKP	57.1	0.0	0.0	0.0
			P	25.0	0.0	0.0	0.0
	MISC	NITRITE/NITRATE-N	D	83.3	0.0	100.0	0.0
			DG	8.3	0.0	0.0	0.0
			G	8.3	0.0	0.0	0.0
	SVOC	1,4-NAPHTHOQUINONE	C	0.0	0.0	100.0	0.0
		ACENAPHTHENE	E	0.0	0.0	100.0	0.0
		HEXACHLOROCYCLOPENTADIENE	E	0.0	0.0	100.0	0.0
		KEPONE	C	0.0	0.0	0.0	100.0
		METHAPYRILENE	C	0.0	0.0	100.0	0.0

1 The Appendix H text explains how to interpret this table.

Analytical Fraction Codes:
EXP = Explosives
HERB = Herbicides
M = Metals, total
MF = Metals, dissolved
MISC = Miscellaneous parameters
SVOC = Semivolatile organic compounds

Data Qualifiers:
J = Result is estimated
U = Analyte was not detected at the indicated detection limit
UJ = Analyte was not detected at the indicated detection limit and result is estimated
UR = Result is not usable and was reported as not detected

Codes indicating reasons for data qualifications:
A = Lab Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
I = ICP Serial Dilution Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography, interferences, etc.)
R = Surrogates Recovery Noncompliance
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC

APPENDIX I

SWMU 12
HUMAN HEALTH RISK ASSESSMENT CALCULATIONS

AND

APPENDIX J

SWMU 12
SUPPORTING DOCUMENTATION FOR THE ECOLOGICAL RISK ASSESSMENT

TABLE 4.80
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Adult

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 6.98E-04
Noncancer Ingestion Intake(RME) = 2.04E-03

Cancer Ingestion Intake(CTE) = 1.02E-04
Noncancer Ingestion Intake(CTE) = 1.02E-03

Cancer Dermal Intake(RME) = 1.26E+01
Noncancer Dermal Intake(RME) = 3.66E+01

Cancer Dermal Intake(CTE) = 1.83E+00
Noncancer Dermal Intake(CTE) = 1.83E+01

TABLE 4.92a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Maximum	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 3.12
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Gully Surface water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	ug/L	3	7	79		ug/L	24	99% UCL-C	ProUCL (1)	24	99% UCL-C	ProUCL (1)
2-Amino-4,6-dinitrotoluene	ug/L	1	2	19	J	ug/L	7	99% UCL-C	ProUCL (1)	7	99% UCL-C	ProUCL (1)
4-Amino-2,6-dinitrotoluene	ug/L	4	7	74		ug/L	23	99% UCL-C	ProUCL (1)	23	99% UCL-C	ProUCL (1)
Rdx	ug/L	15	23	140		ug/L	25	Gamma	ProUCL (1)	25	Gamma	ProUCL (1)
Aluminum	ug/L	3490	6470	67700		ug/L	7570	95% UCL-CL	ProUCL (1)	7570	95% UCL-CL	ProUCL (1)
Arsenic	ug/L	2.6	3.7	20.3		ug/L	5.3	H-UCL	ProUCL (2)	5.3	H-UCL	ProUCL (2)
Barium	ug/L	92.9	123	589	J	ug/L	273	99% UCL-C	ProUCL (1)	273	99% UCL-C	ProUCL (1)
Beryllium	ug/L	0.23	0.46	5.2		ug/L	1.6	99% UCL-C	ProUCL (1)	1.6	99% UCL-C	ProUCL (1)
Cadmium	ug/L	1.7	3.6	43.7	J	ug/L	2.6	95% UCL-CL	ProUCL (1)	2.6	95% UCL-CL	ProUCL (1)
Chromium	ug/L	4.9	9.4	105	J	ug/L	8	95% UCL-CL	ProUCL (1)	8	95% UCL-CL	ProUCL (1)
Cobalt	ug/L	5.9	11.2	123		ug/L	7.8	H-UCL	ProUCL (2)	7.8	H-UCL	ProUCL (2)
Copper	ug/L	48.5	120	1650	J	ug/L	468	99% UCL-C	ProUCL (1)	468	99% UCL-C	ProUCL (1)
Iron	ug/L	5230	9400	95400	J	ug/L	7260	H-UCL	ProUCL (2)	7260	H-UCL	ProUCL (2)
Lead	ug/L	15	34.7	458		ug/L	15	Average	(3)	15	Average	(3)
Manganese	ug/L	1130	2210	24200	J	ug/L	3620	97.5% UCL-C	ProUCL (1)	3620	97.5% UCL-C	ProUCL (1)
Mercury	ug/L	0.067	0.14	1.7		ug/L	0.26	95% UCL-CNP	ProUCL (1)	0.26	95% UCL-CNP	ProUCL (1)
Nickel	ug/L	9.1	15	140	J	ug/L	24.4	95% UCL-CNP	ProUCL (1)	24.4	95% UCL-CNP	ProUCL (1)
Thallium	ug/L	0.081	0.11	0.67	J	ug/L	0.16	95% UCL-C	ProUCL (1)	0.16	95% UCL-C	ProUCL (1)
Vanadium	ug/L	7.7	13.7	138		ug/L	43.4	99% UCL-C	ProUCL (1)	43.4	99% UCL-C	ProUCL (1)
Zinc	ug/L	158	383	5220		ug/L	1480	99% UCL-C	ProUCL (1)	1480	99% UCL-C	ProUCL (1)
Nitrite/Nitrate-N	mg/L	0.99	1.5	8.2		mg/L	3.8	99% UCL-C	ProUCL (1)	3.8	99% UCL-C	ProUCL (1)

Definitions:
95 % UCL-CL = 95% Chebyshev (MVUE) UCL (lognormal).
95 % UCL-CNP = 95% Chebyshev (Mean, Std)) UCL (non-parametric).
97.5 % UCL-C = 97.5% Chebyshev (MVUE) UCL (lognormal).
99 % UCL-C = 99% Chebyshev (Mean, Std) UCL (non-parametric).
Gamma = Adjusted Gamma 95% UCL.

Footnotes:
1 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.
2 - ProUCL indicates data are lognormally distributed.
3 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).

2,4,6-TRINITROTOLUENE	3.0767436	6.62	23.9603965
2-AMINO-4,6-DINITROTOLUENE	1.3388205	2.32	7.11609522
4-AMINO-2,6-DINITROTOLUENE	3.6546667	7.02	23.4949684
RDX	15.269077	22.68	25.3792464
ALUMINUM	3491.2859	6470.99	7572.41204
ARSENIC	2.5776923	3.66	5.33283481
BARIUM	92.915	123.38	272.685611
BERYLLIUM	0.2314103	0.46	1.55504007
CADMIUM	1.6714744	3.55	2.55908315
CHROMIUM	4.8974359	9.41	8.03271389
COBALT	5.8679487	11.19	7.77708171
COPPER	48.475897	119.55	467.950307
IRON	5229.2564	9402.57	7261.38381
LEAD	14.98391	34.72	14.9839103
MANGANESE	1125.259	2208.21	3620.32264
MERCURY	0.0665385	0.14	0.25535759
NICKEL	9.0512821	14.98	24.3766245
THALLIUM	0.0809103	0.11	0.16056061
VANADIUM	7.654359	13.72	43.4342538
ZINC	158.14744	382.92	1484.65195
NITRITE/NITRATE-N	0.9906154	1.46	3.75678099

3 - FOD - Less than 50 percent positive detections. Maximum concentration is used as the EPC.
4 - ProUCL indicates data are log-normally distributed.

TABLE 3.13
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - EAST TRIBUTARY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: East Tributary Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
RDX	ug/L	0.5	NA	0.8		ug/L	0.8	Maximum	N < 10 (1)	0.8	Maximum	N < 10 (1)
Arsenic	ug/L	0.14	NA	0.33	J	ug/L	0.33	Maximum	N < 10	0.33	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 8.96 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.96 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.3E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.8E-03
	(total)												**1.8E-03**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.8E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	3.0E-03
	(total)												**3.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADOLESCENT TRESPASSERS - REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.96
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.84 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-02	$(mg/kg-day)^{-1}$	3.7E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.6E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.3E-06	mg/kg-day	1.10E-01	$(mg/kg-day)^{-1}$	1.4E-07
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.9E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.8E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	4.1E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	8.3E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.4E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	4.1E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.4E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.8E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.8E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.9E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	8.3E-09	mg/kg-day		$(mg/kg-day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.3E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.7E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.0E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	(total)										**5.9E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.5E-07	mg/kg-day	3.00E-02	$(mg/kg-day)^{-1}$	4.6E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	8.4E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.4E-08	mg/kg-day	1.10E-01	$(mg/kg-day)^{-1}$	6.0E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.6E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.8E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	2.7E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	9.3E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.5E-09	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.9E-09	mg/kg-day		$(mg/kg-day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	5.5E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.7E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.6E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.5E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	5.1E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.9E-10	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.5E-10	mg/kg-day		$(mg/kg-day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.5E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	(total)										**3.8E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.3E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.84 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	8.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.6E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.3E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.2E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	7.6E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.8E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	8.3E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.8E-03
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.5E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.5E-03
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.8E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.9E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	9.0E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	4.5E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.7E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.6E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.7E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.7E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.8E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.6E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.3E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.6E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	3.9E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	8.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	5.0E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.2E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	5.0E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.6E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.9E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	8.1E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.0E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.6E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.4E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.4E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.6E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.3E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	7.9E-04
	(total)												**1.2E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	9.7E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.9E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.6E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	8.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	5.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.7E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.5E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.6E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.8E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.9E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	4.2E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.5E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.5E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.7E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	2.3E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.5E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	4.6E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.7E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	8.5E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.0E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.5E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.6E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.3E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.3E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.9E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	8.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.7E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.7E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.3E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.5E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	5.0E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	9.4E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.6E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.9E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.4E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	8.3E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	5.2E-05
	(total)												**1.3E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.5E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
ADOLESCENT TRESPASSERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.84
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.90 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	4.2E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.6E-08
	(total)										**3.0E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.7E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.1E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	(total)										**1.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.2E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.90 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.7E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.8E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.1E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-04
	(total)												**4.5E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	7.2E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.4E-05
	(total)												**2.8E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
ADOLESCENT TRESPASSERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.90
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.96a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.96a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.5E-04
	(total)												**4.5E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.7E-07	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-04
	(total)												**7.0E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADOLESCENT TRESPASSERS - CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.96a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.84a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.1E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	9.4E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.6E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	6.9E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	6.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.1E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	8.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.8E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.3E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.4E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.84a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.8E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.9E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.5E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.1E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.9E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.3E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.3E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.4E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.5E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.3E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	1.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.6E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.2E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.3E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.5E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.9E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	9.7E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	6.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.0E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.2E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.2E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.0E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.0E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.6E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.6E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.1E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	2.0E-04
	(total)												**2.9E-02**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.5E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.2E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.6E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	8.5E-05
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.8E-05
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.9E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.9E-05
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.1E-05
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.4E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.0E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	8.2E-09	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	5.9E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.3E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	5.3E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	8.2E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.1E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	4.0E-08	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.0E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.4E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	6.0E-05
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.7E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.2E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.7E-08	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.9E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.9E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.3E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	6.4E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.5E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	3.1E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	8.2E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.2E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	8.6E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.6E-06	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.0E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.2E-05
	(total)												**3.2E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.0E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
ADOLESCENT TRESPASSERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.84a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.90a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.3E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.4E-09
	(total)										**7.6E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	5.8E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.4E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.0E-10
	(total)										**4.6E-10**
										Total Risk Across All Exposure Routes/Pathways	**8.1E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.90a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.1E-05
	(total)												**1.1E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.7E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.7E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.6E-06
	(total)												**6.9E-06**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
ADOLESCENT TRESPASSERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.90a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 9.10. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	4.E-06		7.E-07	5.E-06	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.9E-06		7.5E-07	4.69E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		5.E-08	2.E-07	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	5.E-07		6.E-08	6.E-07	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					2.2E-06		4.0E-07	2.58E-06
							Total Risk Across Gully Sediment										
							Total Risk Across Gully Surface Water										
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					East Tributary Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					1.9E-06		3.6E-07	2.26E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-08		2.E-09	2.E-08	Rdx	Prostate					East Tributary SW			
			Arsenic	9.E-08		2.E-08	1.E-07	Arsenic	Skin, CVS								
							Total Risk Across East Tributary Sediment							1.1E-07		2.0E-08	1.31E-07
							Total Risk Across East Tributary Surface Water										
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS								
			Arsenic	5.E-06		9.E-07	6.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					Turkey Creek Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					4.8E-06		9.2E-07	5.77E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS					Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment				
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Antimony					Antimony	Blood	3.E-03			3.E-03				
			Arsenic	3.E-06		5.E-07	3.E-06	Arsenic	Skin, CVS	7.E-02		1.E-02	8.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-03	1.E-02				
			Iron					Iron	NA	3.E-01			3.E-01	Gully Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	5.0E-01		1.3E-02	5.15E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	2.8E-06		4.6E-07	3.22E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		1.E-08	1.E-07	2,4,6-Trinitrotoluene	Liver	9.E-02		1.E-02	1.E-01				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-03		5.E-04	7.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-02		2.E-03	2.E-02				
			Rdx	4.E-07		2.E-08	5.E-07	Rdx	Prostate	2.E-02		7.E-04	2.E-02				
			Aluminum					Aluminum	CNS	1.E-02		9.E-04	2.E-02				
			Arsenic	1.E-06		9.E-08	1.E-06	Arsenic	Skin, CVS	3.E-02		2.E-03	4.E-02				
			Barium					Barium	Kidney	3.E-03		2.E-03	5.E-03				
			Beryllium					Beryllium	Gastrointestinal	2.E-03		1.E-02	2.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-02	2.E-02				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-03		3.E-02	3.E-02				
			Cobalt					Cobalt	NA	7.E-04		5.E-05	8.E-04				
			Copper					Copper	Gastrointestinal	2.E-02		1.E-03	2.E-02				
			Iron					Iron	NA	5.E-02		3.E-03	5.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-01		5.E-01	8.E-01				
			Mercury					Mercury	CNS	2.E-03		2.E-03	3.E-03				
			Nickel					Nickel	Body Weight	2.E-03		8.E-04	3.E-03				
			Thallium					Thallium	Liver	4.E-03		3.E-04	5.E-03				
			Vanadium					Vanadium	Kidney	8.E-02		2.E-01	3.E-01	Gully SW			
			Zinc					Zinc	Blood	9.E-03		4.E-04	1.E-02	6.6E-01		7.E-01	1.43E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-03		3.E-04	5.E-03	1.9E-06		1.2E-07	1.98E-06
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Arsenic	1.E-06		2.E-07	2.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	4.E-02				
			Iron					Iron	NA	2.E-01			2.E-01	East Tributary Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	3.5E-01		5.8E-03	3.54E-01
			Vanadium					Vanadium	Kidney	3.E-02			3.E-02	1.3E-06		2.2E-07	1.55E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-08		6.E-10	1.E-08	Rdx	Prostate	5.E-04		2.E-05	5.E-04	East Tributary SW			
			Arsenic	8.E-08		5.E-09	9.E-08	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03	2.6E-03		1.6E-04	2.76E-03
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	9.5E-08		5.9E-09	1.01E-07
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-02			1.E-02				
			Arsenic	3.E-06		6.E-07	4.E-06	Arsenic	Skin, CVS	9.E-02		1.E-02	1.E-01				
			Iron					Iron	NA	5.E-01			5.E-01	Turkey Creek Sed			
			Manganese					Manganese	CNS	2.E-02			2.E-02	6.7E-01		1.5E-02	6.89E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	3.4E-06		5.7E-07	3.97E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-02		2.E-02	3.E-02	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	1.0E-02		1.7E-02	2.75E-02
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.4E-01	Total CNS HI =	8.E-01
Total Kidney HI =	8.8E-02	Total Fetotoxicity HI =	3.E-02
Total CVS HI =	1.2E-01	Total Prostate HI =	2.E-02
Total GI Tract HI =	7.1E-02	Total Bone HI =	3.E-02
Total Skin HI =	1.2E-01	Total Blood HI =	2.E-02
Total Body Weight HI =	3.1E-03		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	3.E-02	Total CNS HI =	6.E-02
Total CVS HI =	4.E-02	Total Prostate HI =	5.E-04
Total Skin HI =	4.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	5.E-02	Total CNS HI =	6.E-02
Total CVS HI =	1.E-01	Total Skin HI =	1.E-01

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Antimony					Antimony	Blood	3.E-04			3.E-04				
			Arsenic	1.E-06		3.E-07	1.E-06	Arsenic	Skin, CVS	8.E-03		2.E-03	1.E-02				
			Cadmium					Cadmium	Kidney	1.E-03		2.E-04	1.E-03				
			Iron					Iron	NA	3.E-02			3.E-02	Gully Sed			
			Manganese					Manganese	CNS	4.E-03			4.E-03	5.4E-02		2.0E-03	5.58E-02
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	1.2E-06		2.8E-07	1.47E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	2.E-08		3.E-08	5.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		7.E-03	1.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-04	6.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	9.E-04		9.E-04	2.E-03				
			Rdx	8.E-08		4.E-08	1.E-07	Rdx	Prostate	7.E-04		4.E-04	1.E-03				
			Aluminum					Aluminum	CNS	6.E-04		6.E-04	1.E-03				
			Arsenic	2.E-07		2.E-07	4.E-07	Arsenic	Skin, CVS	1.E-03		1.E-03	3.E-03				
			Barium					Barium	Kidney	1.E-04		1.E-03	2.E-03				
			Beryllium					Beryllium	Gastrointestinal	7.E-05		8.E-03	9.E-03				
			Cadmium					Cadmium	Kidney	4.E-04		8.E-03	8.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-04		2.E-02	2.E-02				
			Cobalt					Cobalt	NA	3.E-05		3.E-05	6.E-05				
			Copper					Copper	Gastrointestinal	1.E-03		9.E-04	2.E-03				
			Iron					Iron	NA	2.E-03		2.E-03	4.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	1.E-02		3.E-01	3.E-01				
			Mercury					Mercury	CNS	7.E-05		9.E-04	1.E-03				
			Nickel					Nickel	Body Weight	1.E-04		5.E-04	5.E-04				
			Thallium					Thallium	Liver	2.E-04		2.E-04	4.E-04				
			Vanadium					Vanadium	Kidney	4.E-03		1.E-01	1.E-01	Gully SW			
			Zinc					Zinc	Blood	4.E-04		2.E-04	6.E-04	2.8E-02		4.5E-01	4.78E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-04		2.E-04	4.E-04	3.2E-07		2.8E-07	5.98E-07
							Total Risk Across Gully Sediment 1.E-06						Total Hazard Index Across Gully Sediment 6.E-02				
							Total Risk Across Gully Surface Water 6.E-07						Total Hazard Index Across Gully Surface water 5.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	6.E-07		1.E-07	7.E-07	Arsenic	Skin, CVS	4.E-03		9.E-04	5.E-03				
			Iron					Iron	NA	2.E-02			2.E-02	East Tributary Sed			
			Manganese					Manganese	CNS	4.E-03			4.E-03	3.7E-02		8.9E-04	3.82E-02
			Vanadium					Vanadium	Kidney	4.E-03			4.E-03	5.7E-07		1.4E-07	7.07E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-09		1.E-09	4.E-09	Rdx	Prostate	2.E-05		1.E-05	3.E-05	East Tributary SW			
			Arsenic	1.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	9.E-05		8.E-05	2.E-04	1.1E-04		9.4E-05	2.05E-04
							Total Risk Across East Tributary Sediment 7.E-07						Total Hazard Index Across East Tributary Sediment 4.E-02	1.6E-08		1.4E-08	3.02E-08
							Total Risk Across East Tributary Surface Water 3.E-08						Total Hazard Index Across East Tributary Surface water 2.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-03			1.E-03				
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	9.E-03		2.E-03	1.E-02				
			Iron					Iron	NA	5.E-02			5.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	3.E-03			3.E-03	7.2E-02		2.3E-03	7.45E-02
			Vanadium					Vanadium	Kidney	6.E-03			6.E-03	1.5E-06		3.5E-07	1.80E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	4.E-04		1.E-02	1.E-02	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment 2.E-06						Total Hazard Index Across Turkey Creek Sediment 7.E-02	4.4E-04		1.0E-02	1.05E-02
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water 1.E-02				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.3E-02	Total CNS HI =	3.E-01
Total Kidney HI =	1.6E-02	Total Fetotoxicity HI =	2.E-02
Total CVS HI =	1.2E-02	Total Prostate HI =	1.E-03
Total GI Tract HI =	2.6E-02	Total Bone HI =	2.E-02
Total Skin HI =	1.2E-02	Total Blood HI =	1.E-03
Total Body Weight HI =	5.5E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	4.E-03	Total CNS HI =	6.E-03
Total CVS HI =	5.E-03	Total Prostate HI =	3.E-05
Total Skin HI =	5.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	6.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Skin HI =	1.E-02

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	4.E-06		1.E-06	5.E-06	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.9E-06		1.0E-06	4.94E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		5.E-08	2.E-07	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	5.E-07		6.E-08	6.E-07	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					2.2E-06		4.0E-07	2.58E-06
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		5.E-07	2.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					East Tributary Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					1.9E-06		4.8E-07	2.38E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-08		2.E-09	2.E-08	Rdx	Prostate					East Tributary SW			
			Arsenic	9.E-08		2.E-08	1.E-07	Arsenic	Skin, CVS								
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	1.1E-07		2.0E-08	1.31E-07
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS								
			Arsenic	5.E-06		1.E-06	6.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					Turkey Creek Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					4.8E-06		1.2E-06	6.08E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS					Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment				
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Antimony					Antimony	Blood	3.E-03			3.E-03				
			Arsenic	3.E-06		5.E-07	3.E-06	Arsenic	Skin, CVS	7.E-02		1.E-02	9.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-03	1.E-02				
			Iron					Iron	NA	3.E-01			3.E-01	Gully Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	5.0E-01		1.6E-02	5.18E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	2.8E-06		5.5E-07	3.31E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		1.E-08	1.E-07	2,4,6-Trinitrotoluene	Liver	9.E-02		1.E-02	1.E-01				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-03		5.E-04	7.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-02		2.E-03	2.E-02				
			Rdx	4.E-07		2.E-08	5.E-07	Rdx	Prostate	2.E-02		7.E-04	2.E-02				
			Aluminum					Aluminum	CNS	1.E-02		9.E-04	2.E-02				
			Arsenic	1.E-06		9.E-08	1.E-06	Arsenic	Skin, CVS	3.E-02		2.E-03	4.E-02				
			Barium					Barium	Kidney	3.E-03		2.E-03	5.E-03				
			Beryllium					Beryllium	Gastrointestinal	2.E-03		1.E-02	2.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-02	2.E-02				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-03		3.E-02	3.E-02				
			Cobalt					Cobalt	NA	7.E-04		5.E-05	8.E-04				
			Copper					Copper	Gastrointestinal	2.E-02		1.E-03	2.E-02				
			Iron					Iron	NA	5.E-02		3.E-03	5.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-01		5.E-01	8.E-01				
			Mercury					Mercury	CNS	2.E-03		2.E-03	3.E-03				
			Nickel					Nickel	Body Weight	2.E-03		8.E-04	3.E-03				
			Thallium					Thallium	Liver	4.E-03		3.E-04	5.E-03				
			Vanadium					Vanadium	Kidney	8.E-02		2.E-01	3.E-01	Gully SW			
			Zinc					Zinc	Blood	9.E-03		4.E-04	1.E-02	6.6E-01		7.E-01	1.43E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-03		3.E-04	5.E-03	1.9E-06		1.2E-07	1.98E-06
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment	5.E-01			
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water	1.E+00			
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	3.E-02		7.E-03	4.E-02				
			Iron					Iron	NA	2.E-01			2.E-01	East Tributary Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	3.5E-01		6.8E-03	3.55E-01
			Vanadium					Vanadium	Kidney	3.E-02			3.E-02	1.3E-06		2.6E-07	1.59E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-08		6.E-10	1.E-08	Rdx	Prostate	5.E-04		2.E-05	5.E-04	East Tributary SW			
			Arsenic	8.E-08		5.E-09	9.E-08	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03	2.6E-03		1.6E-04	2.76E-03
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	4.E-01	9.5E-08	5.9E-09	1.01E-07
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water	3.E-03			
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-02			1.E-02				
			Arsenic	3.E-06		7.E-07	4.E-06	Arsenic	Skin, CVS	9.E-02		2.E-02	1.E-01				
			Iron					Iron	NA	5.E-01			5.E-01	Turkey Creek Sed			
			Manganese					Manganese	CNS	2.E-02			2.E-02	6.7E-01		1.7E-02	6.92E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	3.4E-06		6.7E-07	4.07E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-02		2.E-02	3.E-02	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	7.E-01	1.0E-02	1.7E-02	2.75E-02
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water	3.E-02			
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.4E-01	Total CNS HI =	8.E-01
Total Kidney HI =	8.8E-02	Total Fetotoxicity HI =	3.E-02
Total CVS HI =	1.2E-01	Total Prostate HI =	2.E-02
Total GI Tract HI =	7.1E-02	Total Bone HI =	3.E-02
Total Skin HI =	1.2E-01	Total Blood HI =	2.E-02
Total Body Weight HI =	3.1E-03		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	3.E-02	Total CNS HI =	6.E-02
Total CVS HI =	4.E-02	Total Prostate HI =	5.E-04
Total Skin HI =	4.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	5.E-02	Total CNS HI =	6.E-02
Total CVS HI =	1.E-01	Total Skin HI =	1.E-01

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Antimony					Antimony	Blood	3.E-04			3.E-04				
			Arsenic	1.E-06		5.E-07	2.E-06	Arsenic	Skin, CVS	8.E-03		3.E-03	1.E-02				
			Cadmium					Cadmium	Kidney	1.E-03		3.E-04	2.E-03				
			Iron					Iron	NA	3.E-02			3.E-02	**Gully Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**5.4E-02**		**3.2E-03**	**5.70E-02**
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	**1.2E-06**		**4.5E-07**	**1.63E-06**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	2.E-08		3.E-08	5.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		7.E-03	1.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-04	6.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	9.E-04		9.E-04	2.E-03				
			Rdx	8.E-08		4.E-08	1.E-07	Rdx	Prostate	7.E-04		4.E-04	1.E-03				
			Aluminum					Aluminum	CNS	6.E-04		6.E-04	1.E-03				
			Arsenic	2.E-07		2.E-07	4.E-07	Arsenic	Skin, CVS	1.E-03		1.E-03	3.E-03				
			Barium					Barium	Kidney	1.E-04		1.E-03	2.E-03				
			Beryllium					Beryllium	Gastrointestinal	7.E-05		8.E-03	9.E-03				
			Cadmium					Cadmium	Kidney	4.E-04		8.E-03	8.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-04		2.E-02	2.E-02				
			Cobalt					Cobalt	NA	3.E-05		3.E-05	6.E-05				
			Copper					Copper	Gastrointestinal	1.E-03		9.E-04	2.E-03				
			Iron					Iron	NA	2.E-03		2.E-03	4.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	1.E-02		3.E-01	3.E-01				
			Mercury					Mercury	CNS	7.E-05		9.E-04	1.E-03				
			Nickel					Nickel	Body Weight	1.E-04		5.E-04	5.E-04				
			Thallium					Thallium	Liver	2.E-04		2.E-04	4.E-04				
			Vanadium					Vanadium	Kidney	4.E-03		1.E-01	1.E-01	**Gully SW**			
			Zinc					Zinc	Blood	4.E-04		2.E-04	6.E-04	**2.8E-02**		**4.5E-01**	**4.78E-01**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-04		2.E-04	4.E-04	**3.2E-07**		**2.8E-07**	**5.98E-07**
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment	6.E-02			
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water	5.E-01			
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	6.E-07		2.E-07	8.E-07	Arsenic	Skin, CVS	4.E-03		1.E-03	5.E-03				
			Iron					Iron	NA	2.E-02			2.E-02	**East Tributary Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**3.7E-02**		**1.4E-03**	**3.87E-02**
			Vanadium					Vanadium	Kidney	4.E-03			4.E-03	**5.7E-07**		**2.2E-07**	**7.88E-07**
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-09		1.E-09	4.E-09	Rdx	Prostate	2.E-05		1.E-05	3.E-05	**East Tributary SW**			
			Arsenic	1.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	9.E-05		8.E-05	2.E-04	**1.1E-04**		**9.4E-05**	**2.05E-04**
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	4.E-02	**1.6E-08**	**1.4E-08**	**3.02E-08**
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water	2.E-04			
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-03			1.E-03				
			Arsenic	1.E-06		6.E-07	2.E-06	Arsenic	Skin, CVS	9.E-03		4.E-03	1.E-02				
			Iron					Iron	NA	5.E-02			5.E-02	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	3.E-03			3.E-03	**7.2E-02**		**3.6E-03**	**7.59E-02**
			Vanadium					Vanadium	Kidney	6.E-03			6.E-03	**1.5E-06**		**5.5E-07**	**2.01E-06**
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	4.E-04		1.E-02	1.E-02	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	8.E-02	**4.4E-04**	**1.0E-02**	**1.05E-02**
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water	1.E-02			
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.3E-02	Total CNS HI =	3.E-01
Total Kidney HI =	1.6E-02	Total Fetotoxicity HI =	2.E-02
Total CVS HI =	1.3E-02	Total Prostate HI =	1.E-03
Total GI Tract HI =	2.6E-02	Total Bone HI =	2.E-02
Total Skin HI =	1.3E-02	Total Blood HI =	1.E-03
Total Body Weight HI =	5.5E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	4.E-03	Total CNS HI =	6.E-03
Total CVS HI =	5.E-03	Total Prostate HI =	3.E-05
Total Skin HI =	5.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	6.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Skin HI =	1.E-02

TABLE 9.4. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADOLESCENT TRESPASSERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Antimony					Antimony	Blood	5.E-04			5.E-04				
			Arsenic	9.E-07		2.E-07	1.E-06	Arsenic	Skin, CVS	1.E-02		2.E-03	1.E-02				
			Cadmium					Cadmium	Kidney	2.E-03		3.E-04	2.E-03				
			Iron					Iron	NA	5.E-02			5.E-02	Gully Sed			
			Manganese					Manganese	CNS	7.E-03			7.E-03	8.8E-02		2.7E-03	9.03E-02
			Vanadium					Vanadium	Kidney	8.E-03			8.E-03	8.8E-07		1.7E-07	1.06E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	4.E-08		5.E-09	4.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		2.E-03	2.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-03		8.E-05	1.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-03		3.E-04	4.E-03				
			Rdx	1.E-07		6.E-09	1.E-07	Rdx	Prostate	3.E-03		1.E-04	3.E-03				
			Aluminum					Aluminum	CNS	3.E-03		2.E-04	3.E-03				
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	6.E-03		4.E-04	6.E-03				
			Barium					Barium	Kidney	5.E-04		4.E-04	9.E-04				
			Beryllium					Beryllium	Gastrointestinal	3.E-04		2.E-03	3.E-03				
			Cadmium					Cadmium	Kidney	2.E-03		2.E-03	4.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	9.E-04		5.E-03	6.E-03				
			Cobalt					Cobalt	NA	1.E-04		8.E-06	1.E-04				
			Copper					Copper	Gastrointestinal	4.E-03		3.E-04	4.E-03				
			Iron					Iron	NA	8.E-03		5.E-04	9.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	5.E-02		8.E-02	1.E-01				
			Mercury					Mercury	CNS	3.E-04		3.E-04	6.E-04				
			Nickel					Nickel	Body Weight	4.E-04		1.E-04	5.E-04				
			Thallium					Thallium	Liver	8.E-04		5.E-05	8.E-04				
			Vanadium					Vanadium	Kidney	1.E-02		4.E-02	5.E-02	Gully SW			
			Zinc					Zinc	Blood	2.E-03		6.E-05	2.E-03	1.2E-01		1.3E-01	2.48E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	8.E-04		5.E-05	8.E-04	5.9E-07		3.8E-08	6.32E-07
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	9.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	2.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Arsenic	4.E-07		8.E-08	5.E-07	Arsenic	Skin, CVS	6.E-03		1.E-03	7.E-03				
			Iron					Iron	NA	4.E-02			4.E-02	East Tributary Sed			
			Manganese					Manganese	CNS	7.E-03			7.E-03	6.1E-02		1.2E-03	6.19E-02
			Vanadium					Vanadium	Kidney	6.E-03			6.E-03	4.3E-07		8.4E-08	5.09E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	5.E-09		2.E-10	5.E-09	Rdx	Prostate	9.E-05		4.E-06	9.E-05	East Tributary SW			
			Arsenic	3.E-08		2.E-09	3.E-08	Arsenic	Skin, CVS	4.E-04		2.E-05	4.E-04	4.5E-04		2.8E-05	4.80E-04
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	6.E-02	3.0E-08		1.9E-09	3.22E-08
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	5.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	2.E-02		3.E-03	2.E-02				
			Iron					Iron	NA	9.E-02			9.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	4.E-03			4.E-03	1.2E-01		3.0E-03	1.21E-01
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	1.1E-06		2.1E-07	1.30E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	2.E-03		3.E-03	5.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	1.E-01	1.8E-03		3.0E-03	4.77E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	5.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	2.4E-02	Total CNS HI =	1.E-01
Total Kidney HI =	1.5E-02	Total Fetotoxicity HI =	6.E-03
Total CVS HI =	2.1E-02	Total Prostate HI =	3.E-03
Total GI Tract HI =	1.2E-02	Total Bone HI =	6.E-03
Total Skin HI =	2.1E-02	Total Blood HI =	3.E-03
Total Body Weight HI =	5.4E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	6.E-03	Total CNS HI =	1.E-02
Total CVS HI =	8.E-03	Total Prostate HI =	9.E-05
Total Skin HI =	8.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-02	Total CNS HI =	1.E-02
Total CVS HI =	2.E-02	Total Skin HI =	2.E-02

TABLE 9.2. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Antimony					Antimony	Blood	3.E-04			3.E-04				
			Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	7.E-03		1.E-03	8.E-03				
			Cadmium					Cadmium	Kidney	1.E-03		1.E-04	1.E-03				
			Iron					Iron	NA	3.E-02			3.E-02	**Gully Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**5.0E-02**		**1.5E-03**	**5.12E-02**
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	**1.1E-06**		**2.3E-07**	**1.36E-06**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene			4.E-09	4.E-09	2,4,6-Trinitrotoluene	Liver			8.E-04	8.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver			3.E-05	3.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver			1.E-04	1.E-04				
			Rdx			5.E-09	5.E-09	Rdx	Prostate			5.E-05	5.E-05				
			Aluminum					Aluminum	CNS			5.E-05	5.E-05				
			Arsenic			2.E-08	2.E-08	Arsenic	Skin, CVS			1.E-04	1.E-04				
			Barium					Barium	Kidney			1.E-04	1.E-04				
			Beryllium					Beryllium	Gastrointestinal			7.E-04	7.E-04				
			Cadmium					Cadmium	Kidney			6.E-04	6.E-04				
			Chromium					Chromium	Fetotoxicity/GS/Bone			1.E-03	1.E-03				
			Cobalt					Cobalt	NA			2.E-06	2.E-06				
			Copper					Copper	Gastrointestinal			7.E-05	7.E-05				
			Iron					Iron	NA			2.E-04	2.E-04				
			Lead					Lead	NA								
			Manganese					Manganese	CNS			2.E-02	2.E-02				
			Mercury					Mercury	CNS			8.E-05	8.E-05				
			Nickel					Nickel	Body Weight			4.E-05	4.E-05				
			Thallium					Thallium	Liver			1.E-05	1.E-05				
			Vanadium					Vanadium	Kidney			1.E-02	1.E-02	**Gully SW**			
			Zinc					Zinc	Blood			2.E-05	2.E-05			**3.8E-02**	**3.80E-02**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			1.E-05	1.E-05			**2.7E-08**	**2.73E-08**
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	5.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	4.E-02				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	5.E-07		1.E-07	7.E-07	Arsenic	Skin, CVS	3.E-03		7.E-04	4.E-03				
			Iron					Iron	NA	2.E-02			2.E-02	**East Tributary Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**3.4E-02**		**6.8E-04**	**3.51E-02**
			Vanadium					Vanadium	Kidney	3.E-03			3.E-03	**5.5E-07**		**1.1E-07**	**6.57E-07**
Surface Water	Surface Water	East Tributary Surface Water	RDX			2.E-10	2.E-10	RDX	Prostate			2.E-06	2.E-06	**East Tributary SW**			
			ARSENIC			2.E-09	2.E-09	ARSENIC	Skin, CVS			1.E-05	1.E-05			**1.6E-05**	**1.57E-05**
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	4.E-02			**2.4E-09**	**2.44E-09**
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	2.E-05				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-03			1.E-03				
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	9.E-03		2.E-03	1.E-02				
			Iron					Iron	NA	5.E-02			5.E-02	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	2.E-03			2.E-03	**6.7E-02**		**1.7E-03**	**6.84E-02**
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	**1.4E-06**		**2.8E-07**	**1.68E-06**
Surface Water	Surface Water	Turkey Creek	MANGANESE					MANGANESE	CNS			2.E-03	2.E-03	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	7.E-02			**1.7E-03**	**1.69E-03**
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	2.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	9.3E-04	Total CNS HI =	3.E-02
Total Kidney HI =	6.7E-03	Total Fetotoxicity HI =	1.E-03
Total CVS HI =	8.6E-03	Total Prostate HI =	5.E-05
Total GI Tract HI =	2.1E-03	Total Bone HI =	1.E-03
Total Skin HI =	8.6E-03	Total Blood HI =	3.E-04
Total Body Weight HI =	3.8E-05		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	3.E-03	Total CNS HI =	6.E-03
Total CVS HI =	4.E-03	Total Prostate HI =	2.E-06
Total Skin HI =	4.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	5.E-03	Total CNS HI =	5.E-03
Total CVS HI =	1.E-02	Total Skin HI =	1.E-02

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	3.E-07		2.E-08	3.E-07	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.2E-07		2.1E-08	3.38E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		5.E-09	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	4.E-08		7.E-09	5.E-08	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	1.E-07		2.E-08	1.E-07	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					1.8E-07		3.4E-08	2.12E-07
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	9.E-04		6.E-05	1.E-03				
			Iron					Iron	NA	6.E-03			6.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	9.3E-03		6.3E-05	9.39E-03
			Vanadium					Vanadium	Kidney	9.E-04			9.E-04	1.5E-07		1.0E-08	1.63E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		2.E-10	2.E-09	Rdx	Prostate	5.E-06		4.E-06	1.E-05	East Tributary SW			
			Arsenic	8.E-09		1.E-09	9.E-09	Arsenic	Skin, CVS	2.E-05		2.E-05	4.E-05	2.8E-05		2.5E-05	5.25E-05
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	9.E-03	9.1E-09	1.6E-09	1.07E-08
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water	5.E-05			
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	3.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-04			6.E-04	1.8E-02		1.6E-04	1.82E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	3.9E-07		2.6E-08	4.15E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-04		3.E-03	3.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	2.E-02	1.1E-04	2.5E-03	2.63E-03
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water	3.E-03			
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Antimony					Antimony	Blood	7.E-04			7.E-04				
			Arsenic	2.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	2.E-02				
			Cadmium					Cadmium	Kidney	3.E-03		1.E-04	3.E-03				
			Iron					Iron	NA	8.E-02			8.E-02	Gully Sed			
			Manganese					Manganese	CNS	1.E-02			1.E-02	1.3E-01		1.3E-03	1.27E-01
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	2.3E-07		1.5E-08	2.45E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		4.E-03	3.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		2.E-04	2.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	5.E-03		5.E-04	6.E-03				
			Rdx	4.E-08		2.E-09	4.E-08	Rdx	Prostate	4.E-03		2.E-04	4.E-03				
			Aluminum					Aluminum	CNS	4.E-03		2.E-04	4.E-03				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	8.E-03		6.E-04	9.E-03				
			Barium					Barium	Kidney	6.E-04		6.E-04	1.E-03				
			Beryllium					Beryllium	Gastrointestinal	4.E-04		4.E-03	4.E-03				
			Cadmium					Cadmium	Kidney	2.E-03		3.E-03	6.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-03		7.E-03	8.E-03				
			Cobalt					Cobalt	NA	2.E-04		1.E-05	2.E-04				
			Copper					Copper	Gastrointestinal	6.E-03		4.E-04	6.E-03				
			Iron					Iron	NA	1.E-02		8.E-04	1.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	7.E-02		1.E-01	2.E-01				
			Mercury					Mercury	CNS	4.E-04		4.E-04	8.E-04				
			Nickel					Nickel	Body Weight	6.E-04		2.E-04	8.E-04				
			Thallium					Thallium	Liver	1.E-03		7.E-05	1.E-03				
			Vanadium					Vanadium	Kidney	2.E-02		5.E-02	7.E-02	Gully SW			
			Zinc					Zinc	Blood	2.E-03		9.E-05	2.E-03	1.7E-01		1.9E-01	3.58E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-03		7.E-05	1.E-03	1.5E-07		1.1E-08	1.66E-07
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-01				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	4.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	9.E-03		6.E-04	9.E-03				
			Iron					Iron	NA	6.E-02			6.E-02	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-02			1.E-02	8.7E-02		5.8E-04	8.77E-02
			Vanadium					Vanadium	Kidney	9.E-03			9.E-03	1.1E-07		7.5E-09	1.18E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		7.E-11	1.E-09	Rdx	Prostate	1.E-04		8.E-06	1.E-04	East Tributary SW			
			Arsenic	7.E-09		4.E-10	7.E-09	Arsenic	Skin, CVS	5.E-04		3.E-05	6.E-04	6.5E-04		4.2E-05	6.91E-04
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	9.E-02	7.9E-09		5.1E-10	8.42E-09
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	7.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Arsenic	3.E-07		2.E-08	3.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	2.E-02				
			Iron					Iron	NA	1.E-01			1.E-01	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-03			6.E-03	1.7E-01		1.5E-03	1.70E-01
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	2.8E-07		1.9E-08	3.02E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	3.E-03		4.E-03	7.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	2.E-01	2.6E-03		4.3E-03	6.87E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	7.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	3.6E-02	Total CNS HI =	2.E-01
Total Kidney HI =	2.2E-02	Total Fetotoxicity HI =	8.E-03
Total CVS HI =	2.8E-02	Total Prostate HI =	4.E-03
Total GI Tract HI =	1.8E-02	Total Bone HI =	8.E-03
Total Skin HI =	2.8E-02	Total Blood HI =	4.E-03
Total Body Weight HI =	7.7E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Prostate HI =	1.E-04
Total Skin HI =	1.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	2.E-02	Total Skin HI =	2.E-02

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	5.E-04			5.E-04				
			Antimony					Antimony	Blood	8.E-05			8.E-05				
			Arsenic	9.E-08		6.E-09	9.E-08	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03				
			Cadmium					Cadmium	Kidney	3.E-04		1.E-05	3.E-04				
			Iron					Iron	NA	8.E-03			8.E-03	Gully Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	1.3E-02		1.4E-04	1.36E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	8.6E-08		5.9E-09	9.21E-08
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-09		4.E-09	5.E-09	2,4,6-Trinitrotoluene	Liver	1.E-03		2.E-03	3.E-03				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		9.E-05	2.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		3.E-04	5.E-04				
			Rdx	6.E-09		5.E-09	1.E-08	Rdx	Prostate	2.E-04		1.E-04	3.E-04				
			Aluminum					Aluminum	CNS	2.E-04		1.E-04	3.E-04				
			Arsenic	2.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	4.E-04		3.E-04	7.E-04				
			Barium					Barium	Kidney	3.E-05		4.E-04	4.E-04				
			Beryllium					Beryllium	Gastrointestinal	2.E-05		2.E-03	2.E-03				
			Cadmium					Cadmium	Kidney	1.E-04		2.E-03	2.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-05		4.E-03	4.E-03				
			Cobalt					Cobalt	NA	8.E-06		7.E-06	2.E-05				
			Copper					Copper	Gastrointestinal	2.E-04		2.E-04	5.E-04				
			Iron					Iron	NA	5.E-04		4.E-04	9.E-04				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-03		7.E-02	7.E-02				
			Mercury					Mercury	CNS	2.E-05		2.E-04	2.E-04				
			Nickel					Nickel	Body Weight	2.E-05		1.E-04	1.E-04				
			Thallium					Thallium	Liver	5.E-05		4.E-05	9.E-05				
			Vanadium					Vanadium	Kidney	9.E-04		3.E-02	3.E-02	Gully SW			
			Zinc					Zinc	Blood	1.E-04		5.E-05	2.E-04	7.1E-03		1.1E-01	1.20E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-05		4.E-05	9.E-05	2.3E-08		2.3E-08	4.60E-08
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	1.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	4.E-08		3.E-09	4.E-08	Arsenic	Skin, CVS	9.E-04		6.E-05	1.E-03				
			Iron					Iron	NA	6.E-03			6.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	9.3E-03		6.3E-05	9.39E-03
			Vanadium					Vanadium	Kidney	9.E-04			9.E-04	4.2E-08		2.8E-09	4.44E-08
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-10		1.E-10	3.E-10	Rdx	Prostate	5.E-06		4.E-06	1.E-05	East Tributary SW			
			Arsenic	1.E-09		9.E-10	2.E-09	Arsenic	Skin, CVS	2.E-05		2.E-05	4.E-05	2.8E-05		2.5E-05	5.25E-05
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	9.E-03	1.2E-09		1.1E-09	2.25E-09
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	5.E-05				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	3.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-04			6.E-04	1.8E-02		1.6E-04	1.82E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.1E-07		7.3E-09	1.13E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-04		3.E-03	3.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	2.E-02	1.1E-04		2.5E-03	2.63E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	3.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	4.1E-03	Total CNS HI =	7.E-02
Total Kidney HI =	4.0E-03	Total Fetotoxicity HI =	4.E-03
Total CVS HI =	2.7E-03	Total Prostate HI =	3.E-04
Total GI Tract HI =	6.6E-03	Total Bone HI =	4.E-03
Total Skin HI =	2.7E-03	Total Blood HI =	3.E-04
Total Body Weight HI =	1.4E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-04	Total CNS HI =	1.E-03
Total CVS HI =	1.E-03	Total Prostate HI =	1.E-05
Total Skin HI =	1.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	4.E-03
Total CVS HI =	3.E-03	Total Skin HI =	3.E-03

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	3.E-07		3.E-08	3.E-07	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.2E-07		2.8E-08	3.44E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		5.E-09	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	4.E-08		7.E-09	5.E-08	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	1.E-07		2.E-08	1.E-07	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					1.8E-07		3.4E-08	2.12E-07
							Total Risk Across Gully Sediment	3.E-07					Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water	2.E-07					Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS								
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS								
			Iron					Iron	NA					East Tributary Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					1.5E-07		1.3E-08	1.66E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		2.E-10	2.E-09	Rdx	Prostate					East Tributary SW			
			Arsenic	8.E-09		1.E-09	9.E-09	Arsenic	Skin, CVS								
							Total Risk Across East Tributary Sediment	2.E-07					Total Hazard Index Across East Tributary Sediment	9.1E-09		1.6E-09	1.07E-08
							Total Risk Across East Tributary Surface Water	1.E-08					Total Hazard Index Across East Tributary Surface water				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS								
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS								
			Iron					Iron	NA					Turkey Creek Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.9E-07		3.4E-08	4.23E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS					Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment	4.E-07					Total Hazard Index Across Turkey Creek Sediment				
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Antimony					Antimony	Blood	7.E-04			7.E-04				
			Arsenic	2.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	2.E-02				
			Cadmium					Cadmium	Kidney	3.E-03		1.E-04	3.E-03				
			Iron					Iron	NA	8.E-02			8.E-02	**Gully Sed**			
			Manganese					Manganese	CNS	1.E-02			1.E-02	**1.3E-01**		**1.6E-03**	**1.27E-01**
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	**2.3E-07**		**1.8E-08**	**2.48E-07**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		4.E-03	3.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		2.E-04	2.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	5.E-03		5.E-04	6.E-03				
			Rdx	4.E-08		2.E-09	4.E-08	Rdx	Prostate	4.E-03		2.E-04	4.E-03				
			Aluminum					Aluminum	CNS	4.E-03		2.E-04	4.E-03				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	8.E-03		6.E-04	9.E-03				
			Barium					Barium	Kidney	6.E-04		6.E-04	1.E-03				
			Beryllium					Beryllium	Gastrointestinal	4.E-04		4.E-03	4.E-03				
			Cadmium					Cadmium	Kidney	2.E-03		3.E-03	6.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-03		7.E-03	8.E-03				
			Cobalt					Cobalt	NA	2.E-04		1.E-05	2.E-04				
			Copper					Copper	Gastrointestinal	6.E-03		4.E-04	6.E-03				
			Iron					Iron	NA	1.E-02		8.E-04	1.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	7.E-02		1.E-01	2.E-01				
			Mercury					Mercury	CNS	4.E-04		4.E-04	8.E-04				
			Nickel					Nickel	Body Weight	6.E-04		2.E-04	8.E-04				
			Thallium					Thallium	Liver	1.E-03		7.E-05	1.E-03				
			Vanadium					Vanadium	Kidney	2.E-02		5.E-02	7.E-02	**Gully SW**			
			Zinc					Zinc	Blood	2.E-03		9.E-05	2.E-03	**1.7E-01**		**1.9E-01**	**3.58E-01**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-03		7.E-05	1.E-03	**1.5E-07**		**1.1E-08**	**1.66E-07**
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-01				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	4.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Arsenic	1.E-07		9.E-09	1.E-07	Arsenic	Skin, CVS	9.E-03		7.E-04	9.E-03				
			Iron					Iron	NA	6.E-02			6.E-02	**East Tributary Sed**			
			Manganese					Manganese	CNS	1.E-02			1.E-02	**8.7E-02**		**6.8E-04**	**8.78E-02**
			Vanadium					Vanadium	Kidney	9.E-03			9.E-03	**1.1E-07**		**8.8E-09**	**1.20E-07**
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		7.E-11	1.E-09	Rdx	Prostate	1.E-04		8.E-06	1.E-04	**East Tributary SW**			
			Arsenic	7.E-09		4.E-10	7.E-09	Arsenic	Skin, CVS	5.E-04		3.E-05	6.E-04	**6.5E-04**		**4.2E-05**	**6.91E-04**
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	9.E-02	**7.9E-09**		**5.1E-10**	**8.42E-09**
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	7.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Arsenic	3.E-07		2.E-08	3.E-07	Arsenic	Skin, CVS	2.E-02		2.E-03	2.E-02				
			Iron					Iron	NA	1.E-01			1.E-01	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	6.E-03			6.E-03	**1.7E-01**		**1.7E-03**	**1.70E-01**
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	**2.8E-07**		**2.2E-08**	**3.05E-07**
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	3.E-03		4.E-03	7.E-03	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	2.E-01	**2.6E-03**		**4.3E-03**	**6.87E-03**
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	7.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	3.6E-02	Total CNS HI =	2.E-01
Total Kidney HI =	2.2E-02	Total Fetotoxicity HI =	8.E-03
Total CVS HI =	2.8E-02	Total Prostate HI =	4.E-03
Total GI Tract HI =	1.8E-02	Total Bone HI =	8.E-03
Total Skin HI =	2.8E-02	Total Blood HI =	4.E-03
Total Body Weight HI =	7.7E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Prostate HI =	1.E-04
Total Skin HI =	1.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	2.E-02	Total Skin HI =	2.E-02

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	5.E-04			5.E-04				
			Antimony					Antimony	Blood	8.E-05			8.E-05				
			Arsenic	9.E-08		9.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	2.E-03				
			Cadmium					Cadmium	Kidney	3.E-04		2.E-05	3.E-04				
			Iron					Iron	NA	8.E-03			8.E-03	**Gully Sed**			
			Manganese					Manganese	CNS	1.E-03			1.E-03	**1.3E-02**		**2.3E-04**	**1.37E-02**
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	**8.6E-08**		**9.4E-09**	**9.56E-08**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-09		4.E-09	5.E-09	2,4,6-Trinitrotoluene	Liver	1.E-03		2.E-03	3.E-03				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		9.E-05	2.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		3.E-04	5.E-04				
			Rdx	6.E-09		5.E-09	1.E-08	Rdx	Prostate	2.E-04		1.E-04	3.E-04				
			Aluminum					Aluminum	CNS	2.E-04		1.E-04	3.E-04				
			Arsenic	2.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	4.E-04		3.E-04	7.E-04				
			Barium					Barium	Kidney	3.E-05		4.E-04	4.E-04				
			Beryllium					Beryllium	Gastrointestinal	2.E-05		2.E-03	2.E-03				
			Cadmium					Cadmium	Kidney	1.E-04		2.E-03	2.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-05		4.E-03	4.E-03				
			Cobalt					Cobalt	NA	8.E-06		7.E-06	2.E-05				
			Copper					Copper	Gastrointestinal	2.E-04		2.E-04	5.E-04				
			Iron					Iron	NA	5.E-04		4.E-04	9.E-04				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-03		7.E-02	7.E-02				
			Mercury					Mercury	CNS	2.E-05		2.E-04	2.E-04				
			Nickel					Nickel	Body Weight	2.E-05		1.E-04	1.E-04				
			Thallium					Thallium	Liver	5.E-05		4.E-05	9.E-05				
			Vanadium					Vanadium	Kidney	9.E-04		3.E-02	3.E-02	**Gully SW**			
			Zinc					Zinc	Blood	1.E-04		5.E-05	2.E-04	**7.1E-03**		**1.1E-01**	**1.20E-01**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-05		4.E-05	9.E-05	**2.3E-08**		**2.3E-08**	**4.60E-08**
							Total Risk Across Gully Sediment 1.E-07						Total Hazard Index Across Gully Sediment 1.E-02				
							Total Risk Across Gully Surface Water 5.E-08						Total Hazard Index Across Gully Surface water 1.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	4.E-08		5.E-09	5.E-08	Arsenic	Skin, CVS	9.E-04		1.E-04	1.E-03				
			Iron					Iron	NA	6.E-03			6.E-03	**East Tributary Sed**			
			Manganese					Manganese	CNS	1.E-03			1.E-03	**9.3E-03**		**1.0E-04**	**9.43E-03**
			Vanadium					Vanadium	Kidney	9.E-04			9.E-04	**4.2E-08**		**4.5E-09**	**4.61E-08**
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-10		1.E-10	3.E-10	Rdx	Prostate	5.E-06		4.E-06	1.E-05	**East Tributary SW**			
			Arsenic	1.E-09		9.E-10	2.E-09	Arsenic	Skin, CVS	2.E-05		2.E-05	4.E-05	**2.8E-05**		**2.5E-05**	**5.25E-05**
							Total Risk Across East Tributary Sediment 5.E-08						Total Hazard Index Across East Tributary Sediment 9.E-03	**1.2E-09**		**1.1E-09**	**2.25E-09**
							Total Risk Across East Tributary Surface Water 2.E-09						Total Hazard Index Across East Tributary Surface water 5.E-05				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	1.E-07		1.E-08	1.E-07	Arsenic	Skin, CVS	2.E-03		3.E-04	3.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	6.E-04			6.E-04	**1.8E-02**		**2.6E-04**	**1.83E-02**
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	**1.1E-07**		**1.2E-08**	**1.18E-07**
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-04		3.E-03	3.E-03	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment 1.E-07						Total Hazard Index Across Turkey Creek Sediment 2.E-02	**1.1E-04**		**2.5E-03**	**2.63E-03**
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water 3.E-03				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	4.1E-03	Total CNS HI =	7.E-02
Total Kidney HI =	4.0E-03	Total Fetotoxicity HI =	4.E-03
Total CVS HI =	2.8E-03	Total Prostate HI =	3.E-04
Total GI Tract HI =	6.6E-03	Total Bone HI =	4.E-03
Total Skin HI =	2.8E-03	Total Blood HI =	3.E-04
Total Body Weight HI =	1.4E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-04	Total CNS HI =	1.E-03
Total CVS HI =	1.E-03	Total Prostate HI =	1.E-05
Total Skin HI =	1.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	4.E-03
Total CVS HI =	3.E-03	Total Skin HI =	3.E-03

TABLE 9.4. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADOLESCENT TRESPASSERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Antimony					Antimony	Blood	6.E-05			6.E-05				
			Arsenic	1.E-07		2.E-08	1.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	2.E-03				
			Cadmium					Cadmium	Kidney	2.E-04		2.E-05	3.E-04				
			Iron					Iron	NA	7.E-03			7.E-03	Gully Sed			
			Manganese					Manganese	CNS	9.E-04			9.E-04	1.1E-02		2.6E-04	1.12E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.1E-07		1.6E-08	1.27E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	9.E-09		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		7.E-04	5.E-03				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-05	3.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-03		9.E-05	1.E-03				
			Rdx	4.E-08		2.E-09	4.E-08	Rdx	Prostate	7.E-04		4.E-05	7.E-04				
			Aluminum					Aluminum	CNS	6.E-04		4.E-05	7.E-04				
			Arsenic	1.E-07		6.E-09	1.E-07	Arsenic	Skin, CVS	1.E-03		9.E-05	2.E-03				
			Barium					Barium	Kidney	1.E-04		1.E-04	2.E-04				
			Beryllium					Beryllium	Gastrointestinal	7.E-05		6.E-04	7.E-04				
			Cadmium					Cadmium	Kidney	4.E-04		5.E-04	1.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-04		1.E-03	1.E-03				
			Cobalt					Cobalt	NA	3.E-05		2.E-06	3.E-05				
			Copper					Copper	Gastrointestinal	1.E-03		6.E-05	1.E-03				
			Iron					Iron	NA	2.E-03		1.E-04	2.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	1.E-02		2.E-02	3.E-02				
			Mercury					Mercury	CNS	7.E-05		6.E-05	1.E-04				
			Nickel					Nickel	Body Weight	1.E-04		3.E-05	1.E-04				
			Thallium					Thallium	Liver	2.E-04		1.E-05	2.E-04				
			Vanadium					Vanadium	Kidney	4.E-03		9.E-03	1.E-02	Gully SW			
			Zinc					Zinc	Blood	4.E-04		2.E-05	4.E-04	2.9E-02		3.2E-02	6.04E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-04		1.E-05	2.E-04	1.5E-07		9.E-09	1.59E-07
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	6.E-02				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	5.E-08		8.E-09	6.E-08	Arsenic	Skin, CVS	8.E-04		1.E-04	9.E-04				
			Iron					Iron	NA	5.E-03			5.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	9.E-04			9.E-04	7.6E-03		1.1E-04	7.71E-03
			Vanadium					Vanadium	Kidney	7.E-04			7.E-04	5.3E-08		7.9E-09	6.11E-08
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		6.E-11	1.E-09	Rdx	Prostate	2.E-05		1.E-06	2.E-05	East Tributary SW			
			Arsenic	6.E-09		4.E-10	7.E-09	Arsenic	Skin, CVS	9.E-05		6.E-06	1.E-04	1.1E-04		6.9E-06	1.20E-04
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	8.E-03	7.6E-09		4.6E-10	8.05E-09
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	1.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	2.E-04			2.E-04				
			Arsenic	1.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS	2.E-03		3.E-04	2.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	5.E-04			5.E-04	1.5E-02		2.9E-04	1.50E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.4E-07		2.0E-08	1.56E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	5.E-04		7.E-04	1.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	1.E-02	4.5E-04		7.0E-04	1.15E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	1.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	6.2E-03	Total CNS HI =	3.E-02
Total Kidney HI =	2.5E-03	Total Fetotoxicity HI =	1.E-03
Total CVS HI =	3.3E-03	Total Prostate HI =	7.E-04
Total GI Tract HI =	3.0E-03	Total Bone HI =	1.E-03
Total Skin HI =	3.3E-03	Total Blood HI =	7.E-04
Total Body Weight HI =	1.3E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	7.E-04	Total CNS HI =	1.E-03
Total CVS HI =	1.E-03	Total Prostate HI =	2.E-05
Total Skin HI =	1.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	2.E-03
Total CVS HI =	2.E-03	Total Skin HI =	2.E-03

TABLE 9.2. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Antimony					Antimony	Blood	7.E-05			7.E-05				
			Arsenic	1.E-07		4.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		7.E-05	2.E-03				
			Cadmium					Cadmium	Kidney	3.E-04		7.E-06	3.E-04				
			Iron					Iron	NA	8.E-03			8.E-03	Gully Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	1.2E-02		7.7E-05	1.25E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.0E-07		4.1E-09	1.06E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene			5.E-10	5.E-10	2,4,6-Trinitrotoluene	Liver			3.E-04	3.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver			1.E-05	1.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver			4.E-05	4.E-05				
			Rdx			7.E-10	7.E-10	Rdx	Prostate			2.E-05	2.E-05				
			Aluminum					Aluminum	CNS			1.E-05	1.E-05				
			Arsenic			2.E-09	2.E-09	Arsenic	Skin, CVS			3.E-05	3.E-05				
			Barium					Barium	Kidney			3.E-05	3.E-05				
			Beryllium					Beryllium	Gastrointestinal			2.E-04	2.E-04				
			Cadmium					Cadmium	Kidney			2.E-04	2.E-04				
			Chromium					Chromium	Fetotoxicity/GS/Bone			3.E-04	3.E-04				
			Cobalt					Cobalt	NA			6.E-07	6.E-07				
			Copper					Copper	Gastrointestinal			2.E-05	2.E-05				
			Iron					Iron	NA			4.E-05	4.E-05				
			Lead					Lead	NA								
			Manganese					Manganese	CNS			6.E-03	6.E-03				
			Mercury					Mercury	CNS			2.E-05	2.E-05				
			Nickel					Nickel	Body Weight			9.E-06	9.E-06				
			Thallium					Thallium	Liver			4.E-06	4.E-06				
			Vanadium					Vanadium	Kidney			3.E-03	3.E-03	Gully SW			
			Zinc					Zinc	Blood			5.E-06	5.E-06			9.6E-03	9.61E-03
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			4.E-06	4.E-06			2.8E-09	2.82E-09
							Total Risk Across Gully Sediment 1.E-07						Total Hazard Index Across Gully Sediment 1.E-02				
							Total Risk Across Gully Surface Water 3.E-09						Total Hazard Index Across Gully Surface water 1.E-02				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	5.E-08		2.E-09	5.E-08	Arsenic	Skin, CVS	9.E-04		3.E-05	9.E-04				
			Iron					Iron	NA	6.E-03			6.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	8.6E-03		3.4E-05	8.65E-03
			Vanadium					Vanadium	Kidney	8.E-04			8.E-04	4.9E-08		2.0E-09	5.13E-08
Surface Water	Surface Water	East Tributary Surface Water	RDX			3.E-11	3.E-11	RDX	Prostate			7.E-07	7.E-07	East Tributary SW			
			ARSENIC			2.E-10	2.E-10	ARSENIC	Skin, CVS			3.E-06	3.E-06			4.2E-06	4.15E-06
							Total Risk Across East Tributary Sediment 5.E-08						Total Hazard Index Across East Tributary Sediment 9.E-03			2.3E-10	2.29E-10
							Total Risk Across East Tributary Surface Water 2.E-10						Total Hazard Index Across East Tributary Surface water 4.E-06				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	1.E-07		5.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		9.E-05	2.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-04			6.E-04	1.7E-02		8.6E-05	1.68E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.3E-07		5.0E-09	1.31E-07
Surface Water	Surface Water	Turkey Creek	MANGANESE					MANGANESE	CNS			4.E-04	4.E-04	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment 1.E-07						Total Hazard Index Across Turkey Creek Sediment 2.E-02			4.2E-04	4.23E-04
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water 4.E-04				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	3.3E-04	Total CNS HI =	7.E-03
Total Kidney HI =	1.7E-03	Total Fetotoxicity HI =	3.E-04
Total CVS HI =	1.9E-03	Total Prostate HI =	2.E-05
Total GI Tract HI =	5.3E-04	Total Bone HI =	3.E-04
Total Skin HI =	1.9E-03	Total Blood HI =	8.E-05
Total Body Weight HI =	9.5E-06		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	8.E-04	Total CNS HI =	1.E-03
Total CVS HI =	9.E-04	Total Prostate HI =	7.E-07
Total Skin HI =	9.E-04		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	1.E-03
Total CVS HI =	2.E-03	Total Skin HI =	2.E-03

TABLE 8.95 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	5.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.95 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.6E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-03
	(total)												**1.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
MIANTENANCE WORKERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.95
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.83 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.4E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	7.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.5E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	6.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	8.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	9.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	8.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.7E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.83 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	7.9E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	6.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.1E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.0E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.4E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.6E-05
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	4.7E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	4.7E-05
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	3.3E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.1E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.7E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.2E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	9.9E-09	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	7.1E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.6E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	6.4E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	9.9E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.3E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	4.8E-08	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.4E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.9E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	7.3E-05
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	4.5E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	9.3E-08	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.2E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.3E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.6E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	7.7E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	3.8E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	9.9E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.4E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.7E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.0E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	5.5E-06	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.4E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.5E-05
	(total)												**3.8E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.8E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
MAINTENANCE WORKERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.83
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.89 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	(total)										**2.4E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.4E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.89 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.3E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.1E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-05
	(total)												**1.6E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
MIANTENANCE WORKERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.89
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.95a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

TABLE 7.95a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.1E-07	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.2E-04
	(total)												**4.2E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.2E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
MIANTENANCE WORKERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT ($MG/CM^2/EVENT$)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = $2FA \times Kp \times C \times CF \times (6T \times tevent/3.1416)^{0.5}$

IF tevent > t*, DAevent = $FA \times Kp \times C \times CF \times ((tevent/(1 + B)) + (2T \times ((1+3B+3B^2)/(1 + B)^2)))$

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.95a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.83a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.8E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	5.4E-10
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	9.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	6.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.0E-10
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.8E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.83a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.4E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.8E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.2E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	7.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.6E-05
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.9E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-05
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.2E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.2E-05
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	8.2E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.7E-05
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	4.2E-07	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	3.0E-05
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.5E-09	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.8E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.0E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.6E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.5E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.3E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.2E-08	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	6.0E-07
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	7.3E-07	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	1.8E-05
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.1E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.8E-05
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.3E-08	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	5.6E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	5.8E-03
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.0E-10	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.9E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	7.6E-09	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	9.5E-06
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.5E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	3.5E-06
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	6.7E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.6E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.4E-06	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-06
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	5.9E-06	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	3.7E-06
	(total)												**9.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.6E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
MAINTENANCE WORKERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	1.00E+00	1.96E+00		9.64E-04		5.59E-03	1	8.96E-08
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	1.00E+00	1.34E+00		6.41E-04		3.46E-03	1	1.43E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	1.00E+00	1.34E+00		6.41E-04		3.46E-03	1	4.71E-08
Rdx	2.50E-02		o		4.42E+00	1.00E+00	1.84E+00		3.39E-04		1.94E-03	1	3.18E-08
Aluminum	7.57E+00		i			1.00E+00			1.00E-03			1	7.57E-06
Arsenic	5.30E-03		i			1.00E+00			1.00E-03			1	5.30E-09
Barium	2.73E-01		i			1.00E+00			1.00E-03			1	2.73E-07
Beryllium	1.60E-03		i			1.00E+00			1.00E-03			1	1.60E-09
Cadmium	2.60E-03		i			1.00E+00			1.00E-03			1	2.60E-09
Chromium	8.00E-03		i			1.00E+00			2.00E-03			1	1.60E-08
Cobalt	7.80E-03		i			1.00E+00			1.00E-03			1	7.80E-09
Copper	4.68E-01		i			1.00E+00			1.00E-03			1	4.68E-07
Iron	7.26E+00		i			1.00E+00			1.00E-03			1	7.26E-06
Lead	1.50E-02		i			1.00E+00			1.00E-03			1	1.50E-08
Manganese	3.62E+00		i			1.00E+00			1.00E-03			1	3.62E-06
Mercury	2.60E-04		i			1.00E+00			1.00E-03			1	2.60E-10
Nickel	2.44E-02		i			1.00E+00			2.00E-04			1	4.88E-09
Thallium	1.60E-04		i			1.00E+00			1.00E-03			1	1.60E-10
Vanadium	4.34E-02		i			1.00E+00			1.00E-03			1	4.34E-08
Zinc	1.48E+00		i			1.00E+00			6.00E-04			1	8.88E-07
Nitrite/Nitrate-N	3.80E+00		i			1.00E+00			1.00E-03			1	3.80E-06

TABLE 4.83a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.89a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.9E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.2E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.3E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-10
	(total)										**2.3E-10**
										Total Risk Across All Exposure Routes/Pathways	**2.3E-10**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.89a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.4E-07
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.0E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-06
	(total)												**4.2E-06**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.2E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
MIANTENANCE WORKERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.89
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.99 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.99 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.5E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.6E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-02
	(total)												**1.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.7E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE CHILD RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.99
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.87 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.9E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	8.6E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	5.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	7.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	6.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.9E-06**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.8E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.7E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	8.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	5.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	8.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	7.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	4.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	9.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.87 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.6E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.3E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.6E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.4E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.2E-02
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.7E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-02
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.0E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-02
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.2E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.6E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.5E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.5E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.4E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.9E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-02
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.4E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-05	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.9E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.9E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.6E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.3E-03
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.3E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.4E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.2E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.5E-03
	(total)												**6.6E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.6E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	4.7E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.6E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	9.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	9.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.4E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	2.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.0E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.4E-02
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.3E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.3E-02
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.0E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.7E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	9.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.9E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	1.5E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.9E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.5E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.7E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.3E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	7.6E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.0E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.1E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.7E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	3.0E-04
	(total)												**7.6E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE CHILD RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.87
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.93 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	5.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.1E-08
	(total)										**9.5E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	5.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.0E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-09
	(total)										**5.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.93 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.5E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.1E-03
	(total)												**2.6E-03**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-04
	(total)												**1.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE CHILD RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.93
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.99a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.99a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.2E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.6E-03
	(total)												**2.6E-03**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.1E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.3E-03
	(total)												**4.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE CHILD RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.99a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.87a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	9.8E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.4E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	7.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	5.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.7E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.7E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.1E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	7.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	6.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	8.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.87a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.3E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.7E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.1E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.0E-03
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.6E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.6E-03
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.3E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	6.5E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	7.6E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.8E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.5E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	3.7E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.9E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.2E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	5.6E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.7E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.8E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	7.6E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.1E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.1E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.8E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.1E-03
	(total)												**1.7E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.2E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.2E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.7E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.5E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	8.6E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	6.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	3.6E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.1E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.3E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	5.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	6.7E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	3.7E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.6E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.7E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.1E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.2E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.1E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	3.9E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.5E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.9E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.3E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.2E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	7.4E-05
	(total)												**1.9E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.6E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE CHILD RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.87a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.93a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-09
	(total)										**7.9E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.0E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-10
	(total)										**5.1E-10**
										Total Risk Across All Exposure Routes/Pathways	**8.4E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.93a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.2E-04
	(total)												**6.5E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.5E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.0E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-05
	(total)												**4.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE CHILD RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.93a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04 Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(RME) = 1.90E-03 Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00 Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(RME) = 3.13E+01 Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.97 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.97 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.5E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.6E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-02
	(total)												**1.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.7E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
CHILD RECREATIONAL USERS - REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.97
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.85 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.9E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	8.6E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	5.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	7.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	6.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.9E-06**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.8E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.7E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	8.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	5.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	8.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	7.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	4.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	9.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.85 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.6E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.3E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.6E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.4E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.2E-02
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.7E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-02
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.0E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-02
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.2E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.6E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.5E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.5E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.4E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.9E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-02
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.4E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-05	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.9E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.9E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.6E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.3E-03
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.3E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.4E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.2E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.5E-03
	(total)												**6.6E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.6E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	4.7E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.6E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	9.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	9.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.4E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	2.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.0E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.4E-02
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.3E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.3E-02
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.0E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.7E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	9.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.9E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	1.5E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.9E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.5E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.7E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.3E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	7.6E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.0E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.1E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.7E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	3.0E-04
	(total)												**7.6E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
CHILD RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.85
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.91 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	5.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.1E-08
	(total)										**9.5E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	5.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.0E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-09
	(total)										**5.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.91 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.5E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.1E-03
	(total)												**2.6E-03**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-04
	(total)												**1.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
CHILD RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME]

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.91
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.97a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.97a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.2E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.6E-03
	(total)												**2.6E-03**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.1E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.3E-03
	(total)												**4.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
CHILD RECREATIONAL USERS - CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT ($MG/CM^2/EVENT$)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = $2FA \times Kp \times C \times CF \times (6T \times tevent/3.1416)^{0.5}$

IF tevent > t*, DAevent = $FA \times Kp \times C \times CF \times ((tevent/(1 + B)) + (2T \times ((1+3B+3B^2)/(1 + B)^2)))$

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.97a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.85a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	9.8E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.4E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	7.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	5.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.7E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.7E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.1E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	7.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	6.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	8.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.85a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.3E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.7E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.1E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.0E-03
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.6E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.6E-03
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.3E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	6.5E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	7.6E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.8E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.5E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	3.7E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.9E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.2E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	5.6E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.7E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.8E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	7.6E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.1E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.1E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.8E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.1E-03
	(total)												**1.7E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.2E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.2E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.7E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.5E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	8.6E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	6.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	3.6E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.1E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.3E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	5.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	6.7E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	3.7E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.6E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.7E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.1E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.2E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.1E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	3.9E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.5E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.9E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.3E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.2E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	7.4E-05
	(total)												**1.9E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.6E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
CHILD RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.85a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.91a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-09
	(total)										**7.9E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.0E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-10
	(total)										**5.1E-10**
										Total Risk Across All Exposure Routes/Pathways	**8.4E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.91a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.2E-04
	(total)												**6.5E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.5E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.0E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-05
	(total)												**4.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
CHILD RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.91a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.100 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.100 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.4E-04
	(total)												**4.4E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	9.7E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE ADULT RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.100
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.88 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	6.7E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.5E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	7.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	7.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	7.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.2E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.0E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.4E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.3E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	6.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	6.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	4.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	9.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	6.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	9.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.88 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.9E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.8E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.2E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.2E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	1.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.5E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.2E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	6.5E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.3E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.8E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	9.5E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.9E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.1E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.0E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	9.9E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.5E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.5E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.9E-04
	(total)												**2.8E-02**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.6E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.5E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.8E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.9E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	5.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.6E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	3.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.3E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.0E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.2E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	8.4E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.9E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	7.7E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.2E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.6E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	5.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	8.6E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.7E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.8E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.9E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	9.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.6E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	4.5E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.2E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.7E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.2E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	6.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.2E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.8E-04
	(total)												**4.5E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE ADULT RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.88
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.94 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	9.2E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	(total)										**1.6E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	8.4E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	(total)										**1.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.0E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.94 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.0E-05
	(total)												**1.1E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.4E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.1E-05
	(total)												**9.4E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE ADULT RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.94
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.100a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE ADULT RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.100a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.88a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.6E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.88a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.8E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	7.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.3E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-06	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.8E-05
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-08	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-05
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.9E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.4E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.9E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.1E-03
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.8E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.5E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.7E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.8E-04
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.8E-05
	(total)												**7.1E-03**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.4E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.3E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	3.6E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.1E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.9E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.2E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.5E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.3E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.1E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.5E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.4E-05
	(total)												**1.1E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE ADULT RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.88a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.94a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	(total)										**1.2E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	9.1E-10
	(total)										**1.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.2E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.94a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-05
	(total)												**2.8E-05**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.0E-05
	(total)												**2.5E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.3E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE ADULT RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.94a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.98 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.98 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.4E-04
	(total)												**4.4E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	9.7E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADULT RECREATIONAL USERS - REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.98
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.86 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	6.7E-07	mg/kg-day	3.00E-02	(mg/kg-day)$^{-1}$	2.0E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.0E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.4E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	1.10E-01	(mg/kg-day)$^{-1}$	7.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.1E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.5E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.2E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	7.6E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.5E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	7.3E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.3E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.0E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.0E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	7.3E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.8E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.5E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.2E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.1E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.1E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	(total)										**3.2E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-06	mg/kg-day	3.00E-02	(mg/kg-day)$^{-1}$	3.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.0E-07	mg/kg-day	1.10E-01	(mg/kg-day)$^{-1}$	4.4E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.9E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.3E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.0E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	6.9E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.1E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	6.6E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	4.1E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.0E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.2E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.8E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.8E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	9.2E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	6.6E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.1E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.1E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.2E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	9.6E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	(total)										**2.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.86 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.9E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.8E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.2E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.2E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	1.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.5E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.2E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	6.5E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.3E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.8E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	9.5E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.9E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.1E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.0E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	9.9E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.5E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.5E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.9E-04
	(total)												**2.8E-02**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.6E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.5E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.8E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.9E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	5.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.6E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	3.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.3E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.0E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.2E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	8.4E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.9E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	7.7E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.2E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.6E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	5.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	8.6E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.7E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.8E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.9E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	9.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.6E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	4.5E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.2E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.7E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.2E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	6.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.2E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.8E-04
	(total)												**4.5E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
ADULT RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.86
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.92 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	9.2E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	(total)										**1.6E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	8.4E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	(total)										**1.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.0E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.92 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.0E-05
	(total)												**1.1E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.4E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.1E-05
	(total)												**9.4E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
ADULT RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.92
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.98a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.98a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.7E-06	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.1E-04
	(total)												**1.1E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.4E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.5E-03
	(total)												**2.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.6E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADULT RECREATIONAL USERS - CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT ($MG/CM^2/EVENT$)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = $2FA \times Kp \times C \times CF \times (6T \times tevent/3.1416)^{0.5}$

IF tevent > t*, DAevent = $FA \times Kp \times C \times CF \times ((tevent/(1 + B)) + (2T \times ((1+3B+3B^2)/(1 + B)^2)))$

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.98a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.86a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.6E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.86a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.8E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	7.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.3E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-06	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.8E-05
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-08	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-05
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.9E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.4E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.9E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.1E-03
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.8E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.5E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.7E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.8E-04
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.8E-05
	(total)												**7.1E-03**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.4E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.3E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	3.6E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.1E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.9E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.2E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.5E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.3E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.1E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.5E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.4E-05
	(total)												**1.1E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
ADULT RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.86a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.92a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	(total)										**1.2E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	9.1E-10
	(total)										**1.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.2E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.92a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-05
	(total)												**2.8E-05**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.0E-05
	(total)												**2.5E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.3E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
ADULT RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 3.14
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - TURKEY CREEK SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Tureky Creek Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Manganese	ug/L	87.1	NA	131	J	ug/L	131	Maximum	N < 10 (1)	131	Maximum	N < 10 (1)

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 4.14
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
`	Soil	Surface Soil	Aluminum					Aluminum	CNS	4.E-01			4.E-01
		SWMU 12 Proper	Arsenic	1.E-05		1.E-06	2.E-05	Arsenic	Skin, CVS	4.E-01		3.E-02	4.E-01
			Iron					Iron	NA	1.E+00			1.E+00
			Manganese					Manganese	CNS	2.E-01			2.E-01
			Vanadium					Vanadium	Kidney	6.E-01			6.E-01
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-05	Total Hazard Index Across Surface Soil - SWMU 12 Proper					3.E+00
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-01			3.E-01
		SWMU 12 Proper	Arsenic	1.E-05		1.E-06	1.E-05	Arsenic	Skin, CVS	3.E-01		3.E-02	3.E-01
			Barium					Barium	Kidney	1.E-02			1.E-02
			Iron					Iron	NA	1.E+00			1.E+00
			Manganese					Manganese	CNS	1.E-01			1.E-01
			Vanadium					Vanadium	Kidney	5.E-01			5.E-01
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-05	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					3.E+00

Target Organ Analysis - Surface Soil

Total CNS HI =	6.E-01	Total Skin HI =	4.E-01
Total CVS HI =	4.E-01	Total Kidney HI =	6.E-01

Target Organ Analysis - Subsurface Soil

Total CNS HI =	4.E-01	Total Skin HI =	3.E-01
Total CVS HI =	3.E-01	Total Kidney HI =	5.E-01

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	4.E-02			4.E-02
		SWMU 12 Proper	Arsenic	6.E-06		8.E-07	7.E-06	Arsenic	Skin, CVS	4.E-02		5.E-03	5.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	2.E-02			2.E-02
			Vanadium					Vanadium	Kidney	7.E-02			7.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				7.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					3.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	4.E-02			4.E-02
		SWMU 12 Proper	Arsenic	5.E-06		6.E-07	6.E-06	Arsenic	Skin, CVS	3.E-02		4.E-03	4.E-02
			Barium					Barium	Kidney	1.E-03			1.E-03
			Iron					Iron	NA	2.E-01			2.E-01
			Manganese					Manganese	CNS	1.E-02			1.E-02
			Vanadium					Vanadium	Kidney	6.E-02			6.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				6.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					3.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	6.E-02	Total Skin HI =	5.E-02
Total CVS HI =	5.E-02	Total Kidney HI =	7.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	5.E-02	Total Skin HI =	4.E-02
Total CVS HI =	4.E-02	Total Kidney HI =	6.E-02

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	3.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	1.E-02			1.E-02
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				1.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	9.E-07		2.E-07	1.E-06	Arsenic	Skin, CVS	2.E-02		5.E-03	3.E-02
			Barium					Barium	Kidney	9.E-04			9.E-04
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	7.E-03			7.E-03
			Vanadium					Vanadium	Kidney	4.E-02			4.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	5.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	4.E-02

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-03			3.E-03
		SWMU 12 Proper	Arsenic	5.E-07		2.E-07	7.E-07	Arsenic	Skin, CVS	3.E-03		1.E-03	4.E-03
			Iron					Iron	NA	1.E-02			1.E-02
			Manganese					Manganese	CNS	2.E-03			2.E-03
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				7.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-03			3.E-03
		SWMU 12 Proper	Arsenic	4.E-07		1.E-07	5.E-07	Arsenic	Skin, CVS	3.E-03		1.E-03	4.E-03
			Barium					Barium	Kidney	9.E-05			9.E-05
			Iron					Iron	NA	1.E-02			1.E-02
			Manganese					Manganese	CNS	8.E-04			8.E-04
			Vanadium					Vanadium	Kidney	4.E-03			4.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	5.E-03	Total Skin HI =	4.E-03
Total CVS HI =	4.E-03	Total Kidney HI =	5.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	4.E-03	Total Skin HI =	4.E-03
Total CVS HI =	4.E-03	Total Kidney HI =	4.E-03

TABLE 9.4. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ASOLESCENT TRESPASSERS
SWMU 13 (MINE FILL B)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	5.E-03			5.E-03
		SWMU 12 Proper	Arsenic	4.E-07		7.E-08	4.E-07	Arsenic	Skin, CVS	5.E-03		1.E-03	6.E-03
			Iron					Iron	NA	2.E-02			2.E-02
			Manganese					Manganese	CNS	3.E-03			3.E-03
			Vanadium					Vanadium	Kidney	8.E-03			8.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					4.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	4.E-03			4.E-03
		SWMU 12 Proper	Arsenic	3.E-07		6.E-08	4.E-07	Arsenic	Skin, CVS	4.E-03		8.E-04	5.E-03
			Barium					Barium	Kidney	2.E-04			2.E-04
			Iron					Iron	NA	2.E-02			2.E-02
			Manganese					Manganese	CNS	1.E-03			1.E-03
			Vanadium					Vanadium	Kidney	7.E-03			7.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				4.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					4.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	7.E-03	Total Skin HI =	6.E-03
Total CVS HI =	6.E-03	Total Kidney HI =	8.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	6.E-03	Total Skin HI =	5.E-03
Total CVS HI =	5.E-03	Total Kidney HI =	7.E-03

TABLE 9.3. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	5.E-06		9.E-07	6.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	4.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	2.E-02			2.E-02
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				6.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	4.E-06		8.E-07	5.E-06	Arsenic	Skin, CVS	2.E-02		5.E-03	3.E-02
			Barium					Barium	Kidney	9.E-04			9.E-04
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	8.E-03			8.E-03
			Vanadium					Vanadium	Kidney	4.E-02			4.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-02	Total Skin HI =	4.E-02
Total CVS HI =	4.E-02	Total Kidney HI =	5.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	4.E-02

TABLE 9.2. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-03		0.E+00	3.E-03
		SWMU 12 Proper	Arsenic	5.E-07		9.E-08	5.E-07	Arsenic	Skin, CVS	3.E-03		6.E-04	3.E-03
			Iron					Iron	NA	1.E-02		0.E+00	1.E-02
			Manganese					Manganese	CNS	1.E-03		0.E+00	1.E-03
			Vanadium					Vanadium	Kidney	5.E-03		0.E+00	5.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-03		0.E+00	3.E-03
		SWMU 12 Proper	Arsenic	4.E-07		7.E-08	5.E-07	Arsenic	Skin, CVS	2.E-03		5.E-04	3.E-03
			Barium					Barium	Kidney	9.E-05		0.E+00	9.E-05
			Iron					Iron	NA	1.E-02		0.E+00	1.E-02
			Manganese					Manganese	CNS	7.E-04		0.E+00	7.E-04
			Vanadium					Vanadium	Kidney	4.E-03		0.E+00	4.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-03	Total Skin HI =	3.E-03
Total CVS HI =	3.E-03	Total Kidney HI =	5.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-03	Total Skin HI =	3.E-03
Total CVS HI =	3.E-03	Total Kidney HI =	4.E-03

TABLE 9.1. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	6.E-02			6.E-02
		SWMU 12 Proper	Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	6.E-02		5.E-03	6.E-02
			Iron					Iron	NA	2.E-01			2.E-01
			Manganese					Manganese	CNS	3.E-02			3.E-02
			Vanadium					Vanadium	Kidney	9.E-02			9.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					4.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	5.E-02			5.E-02
		SWMU 12 Proper	Arsenic	3.E-07		3.E-08	3.E-07	Arsenic	Skin, CVS	5.E-02		4.E-03	5.E-02
			Barium					Barium	Kidney	2.E-03			2.E-03
			Iron					Iron	NA	2.E-01			2.E-01
			Manganese					Manganese	CNS	2.E-02			2.E-02
			Vanadium					Vanadium	Kidney	8.E-02			8.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				3.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					4.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	9.E-02	Total Skin HI =	6.E-02
Total CVS HI =	6.E-02	Total Kidney HI =	9.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	7.E-02	Total Skin HI =	5.E-02
Total CVS HI =	5.E-02	Total Kidney HI =	8.E-02

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-06		8.E-08	2.E-06	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-06		6.E-08	2.E-06	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
`	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-01			1.E-01
		SWMU 12 Proper	Arsenic	2.E-06		6.E-08	2.E-06	Arsenic	Skin, CVS	1.E-01		4.E-03	1.E-01
			Iron					Iron	NA	4.E-01			4.E-01
			Manganese					Manganese	CNS	7.E-02			7.E-02
			Vanadium					Vanadium	Kidney	2.E-01			2.E-01
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					1.E+00
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-01			1.E-01
		SWMU 12 Proper	Arsenic	1.E-06		5.E-08	1.E-06	Arsenic	Skin, CVS	1.E-01		4.E-03	1.E-01
			Barium					Barium	Kidney	4.E-03			4.E-03
			Iron					Iron	NA	5.E-01			5.E-01
			Manganese					Manganese	CNS	3.E-02			3.E-02
			Vanadium					Vanadium	Kidney	2.E-01			2.E-01
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					9.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-01	Total Skin HI =	1.E-01
Total CVS HI =	1.E-01	Total Kidney HI =	2.E-01

Target Organ Analysis - Subsurface Soil

Total CNS HI =	1.E-01	Total Skin HI =	1.E-01
Total CVS HI =	1.E-01	Total Kidney HI =	2.E-01

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	6.E-07		2.E-08	6.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02
			Iron					Iron	NA	5.E-02			5.E-02
			Manganese					Manganese	CNS	7.E-03			7.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				6.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					1.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	5.E-07		2.E-08	5.E-07	Arsenic	Skin, CVS	1.E-02		4.E-04	1.E-02
			Barium					Barium	Kidney	4.E-04			4.E-04
			Iron					Iron	NA	5.E-02			5.E-02
			Manganese					Manganese	CNS	4.E-03			4.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					1.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	2.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	1.E-07		1.E-08	1.E-07	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				1.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	1.E-07		9.E-09	1.E-07	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	7.E-03			7.E-03
		SWMU 12 Proper	Arsenic	9.E-08		7.E-09	1.E-07	Arsenic	Skin, CVS	7.E-03		6.E-04	8.E-03
			Iron					Iron	NA	2.E-02			2.E-02
			Manganese					Manganese	CNS	4.E-03			4.E-03
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				1.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					5.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	6.E-03			6.E-03
		SWMU 12 Proper	Arsenic	8.E-08		6.E-09	8.E-08	Arsenic	Skin, CVS	6.E-03		5.E-04	6.E-03
			Barium					Barium	Kidney	2.E-04			2.E-04
			Iron					Iron	NA	3.E-02			3.E-02
			Manganese					Manganese	CNS	2.E-03			2.E-03
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				8.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					5.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	1.E-02	Total Skin HI =	8.E-03
Total CVS HI =	8.E-03	Total Kidney HI =	1.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	8.E-03	Total Skin HI =	6.E-03
Total CVS HI =	6.E-03	Total Kidney HI =	1.E-02

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	8.E-04			8.E-04
		SWMU 12 Proper	Arsenic	3.E-08		4.E-09	4.E-08	Arsenic	Skin, CVS	8.E-04		8.E-05	8.E-04
			Iron					Iron	NA	3.E-03			3.E-03
			Manganese					Manganese	CNS	4.E-04			4.E-04
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-08	Total Hazard Index Across Surface Soil - SWMU 12 Proper					6.E-03
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	7.E-04			7.E-04
		SWMU 12 Proper	Arsenic	3.E-08		3.E-09	3.E-08	Arsenic	Skin, CVS	6.E-04		7.E-05	7.E-04
			Barium					Barium	Kidney	2.E-05			2.E-05
			Iron					Iron	NA	3.E-03			3.E-03
			Manganese					Manganese	CNS	2.E-04			2.E-04
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				3.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					6.E-03

Target Organ Analysis - Surface Soil

Total CNS HI =	1.E-03	Total Skin HI =	8.E-04
Total CVS HI =	8.E-04	Total Kidney HI =	1.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	9.E-04	Total Skin HI =	7.E-04
Total CVS HI =	7.E-04	Total Kidney HI =	1.E-03

TABLE 9.4. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ASOLESCENT TRESPASSERS
SWMU 13 (MINE FILL B)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-03			1.E-03
		SWMU 12 Proper	Arsenic	9.E-08		7.E-09	9.E-08	Arsenic	Skin, CVS	1.E-03		9.E-05	1.E-03
			Iron					Iron	NA	4.E-03			4.E-03
			Manganese					Manganese	CNS	6.E-04			6.E-04
			Vanadium					Vanadium	Kidney	2.E-03			2.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				9.E-08	Total Hazard Index Across Surface Soil - SWMU 12 Proper					9.E-03
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-03			1.E-03
		SWMU 12 Proper	Arsenic	7.E-08		5.E-09	8.E-08	Arsenic	Skin, CVS	1.E-03		8.E-05	1.E-03
			Barium					Barium	Kidney	4.E-05			4.E-05
			Iron					Iron	NA	5.E-03			5.E-03
			Manganese					Manganese	CNS	3.E-04			3.E-04
			Vanadium					Vanadium	Kidney	2.E-03			2.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				8.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					9.E-03

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-03	Total Skin HI =	1.E-03
Total CVS HI =	1.E-03	Total Kidney HI =	2.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	1.E-03	Total Skin HI =	1.E-03
Total CVS HI =	1.E-03	Total Kidney HI =	2.E-03

TABLE 9.3. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	7.E-07		3.E-08	8.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02
			Iron					Iron	NA	4.E-02			4.E-02
			Manganese					Manganese	CNS	7.E-03			7.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				8.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					1.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	6.E-07		2.E-08	6.E-07	Arsenic	Skin, CVS	1.E-02		4.E-04	1.E-02
			Barium					Barium	Kidney	4.E-04			4.E-04
			Iron					Iron	NA	5.E-02			5.E-02
			Manganese					Manganese	CNS	3.E-03			3.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				6.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					9.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	1.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

TABLE 9.2. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	7.E-04		0.E+00	7.E-04
		SWMU 12 Proper	Arsenic	4.E-08		2.E-09	4.E-08	Arsenic	Skin, CVS	7.E-04		3.E-05	7.E-04
			Iron					Iron	NA	2.E-03		0.E+00	2.E-03
			Manganese					Manganese	CNS	4.E-04		0.E+00	4.E-04
			Vanadium					Vanadium	Kidney	1.E-03		0.E+00	1.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-08	Total Hazard Index Across Surface Soil - SWMU 12 Proper					5.E-03
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	6.E-04		0.E+00	6.E-04
		SWMU 12 Proper	Arsenic	3.E-08		1.E-09	4.E-08	Arsenic	Skin, CVS	6.E-04		2.E-05	6.E-04
			Barium					Barium	Kidney	2.E-05		0.E+00	2.E-05
			Iron					Iron	NA	3.E-03		0.E+00	3.E-03
			Manganese					Manganese	CNS	2.E-04		0.E+00	2.E-04
			Vanadium					Vanadium	Kidney	1.E-03		0.E+00	1.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				4.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					5.E-03

Target Organ Analysis - Surface Soil

Total CNS HI =	1.E-03	Total Skin HI =	7.E-04
Total CVS HI =	7.E-04	Total Kidney HI =	1.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	8.E-04	Total Skin HI =	6.E-04
Total CVS HI =	6.E-04	Total Kidney HI =	1.E-03

TABLE 9.1. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	3.E-02		2.E-03	3.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	1.E-02			1.E-02
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	2.E-07		9.E-09	2.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	3.E-02
			Barium					Barium	Kidney	9.E-04			9.E-04
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	8.E-03			8.E-03
			Vanadium					Vanadium	Kidney	4.E-02			4.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	5.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	4.E-02

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	23400	NA	29800	J	mg/kg	29800	Maximum	N < 10 (1)	29800	Maximum	N < 10 (1)
Arsenic	mg/kg	6.8	NA	9	J	mg/kg	9	Maximum	N < 10	9	Maximum	N < 10
Iron	mg/kg	24400	NA	30600	J	mg/kg	30600	Maximum	N < 10	30600	Maximum	N < 10
Manganese	mg/kg	404	NA	1080	J	mg/kg	1080	Maximum	N < 10	1080	Maximum	N < 10
Vanadium	mg/kg	39.4	NA	48.6	J	mg/kg	48.6	Maximum	N < 10	48.6	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

23,378
6.8
24,389
404
39

TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	24000	26900	37000	J	mg/kg	26900	Student-t	ProUCL (1)	26900	Student-t	ProUCL (1)
Arsenic	mg/kg	6	7.5	12.3	J	mg/kg	7.5	Student-t	ProUCL (1)	7.5	Student-t	ProUCL (1)
Barium	mg/kg	130	185	568	J	mg/kg	183	Gamma	ProUCL (2)	183	Gamma	ProUCL (2)
Iron	mg/kg	29000	34200	49600	J	mg/kg	34200	Student-t	ProUCL (1)	34200	Student-t	ProUCL (1)
Manganese	mg/kg	300	477	1600	J	mg/kg	542	Gamma	ProUCL (2)	542	Gamma	ProUCL (2)
Vanadium	mg/kg	37	41.6	50.5	J	mg/kg	41.6	Student-t	ProUCL (1)	41.6	Student-t	ProUCL (1)

Definitions:
Gamma = Approximate Gamma 95% UCL.

1 - ProUCL indicates data are normally distributed.
2 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.

23,871	26865.0072
6.3	7.47213082
133.1	185.340062
29,481	34170.8091
304	476.835948
37	41.6448372

26865.0072
7.47213082
182.772988
34170.8091
541.703316
41.6448372

Definitions:
95 % UCL-C = 95% Chebyshev UCL (non-parametric).
99 % UCL-C = 99% Chebyshev UCL (non-parametric).
Gamma = Approximate Gamma 95% UCL.
97.5 % UCL-C = 97.5% Chebyshev UCL (log-normal).
95 % UCL-T = 95% UCL of Log-transformed Data.

1 - UCL is greater than the maximum concentration. Therefore, the maximum concentration is used as the EPC.
2 - EPC statistic is recommended by U.S. EPA's ProUCL software.
3 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).
4 - Shapiro-Wilk W Test indicates data are log-normally distributed.

TABLE 8.4 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	8.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.5E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.9E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.4 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	4.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.9E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.0E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	5.1E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.7E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.8E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.6E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	8.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.1E-03
	(total)												**3.7E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.8E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**9.8E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.4
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.4a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	5.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	3.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.8E-08**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.4E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.5E-09
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.4E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.4a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.3E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.2E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.4E-04
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.0E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	2.0E-03
	(total)												**9.4E-03**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.2E-05
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**9.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.4E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.4
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.3 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.0E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-06
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.7E-06**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	6.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.3E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.3E-07**
										Total Risk Across All Exposure Routes/Pathways	**5.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.3 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.9E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.9E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	3.0E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.0E-01
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.1E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.5E-02
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.8E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.8E-02
	(total)												**2.2E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.8E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.3E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.3
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.3a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	5.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.4E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	6.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.4E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**7.7E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.3a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.9E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.4E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.6E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.6E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.1E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	2.1E-02
	(total)												**9.7E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.1E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.1E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.7E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.3
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.2 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.5E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	6.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.0E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.2 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.8E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.8E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.9E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	9.6E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.0E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.4E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.6E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.6E-03
	(total)												**2.1E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.2
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.2a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	9.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.1E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	9.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.1E-08**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.1E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.2E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.2a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.0E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.0E-04
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	7.2E-04	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.4E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.6E-04
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.1E-03
	(total)												**5.3E-03**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.4E-09	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-05
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.8E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.3E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.110a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

1. Table4

TABLE 3.10
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER -PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Middle Zone

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
RDX	ug/L	0.5	NA	4.2	J	ug/L	0.8	Average	(1)	0.8	Average	(1)
Aluminum	ug/L	5620	NA	31000	J	ug/L	6810	Average	(1)	6810	Average	(1)
Antimony	ug/L	0.55	NA	2.9	J	ug/L	1.3	Average	(1)	1.3	Average	(1)
Arsenic	ug/L	3.9	NA	11.4	J	ug/L	2.6	Average	(1)	2.6	Average	(1)
Cadmium	ug/L	0.5	NA	2.3	J	ug/L	0.92	Average	(1)	0.92	Average	(1)
Chromium	ug/L	9.8	NA	47.9	J	ug/L	10.5	Average	(1)	10.5	Average	(1)
Cobalt	ug/L	20.9	NA	79.7	J	ug/L	33.3	Average	(1)	33.3	Average	(1)
Iron	ug/L	12900	NA	48900	J	ug/L	13600	Average	(1)	13600	Average	(1)
Lead	ug/L	5.9	NA	24.7	J	ug/L	7.2	Average	(1)	7.2	Average	(1)
Manganese	ug/L	1360	NA	7570		ug/L	1740	Average	(1)	1740	Average	(1)
Nickel	ug/L	57.4	NA	178		ug/L	73.8	Average	(1)	73.8	Average	(1)
Thallium	ug/L	0.075	NA	0.32	J	ug/L	0.11	Average	(1)	0.11	Average	(1)
Vanadium	ug/L	9.7	NA	49.4	J	ug/L	10.5	Average	(1)	10.5	Average	(1)
Nitrite/Nitrate-N	mg/L	0.3	NA	2		mg/L	0.53	Average	(1)	0.53	Average	(1)

1 - The EPC for groundwater is the arithmetic average of samples in the most highly contaminated area of the plume (See Section 7.3.3 of text).

TABLE 3.11

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	ug/L	0.9	NA	4.2		ug/L	4.2	Maximum	N < 10 (1)	4.2	Maximum	N < 10 (1)
RDX	ug/L	0.9	NA	3.9		ug/L	3.9	Maximum	N < 10	3.9	Maximum	N < 10
Antimony	ug/L	0.74	NA	3.1	J	ug/L	3.1	Maximum	N < 10	3.1	Maximum	N < 10
Arsenic	ug/L	3.8	NA	9.5	J	ug/L	9.5	Maximum	N < 10	9.5	Maximum	N < 10
Iron	ug/L	3850	NA	7150	J	ug/L	7150	Maximum	N < 10	7150	Maximum	N < 10
Manganese	ug/L	1260	NA	2190	J	ug/L	2190	Maximum	N < 10	2190	Maximum	N < 10
Vanadium	ug/L	1.4	NA	4.9		ug/L	4.9	Maximum	N < 10	4.9	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 9.10. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen				
			2,4,6-Trinitrotoluene	9.E-06		1.E-07	9.E-06	2,4,6-Trinitrotoluene	Liver				
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney				
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver				
			2-Nitrotoluene	4.E-07		3.E-08	4.E-07	2-Nitrotoluene	Spleen				
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver				
			4-Nitrotoluene	9.E-08		7.E-09	1.E-07	4-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	2.E-03		9.E-06	2.E-03	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	7.E-04		1.E-06	7.E-04	Arsenic	Skin, CVS				
			Beryllium					Beryllium	GS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Mercury					Mercury	CNS				
			Nickel					Nickel	Body Weight				
			Selenium					Selenium	NOEL				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Zinc					Zinc	Blood				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Upper Zone Groundwater				3.E-03	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					

TABLE 9.10. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	1.E-06		6.E-09	1.E-06	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Antimony					Antimony	Blood				
			Arsenic	7.E-05		1.E-07	7.E-05	Arsenic	Skin, CVS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Nickel					Nickel	Body Weight				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Middle Zone Groundwater				7.E-05	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					
Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	2.E-06		3.E-08	2.E-06	2,4,6-Trinitrotoluene	Liver				
			RDX	8.E-06		3.E-08	8.E-06	RDX	Prostate				
			Antimony					Antimony	Blood				
			Arsenic	3.E-04		4.E-07	3.E-04	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				3.E-04	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	8.E-01		8.E-03	8.E-01
			2,4,6-Trinitrotoluene	4.E-06		3.E-08	4.E-06	2,4,6-Trinitrotoluene	Liver	3.E+00		3.E-02	3.E+00
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	8.E-02		1.E-03	8.E-02
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	5.E+00		2.E-02	5.E+00
			2-Nitrotoluene	2.E-07		8.E-09	2.E-07	2-Nitrotoluene	Spleen	1.E-03		4.E-05	1.E-03
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	8.E+00		4.E-02	8.E+00
			4-Nitrotoluene	4.E-08		2.E-09	4.E-08	4-Nitrotoluene	Spleen	3.E-03		1.E-04	3.E-03
			HMX					HMX	Liver, Blood	2.E-01		3.E-04	2.E-01
			RDX	1.E-03		3.E-06	1.E-03	RDX	Prostate	4.E+01		1.E-01	4.E+01
			Aluminum					Aluminum	CNS	1.E+01		1.E-02	1.E+01
			Arsenic	3.E-04		3.E-07	3.E-04	Arsenic	Skin, CVS	8.E+00		9.E-03	8.E+00
			Beryllium					Beryllium	GS	3.E+00		5.E-01	4.E+00
			Cadmium					Cadmium	Kidney	9.E+00		2.E-01	1.E+01
			Chromium					Chromium	Fetotoxicity/GS/Bone	4.E-01		4.E-02	5.E-01
			Cobalt					Cobalt	NA	2.E+01		2.E-02	2.E+01
			Iron					Iron	NA	3.E+01		3.E-02	3.E+01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	3.E+02		9.E+00	3.E+02
			Mercury					Mercury	CNS	2.E-01		3.E-03	2.E-01
			Nickel					Nickel	Body Weight	4.E+01		2.E-01	4.E+01
			Selenium					Selenium	NOEL	2.E-01		2.E-04	2.E-01
			Thallium					Thallium	Liver	2.E+00		3.E-03	2.E+00
			Vanadium					Vanadium	Kidney	6.E-01		2.E-02	6.E-01
			Zinc					Zinc	Blood	3.E+00		2.E-03	3.E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E+00		2.E-03	2.E+00
			Total Risk Across Pennsylvanian Upper Zone Groundwater				1.E-03		Total Hazard Index Across Pennsylvanian Upper Zone Groundwater				5.E+02

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	2.E+01	Total CNS HI =	3.E+02
Total Kidney HI =	1.E+01	Total Fetotoxicity HI =	5.E-01
Total CVS HI =	8.E+00	Total Body Weight HI =	4.E+01
Total GI Tract HI =	4.E+00	Total Prostate HI =	4.E+01
Total Skin HI =	8.E+00	Total Bone HI =	5.E-01
Total Blood HI =	5.E+00	Total Spleen HI =	8.E-01

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	7.E-07		2.E-09	7.E-07	RDX	Prostate	2.E-02		7.E-05	2.E-02
			Aluminum					Aluminum	CNS	7.E-01		7.E-04	7.E-01
			Antimony					Antimony	Blood	3.E-01		2.E-03	3.E-01
			Arsenic	3.E-05		4.E-08	3.E-05	Arsenic	Skin, CVS	8.E-01		9.E-04	8.E-01
			Cadmium					Cadmium	Kidney	2.E-01		4.E-03	2.E-01
			Chromium					Chromium	Fetotoxicity/GS/Bone	3.E-01		3.E-02	4.E-01
			Cobalt					Cobalt	NA	2.E-01		2.E-04	2.E-01
			Iron					Iron	NA	4.E+00		5.E-03	4.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	7.E+00		2.E-01	7.E+00
			Nickel					Nickel	Body Weight	4.E-01		2.E-03	4.E-01
			Thallium					Thallium	Liver	1.E-01		2.E-04	1.E-01
			Vanadium					Vanadium	Kidney	1.E+00		4.E-02	1.E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-01		6.E-04	5.E-01
			Total Risk Across Pennsylvanian Middle Zone Groundwater				3.E-05	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					2.E+01

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	1.E-01	Total CNS HI =	8.E+00
Total Kidney HI =	1.E+00	Total Fetotoxicity HI =	4.E-01
Total CVS HI =	8.E-01	Total Body Weight HI =	4.E-01
Total GI Tract HI =	4.E-01	Total Prostate HI =	2.E-02
Total Skin HI =	8.E-01	Total Bone HI =	4.E-01
Total Blood HI =	8.E-01		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	1.E-06		9.E-09	1.E-06	2,4,6-Trinitrotoluene	Liver	8.E-01		7.E-03	8.E-01
			RDX	4.E-06		1.E-08	4.E-06	RDX	Prostate	1.E-01		3.E-04	1.E-01
			Antimony					Antimony	Blood	7.E-01		5.E-03	7.E-01
			Arsenic	1.E-04		1.E-07	1.E-04	Arsenic	Skin, CVS	3.E+00		3.E-03	3.E+00
			Iron					Iron	NA	2.E+00		3.E-03	2.E+00
			Manganese					Manganese	CNS	9.E+00		2.E-01	9.E+00
			Vanadium					Vanadium	Kidney	5.E-01		2.E-02	5.E-01
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				1.E-04	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					2.E+01

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	8.E-01	Total CNS HI =	9.E+00
Total Kidney HI =	5.E-01	Total Prostate HI =	1.E-01
Total CVS HI =	3.E+00	Total Skin HI =	3.E+00
Total Blood HI =	7.E-01		

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	2.E-01		5.E-03	2.E-01
			2,4,6-Trinitrotoluene	5.E-06		8.E-08	5.E-06	2,4,6-Trinitrotoluene	Liver	9.E-01		2.E-02	9.E-01
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	2.E-02		6.E-04	2.E-02
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	1.E+00		1.E-02	1.E+00
			2-Nitrotoluene	2.E-07		2.E-08	2.E-07	2-Nitrotoluene	Spleen	3.E-04		2.E-05	3.E-04
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	2.E+00		2.E-02	2.E+00
			4-Nitrotoluene	5.E-08		5.E-09	5.E-08	4-Nitrotoluene	Spleen	8.E-04		8.E-05	9.E-04
			HMX					HMX	Liver, Blood	5.E-02		2.E-04	5.E-02
			RDX	1.E-03		7.E-06	1.E-03	RDX	Prostate	1.E+01		6.E-02	1.E+01
			Aluminum					Aluminum	CNS	4.E+00		9.E-03	4.E+00
			Arsenic	4.E-04		8.E-07	4.E-04	Arsenic	Skin, CVS	2.E+00		5.E-03	2.E+00
			Beryllium					Beryllium	GS	9.E-01		3.E-01	1.E+00
			Cadmium					Cadmium	Kidney	3.E+00		1.E-01	3.E+00
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-01		2.E-02	1.E-01
			Cobalt					Cobalt	NA	4.E+00		1.E-02	4.E+00
			Iron					Iron	NA	9.E+00		2.E-02	9.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	9.E+01		5.E+00	1.E+02
			Mercury					Mercury	CNS	5.E-02		2.E-03	5.E-02
			Nickel					Nickel	Body Weight	1.E+01		1.E-01	1.E+01
			Selenium					Selenium	NOEL	5.E-02		1.E-04	5.E-02
			Thallium					Thallium	Liver	7.E-01		2.E-03	7.E-01
			Vanadium					Vanadium	Kidney	2.E-01		1.E-02	2.E-01
			Zinc					Zinc	Blood	1.E+00		1.E-03	1.E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-01		1.E-03	5.E-01
			Total Risk Across Pennsylvanian Upper Zone Groundwater				1.E-03		Total Hazard Index Across Pennsylvanian Upper Zone Groundwater				1.E+02

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	5.E+00	Total CNS HI =	1.E+02
Total Kidney HI =	3.E+00	Total Fetotoxicity HI =	1.E-01
Total CVS HI =	2.E+00	Total Body Weight HI =	1.E+01
Total GI Tract HI =	1.E+00	Total Prostate HI =	1.E+01
Total Skin HI =	2.E+00	Total Bone HI =	1.E-01
Total Blood HI =	2.E+00	Total Spleen HI =	2.E-01

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	8.E-07		5.E-09	8.E-07	RDX	Prostate	7.E-03		4.E-05	7.E-03
			Aluminum					Aluminum	CNS	2.E-01		4.E-04	2.E-01
			Antimony					Antimony	Blood	9.E-02		1.E-03	9.E-02
			Arsenic	4.E-05		8.E-08	4.E-05	Arsenic	Skin, CVS	2.E-01		5.E-04	2.E-01
			Cadmium					Cadmium	Kidney	5.E-02		2.E-03	5.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-01		2.E-02	1.E-01
			Cobalt					Cobalt	NA	5.E-02		1.E-04	5.E-02
			Iron					Iron	NA	1.E+00		3.E-03	1.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	2.E+00		1.E-01	2.E+00
			Nickel					Nickel	Body Weight	1.E-01		1.E-03	1.E-01
			Thallium					Thallium	Liver	4.E-02		1.E-04	4.E-02
			Vanadium					Vanadium	Kidney	3.E-01		2.E-02	3.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-01		3.E-04	1.E-01
			Total Risk Across Pennsylvanian Middle Zone Groundwater				4.E-05	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					5.E+00

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	4.E-02	Total CNS HI =	2.E+00
Total Kidney HI =	4.E-01	Total Fetotoxicity HI =	1.E-01
Total CVS HI =	2.E-01	Total Body Weight HI =	1.E-01
Total GI Tract HI =	1.E-01	Total Prostate HI =	7.E-03
Total Skin HI =	2.E-01	Total Bone HI =	1.E-01
Total Blood HI =	2.E-01		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	1.E-06		2.E-08	1.E-06	2,4,6-Trinitrotoluene	Liver	2.E-01		4.E-03	2.E-01
			RDX	4.E-06		2.E-08	4.E-06	RDX	Prostate	4.E-02		2.E-04	4.E-02
			Antimony					Antimony	Blood	2.E-01		3.E-03	2.E-01
			Arsenic	1.E-04		3.E-07	1.E-04	Arsenic	Skin, CVS	9.E-01		2.E-03	9.E-01
			Iron					Iron	NA	7.E-01		1.E-03	7.E-01
			Manganese					Manganese	CNS	3.E+00		1.E-01	3.E+00
			Vanadium					Vanadium	Kidney	1.E-01		1.E-02	1.E-01
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				1.E-04	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					5.E+00

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	2.E-01	Total CNS HI =	3.E+00
Total Kidney HI =	1.E-01	Total Prostate HI =	4.E-02
Total CVS HI =	9.E-01	Total Skin HI =	9.E-01
Total Blood HI =	2.E-01		

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen				
			2,4,6-Trinitrotoluene	8.E-07		2.E-08	8.E-07	2,4,6-Trinitrotoluene	Liver				
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney				
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver				
			2-Nitrotoluene	3.E-08		4.E-09	4.E-08	2-Nitrotoluene	Spleen				
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver				
			4-Nitrotoluene	8.E-09		1.E-09	9.E-09	4-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	2.E-04		1.E-06	2.E-04	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	6.E-05		2.E-07	6.E-05	Arsenic	Skin, CVS				
			Beryllium					Beryllium	GS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Mercury					Mercury	CNS				
			Nickel					Nickel	Body Weight				
			Selenium					Selenium	NOEL				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Zinc					Zinc	Blood				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Upper Zone Groundwater				2.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	1.E-07		1.E-09	1.E-07	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Antimony					Antimony	Blood				
			Arsenic	6.E-06		2.E-08	6.E-06	Arsenic	Skin, CVS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Nickel					Nickel	Body Weight				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Middle Zone Groundwater				6.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					
Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	2.E-07		4.E-09	2.E-07	2,4,6-Trinitrotoluene	Liver				
			RDX	6.E-07		5.E-09	7.E-07	RDX	Prostate				
			Antimony					Antimony	Blood				
			Arsenic	2.E-05		6.E-08	2.E-05	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				2.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	8.E-02		1.E-03	8.E-02
			2,4,6-Trinitrotoluene	4.E-07		5.E-09	4.E-07	2,4,6-Trinitrotoluene	Liver	3.E-01		4.E-03	3.E-01
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	8.E-03		2.E-04	8.E-03
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	5.E-01		3.E-03	5.E-01
			2-Nitrotoluene	2.E-08		1.E-09	2.E-08	2-Nitrotoluene	Spleen	9.E-05		6.E-06	1.E-04
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	8.E-01		5.E-03	8.E-01
			4-Nitrotoluene	4.E-09		3.E-10	4.E-09	4-Nitrotoluene	Spleen	3.E-04		2.E-05	3.E-04
			HMX					HMX	Liver, Blood	2.E-02		4.E-05	2.E-02
			RDX	1.E-04		4.E-07	1.E-04	RDX	Prostate	3.E+00		1.E-02	3.E+00
			Aluminum					Aluminum	CNS	1.E+00		2.E-03	1.E+00
			Arsenic	3.E-05		5.E-08	3.E-05	Arsenic	Skin, CVS	8.E-01		1.E-03	8.E-01
			Beryllium					Beryllium	GS	3.E-01		8.E-02	4.E-01
			Cadmium					Cadmium	Kidney	9.E-01		3.E-02	1.E+00
			Chromium					Chromium	Fetotoxicity/GS/Bone	4.E-02		5.E-03	5.E-02
			Cobalt					Cobalt	NA	2.E+00		3.E-03	2.E+00
			Iron					Iron	NA	3.E+00		5.E-03	3.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	3.E+01		1.E+00	3.E+01
			Mercury					Mercury	CNS	2.E-02		4.E-04	2.E-02
			Nickel					Nickel	Body Weight	4.E+00		3.E-02	4.E+00
			Selenium					Selenium	NOEL	2.E-02		3.E-05	2.E-02
			Thallium					Thallium	Liver	2.E-01		4.E-04	2.E-01
			Vanadium					Vanadium	Kidney	6.E-02		4.E-03	6.E-02
			Zinc					Zinc	Blood	3.E-01		3.E-04	3.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-01		3.E-04	2.E-01
			Total Risk Across Pennsylvanian Upper Zone Groundwater				1.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					5.E+01

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	2.E+00	Total CNS HI =	3.E+01
Total Kidney HI =	1.E+00	Total Fetotoxicity HI =	5.E-02
Total CVS HI =	8.E-01	Total Body Weight HI =	4.E+00
Total GI Tract HI =	4.E-01	Total Prostate HI =	3.E+00
Total Skin HI =	8.E-01	Total Bone HI =	5.E-02
Total Blood HI =	5.E-01	Total Spleen HI =	8.E-02

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	7.E-08		3.E-10	7.E-08	RDX	Prostate	3.E-03		1.E-05	3.E-03
			Aluminum					Aluminum	CNS	6.E-02		1.E-04	6.E-02
			Antimony					Antimony	Blood	3.E-02		3.E-04	3.E-02
			Arsenic	3.E-06		5.E-09	3.E-06	Arsenic	Skin, CVS	8.E-02		1.E-04	8.E-02
			Cadmium					Cadmium	Kidney	2.E-02		6.E-04	2.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone	3.E-02		4.E-03	4.E-02
			Cobalt					Cobalt	NA	2.E-02		3.E-05	2.E-02
			Iron					Iron	NA	4.E-01		7.E-04	4.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	7.E-01		3.E-02	7.E-01
			Nickel					Nickel	Body Weight	4.E-02		3.E-04	4.E-02
			Thallium					Thallium	Liver	1.E-02		2.E-05	1.E-02
			Vanadium					Vanadium	Kidney	1.E-01		6.E-03	1.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-02		8.E-05	5.E-02
			Total Risk Across Pennsylvanian Middle Zone Groundwater				3.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					2.E+00

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	1.E-02	Total CNS HI =	8.E-01
Total Kidney HI =	1.E-01	Total Fetotoxicity HI =	4.E-02
Total CVS HI =	8.E-02	Total Body Weight HI =	4.E-02
Total GI Tract HI =	4.E-02	Total Prostate HI =	3.E-03
Total Skin HI =	8.E-02	Total Bone HI =	4.E-02
Total Blood HI =	8.E-02		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	1.E-07		1.E-09	1.E-07	2,4,6-Trinitrotoluene	Liver	8.E-02		1.E-03	8.E-02
			RDX	3.E-07		1.E-09	4.E-07	RDX	Prostate	1.E-02		5.E-05	1.E-02
			Antimony					Antimony	Blood	7.E-02		8.E-04	7.E-02
			Arsenic	1.E-05		2.E-08	1.E-05	Arsenic	Skin, CVS	3.E-01		5.E-04	3.E-01
			Iron					Iron	NA	2.E-01		4.E-04	2.E-01
			Manganese					Manganese	CNS	9.E-01		4.E-02	9.E-01
			Vanadium					Vanadium	Kidney	5.E-02		3.E-03	5.E-02
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				1.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					2.E+00

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	8.E-02	Total CNS HI =	9.E-01
Total Kidney HI =	5.E-02	Total Prostate HI =	1.E-02
Total CVS HI =	3.E-01	Total Skin HI =	3.E-01
Total Blood HI =	7.E-02		

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	2.E-02		7.E-04	2.E-02
			2,4,6-Trinitrotoluene	4.E-07		1.E-08	4.E-07	2,4,6-Trinitrotoluene	Liver	7.E-02		2.E-03	7.E-02
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	2.E-03		9.E-05	2.E-03
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	1.E-01		2.E-03	1.E-01
			2-Nitrotoluene	2.E-08		3.E-09	2.E-08	2-Nitrotoluene	Spleen	2.E-05		4.E-06	2.E-05
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	2.E-01		3.E-03	2.E-01
			4-Nitrotoluene	4.E-09		7.E-10	4.E-09	4-Nitrotoluene	Spleen	6.E-05		1.E-05	7.E-05
			HMX					HMX	Liver, Blood	4.E-03		2.E-05	4.E-03
			RDX	8.E-05		1.E-06	9.E-05	RDX	Prostate	7.E-01		9.E-03	8.E-01
			Aluminum					Aluminum	CNS	3.E-01		1.E-03	3.E-01
			Arsenic	3.E-05		1.E-07	3.E-05	Arsenic	Skin, CVS	2.E-01		8.E-04	2.E-01
			Beryllium					Beryllium	GS	7.E-02		4.E-02	1.E-01
			Cadmium					Cadmium	Kidney	2.E-01		2.E-02	2.E-01
			Chromium					Chromium	Fetotoxicity/GS/Bone	9.E-03		3.E-03	1.E-02
			Cobalt					Cobalt	NA	3.E-01		1.E-03	3.E-01
			Iron					Iron	NA	6.E-01		3.E-03	6.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	7.E+00		8.E-01	8.E+00
			Mercury					Mercury	CNS	4.E-03		2.E-04	4.E-03
			Nickel					Nickel	Body Weight	8.E-01		2.E-02	8.E-01
			Selenium					Selenium	NOEL	4.E-03		2.E-05	4.E-03
			Thallium					Thallium	Liver	5.E-02		2.E-04	5.E-02
			Vanadium					Vanadium	Kidney	1.E-02		2.E-03	1.E-02
			Zinc					Zinc	Blood	7.E-02		2.E-04	7.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	4.E-02		2.E-04	4.E-02
			Total Risk Across Pennsylvanian Upper Zone Groundwater				1.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					1.E+01

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	4.E-01	Total CNS HI =	8.E+00
Total Kidney HI =	2.E-01	Total Fetotoxicity HI =	1.E-02
Total CVS HI =	2.E-01	Total Body Weight HI =	8.E-01
Total GI Tract HI =	1.E-01	Total Prostate HI =	8.E-01
Total Skin HI =	2.E-01	Total Bone HI =	1.E-02
Total Blood HI =	1.E-01	Total Spleen HI =	2.E-02

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	6.E-08		7.E-10	6.E-08	RDX	Prostate	5.E-04		6.E-06	5.E-04
			Aluminum					Aluminum	CNS	1.E-02		6.E-05	1.E-02
			Antimony					Antimony	Blood	7.E-03		2.E-04	7.E-03
			Arsenic	3.E-06		1.E-08	3.E-06	Arsenic	Skin, CVS	2.E-02		8.E-05	2.E-02
			Cadmium					Cadmium	Kidney	4.E-03		3.E-04	4.E-03
			Chromium					Chromium	Fetotoxicity/GS/Bone	7.E-03		3.E-03	1.E-02
			Cobalt					Cobalt	NA	3.E-03		2.E-05	3.E-03
			Iron					Iron	NA	9.E-02		4.E-04	9.E-02
			Lead					Lead	NA				
			Manganese					Manganese	CNS	1.E-01		2.E-02	2.E-01
			Nickel					Nickel	Body Weight	8.E-03		2.E-04	8.E-03
			Thallium					Thallium	Liver	3.E-03		1.E-05	3.E-03
			Vanadium					Vanadium	Kidney	2.E-02		4.E-03	3.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-02		5.E-05	1.E-02
			Total Risk Across Pennsylvanian Middle Zone Groundwater				3.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					4.E-01

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	3.E-03	Total CNS HI =	2.E-01
Total Kidney HI =	3.E-02	Total Fetotoxicity HI =	1.E-02
Total CVS HI =	2.E-02	Total Body Weight HI =	8.E-03
Total GI Tract HI =	1.E-02	Total Prostate HI =	5.E-04
Total Skin HI =	2.E-02	Total Bone HI =	1.E-02
Total Blood HI =	2.E-02		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	9.E-08		3.E-09	9.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		6.E-04	2.E-02
			RDX	3.E-07		3.E-09	3.E-07	RDX	Prostate	3.E-03		3.E-05	3.E-03
			Antimony					Antimony	Blood	2.E-02		5.E-04	2.E-02
			Arsenic	1.E-05		4.E-08	1.E-05	Arsenic	Skin, CVS	6.E-02		3.E-04	6.E-02
			Iron					Iron	NA	5.E-02		2.E-04	5.E-02
			Manganese					Manganese	CNS	2.E-01		2.E-02	2.E-01
			Vanadium					Vanadium	Kidney	1.E-02		2.E-03	1.E-02
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				1.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					4.E-01

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	2.E-02	Total CNS HI =	2.E-01
Total Kidney HI =	1.E-02	Total Prostate HI =	3.E-03
Total CVS HI =	6.E-02	Total Skin HI =	6.E-02
Total Blood HI =	2.E-02		

TABLE 9.3. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	8.E-02		6.E-04	8.E-02
			2,4,6-Trinitrotoluene	2.E-06		1.E-08	2.E-06	2,4,6-Trinitrotoluene	Liver	3.E-01		2.E-03	3.E-01
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	8.E-03		8.E-05	8.E-03
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	5.E-01		2.E-03	5.E-01
			2-Nitrotoluene	8.E-08		3.E-09	8.E-08	2-Nitrotoluene	Spleen	1.E-04		3.E-06	1.E-04
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	8.E-01		3.E-03	8.E-01
			4-Nitrotoluene	2.E-08		6.E-10	2.E-08	4-Nitrotoluene	Spleen	3.E-04		1.E-05	3.E-04
			HMX					HMX	Liver, Blood	2.E-02		2.E-05	2.E-02
			RDX	4.E-04		9.E-07	4.E-04	RDX	Prostate	4.E+00		8.E-03	4.E+00
			Aluminum					Aluminum	CNS	1.E+00		1.E-03	1.E+00
			Arsenic	1.E-04		1.E-07	1.E-04	Arsenic	Skin, CVS	8.E-01		7.E-04	8.E-01
			Beryllium					Beryllium	GS	3.E-01		4.E-02	4.E-01
			Cadmium					Cadmium	Kidney	9.E-01		2.E-02	1.E+00
			Chromium					Chromium	Fetotoxicity/GS/Bone	4.E-02		3.E-03	5.E-02
			Cobalt					Cobalt	NA	2.E+00		1.E-03	2.E+00
			Iron					Iron	NA	3.E+00		3.E-03	3.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	3.E+01		7.E-01	3.E+01
			Mercury					Mercury	CNS	2.E-02		2.E-04	2.E-02
			Nickel					Nickel	Body Weight	4.E+00		2.E-02	4.E+00
			Selenium					Selenium	NOEL	2.E-02		1.E-05	2.E-02
			Thallium					Thallium	Liver	3.E-01		2.E-04	3.E-01
			Vanadium					Vanadium	Kidney	6.E-02		2.E-03	6.E-02
			Zinc					Zinc	Blood	3.E-01		2.E-04	3.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-01		1.E-04	2.E-01
			Total Risk Across Pennsylvanian Upper Zone Groundwater				6.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					5.E+01

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	2.E+00	Total CNS HI =	3.E+01
Total Kidney HI =	1.E+00	Total Fetotoxicity HI =	5.E-02
Total CVS HI =	8.E-01	Total Body Weight HI =	4.E+00
Total GI Tract HI =	4.E-01	Total Prostate HI =	4.E+00
Total Skin HI =	8.E-01	Total Bone HI =	5.E-02
Total Blood HI =	6.E-01	Total Spleen HI =	8.E-02

TABLE 9.3. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	3.E-07		6.E-10	3.E-07	RDX	Prostate	3.E-03		5.E-06	3.E-03
			Aluminum					Aluminum	CNS	7.E-02		5.E-05	7.E-02
			Antimony					Antimony	Blood	3.E-02		2.E-04	3.E-02
			Arsenic	1.E-05		1.E-08	1.E-05	Arsenic	Skin, CVS	8.E-02		7.E-05	8.E-02
			Cadmium					Cadmium	Kidney	2.E-02		3.E-04	2.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone	3.E-02		2.E-03	4.E-02
			Cobalt					Cobalt	NA	2.E-02		1.E-05	2.E-02
			Iron					Iron	NA	4.E-01		4.E-04	4.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	7.E-01		1.E-02	7.E-01
			Nickel					Nickel	Body Weight	4.E-02		1.E-04	4.E-02
			Thallium					Thallium	Liver	2.E-02		1.E-05	2.E-02
			Vanadium					Vanadium	Kidney	1.E-01		3.E-03	1.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-02		4.E-05	5.E-02
			Total Risk Across Pennsylvanian Middle Zone Groundwater				1.E-05	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					2.E+00

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	2.E-02	Total CNS HI =	8.E-01
Total Kidney HI =	1.E-01	Total Fetotoxicity HI =	4.E-02
Total CVS HI =	8.E-02	Total Body Weight HI =	4.E-02
Total GI Tract HI =	4.E-02	Total Prostate HI =	3.E-03
Total Skin HI =	8.E-02	Total Bone HI =	4.E-02
Total Blood HI =	8.E-02		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	4.E-07		3.E-09	4.E-07	2,4,6-Trinitrotoluene	Liver	8.E-02		5.E-04	8.E-02
			RDX	1.E-06		3.E-09	2.E-06	RDX	Prostate	1.E-02		3.E-05	1.E-02
			Antimony					Antimony	Blood	8.E-02		4.E-04	8.E-02
			Arsenic	5.E-05		4.E-08	5.E-05	Arsenic	Skin, CVS	3.E-01		3.E-04	3.E-01
			Iron					Iron	NA	2.E-01		2.E-04	2.E-01
			Manganese					Manganese	CNS	9.E-01		2.E-02	9.E-01
			Vanadium					Vanadium	Kidney	5.E-02		2.E-03	5.E-02
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				5.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					2.E+00

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	8.E-02	Total CNS HI =	9.E-01
Total Kidney HI =	5.E-02	Total Prostate HI =	1.E-02
Total CVS HI =	3.E-01	Total Skin HI =	3.E-01
Total Blood HI =	8.E-02		

TABLE 9.1. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen			1.E-03	1.E-03
			2,4,6-Trinitrotoluene			7.E-10	7.E-10	2,4,6-Trinitrotoluene	Liver			3.E-03	3.E-03
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney			1.E-04	1.E-04
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver			3.E-03	3.E-03
			2-Nitrotoluene			2.E-10	2.E-10	2-Nitrotoluene	Spleen			6.E-06	6.E-06
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver			5.E-03	5.E-03
			4-Nitrotoluene			4.E-11	4.E-11	4-Nitrotoluene	Spleen			2.E-05	2.E-05
			HMX					HMX	Liver, Blood			4.E-05	4.E-05
			RDX			6.E-08	6.E-08	RDX	Prostate			1.E-02	1.E-02
			Aluminum					Aluminum	CNS			5.E-03	5.E-03
			Arsenic			2.E-08	2.E-08	Arsenic	Skin, CVS			3.E-03	3.E-03
			Beryllium					Beryllium	GS			2.E-01	2.E-01
			Cadmium					Cadmium	Kidney			8.E-02	8.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone			1.E-02	1.E-02
			Cobalt					Cobalt	NA			6.E-03	6.E-03
			Iron					Iron	NA			1.E-02	1.E-02
			Lead					Lead	NA				
			Manganese					Manganese	CNS			3.E+00	3.E+00
			Mercury					Mercury	CNS			1.E-03	1.E-03
			Nickel					Nickel	Body Weight			8.E-02	8.E-02
			Selenium					Selenium	NOEL			7.E-05	7.E-05
			Thallium					Thallium	Liver			1.E-03	1.E-03
			Vanadium					Vanadium	Kidney			9.E-03	9.E-03
			Zinc					Zinc	Blood			8.E-04	8.E-04
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			7.E-04	7.E-04
			Total Risk Across Pennsylvanian Upper Zone Groundwater				8.E-08	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					4.E+00

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	1.E-02	Total CNS HI =	3.E+00
Total Kidney HI =	8.E-02	Total Fetotoxicity HI =	1.E-02
Total CVS HI =	3.E-03	Total Body Weight HI =	8.E-02
Total GI Tract HI =	2.E-01	Total Prostate HI =	1.E-02
Total Skin HI =	3.E-03	Total Bone HI =	1.E-02
Total Blood HI =	2.E-03	Total Spleen HI =	1.E-03

TABLE 9.1. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX			4.E-11	4.E-11	RDX	Prostate			9.E-06	9.E-06
			Aluminum					Aluminum	CNS			3.E-04	3.E-04
			Antimony					Antimony	Blood			8.E-04	8.E-04
			Arsenic			2.E-09	2.E-09	Arsenic	Skin, CVS			3.E-04	3.E-04
			Cadmium					Cadmium	Kidney			1.E-03	1.E-03
			Chromium					Chromium	Fetotoxicity/GS/Bone			1.E-02	1.E-02
			Cobalt					Cobalt	NA			6.E-05	6.E-05
			Iron					Iron	NA			2.E-03	2.E-03
			Lead					Lead	NA				
			Manganese					Manganese	CNS			7.E-02	7.E-02
			Nickel					Nickel	Body Weight			7.E-04	7.E-04
			Thallium					Thallium	Liver			6.E-05	6.E-05
			Vanadium					Vanadium	Kidney			2.E-02	2.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			2.E-04	2.E-04
			Total Risk Across Pennsylvanian Middle Zone Groundwater				2.E-09	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					1.E-01

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	6.E-05	Total CNS HI =	7.E-02
Total Kidney HI =	2.E-02	Total Fetotoxicity HI =	1.E-02
Total CVS HI =	3.E-04	Total Body Weight HI =	7.E-04
Total GI Tract HI =	1.E-02	Total Prostate HI =	9.E-06
Total Skin HI =	3.E-04	Total Bone HI =	1.E-02
Total Blood HI =	1.E-03		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene			2.E-10	2.E-10	2,4,6-Trinitrotoluene	Liver			9.E-04	9.E-04
			RDX			2.E-10	2.E-10	RDX	Prostate			5.E-05	5.E-05
			Antimony					Antimony	Blood			2.E-03	2.E-03
			Arsenic			8.E-09	8.E-09	Arsenic	Skin, CVS			1.E-03	1.E-03
			Iron					Iron	NA			9.E-04	9.E-04
			Manganese					Manganese	CNS			9.E-02	9.E-02
			Vanadium					Vanadium	Kidney			7.E-03	7.E-03
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				8.E-09	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					1.E-01

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	9.E-04	Total CNS HI =	9.E-02
Total Kidney HI =	7.E-03	Total Prostate HI =	5.E-05
Total CVS HI =	1.E-03	Total Skin HI =	1.E-03
Total Blood HI =	2.E-03		

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen				
			2,4,6-Trinitrotoluene	1.E-06		2.E-08	1.E-06	2,4,6-Trinitrotoluene	Liver				
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney				
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver				
			2-Nitrotoluene	5.E-08		4.E-09	5.E-08	2-Nitrotoluene	Spleen				
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver				
			4-Nitrotoluene	1.E-08		1.E-09	1.E-08	4-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	3.E-04		2.E-06	3.E-04	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	8.E-05		2.E-07	8.E-05	Arsenic	Skin, CVS				
			Beryllium					Beryllium	GS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Mercury					Mercury	CNS				
			Nickel					Nickel	Body Weight				
			Selenium					Selenium	NOEL				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Zinc					Zinc	Blood				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Upper Zone Groundwater				3.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	2.E-07		1.E-09	2.E-07	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Antimony					Antimony	Blood				
			Arsenic	8.E-06		2.E-08	8.E-06	Arsenic	Skin, CVS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Nickel					Nickel	Body Weight				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Middle Zone Groundwater				8.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					
Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	3.E-07		5.E-09	3.E-07	2,4,6-Trinitrotoluene	Liver				
			RDX	9.E-07		5.E-09	9.E-07	RDX	Prostate				
			Antimony					Antimony	Blood				
			Arsenic	3.E-05		6.E-08	3.E-05	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				3.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	2.E-01		4.E-03	2.E-01
			2,4,6-Trinitrotoluene	4.E-07		6.E-09	4.E-07	2,4,6-Trinitrotoluene	Liver	1.E+00		1.E-02	1.E+00
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	2.E-02		6.E-04	2.E-02
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	1.E+00		1.E-02	1.E+00
			2-Nitrotoluene	2.E-08		1.E-09	2.E-08	2-Nitrotoluene	Spleen	3.E-04		2.E-05	3.E-04
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	2.E+00		2.E-02	2.E+00
			4-Nitrotoluene	4.E-09		4.E-10	4.E-09	4-Nitrotoluene	Spleen	8.E-04		7.E-05	9.E-04
			HMX					HMX	Liver, Blood	5.E-02		1.E-04	5.E-02
			RDX	1.E-04		5.E-07	1.E-04	RDX	Prostate	1.E+01		5.E-02	1.E+01
			Aluminum					Aluminum	CNS	4.E+00		7.E-03	4.E+00
			Arsenic	3.E-05		5.E-08	3.E-05	Arsenic	Skin, CVS	2.E+00		4.E-03	2.E+00
			Beryllium					Beryllium	GS	1.E+00		2.E-01	1.E+00
			Cadmium					Cadmium	Kidney	3.E+00		9.E-02	3.E+00
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-01		2.E-02	1.E-01
			Cobalt					Cobalt	NA	5.E+00		8.E-03	5.E+00
			Iron					Iron	NA	9.E+00		1.E-02	9.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	9.E+01		4.E+00	1.E+02
			Mercury					Mercury	CNS	5.E-02		1.E-03	5.E-02
			Nickel					Nickel	Body Weight	1.E+01		1.E-01	1.E+01
			Selenium					Selenium	NOEL	5.E-02		9.E-05	5.E-02
			Thallium					Thallium	Liver	7.E-01		1.E-03	7.E-01
			Vanadium					Vanadium	Kidney	2.E-01		1.E-02	2.E-01
			Zinc					Zinc	Blood	1.E+00		1.E-03	1.E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-01		8.E-04	5.E-01
			Total Risk Across Pennsylvanian Upper Zone Groundwater				1.E-04		Total Hazard Index Across Pennsylvanian Upper Zone Groundwater				2.E+02

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	6.E+00	Total CNS HI =	1.E+02
Total Kidney HI =	3.E+00	Total Fetotoxicity HI =	1.E-01
Total CVS HI =	2.E+00	Total Body Weight HI =	1.E+01
Total GI Tract HI =	1.E+00	Total Prostate HI =	1.E+01
Total Skin HI =	2.E+00	Total Bone HI =	1.E-01
Total Blood HI =	2.E+00	Total Spleen HI =	2.E-01

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	7.E-08		4.E-10	7.E-08	RDX	Prostate	7.E-03		4.E-05	7.E-03
			Aluminum					Aluminum	CNS	2.E-01		3.E-04	2.E-01
			Antimony					Antimony	Blood	9.E-02		1.E-03	1.E-01
			Arsenic	3.E-06		5.E-09	3.E-06	Arsenic	Skin, CVS	2.E-01		4.E-04	2.E-01
			Cadmium					Cadmium	Kidney	5.E-02		2.E-03	5.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-01		1.E-02	1.E-01
			Cobalt					Cobalt	NA	5.E-02		8.E-05	5.E-02
			Iron					Iron	NA	1.E+00		2.E-03	1.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	2.E+00		9.E-02	2.E+00
			Nickel					Nickel	Body Weight	1.E-01		9.E-04	1.E-01
			Thallium					Thallium	Liver	4.E-02		7.E-05	4.E-02
			Vanadium					Vanadium	Kidney	3.E-01		2.E-02	3.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-01		2.E-04	1.E-01
			Total Risk Across Pennsylvanian Middle Zone Groundwater				3.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					5.E+00

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	4.E-02	Total CNS HI =	2.E+00
Total Kidney HI =	4.E-01	Total Fetotoxicity HI =	1.E-01
Total CVS HI =	2.E-01	Total Body Weight HI =	1.E-01
Total GI Tract HI =	1.E-01	Total Prostate HI =	7.E-03
Total Skin HI =	2.E-01	Total Bone HI =	1.E-01
Total Blood HI =	2.E-01		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	1.E-07		2.E-09	1.E-07	2,4,6-Trinitrotoluene	Liver	2.E-01		4.E-03	2.E-01
			RDX	3.E-07		2.E-09	3.E-07	RDX	Prostate	4.E-02		2.E-04	4.E-02
			Antimony					Antimony	Blood	2.E-01		2.E-03	2.E-01
			Arsenic	1.E-05		2.E-08	1.E-05	Arsenic	Skin, CVS	9.E-01		1.E-03	9.E-01
			Iron					Iron	NA	7.E-01		1.E-03	7.E-01
			Manganese					Manganese	CNS	3.E+00		1.E-01	3.E+00
			Vanadium					Vanadium	Kidney	1.E-01		9.E-03	1.E-01
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				1.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					5.E+00

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	2.E-01	Total CNS HI =	3.E+00
Total Kidney HI =	1.E-01	Total Prostate HI =	4.E-02
Total CVS HI =	9.E-01	Total Skin HI =	9.E-01
Total Blood HI =	2.E-01		

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	1.E-01		2.E-03	1.E-01
			2,4,6-Trinitrotoluene	7.E-07		1.E-08	7.E-07	2,4,6-Trinitrotoluene	Liver	4.E-01		9.E-03	4.E-01
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	1.E-02		3.E-04	1.E-02
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	6.E-01		7.E-03	6.E-01
			2-Nitrotoluene	3.E-08		3.E-09	3.E-08	2-Nitrotoluene	Spleen	1.E-04		1.E-05	1.E-04
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	1.E+00		1.E-02	1.E+00
			4-Nitrotoluene	7.E-09		7.E-10	7.E-09	4-Nitrotoluene	Spleen	4.E-04		4.E-05	4.E-04
			HMX					HMX	Liver, Blood	2.E-02		9.E-05	2.E-02
			RDX	2.E-04		1.E-06	2.E-04	RDX	Prostate	5.E+00		3.E-02	5.E+00
			Aluminum					Aluminum	CNS	2.E+00		4.E-03	2.E+00
			Arsenic	5.E-05		1.E-07	5.E-05	Arsenic	Skin, CVS	1.E+00		2.E-03	1.E+00
			Beryllium					Beryllium	GS	4.E-01		1.E-01	6.E-01
			Cadmium					Cadmium	Kidney	1.E+00		5.E-02	1.E+00
			Chromium					Chromium	Fetotoxicity/GS/Bone	6.E-02		1.E-02	7.E-02
			Cobalt					Cobalt	NA	2.E+00		4.E-03	2.E+00
			Iron					Iron	NA	4.E+00		9.E-03	4.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	4.E+01		2.E+00	5.E+01
			Mercury					Mercury	CNS	2.E-02		7.E-04	2.E-02
			Nickel					Nickel	Body Weight	5.E+00		6.E-02	5.E+00
			Selenium					Selenium	NOEL	2.E-02		5.E-05	2.E-02
			Thallium					Thallium	Liver	3.E-01		7.E-04	3.E-01
			Vanadium					Vanadium	Kidney	8.E-02		6.E-03	8.E-02
			Zinc					Zinc	Blood	5.E-01		6.E-04	5.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-01		5.E-04	2.E-01
			Total Risk Across Pennsylvanian Upper Zone Groundwater				2.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					7.E+01

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	3.E+00	Total CNS HI =	5.E+01
Total Kidney HI =	1.E+00	Total Fetotoxicity HI =	7.E-02
Total CVS HI =	1.E+00	Total Body Weight HI =	5.E+00
Total GI Tract HI =	6.E-01	Total Prostate HI =	5.E+00
Total Skin HI =	1.E+00	Total Bone HI =	7.E-02
Total Blood HI =	7.E-01	Total Spleen HI =	1.E-01

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	1.E-07		7.E-10	1.E-07	RDX	Prostate	3.E-03		2.E-05	3.E-03
			Aluminum					Aluminum	CNS	9.E-02		2.E-04	9.E-02
			Antimony					Antimony	Blood	4.E-02		6.E-04	4.E-02
			Arsenic	5.E-06		1.E-08	5.E-06	Arsenic	Skin, CVS	1.E-01		2.E-04	1.E-01
			Cadmium					Cadmium	Kidney	2.E-02		1.E-03	2.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-02		8.E-03	5.E-02
			Cobalt					Cobalt	NA	2.E-02		5.E-05	2.E-02
			Iron					Iron	NA	6.E-01		1.E-03	6.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	9.E-01		5.E-02	1.E+00
			Nickel					Nickel	Body Weight	5.E-02		5.E-04	5.E-02
			Thallium					Thallium	Liver	2.E-02		4.E-05	2.E-02
			Vanadium					Vanadium	Kidney	1.E-01		1.E-02	1.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	7.E-02		1.E-04	7.E-02
			Total Risk Across Pennsylvanian Middle Zone Groundwater				5.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					2.E+00

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	2.E-02	Total CNS HI =	1.E+00
Total Kidney HI =	2.E-01	Total Fetotoxicity HI =	5.E-02
Total CVS HI =	1.E-01	Total Body Weight HI =	5.E-02
Total GI Tract HI =	5.E-02	Total Prostate HI =	3.E-03
Total Skin HI =	1.E-01	Total Bone HI =	5.E-02
Total Blood HI =	1.E-01		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	2.E-07		3.E-09	2.E-07	2,4,6-Trinitrotoluene	Liver	1.E-01		2.E-03	1.E-01
			RDX	6.E-07		4.E-09	6.E-07	RDX	Prostate	2.E-02		1.E-04	2.E-02
			Antimony					Antimony	Blood	1.E-01		1.E-03	1.E-01
			Arsenic	2.E-05		4.E-08	2.E-05	Arsenic	Skin, CVS	4.E-01		9.E-04	4.E-01
			Iron					Iron	NA	3.E-01		7.E-04	3.E-01
			Manganese					Manganese	CNS	1.E+00		6.E-02	1.E+00
			Vanadium					Vanadium	Kidney	6.E-02		5.E-03	7.E-02
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				2.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					2.E+00

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	1.E-01	Total CNS HI =	1.E+00
Total Kidney HI =	7.E-02	Total Prostate HI =	2.E-02
Total CVS HI =	4.E-01	Total Skin HI =	4.E-01
Total Blood HI =	1.E-01		

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen				
			2,4,6-Trinitrotoluene	1.E-07		2.E-09	1.E-07	2,4,6-Trinitrotoluene	Liver				
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney				
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver				
			2-Nitrotoluene	5.E-09		5.E-10	6.E-09	2-Nitrotoluene	Spleen				
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver				
			4-Nitrotoluene	1.E-09		1.E-10	1.E-09	4-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	3.E-05		2.E-07	3.E-05	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	9.E-06		2.E-08	9.E-06	Arsenic	Skin, CVS				
			Beryllium					Beryllium	GS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Mercury					Mercury	CNS				
			Nickel					Nickel	Body Weight				
			Selenium					Selenium	NOEL				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Zinc					Zinc	Blood				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Upper Zone Groundwater				4.E-05	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	2.E-08		1.E-10	2.E-08	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Antimony					Antimony	Blood				
			Arsenic	9.E-07		2.E-09	9.E-07	Arsenic	Skin, CVS				
			Cadmium					Cadmium	Kidney				
			Chromium					Chromium	Fetotoxicity/GS/Bone				
			Cobalt					Cobalt	NA				
			Iron					Iron	NA				
			Lead					Lead	NA				
			Manganese					Manganese	CNS				
			Nickel					Nickel	Body Weight				
			Thallium					Thallium	Liver				
			Vanadium					Vanadium	Kidney				
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood				
			Total Risk Across Pennsylvanian Middle Zone Groundwater				9.E-07	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					
Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	3.E-08		5.E-10	3.E-08	2,4,6-Trinitrotoluene	Liver				
			RDX	1.E-07		6.E-10	1.E-07	RDX	Prostate				
			Antimony					Antimony	Blood				
			Arsenic	3.E-06		6.E-09	3.E-06	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				4.E-06	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	4.E-02		5.E-04	4.E-02
			2,4,6-Trinitrotoluene	7.E-08		7.E-10	7.E-08	2,4,6-Trinitrotoluene	Liver	2.E-01		2.E-03	2.E-01
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	4.E-03		6.E-05	4.E-03
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	2.E-01		1.E-03	2.E-01
			2-Nitrotoluene	3.E-09		2.E-10	3.E-09	2-Nitrotoluene	Spleen	5.E-05		2.E-06	5.E-05
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	4.E-01		2.E-03	4.E-01
			4-Nitrotoluene	7.E-10		4.E-11	7.E-10	4-Nitrotoluene	Spleen	1.E-04		8.E-06	2.E-04
			HMX					HMX	Liver, Blood	8.E-03		2.E-05	8.E-03
			RDX	2.E-05		6.E-08	2.E-05	RDX	Prostate	2.E+00		6.E-03	2.E+00
			Aluminum					Aluminum	CNS	7.E-01		7.E-04	7.E-01
			Arsenic	5.E-06		6.E-09	5.E-06	Arsenic	Skin, CVS	4.E-01		4.E-04	4.E-01
			Beryllium					Beryllium	GS	2.E-01		3.E-02	2.E-01
			Cadmium					Cadmium	Kidney	5.E-01		1.E-02	5.E-01
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-02		2.E-03	2.E-02
			Cobalt					Cobalt	NA	8.E-01		9.E-04	8.E-01
			Iron					Iron	NA	2.E+00		2.E-03	2.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	2.E+01		4.E-01	2.E+01
			Mercury					Mercury	CNS	8.E-03		1.E-04	9.E-03
			Nickel					Nickel	Body Weight	2.E+00		1.E-02	2.E+00
			Selenium					Selenium	NOEL	9.E-03		1.E-05	9.E-03
			Thallium					Thallium	Liver	1.E-01		1.E-04	1.E-01
			Vanadium					Vanadium	Kidney	3.E-02		1.E-03	3.E-02
			Zinc					Zinc	Blood	2.E-01		1.E-04	2.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	9.E-02		9.E-05	9.E-02
			Total Risk Across Pennsylvanian Upper Zone Groundwater				2.E-05	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					3.E+01

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	9.E-01	Total CNS HI =	2.E+01
Total Kidney HI =	5.E-01	Total Fetotoxicity HI =	2.E-02
Total CVS HI =	4.E-01	Total Body Weight HI =	2.E+00
Total GI Tract HI =	2.E-01	Total Prostate HI =	2.E+00
Total Skin HI =	4.E-01	Total Bone HI =	2.E-02
Total Blood HI =	3.E-01	Total Spleen HI =	4.E-02

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	1.E-08		4.E-11	1.E-08	RDX	Prostate	1.E-03		4.E-06	1.E-03
			Aluminum					Aluminum	CNS	3.E-02		4.E-05	3.E-02
			Antimony					Antimony	Blood	2.E-02		1.E-04	2.E-02
			Arsenic	5.E-07		6.E-10	5.E-07	Arsenic	Skin, CVS	4.E-02		5.E-05	4.E-02
			Cadmium					Cadmium	Kidney	9.E-03		2.E-04	9.E-03
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-02		1.E-03	2.E-02
			Cobalt					Cobalt	NA	8.E-03		9.E-06	8.E-03
			Iron					Iron	NA	2.E-01		2.E-04	2.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	3.E-01		9.E-03	4.E-01
			Nickel					Nickel	Body Weight	2.E-02		1.E-04	2.E-02
			Thallium					Thallium	Liver	7.E-03		8.E-06	7.E-03
			Vanadium					Vanadium	Kidney	5.E-02		2.E-03	5.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	3.E-02		3.E-05	3.E-02
			Total Risk Across Pennsylvanian Middle Zone Groundwater				5.E-07	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					8.E-01

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	7.E-03	Total CNS HI =	4.E-01
Total Kidney HI =	6.E-02	Total Fetotoxicity HI =	2.E-02
Total CVS HI =	4.E-02	Total Body Weight HI =	2.E-02
Total GI Tract HI =	2.E-02	Total Prostate HI =	1.E-03
Total Skin HI =	4.E-02	Total Bone HI =	2.E-02
Total Blood HI =	4.E-02		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	2.E-08		2.E-10	2.E-08	2,4,6-Trinitrotoluene	Liver	4.E-02		4.E-04	4.E-02
			RDX	6.E-08		2.E-10	6.E-08	RDX	Prostate	6.E-03		2.E-05	6.E-03
			Antimony					Antimony	Blood	4.E-02		3.E-04	4.E-02
			Arsenic	2.E-06		2.E-09	2.E-06	Arsenic	Skin, CVS	2.E-01		2.E-04	2.E-01
			Iron					Iron	NA	1.E-01		1.E-04	1.E-01
			Manganese					Manganese	CNS	4.E-01		1.E-02	4.E-01
			Vanadium					Vanadium	Kidney	2.E-02		1.E-03	2.E-02
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				2.E-06	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					8.E-01

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	4.E-02	Total CNS HI =	4.E-01
Total Kidney HI =	2.E-02	Total Prostate HI =	6.E-03
Total CVS HI =	2.E-01	Total Skin HI =	2.E-01
Total Blood HI =	4.E-02		

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	8.E-03		3.E-04	8.E-03
			2,4,6-Trinitrotoluene	5.E-08		1.E-09	5.E-08	2,4,6-Trinitrotoluene	Liver	3.E-02		1.E-03	4.E-02
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	8.E-04		4.E-05	9.E-04
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	5.E-02		8.E-04	5.E-02
			2-Nitrotoluene	2.E-09		3.E-10	3.E-09	2-Nitrotoluene	Spleen	1.E-05		1.E-06	1.E-05
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	9.E-02		1.E-03	9.E-02
			4-Nitrotoluene	5.E-10		8.E-11	6.E-10	4-Nitrotoluene	Spleen	3.E-05		5.E-06	4.E-05
			HMX					HMX	Liver, Blood	2.E-03		1.E-05	2.E-03
			RDX	1.E-05		1.E-07	1.E-05	RDX	Prostate	4.E-01		3.E-03	4.E-01
			Aluminum					Aluminum	CNS	1.E-01		4.E-04	1.E-01
			Arsenic	4.E-06		1.E-08	4.E-06	Arsenic	Skin, CVS	8.E-02		3.E-04	8.E-02
			Beryllium					Beryllium	GS	3.E-02		1.E-02	5.E-02
			Cadmium					Cadmium	Kidney	1.E-01		6.E-03	1.E-01
			Chromium					Chromium	Fetotoxicity/GS/Bone	4.E-03		1.E-03	5.E-03
			Cobalt					Cobalt	NA	2.E-01		5.E-04	2.E-01
			Iron					Iron	NA	3.E-01		1.E-03	3.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	3.E+00		3.E-01	4.E+00
			Mercury					Mercury	CNS	2.E-03		8.E-05	2.E-03
			Nickel					Nickel	Body Weight	4.E-01		6.E-03	4.E-01
			Selenium					Selenium	NOEL	2.E-03		6.E-06	2.E-03
			Thallium					Thallium	Liver	3.E-02		8.E-05	3.E-02
			Vanadium					Vanadium	Kidney	6.E-03		7.E-04	7.E-03
			Zinc					Zinc	Blood	4.E-02		7.E-05	4.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-02		6.E-05	2.E-02
			Total Risk Across Pennsylvanian Upper Zone Groundwater				2.E-05	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					6.E+00

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	2.E-01	Total CNS HI =	4.E+00
Total Kidney HI =	1.E-01	Total Fetotoxicity HI =	5.E-03
Total CVS HI =	8.E-02	Total Body Weight HI =	4.E-01
Total GI Tract HI =	6.E-02	Total Prostate HI =	4.E-01
Total Skin HI =	8.E-02	Total Bone HI =	5.E-03
Total Blood HI =	6.E-02	Total Spleen HI =	8.E-03

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	9.E-09		8.E-11	9.E-09	RDX	Prostate	3.E-04		3.E-06	3.E-04
			Aluminum					Aluminum	CNS	7.E-03		2.E-05	7.E-03
			Antimony					Antimony	Blood	3.E-03		7.E-05	3.E-03
			Arsenic	4.E-07		1.E-09	4.E-07	Arsenic	Skin, CVS	9.E-03		3.E-05	9.E-03
			Cadmium					Cadmium	Kidney	2.E-03		1.E-04	2.E-03
			Chromium					Chromium	Fetotoxicity/GS/Bone	4.E-03		9.E-04	4.E-03
			Cobalt					Cobalt	NA	2.E-03		5.E-06	2.E-03
			Iron					Iron	NA	5.E-02		1.E-04	5.E-02
			Lead					Lead	NA				
			Manganese					Manganese	CNS	7.E-02		6.E-03	8.E-02
			Nickel					Nickel	Body Weight	4.E-03		6.E-05	4.E-03
			Thallium					Thallium	Liver	2.E-03		5.E-06	2.E-03
			Vanadium					Vanadium	Kidney	1.E-02		1.E-03	1.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-03		2.E-05	5.E-03
			Total Risk Across Pennsylvanian Middle Zone Groundwater				4.E-07	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					2.E-01

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	2.E-03	Total CNS HI =	9.E-02
Total Kidney HI =	1.E-02	Total Fetotoxicity HI =	4.E-03
Total CVS HI =	9.E-03	Total Body Weight HI =	4.E-03
Total GI Tract HI =	4.E-03	Total Prostate HI =	3.E-04
Total Skin HI =	9.E-03	Total Bone HI =	4.E-03
Total Blood HI =	9.E-03		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	1.E-08		4.E-10	1.E-08	2,4,6-Trinitrotoluene	Liver	9.E-03		2.E-04	9.E-03
			RDX	4.E-08		4.E-10	4.E-08	RDX	Prostate	1.E-03		1.E-05	1.E-03
			Antimony					Antimony	Blood	8.E-03		2.E-04	8.E-03
			Arsenic	1.E-06		4.E-09	1.E-06	Arsenic	Skin, CVS	3.E-02		1.E-04	3.E-02
			Iron					Iron	NA	2.E-02		7.E-05	2.E-02
			Manganese					Manganese	CNS	9.E-02		7.E-03	1.E-01
			Vanadium					Vanadium	Kidney	5.E-03		6.E-04	6.E-03
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				2.E-06	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					2.E-01

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	9.E-03	Total CNS HI =	1.E-01
Total Kidney HI =	6.E-03	Total Prostate HI =	1.E-03
Total CVS HI =	3.E-02	Total Skin HI =	3.E-02
Total Blood HI =	8.E-03		

TABLE 9.3. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen	7.E-02		4.E-04	7.E-02
			2,4,6-Trinitrotoluene	6.E-07		3.E-09	6.E-07	2,4,6-Trinitrotoluene	Liver	3.E-01		1.E-03	3.E-01
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney	7.E-03		6.E-05	7.E-03
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver	4.E-01		1.E-03	4.E-01
			2-Nitrotoluene	3.E-08		7.E-10	3.E-08	2-Nitrotoluene	Spleen	9.E-05		2.E-06	9.E-05
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver	7.E-01		2.E-03	7.E-01
			4-Nitrotoluene	6.E-09		2.E-10	6.E-09	4-Nitrotoluene	Spleen	3.E-04		7.E-06	3.E-04
			HMX					HMX	Liver, Blood	2.E-02		1.E-05	2.E-02
			RDX	1.E-04		2.E-07	1.E-04	RDX	Prostate	3.E+00		5.E-03	3.E+00
			Aluminum					Aluminum	CNS	1.E+00		7.E-04	1.E+00
			Arsenic	4.E-05		2.E-08	4.E-05	Arsenic	Skin, CVS	7.E-01		4.E-04	7.E-01
			Beryllium					Beryllium	GS	3.E-01		2.E-02	3.E-01
			Cadmium					Cadmium	Kidney	8.E-01		9.E-03	8.E-01
			Chromium					Chromium	Fetotoxicity/GS/Bone	4.E-02		2.E-03	4.E-02
			Cobalt					Cobalt	NA	1.E+00		8.E-04	1.E+00
			Iron					Iron	NA	3.E+00		1.E-03	3.E+00
			Lead					Lead	NA				
			Manganese					Manganese	CNS	3.E+01		4.E-01	3.E+01
			Mercury					Mercury	CNS	2.E-02		1.E-04	2.E-02
			Nickel					Nickel	Body Weight	3.E+00		1.E-02	4.E+00
			Selenium					Selenium	NOEL	2.E-02		9.E-06	2.E-02
			Thallium					Thallium	Liver	2.E-01		1.E-04	2.E-01
			Vanadium					Vanadium	Kidney	5.E-02		1.E-03	5.E-02
			Zinc					Zinc	Blood	3.E-01		1.E-04	3.E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-01		9.E-05	2.E-01
			Total Risk Across Pennsylvanian Upper Zone Groundwater				2.E-04	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					5.E+01

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	2.E+00	Total CNS HI =	3.E+01
Total Kidney HI =	9.E-01	Total Fetotoxicity HI =	4.E-02
Total CVS HI =	7.E-01	Total Body Weight HI =	4.E+00
Total GI Tract HI =	4.E-01	Total Prostate HI =	3.E+00
Total Skin HI =	7.E-01	Total Bone HI =	4.E-02
Total Blood HI =	5.E-01	Total Spleen HI =	7.E-02

TABLE 9.3. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX	1.E-07		2.E-10	1.E-07	RDX	Prostate	2.E-03		4.E-06	2.E-03
			Aluminum					Aluminum	CNS	6.E-02		3.E-05	6.E-02
			Antimony					Antimony	Blood	3.E-02		1.E-04	3.E-02
			Arsenic	4.E-06		2.E-09	4.E-06	Arsenic	Skin, CVS	7.E-02		4.E-05	7.E-02
			Cadmium					Cadmium	Kidney	2.E-02		2.E-04	2.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone	3.E-02		1.E-03	3.E-02
			Cobalt					Cobalt	NA	1.E-02		8.E-06	1.E-02
			Iron					Iron	NA	4.E-01		2.E-04	4.E-01
			Lead					Lead	NA				
			Manganese					Manganese	CNS	6.E-01		9.E-03	6.E-01
			Nickel					Nickel	Body Weight	3.E-02		9.E-05	3.E-02
			Thallium					Thallium	Liver	1.E-02		7.E-06	1.E-02
			Vanadium					Vanadium	Kidney	9.E-02		2.E-03	9.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-02		3.E-05	5.E-02
			Total Risk Across Pennsylvanian Middle Zone Groundwater				4.E-06	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					1.E+00

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	1.E-02	Total CNS HI =	7.E-01
Total Kidney HI =	1.E-01	Total Fetotoxicity HI =	3.E-02
Total CVS HI =	7.E-02	Total Body Weight HI =	3.E-02
Total GI Tract HI =	3.E-02	Total Prostate HI =	2.E-03
Total Skin HI =	7.E-02	Total Bone HI =	3.E-02
Total Blood HI =	7.E-02		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene	1.E-07		7.E-10	1.E-07	2,4,6-Trinitrotoluene	Liver	7.E-02		4.E-04	7.E-02
			RDX	5.E-07		8.E-10	5.E-07	RDX	Prostate	1.E-02		2.E-05	1.E-02
			Antimony					Antimony	Blood	7.E-02		2.E-04	7.E-02
			Arsenic	2.E-05		9.E-09	2.E-05	Arsenic	Skin, CVS	3.E-01		1.E-04	3.E-01
			Iron					Iron	NA	2.E-01		1.E-04	2.E-01
			Manganese					Manganese	CNS	8.E-01		1.E-02	8.E-01
			Vanadium					Vanadium	Kidney	4.E-02		9.E-04	4.E-02
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				2.E-05	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					1.E+00

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	7.E-02	Total CNS HI =	8.E-01
Total Kidney HI =	4.E-02	Total Prostate HI =	1.E-02
Total CVS HI =	3.E-01	Total Skin HI =	3.E-01
Total Blood HI =	7.E-02		

TABLE 9.1. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Upper Zone	1,3-Dinitrobenzene					1,3-Dinitrobenzene	Spleen			9.E-04	9.E-04
			2,4,6-Trinitrotoluene			6.E-10	6.E-10	2,4,6-Trinitrotoluene	Liver			3.E-03	3.E-03
			2,6-Dinitrotoluene					2,6-Dinitrotoluene	CNS, Blood, Kidney			1.E-04	1.E-04
			2-Amino-4,6-Dinitrotoluene					2-Amino-4,6-Dinitrotoluene	Liver			2.E-03	2.E-03
			2-Nitrotoluene			2.E-10	2.E-10	2-Nitrotoluene	Spleen			5.E-06	5.E-06
			4-Amino-2,6-Dinitrotoluene					4-Amino-2,6-Dinitrotoluene	Liver			4.E-03	4.E-03
			4-Nitrotoluene			4.E-11	4.E-11	4-Nitrotoluene	Spleen			2.E-05	2.E-05
			HMX					HMX	Liver, Blood			3.E-05	3.E-05
			RDX			5.E-08	5.E-08	RDX	Prostate			1.E-02	1.E-02
			Aluminum					Aluminum	CNS			4.E-03	4.E-03
			Arsenic			2.E-08	2.E-08	Arsenic	Skin, CVS			2.E-03	2.E-03
			Beryllium					Beryllium	GS			1.E-01	1.E-01
			Cadmium					Cadmium	Kidney			6.E-02	6.E-02
			Chromium					Chromium	Fetotoxicity/GS/Bone			1.E-02	1.E-02
			Cobalt					Cobalt	NA			5.E-03	5.E-03
			Iron					Iron	NA			9.E-03	9.E-03
			Lead					Lead	NA				
			Manganese					Manganese	CNS			2.E+00	2.E+00
			Mercury					Mercury	CNS			7.E-04	7.E-04
			Nickel					Nickel	Body Weight			6.E-02	6.E-02
			Selenium					Selenium	NOEL			5.E-05	5.E-05
			Thallium					Thallium	Liver			7.E-04	7.E-04
			Vanadium					Vanadium	Kidney			7.E-03	7.E-03
			Zinc					Zinc	Blood			6.E-04	6.E-04
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			5.E-04	5.E-04
			Total Risk Across Pennsylvanian Upper Zone Groundwater				7.E-08	Total Hazard Index Across Pennsylvanian Upper Zone Groundwater					3.E+00

Target Organ Analysis - Pennsylvanian Upper Zone

Total Liver HI =	1.E-02	Total CNS HI =	2.E+00
Total Kidney HI =	6.E-02	Total Fetotoxicity HI =	1.E-02
Total CVS HI =	2.E-03	Total Body Weight HI =	6.E-02
Total GI Tract HI =	2.E-01	Total Prostate HI =	1.E-02
Total Skin HI =	2.E-03	Total Bone HI =	1.E-02
Total Blood HI =	1.E-03	Total Spleen HI =	9.E-04

TABLE 9.1. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Water	Pennsylvanian Middle Zone	RDX			4.E-11	4.E-11	RDX	Prostate			8.E-06	8.E-06
			Aluminum					Aluminum	CNS			2.E-04	2.E-04
			Antimony					Antimony	Blood			6.E-04	6.E-04
			Arsenic			2.E-09	2.E-09	Arsenic	Skin, CVS			3.E-04	3.E-04
			Cadmium					Cadmium	Kidney			1.E-03	1.E-03
			Chromium					Chromium	Fetotoxicity/GS/Bone			8.E-03	8.E-03
			Cobalt					Cobalt	NA			5.E-05	5.E-05
			Iron					Iron	NA			1.E-03	1.E-03
			Lead					Lead	NA				
			Manganese					Manganese	CNS			5.E-02	5.E-02
			Nickel					Nickel	Body Weight			5.E-04	5.E-04
			Thallium					Thallium	Liver			5.E-05	5.E-05
			Vanadium					Vanadium	Kidney			1.E-02	1.E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			2.E-04	2.E-04
			Total Risk Across Pennsylvanian Middle Zone Groundwater				2.E-09	Total Hazard Index Across Pennsylvanian Middle Zone Groundwater					8.E-02

Target Organ Analysis - Pennsylvanian Middle Zone

Total Liver HI =	5.E-05	Total CNS HI =	5.E-02
Total Kidney HI =	1.E-02	Total Fetotoxicity HI =	8.E-03
Total CVS HI =	3.E-04	Total Body Weight HI =	5.E-04
Total GI Tract HI =	8.E-03	Total Prostate HI =	8.E-06
Total Skin HI =	3.E-04	Total Bone HI =	8.E-03
Total Blood HI =	8.E-04		

Groundwater	Water	Pennsylvanian Lower and Mississippian Glen Dean Zone	2,4,6-Trinitrotoluene			2.E-10	2.E-10	2,4,6-Trinitrotoluene	Liver			7.E-04	7.E-04
			RDX			2.E-10	2.E-10	RDX	Prostate			4.E-05	4.E-05
			Antimony					Antimony	Blood			2.E-03	2.E-03
			Arsenic			6.E-09	6.E-09	Arsenic	Skin, CVS			9.E-04	9.E-04
			Iron					Iron	NA			7.E-04	7.E-04
			Manganese					Manganese	CNS			7.E-02	7.E-02
			Vanadium					Vanadium	Kidney			5.E-03	5.E-03
			Total Risk Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater				6.E-09	Total HI Across Pennsylvanian Lower and Mississippian Glen Dean Zone Groundwater					8.E-02

Target Organ Analysis - Pennsylvanian Lower and Mississippian Glen Dean Zone

Total Liver HI =	7.E-04	Total CNS HI =	7.E-02
Total Kidney HI =	5.E-03	Total Prostate HI =	4.E-05
Total CVS HI =	9.E-04	Total Skin HI =	9.E-04
Total Blood HI =	2.E-03		

TABLE 8.66 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	5.9E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-06
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	3.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	3.5E-07	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	8.0E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	5.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.0E-06	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	3.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	3.8E-03	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.2E-04
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	4.9E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	8.7E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	4.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	3.3E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.8E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.9E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	3.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	6.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.6E-04**

TABLE 8.66 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	3.7E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.1E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	2.6E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	3.7E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	6.3E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	3.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	8.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	8.9E-07
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	4.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	7.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	7.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	9.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	4.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.0E-06**
										Total Risk Across All Exposure Routes/Pathways	**5.6E-04**

TABLE 7.66 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.8E-06	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	7.8E-02
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.3E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.8E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	7.8E-03
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	9.8E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.9E-01
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	9.8E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	9.8E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	8.3E-01
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.9E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.9E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	8.6E-04	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.7E-02
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.1E-02	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.6E+00
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.4E+00	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E+00
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.4E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.1E-01
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	6.7E-04	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.4E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.7E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.5E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.3E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.2E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.2E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.6E+00
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	9.3E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.1E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.8E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	7.9E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.3E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.2E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.7E-02
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	8.0E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.0E+00
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	9.0E-05	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.8E-02
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.8E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.5E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	6.0E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	6.0E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.0E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.5E-01
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.8E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.8E-01
	(total)												**5.1E+01**

TABLE 7.66 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.0E-08	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	6.0E-04
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.0E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.8E-08	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	7.8E-05
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	3.3E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.7E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	3.1E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	3.1E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	5.6E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.8E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.0E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.0E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.0E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.1E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	2.3E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.5E-03
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.1E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.1E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.0E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	6.7E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	5.5E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	3.9E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	3.9E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.6E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	2.1E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.8E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.6E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.3E-03
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	7.7E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.6E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.2E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	6.5E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	6.8E-01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.3E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.0E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.3E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.6E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	7.4E-08	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.5E-05
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.5E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.1E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	4.9E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.9E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	5.2E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.7E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.5E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.5E-04
	(total)												**7.7E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.2E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
REASONABLE MAXIMUM EXPOSURE (RME) -- OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.25	9.19E-01	1.75E-03	3.73E-05	1	1.85E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	3.17E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.25	1.12E+00	2.07E-03	1.07E-02	1	2.42E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.02E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.25	6.15E-01	8.91E-03	4.01E-02	1	9.66E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.74E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.25	6.16E-01	9.91E-03	4.47E-02	1	3.23E-09
HMX	8.80E-02	o	1.15E+01	0.25	4.78E+00	1.21E-04	8.01E-04	1	3.22E-08
RDX	1.10E+00	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	6.99E-07
Aluminum	1.40E+02	i		0.25		1.00E-03		1	3.50E-05
Arsenic	2.49E-02	i		0.25		1.00E-03		1	6.23E-09
Beryllium	6.85E-02	i		0.25		1.00E-03		1	1.71E-08
Cadmium	4.85E-02	i		0.25		1.00E-03		1	1.21E-08
Chromium	1.30E-02	i		0.25		2.00E-03		1	6.50E-09
Cobalt	3.25E+00	i		0.25		1.00E-03		1	8.13E-07
Iron	9.51E+01	i		0.25		1.00E-03		1	2.38E-05
Lead	3.92E-02	i		0.25		1.00E-03		1	9.80E-09
Manganese	8.03E+01	i		0.25		1.00E-03		1	2.01E-05
Mercury	5.30E-04	i		0.25		1.00E-03		1	1.33E-10
Nickel	8.16E+00	i		0.25		2.00E-04		1	4.08E-07
Selenium	9.20E-03	i		0.25		1.00E-03		1	2.30E-09
Thallium	1.80E-03	i		0.25		1.00E-03		1	4.50E-10
Vanadium	6.10E-03	i		0.25		1.00E-03		1	1.53E-09
Zinc	1.07E+01	i		0.25		6.00E-04		1	1.61E-06
Nitrite/Nitrate-N	1.80E+00	i		0.25		1.00E-03		1	4.50E-07

TABLE 4.66
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 1.15E+01
Noncancer Dermal Intake(RME) = 3.23E+01

Cancer Dermal Intake(CTE) = 3.64E+00
Noncancer Dermal Intake(CTE) = 2.83E+01

TABLE 8.66a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.9E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	5.6E-07
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.1E-07	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	3.3E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	9.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.2E-03	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-04
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.5E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.7E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.1E-05
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	7.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	5.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.0E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	4.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	8.8E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	9.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	6.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.2E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.8E-04**

TABLE 8.66a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	5.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	9.4E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-09
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.9E-09	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	6.6E-10
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	9.6E-09	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	9.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	2.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.3E-07
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	8.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.5E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.3E-08
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	5.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	3.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	9.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	5.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	3.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.6E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.8E-04**

TABLE 7.66a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.9E-06	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	6.9E-02
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.5E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.9E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.9E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	6.9E-03
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	8.6E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.3E-01
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	8.6E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	8.6E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.5E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	7.3E-01
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.6E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.6E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.5E-04	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.5E-02
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	9.4E-03	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.1E+00
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.2E+00	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.2E+00
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.1E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.1E-01
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	5.9E-04	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.9E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.2E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.3E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.1E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.8E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.4E+00
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	8.2E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.7E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.4E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	6.9E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.9E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.5E-02
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	7.0E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.5E+00
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	7.9E-05	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.6E-02
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.5E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.2E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.2E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	9.2E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.1E-01
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.5E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.5E-01
	(total)												**4.5E+01**

TABLE 7.66a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	4.3E-08	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	4.3E-04
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	7.3E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.5E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	5.6E-08	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.6E-05
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.4E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.2E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.2E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.2E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.0E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.0E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	7.5E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	7.5E-06
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.4E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.5E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.6E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-03
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	6.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.6E-04
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.9E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	3.2E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.3E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.3E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	9.2E-03
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.2E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.6E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.5E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.7E-04
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	4.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.9E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	3.8E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.0E-01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	2.5E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.2E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	7.7E-06	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	9.6E-03
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	4.3E-08	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	8.7E-06
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	8.5E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.2E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	2.9E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.1E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.0E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	8.5E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	8.5E-05
	(total)												**4.5E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.5E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
CENTRAL TENDENCY EXPOSURE (CTE) -- OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.167	9.19E-01	1.75E-03	3.73E-05	1	1.51E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	2.59E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.167	1.12E+00	2.07E-03	1.07E-02	1	1.98E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	8.36E-09
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.167	6.15E-01	8.91E-03	4.01E-02	1	7.90E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	1.42E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.167	6.16E-01	9.91E-03	4.47E-02	1	2.64E-09
HMX	8.80E-02	o	1.15E+01	0.167	4.78E+00	1.21E-04	8.01E-04	1	2.63E-08
RDX	1.10E+00	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	5.72E-07
Aluminum	1.40E+02	i		0.167		1.00E-03		1	2.34E-05
Arsenic	2.49E-02	i		0.167		1.00E-03		1	4.16E-09
Beryllium	6.85E-02	i		0.167		1.00E-03		1	1.14E-08
Cadmium	4.85E-02	i		0.167		1.00E-03		1	8.10E-09
Chromium	1.30E-02	i		0.167		2.00E-03		1	4.34E-09
Cobalt	3.25E+00	i		0.167		1.00E-03		1	5.43E-07
Iron	9.51E+01	i		0.167		1.00E-03		1	1.59E-05
Lead	3.92E-02	i		0.167		1.00E-03		1	6.55E-09
Manganese	8.03E+01	i		0.167		1.00E-03		1	1.34E-05
Mercury	5.30E-04	i		0.167		1.00E-03		1	8.85E-11
Nickel	8.16E+00	i		0.167		2.00E-04		1	2.73E-07
Selenium	9.20E-03	i		0.167		1.00E-03		1	1.54E-09
Thallium	1.80E-03	i		0.167		1.00E-03		1	3.01E-10
Vanadium	6.10E-03	i		0.167		1.00E-03		1	1.02E-09
Zinc	1.07E+01	i		0.167		6.00E-04		1	1.07E-06
Nitrite/Nitrate-N	1.80E+00	i		0.167		1.00E-03		1	3.01E-07

TABLE 4.66
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 1.15E+01
Noncancer Dermal Intake(RME) = 3.23E+01

Cancer Dermal Intake(CTE) = 3.64E+00
Noncancer Dermal Intake(CTE) = 2.83E+01

TABLE 8.72 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.1E-07
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	4.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	9.1E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-05
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	3.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	4.8E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	6.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	3.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.9E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.4E-05**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	5.9E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.5E-10
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	3.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	7.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	2.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	9.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	3.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.4E-05**

TABLE 7.72 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	7.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.6E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.7E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.7E-02
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.3E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	3.2E-02
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.5E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.5E-02
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	9.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.8E-02
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.0E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.4E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.3E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.6E-02
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.3E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.4E-01
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	7.0E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.7E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.1E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.2E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.6E-02
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.1E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.5E-02
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.0E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.0E-01
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	5.2E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.2E-02
	(total)												**1.6E+00**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.5E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	5.5E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.5E-05
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.0E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.7E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.0E-05
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	7.4E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.0E-04
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.7E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.3E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.7E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.3E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.7E-04
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	5.8E-08	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.4E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.5E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	1.2E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.5E-04
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	8.9E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.3E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.5E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.3E-03
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	4.3E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	4.3E-05
	(total)												**2.1E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	5.09E-10
Aluminum	6.81E+00	i		0.25		1.00E-03		1	1.70E-06
Antimony	1.30E-03	i		0.25		1.00E-03		1	3.25E-10
Arsenic	2.60E-03	i		0.25		1.00E-03		1	6.50E-10
Cadmium	9.20E-04	i		0.25		1.00E-03		1	2.30E-10
Chromium	1.05E-02	i		0.25		2.00E-03		1	5.25E-09
Cobalt	3.33E-02	i		0.25		1.00E-03		1	8.33E-09
Iron	1.36E+01	i		0.25		1.00E-03		1	3.40E-06
Lead	7.20E-03	i		0.25		1.00E-03		1	1.80E-09
Manganese	1.74E+00	i		0.25		1.00E-03		1	4.35E-07
Nickel	7.38E-02	i		0.25		2.00E-04		1	3.69E-09
Thallium	1.10E-04	i		0.25		1.00E-03		1	2.75E-11
Vanadium	1.05E-02	i		0.25		1.00E-03		1	2.63E-09
Nitrite/Nitrate-N	5.30E-01	i		0.25		1.00E-03		1	1.33E-07

TABLE 4.72
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 1.15E+01
Noncancer Dermal Intake(RME) = 3.23E+01

Cancer Dermal Intake(CTE) = 3.64E+00
Noncancer Dermal Intake(CTE) = 2.83E+01

TABLE 8.72a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	8.8E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.7E-08
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	7.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.9E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.3E-06
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.5E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	7.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.9E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	8.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	5.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.4E-06**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.7E-10
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	4.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	7.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.6E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.4E-09
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	5.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	8.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	4.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	9.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	6.7E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	3.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.4E-06**

TABLE 7.72a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	6.9E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	5.8E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.8E-02
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.1E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	2.8E-02
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.2E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.4E-02
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	7.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.6E-02
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.0E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.0E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.9E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.4E-02
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.2E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.9E-01
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	6.2E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.5E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	6.2E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	6.3E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-02
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	9.4E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.3E-02
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.0E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	9.0E-02
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	4.5E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	4.5E-02
	(total)												**1.4E+00**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.2E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.9E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	3.2E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.2E-05
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	6.1E-09	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.0E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.2E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-05
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	4.3E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.7E-04
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.9E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.3E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.6E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.9E-06
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	6.4E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.1E-04
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	3.4E-08	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	8.2E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	8.6E-03
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	8.7E-05
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	5.2E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.4E-06
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.0E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.9E-03
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	2.5E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.5E-05
	(total)												**1.2E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	4.16E-10
Aluminum	6.81E+00	i		0.167		1.00E-03		1	1.14E-06
Antimony	1.30E-03	i		0.167		1.00E-03		1	2.17E-10
Arsenic	2.60E-03	i		0.167		1.00E-03		1	4.34E-10
Cadmium	9.20E-04	i		0.167		1.00E-03		1	1.54E-10
Chromium	1.05E-02	i		0.167		2.00E-03		1	3.51E-09
Cobalt	3.33E-02	i		0.167		1.00E-03		1	5.56E-09
Iron	1.36E+01	i		0.167		1.00E-03		1	2.27E-06
Lead	7.20E-03	i		0.167		1.00E-03		1	1.20E-09
Manganese	1.74E+00	i		0.167		1.00E-03		1	2.91E-07
Nickel	7.38E-02	i		0.167		2.00E-04		1	2.46E-09
Thallium	1.10E-04	i		0.167		1.00E-03		1	1.84E-11
Vanadium	1.05E-02	i		0.167		1.00E-03		1	1.75E-09
Nitrite/Nitrate-N	5.30E-01	i		0.167		1.00E-03		1	8.85E-08

TABLE 4.72
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 1.15E+01
Noncancer Dermal Intake(RME) = 3.23E+01

Cancer Dermal Intake(CTE) = 3.64E+00
Noncancer Dermal Intake(CTE) = 2.83E+01

TABLE 8.79 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.5E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.4E-07
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.4E-05	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-06
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	3.3E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.0E-05
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.5E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	7.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.2E-05**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	9.0E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	2.9E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.1E-09
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	8.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.1E-08
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.2E-05**

TABLE 7.79 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.1E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.2E-02
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.8E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-02
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	3.0E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	7.6E-02
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	9.3E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.1E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	7.0E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.1E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	8.9E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.8E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	4.8E-02
	(total)												**1.7E+00**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.5E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	5.1E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	8.0E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.7E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.5E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	4.2E-04
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	7.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.6E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	5.8E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.9E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.8E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.8E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.0E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.5E-03
	(total)												**2.1E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	7.84E-09
RDX	3.90E-03	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	2.48E-09
Antimony	3.10E-03	i		0.25		1.00E-03		1	7.75E-10
Arsenic	9.50E-03	i		0.25		1.00E-03		1	2.38E-09
Iron	7.15E+00	i		0.25		1.00E-03		1	1.79E-06
Manganese	2.19E+00	i		0.25		1.00E-03		1	5.48E-07
Vanadium	4.90E-03	i		0.25		1.00E-03		1	1.23E-09

TABLE 4.79
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 1.15E+01
Noncancer Dermal Intake(RME) = 3.23E+01

Cancer Dermal Intake(CTE) = 3.64E+00
Noncancer Dermal Intake(CTE) = 2.83E+01

TABLE 8.78a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.6E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-07
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	4.3E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.7E-07
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.0E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-05
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	7.9E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	5.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-05**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.3E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	7.0E-10
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	7.4E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	8.1E-10
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	5.8E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.7E-09
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	4.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-05**

TABLE 7.78a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.6E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	7.2E-02
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.3E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.1E-02
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.7E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	6.6E-02
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	8.1E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.7E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	6.1E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.9E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.8E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	4.2E-02
	(total)												**1.4E+00**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.8E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.6E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	5.7E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.9E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.5E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.4E-04
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	4.5E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.5E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	3.4E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.0E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.1E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	2.3E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	8.9E-04
	(total)												**1.3E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.5E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	6.41E-09
RDX	3.90E-03	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	2.03E-09
Antimony	3.10E-03	i		0.167		1.00E-03		1	5.18E-10
Arsenic	9.50E-03	i		0.167		1.00E-03		1	1.59E-09
Iron	7.15E+00	i		0.167		1.00E-03		1	1.19E-06
Manganese	2.19E+00	i		0.167		1.00E-03		1	3.66E-07
Vanadium	4.90E-03	i		0.167		1.00E-03		1	8.18E-10

TABLE 4.78
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
OCCUPATIONAL WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Occupational Worker
Receptor Age: Adult

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED / BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 1.15E+01
Noncancer Dermal Intake(RME) = 3.23E+01

Cancer Dermal Intake(CTE) = 3.64E+00
Noncancer Dermal Intake(CTE) = 2.83E+01

TABLE 8.65 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk

TABLE 8.65 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.5E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	7.5E-10
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	8.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	7.9E-10	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.6E-09	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.5E-11
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	5.5E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.0E-08
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	7.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-08
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	3.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	5.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	2.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	9.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	5.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	3.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**8.2E-08**

TABLE 7.65 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene		mg/L		mg/L	M	1.0E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	1.0E-03
	2,4,6-Trinitrotoluene		mg/L		mg/L	M	1.7E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.5E-03
	2,6-Dinitrotoluene		mg/L		mg/L	M	1.3E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.3E-04
	2-Amino-4,6-Dinitrotoluene		mg/L		mg/L	M	5.6E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.8E-03
	2-Nitrotoluene		mg/L		mg/L	M	5.5E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	5.5E-06
	4-Amino-2,6-Dinitrotoluene		mg/L		mg/L	M	9.5E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.8E-03
	4-Nitrotoluene		mg/L		mg/L	M	1.8E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.8E-05
	HMX		mg/L		mg/L	M	1.8E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.5E-05
	RDX		mg/L		mg/L	M	3.8E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-02
	Aluminum		mg/L		mg/L	M	5.4E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.4E-03
	Arsenic		mg/L		mg/L	M	9.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.2E-03
	Beryllium		mg/L		mg/L	M	2.7E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.9E-01
	Cadmium		mg/L		mg/L	M	1.9E-06	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	7.5E-02
	Chromium		mg/L		mg/L	M	1.0E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.3E-02
	Cobalt		mg/L		mg/L	M	1.3E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	6.3E-03
	Iron		mg/L		mg/L	M	3.7E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.2E-02
	Lead		mg/L		mg/L	M	1.5E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese		mg/L		mg/L	M	3.1E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	3.2E+00
	Mercury		mg/L		mg/L	M	2.1E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	9.8E-04
	Nickel		mg/L		mg/L	M	6.3E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	7.9E-02
	Selenium		mg/L		mg/L	M	3.6E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	7.1E-05
	Thallium		mg/L		mg/L	M	7.0E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.0E-03
	Vanadium		mg/L		mg/L	M	2.4E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	9.1E-03
	Zinc		mg/L		mg/L	M	2.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	8.3E-04
	Nitrite/Nitrate-N		mg/L		mg/L	M	7.0E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	7.0E-04
	(total)												**3.7E+00**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.7E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
REASONABLE MAXIMUM EXPOSURE (RME) -- CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	2	9.19E-01	1.75E-03	3.73E-05	1	5.23E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	2	1.96E+00	9.64E-04	5.59E-03	1	8.98E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	2	1.12E+00	2.07E-03	1.07E-02	1	6.85E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	2	1.34E+00	6.41E-04	3.46E-03	1	2.89E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	2	6.15E-01	8.91E-03	4.01E-02	1	2.85E-09
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	2	1.34E+00	6.41E-04	3.46E-03	1	4.92E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	2	6.16E-01	9.91E-03	4.47E-02	1	9.52E-09
HMX	8.80E-02	o	1.15E+01	2	4.78E+00	1.21E-04	8.01E-04	1	9.10E-08
RDX	1.10E+00	o	4.42E+00	2	1.84E+00	3.39E-04	1.94E-03	1	1.98E-06
Aluminum	1.40E+02	i		2		1.00E-03		1	2.80E-04
Arsenic	2.49E-02	i		2		1.00E-03		1	4.98E-08
Beryllium	6.85E-02	i		2		1.00E-03		1	1.37E-07
Cadmium	4.85E-02	i		2		1.00E-03		1	9.70E-08
Chromium	1.30E-02	i		2		2.00E-03		1	5.20E-08
Cobalt	3.25E+00	i		2		1.00E-03		1	6.50E-06
Iron	9.51E+01	i		2		1.00E-03		1	1.90E-04
Lead	3.92E-02	i		2		1.00E-03		1	7.84E-08
Manganese	8.03E+01	i		2		1.00E-03		1	1.61E-04
Mercury	5.30E-04	i		2		1.00E-03		1	1.06E-09
Nickel	8.16E+00	i		2		2.00E-04		1	3.26E-06
Selenium	9.20E-03	i		2		1.00E-03		1	1.84E-08
Thallium	1.80E-03	i		2		1.00E-03		1	3.60E-09
Vanadium	6.10E-03	i		2		1.00E-03		1	1.22E-08
Zinc	1.07E+01	i		2		6.00E-04		1	1.28E-05
Nitrite/Nitrate-N	1.80E+00	i		2		1.00E-03		1	3.60E-06

TABLE 4.65
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	t_{event}	Duration of Event	hour/event	2	Professional Judgement	1.5	Professional Judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 2.77E-01
Noncancer Dermal Intake(RME) = 1.94E+01

Cancer Dermal Intake(CTE) = 2.77E-01
Noncancer Dermal Intake(CTE) = 1.94E+01

TABLE 8.65a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk

TABLE 8.65a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.2E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	6.5E-10
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	6.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	6.7E-10	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.2E-09	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	3.8E-11
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	4.7E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.2E-08
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	5.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.0E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	3.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	2.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	6.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	3.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	7.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	2.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	2.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	7.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.9E-08**

TABLE 7.65a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient

TABLE 7.65a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.8E-08	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	8.8E-04
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.5E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.0E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.1E-04
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	4.9E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.4E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	4.7E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	4.7E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	8.3E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.1E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.6E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.6E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.5E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.1E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	3.3E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.1E-02
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	4.1E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	4.1E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	7.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.4E-03
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.0E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.4E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.4E-06	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	5.6E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	7.6E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.0E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	9.4E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.7E-03
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.8E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.2E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.1E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.3E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.4E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.5E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	7.3E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	4.7E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	5.9E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.7E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	5.3E-05
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.2E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.5E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.8E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	6.8E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.2E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.2E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.2E-04
	(total)												**2.8E+00**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
CENTRAL TENDENCY EXPOSURE (CTE) -- CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF
FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	1.5	9.19E-01	1.75E-03	3.73E-05	1	4.53E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	1.5	1.96E+00	9.64E-04	5.59E-03	1	7.77E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	1.5	1.12E+00	2.07E-03	1.07E-02	1	5.93E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	1.5	1.34E+00	6.41E-04	3.46E-03	1	2.51E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	1.5	6.15E-01	8.91E-03	4.01E-02	1	2.43E-09
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	1.5	1.34E+00	6.41E-04	3.46E-03	1	4.26E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	1.5	6.16E-01	9.91E-03	4.47E-02	1	8.10E-09
HMX	8.80E-02	o	1.15E+01	1.5	4.78E+00	1.21E-04	8.01E-04	1	7.88E-08
RDX	1.10E+00	o	4.42E+00	1.5	1.84E+00	3.39E-04	1.94E-03	1	1.71E-06
Aluminum	1.40E+02	i		1.5		1.00E-03		1	2.10E-04
Arsenic	2.49E-02	i		1.5		1.00E-03		1	3.74E-08
Beryllium	6.85E-02	i		1.5		1.00E-03		1	1.03E-07
Cadmium	4.85E-02	i		1.5		1.00E-03		1	7.28E-08
Chromium	1.30E-02	i		1.5		2.00E-03		1	3.90E-08
Cobalt	3.25E+00	i		1.5		1.00E-03		1	4.88E-06
Iron	9.51E+01	i		1.5		1.00E-03		1	1.43E-04
Lead	3.92E-02	i		1.5		1.00E-03		1	5.88E-08
Manganese	8.03E+01	i		1.5		1.00E-03		1	1.20E-04
Mercury	5.30E-04	i		1.5		1.00E-03		1	7.95E-10
Nickel	8.16E+00	i		1.5		2.00E-04		1	2.45E-06
Selenium	9.20E-03	i		1.5		1.00E-03		1	1.38E-08
Thallium	1.80E-03	i		1.5		1.00E-03		1	2.70E-09
Vanadium	6.10E-03	i		1.5		1.00E-03		1	9.15E-09
Zinc	1.07E+01	i		1.5		6.00E-04		1	9.63E-06
Nitrite/Nitrate-N	1.80E+00	i		1.5		1.00E-03		1	2.70E-06

TABLE 4.65
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	t_{event}	Duration of Event	hour/event	2	Professional Judgement	1.5	Professional Judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 2.77E-01
Noncancer Dermal Intake(RME) = 1.94E+01

Cancer Dermal Intake(CTE) = 2.77E-01
Noncancer Dermal Intake(CTE) = 1.94E+01

TABLE 8.71 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	4.0E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.4E-11
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	3.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	7.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.4E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	5.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	7.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	4.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	9.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	8.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	6.1E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	2.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.2E-09**

TABLE 7.71 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	9.3E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.6E-04
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	5.0E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	8.4E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.0E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-04
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	3.6E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.4E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.1E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.1E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.3E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	6.5E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	5.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-03
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.8E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	6.7E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	5.7E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	7.1E-04
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	4.3E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	6.1E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	4.1E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.6E-02
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	2.1E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.1E-04
	(total)												**1.0E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.0E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	2	1.84E+00	3.39E-04	1.94E-03	1	1.44E-09
Aluminum	6.81E+00	i		2		1.00E-03		1	1.36E-05
Antimony	1.30E-03	i		2		1.00E-03		1	2.60E-09
Arsenic	2.60E-03	i		2		1.00E-03		1	5.20E-09
Cadmium	9.20E-04	i		2		1.00E-03		1	1.84E-09
Chromium	1.05E-02	i		2		2.00E-03		1	4.20E-08
Cobalt	3.33E-02	i		2		1.00E-03		1	6.66E-08
Iron	1.36E+01	i		2		1.00E-03		1	2.72E-05
Lead	7.20E-03	i		2		1.00E-03		1	1.44E-08
Manganese	1.74E+00	i		2		1.00E-03		1	3.48E-06
Nickel	7.38E-02	i		2		2.00E-04		1	2.95E-08
Thallium	1.10E-04	i		2		1.00E-03		1	2.20E-10
Vanadium	1.05E-02	i		2		1.00E-03		1	2.10E-08
Nitrite/Nitrate-N	5.30E-01	i		2		1.00E-03		1	1.06E-06

TABLE 4.71
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	of the text.
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	t_{event}	Duration of Event	hour/event	2	Professional Judgement	1.5	Professional Judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 2.77E-01
Noncancer Dermal Intake(RME) = 1.94E+01

Cancer Dermal Intake(CTE) = 2.77E-01
Noncancer Dermal Intake(CTE) = 1.94E+01

TABLE 8.71a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	3.4E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.8E-11
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	5.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.1E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	3.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	5.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	7.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	6.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	4.6E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	4.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.7E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-09**

TABLE 7.71a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	2.4E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.0E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.0E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.0E-04
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	3.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	6.3E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	7.6E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.5E-04
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	2.7E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.1E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.1E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	8.1E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	9.7E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.8E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	4.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.3E-03
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.1E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	5.1E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	5.3E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.3E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	5.4E-04
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	3.2E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.6E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.1E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-02
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.5E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.5E-04
	(total)												**7.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.7E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/06/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	1.5	1.84E+00	3.39E-04	1.94E-03	1	1.25E-09
Aluminum	6.81E+00	i		1.5		1.00E-03		1	1.02E-05
Antimony	1.30E-03	i		1.5		1.00E-03		1	1.95E-09
Arsenic	2.60E-03	i		1.5		1.00E-03		1	3.90E-09
Cadmium	9.20E-04	i		1.5		1.00E-03		1	1.38E-09
Chromium	1.05E-02	i		1.5		2.00E-03		1	3.15E-08
Cobalt	3.33E-02	i		1.5		1.00E-03		1	5.00E-08
Iron	1.36E+01	i		1.5		1.00E-03		1	2.04E-05
Lead	7.20E-03	i		1.5		1.00E-03		1	1.08E-08
Manganese	1.74E+00	i		1.5		1.00E-03		1	2.61E-06
Nickel	7.38E-02	i		1.5		2.00E-04		1	2.21E-08
Thallium	1.10E-04	i		1.5		1.00E-03		1	1.65E-10
Vanadium	1.05E-02	i		1.5		1.00E-03		1	1.58E-08
Nitrite/Nitrate-N	5.30E-01	i		1.5		1.00E-03		1	7.95E-07

TABLE 4.71
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	of the text.
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	t_{event}	Duration of Event	hour/event	2	Professional Judgement	1.5	Professional Judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 3.49E-03
Noncancer Ingestion Intake(RME) = 9.78E-03

Cancer Ingestion Intake(CTE) = 1.10E-03
Noncancer Ingestion Intake(CTE) = 8.57E-03

Cancer Dermal Intake(RME) = 2.77E-01
Noncancer Dermal Intake(RME) = 1.94E+01

Cancer Dermal Intake(CTE) = 2.77E-01
Noncancer Dermal Intake(CTE) = 1.94E+01

TABLE 8.77 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	6.1E-09	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.9E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.1E-10
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	5.3E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.9E-09
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	2.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**8.3E-09**

TABLE 7.77 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.3E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.6E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.4E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.5E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.2E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.0E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	3.7E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.8E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.2E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	8.5E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	8.8E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.9E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	7.3E-03
	(total)												**1.0E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.0E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	2	1.96E+00	9.64E-04	5.59E-03	1	2.22E-08
RDX	3.90E-03	o	4.42E+00	2	1.84E+00	3.39E-04	1.94E-03	1	7.01E-09
Antimony	3.10E-03	i		2		1.00E-03		1	6.20E-09
Arsenic	9.50E-03	i		2		1.00E-03		1	1.90E-08
Iron	7.15E+00	i		2		1.00E-03		1	1.43E-05
Manganese	2.19E+00	i		2		1.00E-03		1	4.38E-06
Vanadium	4.90E-03	i		2		1.00E-03		1	9.80E-09

TABLE 4.77
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Age: Adult

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	of the text.
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	t_{event}	Duration of Event	hour/event	2	Professional Judgement	1.5	Professional Judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 2.77E-01 Cancer Dermal Intake(CTE) = 2.77E-01
Noncancer Dermal Intake(RME) = 1.94E+01 Noncancer Dermal Intake(CTE) = 1.94E+01

TABLE 8.77a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	5.3E-09	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.7E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	3.9E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.9E-09
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	9.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**6.3E-09**

TABLE 7.77a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.7E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	7.4E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.2E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.9E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	9.0E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.5E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.8E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.2E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.9E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.4E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	6.6E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.4E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.5E-03
	(total)												**7.6E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.6E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	1.5	1.96E+00	9.64E-04	5.59E-03	1	1.92E-08
RDX	3.90E-03	o	4.42E+00	1.5	1.84E+00	3.39E-04	1.94E-03	1	6.07E-09
Antimony	3.10E-03	i		1.5		1.00E-03		1	4.65E-09
Arsenic	9.50E-03	i		1.5		1.00E-03		1	1.43E-08
Iron	7.15E+00	i		1.5		1.00E-03		1	1.07E-05
Manganese	2.19E+00	i		1.5		1.00E-03		1	3.29E-06
Vanadium	4.90E-03	i		1.5		1.00E-03		1	7.35E-09

TABLE 4.77
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CONSTRUCTION WORKERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Age: Adult

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	of the text.
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	t_{event}	Duration of Event	hour/event	2	Professional Judgement	1.5	Professional Judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 2.77E-01 Cancer Dermal Intake(CTE) = 2.77E-01
Noncancer Dermal Intake(RME) = 1.94E+01 Noncancer Dermal Intake(CTE) = 1.94E+01

TABLE 8.69 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-04	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-06
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	8.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	8.2E-07	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-07
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.5E-06	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-08
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	9.0E-03	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.9E-04
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.2E+00	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.0E-04	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.1E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	5.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	7.8E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	6.6E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	6.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	8.8E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.5E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-03**

TABLE 8.69 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.1E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	3.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	3.5E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	8.0E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	6.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.2E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	2.5E-05	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.8E-06
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.3E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-07
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	6.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	8.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	7.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	8.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	5.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.2E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-03**

TABLE 7.69 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.7E-05	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	7.7E-01
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.6E-03	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.3E+00
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.7E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	7.7E-02
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	9.6E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.8E+00
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	9.6E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	9.6E-04
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.6E-03	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	8.2E+00
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.9E-05	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.9E-03
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	8.4E-03	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.7E-01
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.1E-01	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.5E+01
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.3E+01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.3E+01
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.4E-03	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.0E+00
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	6.6E-03	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.3E+00
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.7E-03	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.3E+00
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.2E-03	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.2E-01
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.1E-01	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.6E+01
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	9.1E+00	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.0E+01
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.8E-03	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	7.7E+00	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.2E+02
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.1E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.7E-01
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	7.8E-01	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.9E+01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	8.8E-04	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.8E-01
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.7E-04	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.5E+00
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.8E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.8E-01
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.0E+00	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.4E+00
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.7E-01	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.7E+00
	(total)												**5.0E+02**

TABLE 7.69 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.8E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	7.8E-03
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.3E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.7E-02
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.0E-03
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	4.3E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.2E-02
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	4.1E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	4.1E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	7.3E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	3.7E-02
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.4E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.4E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.4E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.7E-04
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	3.0E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	9.8E-02
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.5E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.5E-02
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.6E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.8E-03
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	7.2E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	5.2E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	5.1E-06	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	2.0E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	2.7E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.7E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.4E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.7E-02
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.0E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.3E-02
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	4.1E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	8.5E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	8.8E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.6E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.7E-03
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.7E-04	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	2.2E-01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	9.7E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.9E-04
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.9E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.7E-03
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	6.4E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.5E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	6.8E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-03
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.9E-04	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.9E-03
	(total)												**1.0E+01**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.1E+02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
REASONABLE MAXIMUM EXPOSURE (RME) -- FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.25	9.19E-01	1.75E-03	3.73E-05	1	1.85E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	3.17E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.25	1.12E+00	2.07E-03	1.07E-02	1	2.42E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.02E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.25	6.15E-01	8.91E-03	4.01E-02	1	9.66E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.74E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.25	6.16E-01	9.91E-03	4.47E-02	1	3.23E-09
HMX	8.80E-02	o	1.15E+01	0.25	4.78E+00	1.21E-04	8.01E-04	1	3.22E-08
RDX	1.10E+00	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	6.99E-07
Aluminum	1.40E+02	i		0.25		1.00E-03		1	3.50E-05
Arsenic	2.49E-02	i		0.25		1.00E-03		1	6.23E-09
Beryllium	6.85E-02	i		0.25		1.00E-03		1	1.71E-08
Cadmium	4.85E-02	i		0.25		1.00E-03		1	1.21E-08
Chromium	1.30E-02	i		0.25		2.00E-03		1	6.50E-09
Cobalt	3.25E+00	i		0.25		1.00E-03		1	8.13E-07
Iron	9.51E+01	i		0.25		1.00E-03		1	2.38E-05
Lead	3.92E-02	i		0.25		1.00E-03		1	9.80E-09
Manganese	8.03E+01	i		0.25		1.00E-03		1	2.01E-05
Mercury	5.30E-04	i		0.25		1.00E-03		1	1.33E-10
Nickel	8.16E+00	i		0.25		2.00E-04		1	4.08E-07
Selenium	9.20E-03	i		0.25		1.00E-03		1	2.30E-09
Thallium	1.80E-03	i		0.25		1.00E-03		1	4.50E-10
Vanadium	6.10E-03	i		0.25		1.00E-03		1	1.53E-09
Zinc	1.07E+01	i		0.25		6.00E-04		1	1.61E-06
Nitrite/Nitrate-N	1.80E+00	i		0.25		1.00E-03		1	4.50E-07

TABLE 4.69
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1.5	U.S. EPA, August 1997	0.66	U.S. EPA, August 1997	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.22E-03
Noncancer Ingestion Intake(RME) = 9.59E-02

Cancer Ingestion Intake(CTE) = 8.06E-04
Noncancer Ingestion Intake(CTE) = 2.82E-02

Cancer Dermal Intake(RME) = 3.62E+01
Noncancer Dermal Intake(RME) = 4.22E+02

Cancer Dermal Intake(CTE) = 8.06E+00
Noncancer Dermal Intake(CTE) = 2.82E+02

TABLE 8.69a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.1E-07
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	8.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	8.1E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.4E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.1E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	8.9E-04	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.8E-05
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.1E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.0E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.0E-05
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	5.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	7.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	6.5E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	6.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	4.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	8.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-04**

TABLE 8.69a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.1E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	6.3E-09
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	6.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	6.4E-09	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.1E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	3.6E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	4.6E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.1E-07
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.0E-08
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	6.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	4.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	5.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	7.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	8.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	8.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-04**

TABLE 7.69a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-05	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	2.3E-01
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.8E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.6E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.3E-02
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.8E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.4E+00
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.8E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.8E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.4E+00
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	8.5E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	8.5E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.5E-03	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	5.0E-02
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	3.1E-02	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.0E+01
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	3.9E+00	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.9E+00
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	7.0E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.3E+00
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.9E-03	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.7E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.4E-03	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.7E+00
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	3.7E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-01
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	9.2E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.6E+00
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.7E+00	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	8.9E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.1E-03	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.3E+00	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	9.4E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.5E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.0E-02
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.3E-01	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.2E+01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.6E-04	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	5.2E-02
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.1E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.3E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.7E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.7E-01
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.0E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E+00
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.1E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.1E-01
	(total)												**1.5E+02**

TABLE 7.69a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	4.3E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	4.3E-03
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	7.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.5E-02
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	5.6E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.6E-04
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.4E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.2E-02
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.2E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.2E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.0E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.0E-02
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	7.4E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	7.4E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.4E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.5E-04
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.6E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-02
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	6.6E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.6E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.9E-03
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	3.2E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.3E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.3E-06	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	9.1E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.2E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.6E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.5E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.7E-03
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	4.5E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-02
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.8E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	3.8E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	3.9E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	2.5E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.2E-03
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	7.7E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	9.6E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	4.3E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	8.7E-05
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	8.5E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.2E-03
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	2.9E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.1E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E-03
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	8.5E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	8.5E-04
	(total)												**4.5E+00**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.5E+02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
CENTRAL TENDENCY EXPOSURE (CTE) -- FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF
FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.167	9.19E-01	1.75E-03	3.73E-05	1	1.51E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	2.59E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.167	1.12E+00	2.07E-03	1.07E-02	1	1.98E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	8.36E-09
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.167	6.15E-01	8.91E-03	4.01E-02	1	7.90E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	1.42E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.167	6.16E-01	9.91E-03	4.47E-02	1	2.64E-09
HMX	8.80E-02	o	1.15E+01	0.167	4.78E+00	1.21E-04	8.01E-04	1	2.63E-08
RDX	1.10E+00	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	5.72E-07
Aluminum	1.40E+02	i		0.167		1.00E-03		1	2.34E-05
Arsenic	2.49E-02	i		0.167		1.00E-03		1	4.16E-09
Beryllium	6.85E-02	i		0.167		1.00E-03		1	1.14E-08
Cadmium	4.85E-02	i		0.167		1.00E-03		1	8.10E-09
Chromium	1.30E-02	i		0.167		2.00E-03		1	4.34E-09
Cobalt	3.25E+00	i		0.167		1.00E-03		1	5.43E-07
Iron	9.51E+01	i		0.167		1.00E-03		1	1.59E-05
Lead	3.92E-02	i		0.167		1.00E-03		1	6.55E-09
Manganese	8.03E+01	i		0.167		1.00E-03		1	1.34E-05
Mercury	5.30E-04	i		0.167		1.00E-03		1	8.85E-11
Nickel	8.16E+00	i		0.167		2.00E-04		1	2.73E-07
Selenium	9.20E-03	i		0.167		1.00E-03		1	1.54E-09
Thallium	1.80E-03	i		0.167		1.00E-03		1	3.01E-10
Vanadium	6.10E-03	i		0.167		1.00E-03		1	1.02E-09
Zinc	1.07E+01	i		0.167		6.00E-04		1	1.07E-06
Nitrite/Nitrate-N	1.80E+00	i		0.167		1.00E-03		1	3.01E-07

TABLE 4.69
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1.5	U.S. EPA, August 1997	0.66	U.S. EPA, August 1997	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.22E-03
Noncancer Ingestion Intake(RME) = 9.59E-02

Cancer Ingestion Intake(CTE) = 8.06E-04
Noncancer Ingestion Intake(CTE) = 2.82E-02

Cancer Dermal Intake(RME) = 3.62E+01
Noncancer Dermal Intake(RME) = 4.22E+02

Cancer Dermal Intake(CTE) = 8.06E+00
Noncancer Dermal Intake(CTE) = 2.82E+02

TABLE 8.75 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	6.3E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.9E-07
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	5.6E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	2.1E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.2E-05
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	7.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.1E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	5.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	6.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	8.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	4.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.3E-05**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	1.8E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-09
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	2.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-08
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	6.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	9.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	4.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.3E-05**

TABLE 7.75 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	7.3E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.4E-02
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.5E-01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.5E-01
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.3E-04	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	3.2E-01
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	2.5E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-01
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	8.8E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.8E-01
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.0E-03	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.4E-01
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.2E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.6E-01
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.3E+00	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.3E+00
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	6.9E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.7E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.0E+00
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.1E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.5E-01
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	1.0E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.5E-01
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.0E-03	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.0E+00
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	5.0E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.0E-01
	(total)												**1.6E+01**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	2.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.8E-05
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	7.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	7.2E-04
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.4E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.4E-03
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	2.8E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.2E-04
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	9.7E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.9E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.2E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.0E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.5E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.8E-04
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.8E-03
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	7.6E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.8E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.9E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	1.6E-06	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.9E-03
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	1.1E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.6E-04
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.1E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	4.3E-02
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	5.6E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.6E-04
	(total)												**2.8E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	7.64E-04	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	4.86E-10
Aluminum	6.81E+00	i		0.25		1.00E-03		1	1.70E-06
Antimony	1.34E-03	i		0.25		1.00E-03		1	3.34E-10
Arsenic	2.61E-03	i		0.25		1.00E-03		1	6.53E-10
Cadmium	9.21E-04	i		0.25		1.00E-03		1	2.30E-10
Chromium	1.05E-02	i		0.25		2.00E-03		1	5.27E-09
Cobalt	3.33E-02	i		0.25		1.00E-03		1	8.32E-09
Iron	1.36E+01	i		0.25		1.00E-03		1	3.40E-06
Lead	7.17E-03	i		0.25		1.00E-03		1	1.79E-09
Manganese	1.74E+00	i		0.25		1.00E-03		1	4.35E-07
Nickel	7.38E-02	i		0.25		2.00E-04		1	3.69E-09
Thallium	1.09E-04	i		0.25		1.00E-03		1	2.72E-11
Vanadium	1.05E-02	i		0.25		1.00E-03		1	2.62E-09
Nitrite/Nitrate-N	5.26E-01	i		0.25		1.00E-03		1	1.32E-07

TABLE 4.75
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1.5	U.S. EPA, August 1997	0.66	U.S. EPA, August 1997	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.22E-03
Noncancer Ingestion Intake(RME) = 9.59E-02

Cancer Ingestion Intake(CTE) = 8.06E-04
Noncancer Ingestion Intake(CTE) = 2.82E-02

Cancer Dermal Intake(RME) = 3.62E+01
Noncancer Dermal Intake(RME) = 4.22E+02

Cancer Dermal Intake(CTE) = 8.06E+00
Noncancer Dermal Intake(CTE) = 2.82E+02

TABLE 8.75a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	6.2E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.8E-08
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	5.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	2.1E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.2E-06
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	7.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	5.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	6.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	8.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	4.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.2E-06**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	3.2E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.5E-10
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	9.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	3.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-09
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	1.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	4.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	9.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	1.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	7.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.2E-06**

TABLE 7.75a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	2.2E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.2E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.9E-01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.9E-01
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	3.8E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	9.4E-02
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	7.4E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.5E-01
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	2.6E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	5.2E-02
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.0E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	9.9E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	9.4E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.7E-02
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	3.8E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.3E+00
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	2.0E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	4.9E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.0E+00
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.1E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.0E-01
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	3.1E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.4E-02
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.0E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.0E-01
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	1.5E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.5E-01
	(total)												**4.7E+00**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	1.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-05
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	3.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.2E-04
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	6.3E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.0E-03
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-04
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	4.3E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.7E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.9E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.3E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.6E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.8E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	6.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.1E-03
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	3.4E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	8.2E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	8.5E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.0E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	8.7E-04
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	5.1E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.3E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	4.9E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.9E-02
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	2.5E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.5E-04
	(total)												**1.2E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	7.64E-04	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	3.97E-10
Aluminum	6.81E+00	i		0.167		1.00E-03		1	1.14E-06
Antimony	1.34E-03	i		0.167		1.00E-03		1	2.23E-10
Arsenic	2.61E-03	i		0.167		1.00E-03		1	4.36E-10
Cadmium	9.21E-04	i		0.167		1.00E-03		1	1.54E-10
Chromium	1.05E-02	i		0.167		2.00E-03		1	3.52E-09
Cobalt	3.33E-02	i		0.167		1.00E-03		1	5.56E-09
Iron	1.36E+01	i		0.167		1.00E-03		1	2.27E-06
Lead	7.17E-03	i		0.167		1.00E-03		1	1.20E-09
Manganese	1.74E+00	i		0.167		1.00E-03		1	2.91E-07
Nickel	7.38E-02	i		0.167		2.00E-04		1	2.47E-09
Thallium	1.09E-04	i		0.167		1.00E-03		1	1.81E-11
Vanadium	1.05E-02	i		0.167		1.00E-03		1	1.75E-09
Nitrite/Nitrate-N	5.26E-01	i		0.167		1.00E-03		1	8.79E-08

TABLE 4.75
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1.5	U.S. EPA, August 1997	0.66	U.S. EPA, August 1997	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.22E-03
Noncancer Ingestion Intake(RME) = 9.59E-02

Cancer Ingestion Intake(CTE) = 8.06E-04
Noncancer Ingestion Intake(CTE) = 2.82E-02

Cancer Dermal Intake(RME) = 3.62E+01
Noncancer Dermal Intake(RME) = 4.22E+02

Cancer Dermal Intake(CTE) = 8.06E+00
Noncancer Dermal Intake(CTE) = 2.82E+02

TABLE 8.81 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.5E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-06
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.2E-05	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.5E-06
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	7.8E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	5.9E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.8E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-04**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.8E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	8.5E-09
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	9.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.9E-09
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	8.6E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-07
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	6.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-04**

TABLE 7.81 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.0E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.1E-01
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.7E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-01
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	3.0E-04	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	7.4E-01
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	9.1E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.0E+00
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	6.9E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E+00
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.1E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	8.8E+00
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.7E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	4.7E-01
	(total)												**1.6E+01**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.6E-03
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.5E-04
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	3.3E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	5.4E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.0E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.3E-03
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	7.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.5E-03
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.3E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.4E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	5.2E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.0E-02
	(total)												**2.8E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	7.84E-09
RDX	3.90E-03	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	2.48E-09
Antimony	3.10E-03	i		0.25		1.00E-03		1	7.75E-10
Arsenic	9.50E-03	i		0.25		1.00E-03		1	2.38E-09
Iron	7.15E+00	i		0.25		1.00E-03		1	1.79E-06
Manganese	2.19E+00	i		0.25		1.00E-03		1	5.48E-07
Vanadium	4.90E-03	i		0.25		1.00E-03		1	1.23E-09

TABLE 4.81
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Child

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1.5	U.S. EPA, August 1997	0.66	U.S. EPA, August 1997	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.22E-03
Noncancer Ingestion Intake(RME) = 9.59E-02

Cancer Ingestion Intake(CTE) = 8.06E-04
Noncancer Ingestion Intake(CTE) = 2.82E-02

Cancer Dermal Intake(RME) = 3.62E+01
Noncancer Dermal Intake(RME) = 4.22E+02

Cancer Dermal Intake(CTE) = 8.06E+00
Noncancer Dermal Intake(CTE) = 2.82E+02

TABLE 8.81a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.4E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	7.7E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-05
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	5.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	3.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-05**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	5.2E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.6E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-09
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.3E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	9.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	6.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-05**

TABLE 7.81a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.2E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.4E-01
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.1E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-02
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	8.7E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	2.2E-01
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.7E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.9E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.0E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.7E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.2E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.6E+00
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.4E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.4E-01
	(total)												**4.8E+00**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.8E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.6E-03
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	5.7E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.9E-04
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.5E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.4E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	4.5E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.5E-03
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	3.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-03
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.0E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.1E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	2.3E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	8.9E-03
	(total)												**1.3E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.9E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/03/08

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	6.41E-09
RDX	3.90E-03	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	2.03E-09
Antimony	3.10E-03	i		0.167		1.00E-03		1	5.18E-10
Arsenic	9.50E-03	i		0.167		1.00E-03		1	1.59E-09
Iron	7.15E+00	i		0.167		1.00E-03		1	1.19E-06
Manganese	2.19E+00	i		0.167		1.00E-03		1	3.66E-07
Vanadium	4.90E-03	i		0.167		1.00E-03		1	8.18E-10

TABLE 4.81
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Child

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1.5	U.S. EPA, August 1997	0.66	U.S. EPA, August 1997	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.22E-03
Noncancer Ingestion Intake(RME) = 9.59E-02

Cancer Ingestion Intake(CTE) = 8.06E-04
Noncancer Ingestion Intake(CTE) = 2.82E-02

Cancer Dermal Intake(RME) = 3.62E+01
Noncancer Dermal Intake(RME) = 4.22E+02

Cancer Dermal Intake(CTE) = 8.06E+00
Noncancer Dermal Intake(CTE) = 2.82E+02

TABLE 8.67 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-07
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	8.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	8.1E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.4E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	9.0E-04	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.9E-05
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.1E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.0E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.0E-05
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	5.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	7.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	6.5E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	6.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	7.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	8.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-04**

TABLE 8.67 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	9.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	5.1E-09
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	5.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	5.2E-09	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	9.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.7E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	2.9E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	3.8E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.1E-07
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.3E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.0E-08
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	6.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	4.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	5.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	7.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	8.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	8.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-04**

TABLE 7.67 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.6E-06	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	7.6E-02
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.6E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.2E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.6E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	7.6E-03
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	9.5E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.7E-01
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	9.5E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	9.5E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.6E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	8.1E-01
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.8E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.8E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	8.4E-04	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.7E-02
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.0E-02	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.5E+00
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.3E+00	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.3E+00
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.4E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.9E-01
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	6.5E-04	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.3E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.6E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.2E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.2E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.1E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.1E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.5E+00
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	9.0E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.0E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.7E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	7.6E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.2E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.0E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.7E-02
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	7.8E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.9E+00
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	8.7E-05	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.7E-02
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.7E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.4E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.8E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.8E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.0E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.4E-01
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.7E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.7E-01
	(total)												**5.0E+01**

TABLE 7.67 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.2E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	1.2E-03
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.5E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.5E-04
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	6.4E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	3.2E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	6.1E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	6.1E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.1E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	5.5E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.0E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.0E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.0E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	4.4E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.5E-02
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	2.2E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.2E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.3E-03
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.1E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	7.7E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	7.6E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.0E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	4.1E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	5.4E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	5.1E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.5E-03
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.5E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.0E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	6.1E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.3E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.3E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	8.3E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	4.0E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.6E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	3.2E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.4E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	2.9E-05
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.8E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.0E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	9.6E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.7E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.4E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.8E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.8E-04
	(total)												**1.5E+00**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.1E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
REASONABLE MAXIMUM EXPOSURE (RME) -- CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.25	9.19E-01	1.75E-03	3.73E-05	1	1.85E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	3.17E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.25	1.12E+00	2.07E-03	1.07E-02	1	2.42E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.02E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.25	6.15E-01	8.91E-03	4.01E-02	1	9.66E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.74E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.25	6.16E-01	9.91E-03	4.47E-02	1	3.23E-09
HMX	8.80E-02	o	1.15E+01	0.25	4.78E+00	1.21E-04	8.01E-04	1	3.22E-08
RDX	1.10E+00	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	6.99E-07
Aluminum	1.40E+02	i		0.25		1.00E-03		1	3.50E-05
Arsenic	2.49E-02	i		0.25		1.00E-03		1	6.23E-09
Beryllium	6.85E-02	i		0.25		1.00E-03		1	1.71E-08
Cadmium	4.85E-02	i		0.25		1.00E-03		1	1.21E-08
Chromium	1.30E-02	i		0.25		2.00E-03		1	6.50E-09
Cobalt	3.25E+00	i		0.25		1.00E-03		1	8.13E-07
Iron	9.51E+01	i		0.25		1.00E-03		1	2.38E-05
Lead	3.92E-02	i		0.25		1.00E-03		1	9.80E-09
Manganese	8.03E+01	i		0.25		1.00E-03		1	2.01E-05
Mercury	5.30E-04	i		0.25		1.00E-03		1	1.33E-10
Nickel	8.16E+00	i		0.25		2.00E-04		1	4.08E-07
Selenium	9.20E-03	i		0.25		1.00E-03		1	2.30E-09
Thallium	1.80E-03	i		0.25		1.00E-03		1	4.50E-10
Vanadium	6.10E-03	i		0.25		1.00E-03		1	1.53E-09
Zinc	1.07E+01	i		0.25		6.00E-04		1	1.61E-06
Nitrite/Nitrate-N	1.80E+00	i		0.25		1.00E-03		1	4.50E-07

TABLE 4.67
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.14E-04
Noncancer Ingestion Intake(RME) = 9.50E-03

Cancer Ingestion Intake(CTE) = 1.36E-04
Noncancer Ingestion Intake(CTE) = 4.75E-03

Cancer Dermal Intake(RME) = 5.37E+00
Noncancer Dermal Intake(RME) = 6.27E+01

Cancer Dermal Intake(CTE) = 8.95E-01
Noncancer Dermal Intake(CTE) = 3.13E+01

TABLE 8.67a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.3E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	6.9E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.4E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	3.1E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	4.1E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	6.9E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.5E-04	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.6E-05
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.9E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.4E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.1E-06
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	9.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	6.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	4.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.3E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	5.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	7.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	8.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-05**

TABLE 8.67a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.3E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	7.0E-10
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	7.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	7.1E-10	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.4E-09	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.0E-11
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	5.1E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.6E-08
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.7E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	7.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	3.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	4.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	5.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	7.9E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	9.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.2E-05**

TABLE 7.67a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-06	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	3.8E-02
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	8.1E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.6E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.8E-03
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	4.7E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.4E-01
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	4.7E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	4.7E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	8.1E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	4.0E-01
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.4E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.4E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	4.2E-04	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	8.4E-03
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	5.2E-03	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E+00
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	6.6E-01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.6E-01
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.2E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.9E-01
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	3.3E-04	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.3E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.6E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	6.2E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.5E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.7E-01
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	4.5E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.9E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	3.8E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.6E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	2.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-03
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	3.9E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.9E+00
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	4.4E-05	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	8.7E-03
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	8.5E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.2E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	2.9E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.9E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	5.1E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.7E-01
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	8.5E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	8.5E-02
	(total)												**2.5E+01**

TABLE 7.67a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	4.7E-08	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	4.7E-04
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	8.1E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.6E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.2E-08	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	6.2E-05
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.6E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.3E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.5E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.5E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.5E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.2E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	8.3E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	8.3E-06
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	8.2E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.6E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.8E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.0E-03
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	7.3E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	7.3E-04
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.3E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	3.6E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.6E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	2.5E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.0E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.4E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.8E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.7E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	8.5E-04
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	5.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.7E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	2.1E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	4.2E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.4E-01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	2.8E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.3E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	8.5E-06	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.1E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	4.8E-08	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	9.6E-06
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	9.4E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.3E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	3.2E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	3.4E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	9.4E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	9.4E-05
	(total)												**5.0E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.5E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
CENTRAL TENDENCY EXPOSURE (CTE) -- CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF
FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.167	9.19E-01	1.75E-03	3.73E-05	1	1.51E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	2.59E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.167	1.12E+00	2.07E-03	1.07E-02	1	1.98E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	8.36E-09
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.167	6.15E-01	8.91E-03	4.01E-02	1	7.90E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	1.42E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.167	6.16E-01	9.91E-03	4.47E-02	1	2.64E-09
HMX	8.80E-02	o	1.15E+01	0.167	4.78E+00	1.21E-04	8.01E-04	1	2.63E-08
RDX	1.10E+00	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	5.72E-07
Aluminum	1.40E+02	i		0.167		1.00E-03		1	2.34E-05
Arsenic	2.49E-02	i		0.167		1.00E-03		1	4.16E-09
Beryllium	6.85E-02	i		0.167		1.00E-03		1	1.14E-08
Cadmium	4.85E-02	i		0.167		1.00E-03		1	8.10E-09
Chromium	1.30E-02	i		0.167		2.00E-03		1	4.34E-09
Cobalt	3.25E+00	i		0.167		1.00E-03		1	5.43E-07
Iron	9.51E+01	i		0.167		1.00E-03		1	1.59E-05
Lead	3.92E-02	i		0.167		1.00E-03		1	6.55E-09
Manganese	8.03E+01	i		0.167		1.00E-03		1	1.34E-05
Mercury	5.30E-04	i		0.167		1.00E-03		1	8.85E-11
Nickel	8.16E+00	i		0.167		2.00E-04		1	2.73E-07
Selenium	9.20E-03	i		0.167		1.00E-03		1	1.54E-09
Thallium	1.80E-03	i		0.167		1.00E-03		1	3.01E-10
Vanadium	6.10E-03	i		0.167		1.00E-03		1	1.02E-09
Zinc	1.07E+01	i		0.167		6.00E-04		1	1.07E-06
Nitrite/Nitrate-N	1.80E+00	i		0.167		1.00E-03		1	3.01E-07

TABLE 4.67
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.14E-04
Noncancer Ingestion Intake(RME) = 9.50E-03

Cancer Ingestion Intake(CTE) = 1.36E-04
Noncancer Ingestion Intake(CTE) = 4.75E-03

Cancer Dermal Intake(RME) = 5.37E+00
Noncancer Dermal Intake(RME) = 6.27E+01

Cancer Dermal Intake(CTE) = 8.95E-01
Noncancer Dermal Intake(CTE) = 3.13E+01

TABLE 8.73 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.2E-08
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	5.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.2E-06
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	7.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	5.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	6.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	9.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	8.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	4.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.2E-06**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	2.7E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.0E-10
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	9.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	3.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.2E-09
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	1.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	4.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	9.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	7.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.3E-06**

TABLE 7.73 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	7.6E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.5E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.5E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.5E-02
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.2E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	3.1E-02
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.5E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.2E-02
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	8.7E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.7E-02
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.0E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.3E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.2E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.6E-02
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.3E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.3E-01
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	6.8E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.7E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	6.9E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.0E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.5E-02
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.0E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.5E-02
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.0E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.0E-01
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	5.0E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.0E-02
	(total)												**1.6E+00**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	3.2E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.1E-05
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.1E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.1E-04
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	2.0E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.4E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	4.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-04
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	1.4E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	5.8E-04
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.3E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	4.4E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	5.2E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.6E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	2.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.1E-04
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	1.1E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.7E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.8E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.3E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	2.9E-04
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.7E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.5E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.6E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	6.3E-03
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	8.3E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	8.3E-05
	(total)												**4.1E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	5.09E-10
Aluminum	6.81E+00	i		0.25		1.00E-03		1	1.70E-06
Antimony	1.30E-03	i		0.25		1.00E-03		1	3.25E-10
Arsenic	2.60E-03	i		0.25		1.00E-03		1	6.50E-10
Cadmium	9.20E-04	i		0.25		1.00E-03		1	2.30E-10
Chromium	1.05E-02	i		0.25		2.00E-03		1	5.25E-09
Cobalt	3.33E-02	i		0.25		1.00E-03		1	8.33E-09
Iron	1.36E+01	i		0.25		1.00E-03		1	3.40E-06
Lead	7.20E-03	i		0.25		1.00E-03		1	1.80E-09
Manganese	1.74E+00	i		0.25		1.00E-03		1	4.35E-07
Nickel	7.38E-02	i		0.25		2.00E-04		1	3.69E-09
Thallium	1.10E-04	i		0.25		1.00E-03		1	2.75E-11
Vanadium	1.05E-02	i		0.25		1.00E-03		1	2.63E-09
Nitrite/Nitrate-N	5.30E-01	i		0.25		1.00E-03		1	1.33E-07

TABLE 4.73
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.14E-04
Noncancer Ingestion Intake(RME) = 9.50E-03

Cancer Ingestion Intake(CTE) = 1.36E-04
Noncancer Ingestion Intake(CTE) = 4.75E-03

Cancer Dermal Intake(RME) = 5.37E+00
Noncancer Dermal Intake(RME) = 6.27E+01

Cancer Dermal Intake(CTE) = 8.95E-01
Noncancer Dermal Intake(CTE) = 3.13E+01

TABLE 8.73a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	9.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	3.5E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-07
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	4.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	9.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	1.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	7.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.4E-07**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	3.7E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.1E-11
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	3.9E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.8E-10
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	5.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	1.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.6E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	7.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.2E-10**
										Total Risk Across All Exposure Routes/Pathways	**5.4E-07**

TABLE 7.73a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	3.2E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.2E-02
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	6.2E-06	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	1.5E-02
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.2E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-02
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	4.4E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.7E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.0E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.6E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.9E-03
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	6.5E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.2E-01
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	3.4E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	8.3E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.4E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	3.5E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.8E-02
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	5.2E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.5E-03
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.0E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.0E-02
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	2.5E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.5E-02
	(total)												**7.8E-01**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.3E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	3.6E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.6E-05
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	6.8E-09	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.1E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.4E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.5E-05
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	4.8E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.9E-04
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.1E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.5E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.7E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	8.7E-06
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	7.1E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.4E-04
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	3.8E-08	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	9.1E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	9.5E-03
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.7E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	9.7E-05
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	5.8E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	8.2E-06
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.5E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.1E-03
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	2.8E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.8E-05
	(total)												**1.4E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.0E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	4.16E-10
Aluminum	6.81E+00	i		0.167		1.00E-03		1	1.14E-06
Antimony	1.30E-03	i		0.167		1.00E-03		1	2.17E-10
Arsenic	2.60E-03	i		0.167		1.00E-03		1	4.34E-10
Cadmium	9.20E-04	i		0.167		1.00E-03		1	1.54E-10
Chromium	1.05E-02	i		0.167		2.00E-03		1	3.51E-09
Cobalt	3.33E-02	i		0.167		1.00E-03		1	5.56E-09
Iron	1.36E+01	i		0.167		1.00E-03		1	2.27E-06
Lead	7.20E-03	i		0.167		1.00E-03		1	1.20E-09
Manganese	1.74E+00	i		0.167		1.00E-03		1	2.91E-07
Nickel	7.38E-02	i		0.167		2.00E-04		1	2.46E-09
Thallium	1.10E-04	i		0.167		1.00E-03		1	1.84E-11
Vanadium	1.05E-02	i		0.167		1.00E-03		1	1.75E-09
Nitrite/Nitrate-N	5.30E-01	i		0.167		1.00E-03		1	8.85E-08

TABLE 4.73
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.14E-04
Noncancer Ingestion Intake(RME) = 9.50E-03

Cancer Ingestion Intake(CTE) = 1.36E-04
Noncancer Ingestion Intake(CTE) = 4.75E-03

Cancer Dermal Intake(RME) = 5.37E+00
Noncancer Dermal Intake(RME) = 6.27E+01

Cancer Dermal Intake(CTE) = 8.95E-01
Noncancer Dermal Intake(CTE) = 3.13E+01

TABLE 8.79 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.4E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.2E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	7.7E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-05
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	5.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-05**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.2E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.3E-09
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.3E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.3E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	9.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	6.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-05**

TABLE 7.79 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.0E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.0E-02
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.7E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-02
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.9E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	7.4E-02
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	9.0E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.0E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	6.8E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.1E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	8.7E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.7E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	4.7E-02
	(total)												**1.6E+00**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.8E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.2E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.9E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	8.1E-04
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.5E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.0E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	1.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.7E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	3.4E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	3.6E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	7.7E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.0E-03
	(total)												**4.1E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	7.84E-09
RDX	3.90E-03	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	2.48E-09
Antimony	3.10E-03	i		0.25		1.00E-03		1	7.75E-10
Arsenic	9.50E-03	i		0.25		1.00E-03		1	2.38E-09
Iron	7.15E+00	i		0.25		1.00E-03		1	1.79E-06
Manganese	2.19E+00	i		0.25		1.00E-03		1	5.48E-07
Vanadium	4.90E-03	i		0.25		1.00E-03		1	1.23E-09

TABLE 4.79
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Child

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.14E-04
Noncancer Ingestion Intake(RME) = 9.50E-03

Cancer Ingestion Intake(CTE) = 1.36E-04
Noncancer Ingestion Intake(CTE) = 4.75E-03

Cancer Dermal Intake(RME) = 5.37E+00
Noncancer Dermal Intake(RME) = 6.27E+01

Cancer Dermal Intake(CTE) = 8.95E-01
Noncancer Dermal Intake(CTE) = 3.13E+01

TABLE 8.79a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	5.7E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-08
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	5.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.8E-08
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.3E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-06
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	9.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	3.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	6.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.0E-06**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	5.7E-09	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-10
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.8E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-10
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.4E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	7.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-06**

TABLE 7.79a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.0E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-02
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.9E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.2E-03
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.5E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	3.7E-02
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	4.5E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.5E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	3.4E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.0E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.3E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	2.3E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.3E-02
	(total)												**8.0E-01**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.0E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	6.4E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.6E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.7E-04
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	5.0E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.7E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	3.7E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.2E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.1E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.2E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	2.6E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	9.9E-04
	(total)												**1.4E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.2E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	6.41E-09
RDX	3.90E-03	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	2.03E-09
Antimony	3.10E-03	i		0.167		1.00E-03		1	5.18E-10
Arsenic	9.50E-03	i		0.167		1.00E-03		1	1.59E-09
Iron	7.15E+00	i		0.167		1.00E-03		1	1.19E-06
Manganese	2.19E+00	i		0.167		1.00E-03		1	3.66E-07
Vanadium	4.90E-03	i		0.167		1.00E-03		1	8.18E-10

TABLE 4.79
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Child

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	6,600	U.S. EPA, July 2004	6,600	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 8.14E-04
Noncancer Ingestion Intake(RME) = 9.50E-03

Cancer Ingestion Intake(CTE) = 1.36E-04
Noncancer Ingestion Intake(CTE) = 4.75E-03

Cancer Dermal Intake(RME) = 5.37E+00
Noncancer Dermal Intake(RME) = 6.27E+01

Cancer Dermal Intake(CTE) = 8.95E-01
Noncancer Dermal Intake(CTE) = 3.13E+01

TABLE 8.70 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.6E-04	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.8E-06
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	7.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	9.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	9.4E-07	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.8E-06	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.8E-08
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	8.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.0E-02	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-03
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.3E+00	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.3E-04	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	6.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	8.9E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	7.5E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	7.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	8.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.0E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-03**

TABLE 8.70 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.7E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	8.0E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	8.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	8.2E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.7E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	5.9E-05	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.5E-06
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	3.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	5.3E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.9E-07
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	5.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	6.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	8.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	3.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	3.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	3.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.4E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.5E-03**

TABLE 7.70 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-05	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	2.2E-01
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.7E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.3E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.2E-02
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.7E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.4E+00
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.7E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.7E-04
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.7E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.3E+00
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	8.2E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	8.2E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	2.4E-03	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.8E-02
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	3.0E-02	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.0E+01
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	3.8E+00	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.8E+00
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	6.8E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.3E+00
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.9E-03	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.3E-03	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.7E+00
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	3.6E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-01
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	8.9E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.5E+00
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.6E+00	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	8.7E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.1E-03	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.2E+00	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	9.2E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.5E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.8E-02
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	2.2E-01	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.1E+01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.5E-04	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	5.0E-02
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	4.9E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.0E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.7E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.7E-01
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	2.9E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.8E-01
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	4.9E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	4.9E-01
	(total)												**1.4E+02**

TABLE 7.70 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	4.6E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	4.6E-03
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	7.8E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.6E-02
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.0E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	6.0E-04
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.5E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.3E-02
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.4E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.4E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.3E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	2.1E-02
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	8.0E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	8.0E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	7.9E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.6E-04
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.7E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.7E-02
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	8.6E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	8.6E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.1E-03
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	4.2E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	3.0E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	3.0E-06	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.2E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.6E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.1E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.0E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.0E-02
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	5.9E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-02
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	2.4E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	5.0E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	5.2E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	3.3E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.6E-03
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.0E-04	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.3E-01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	5.7E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.1E-04
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.1E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.6E-03
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	3.8E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.4E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	4.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.3E-03
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.1E-04	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.1E-03
	(total)												**5.9E+00**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.5E+02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
REASONABLE MAXIMUM EXPOSURE (RME) -- FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.25	9.19E-01	1.75E-03	3.73E-05	1	1.85E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	3.17E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.25	1.12E+00	2.07E-03	1.07E-02	1	2.42E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.02E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.25	6.15E-01	8.91E-03	4.01E-02	1	9.66E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.74E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.25	6.16E-01	9.91E-03	4.47E-02	1	3.23E-09
HMX	8.80E-02	o	1.15E+01	0.25	4.78E+00	1.21E-04	8.01E-04	1	3.22E-08
RDX	1.10E+00	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	6.99E-07
Aluminum	1.40E+02	i		0.25		1.00E-03		1	3.50E-05
Arsenic	2.49E-02	i		0.25		1.00E-03		1	6.23E-09
Beryllium	6.85E-02	i		0.25		1.00E-03		1	1.71E-08
Cadmium	4.85E-02	i		0.25		1.00E-03		1	1.21E-08
Chromium	1.30E-02	i		0.25		2.00E-03		1	6.50E-09
Cobalt	3.25E+00	i		0.25		1.00E-03		1	8.13E-07
Iron	9.51E+01	i		0.25		1.00E-03		1	2.38E-05
Lead	3.92E-02	i		0.25		1.00E-03		1	9.80E-09
Manganese	8.03E+01	i		0.25		1.00E-03		1	2.01E-05
Mercury	5.30E-04	i		0.25		1.00E-03		1	1.33E-10
Nickel	8.16E+00	i		0.25		2.00E-04		1	4.08E-07
Selenium	9.20E-03	i		0.25		1.00E-03		1	2.30E-09
Thallium	1.80E-03	i		0.25		1.00E-03		1	4.50E-10
Vanadium	6.10E-03	i		0.25		1.00E-03		1	1.53E-09
Zinc	1.07E+01	i		0.25		6.00E-04		1	1.61E-06
Nitrite/Nitrate-N	1.80E+00	i		0.25		1.00E-03		1	4.50E-07

TABLE 4.70
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	2	U.S. EPA, May 1993	1.4	U.S. EPA, May 1993	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 9.39E-03
Noncancer Ingestion Intake(RME) = 2.74E-02

Cancer Ingestion Intake(CTE) = 1.28E-03
Noncancer Ingestion Intake(CTE) = 1.28E-02

Cancer Dermal Intake(RME) = 8.45E+01
Noncancer Dermal Intake(RME) = 2.47E+02

Cancer Dermal Intake(CTE) = 1.65E+01
Noncancer Dermal Intake(CTE) = 1.65E+02

TABLE 8.70a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.2E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	6.5E-07
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.3E-07	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	2.9E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	3.8E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	6.5E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.4E-03	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.6E-04
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.8E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.2E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.8E-05
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	8.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	6.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	4.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.2E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	5.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.0E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	6.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.0E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	7.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.0E-04**

TABLE 8.70a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.3E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.3E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	3.0E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	4.3E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	7.4E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	4.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	9.4E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.0E-06
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	3.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	6.9E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	7.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	8.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	4.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-06**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-04**

TABLE 7.70a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-05	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	1.0E-01
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.2E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.4E-01
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.0E-02
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.3E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	6.4E-01
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.3E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.3E-04
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.2E-04	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.1E+00
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	3.8E-06	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	3.8E-04
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.1E-03	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.3E-02
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.4E-02	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.7E+00
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.8E+00	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.8E+00
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	3.2E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.1E+00
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	8.8E-04	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	4.4E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	6.2E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.2E+00
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.7E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.6E-02
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	4.2E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.1E+00
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.2E+00	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.1E+00
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	5.0E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.0E+00	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.3E+01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	6.8E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.3E-02
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.0E-01	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.2E+00
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.2E-04	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	2.4E-02
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	2.3E-05	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	3.3E-01
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	7.8E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	7.8E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.4E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-01
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	2.3E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	2.3E-01
	(total)												**6.7E+01**

TABLE 7.70a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.5E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	2.5E-03
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.6E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.3E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.3E-04
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.4E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	6.9E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.3E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.3E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.3E-06	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.2E-02
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	4.3E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	4.3E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	4.3E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	8.7E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	9.4E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.1E-02
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	3.9E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.9E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	6.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.3E-03
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.9E-06	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.3E-01
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.3E-06	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	5.3E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	7.2E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	9.5E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	8.9E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.5E-03
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.6E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	8.7E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.1E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.2E-03	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.3E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.5E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	6.9E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	4.5E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	5.6E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.5E-07	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	5.1E-05
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.0E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.1E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.7E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	6.5E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.8E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.9E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.0E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.0E-04
	(total)												**2.6E+00**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.0E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
CENTRAL TENDENCY EXPOSURE (CTE) -- FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.167	9.19E-01	1.75E-03	3.73E-05	1	1.51E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	2.59E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.167	1.12E+00	2.07E-03	1.07E-02	1	1.98E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	8.36E-09
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.167	6.15E-01	8.91E-03	4.01E-02	1	7.90E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	1.42E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.167	6.16E-01	9.91E-03	4.47E-02	1	2.64E-09
HMX	8.80E-02	o	1.15E+01	0.167	4.78E+00	1.21E-04	8.01E-04	1	2.63E-08
RDX	1.10E+00	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	5.72E-07
Aluminum	1.40E+02	i		0.167		1.00E-03		1	2.34E-05
Arsenic	2.49E-02	i		0.167		1.00E-03		1	4.16E-09
Beryllium	6.85E-02	i		0.167		1.00E-03		1	1.14E-08
Cadmium	4.85E-02	i		0.167		1.00E-03		1	8.10E-09
Chromium	1.30E-02	i		0.167		2.00E-03		1	4.34E-09
Cobalt	3.25E+00	i		0.167		1.00E-03		1	5.43E-07
Iron	9.51E+01	i		0.167		1.00E-03		1	1.59E-05
Lead	3.92E-02	i		0.167		1.00E-03		1	6.55E-09
Manganese	8.03E+01	i		0.167		1.00E-03		1	1.34E-05
Mercury	5.30E-04	i		0.167		1.00E-03		1	8.85E-11
Nickel	8.16E+00	i		0.167		2.00E-04		1	2.73E-07
Selenium	9.20E-03	i		0.167		1.00E-03		1	1.54E-09
Thallium	1.80E-03	i		0.167		1.00E-03		1	3.01E-10
Vanadium	6.10E-03	i		0.167		1.00E-03		1	1.02E-09
Zinc	1.07E+01	i		0.167		6.00E-04		1	1.07E-06
Nitrite/Nitrate-N	1.80E+00	i		0.167		1.00E-03		1	3.01E-07

TABLE 4.70
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	2	U.S. EPA, May 1993	1.4	U.S. EPA, May 1993	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 9.39E-03
Noncancer Ingestion Intake(RME) = 2.74E-02

Cancer Ingestion Intake(CTE) = 1.28E-03
Noncancer Ingestion Intake(CTE) = 1.28E-02

Cancer Dermal Intake(RME) = 8.45E+01
Noncancer Dermal Intake(RME) = 2.47E+02

Cancer Dermal Intake(CTE) = 1.65E+01
Noncancer Dermal Intake(CTE) = 1.65E+02

TABLE 8.76 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	7.2E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.9E-07
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	2.5E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-05
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	8.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.3E-01	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	6.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.6E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	6.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	4.9E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.8E-05**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	4.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.5E-09
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	5.5E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.3E-08
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	4.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	7.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	2.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	3.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	3.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	2.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	1.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.8E-05**

TABLE 7.76 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	2.1E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.0E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.9E-01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.9E-01
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	3.7E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	9.2E-02
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	7.2E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.4E-01
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	2.5E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	5.0E-02
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.9E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	9.6E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	9.1E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.6E-02
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	3.7E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.2E+00
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	2.0E-04	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	4.8E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.0E+00
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	2.0E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.0E-01
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	3.0E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.3E-02
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.9E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.9E-01
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	1.4E-02	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.4E-01
	(total)												**4.5E+00**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	1.2E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.0E-05
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	4.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	4.2E-04
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	8.2E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.4E-03
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	1.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.4E-04
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	5.7E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	2.3E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.3E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.7E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.1E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.0E-04
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	8.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.8E-03
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	4.4E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.1E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.1E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	9.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.1E-03
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	6.7E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	9.6E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.5E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.5E-02
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	3.2E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	3.2E-04
	(total)												**1.6E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.7E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	7.64E-04	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	4.86E-10
Aluminum	6.81E+00	i		0.25		1.00E-03		1	1.70E-06
Antimony	1.34E-03	i		0.25		1.00E-03		1	3.34E-10
Arsenic	2.61E-03	i		0.25		1.00E-03		1	6.53E-10
Cadmium	9.21E-04	i		0.25		1.00E-03		1	2.30E-10
Chromium	1.05E-02	i		0.25		2.00E-03		1	5.27E-09
Cobalt	3.33E-02	i		0.25		1.00E-03		1	8.32E-09
Iron	1.36E+01	i		0.25		1.00E-03		1	3.40E-06
Lead	7.17E-03	i		0.25		1.00E-03		1	1.79E-09
Manganese	1.74E+00	i		0.25		1.00E-03		1	4.35E-07
Nickel	7.38E-02	i		0.25		2.00E-04		1	3.69E-09
Thallium	1.09E-04	i		0.25		1.00E-03		1	2.72E-11
Vanadium	1.05E-02	i		0.25		1.00E-03		1	2.62E-09
Nitrite/Nitrate-N	5.26E-01	i		0.25		1.00E-03		1	1.32E-07

TABLE 4.76
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	2	U.S. EPA, May 1993	1.4	U.S. EPA, May 1993	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 9.39E-03
Noncancer Ingestion Intake(RME) = 2.74E-02

Cancer Ingestion Intake(CTE) = 1.28E-03
Noncancer Ingestion Intake(CTE) = 1.28E-02

Cancer Dermal Intake(RME) = 8.45E+01
Noncancer Dermal Intake(RME) = 2.47E+02

Cancer Dermal Intake(CTE) = 1.65E+01
Noncancer Dermal Intake(CTE) = 1.65E+02

TABLE 8.76a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	9.8E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	8.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	3.4E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.0E-06
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	4.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	9.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	9.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	6.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.1E-06**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	6.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.2E-10
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	3.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	7.2E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	2.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	3.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	4.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	3.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.1E-06**

TABLE 7.76a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	9.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.3E-03
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	8.7E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	8.7E-02
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	1.7E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	4.3E-02
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	3.4E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.1E-01
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	1.2E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.4E-02
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.4E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.5E-02
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	4.3E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.1E-02
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.7E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.8E-01
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	9.2E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	2.2E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	9.3E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	9.5E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.7E-02
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	1.4E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.0E-02
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.3E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.3E-01
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	6.7E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	6.7E-02
	(total)												**2.1E+00**
Dermal	RDX	7.64E-04	mg/L	7.64E-04	mg/L	M	6.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.9E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.9E-04
	Antimony	1.34E-03	mg/L	1.34E-03	mg/L	M	3.7E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	6.1E-04
	Arsenic	2.61E-03	mg/L	2.61E-03	mg/L	M	7.2E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.4E-04
	Cadmium	9.21E-04	mg/L	9.21E-04	mg/L	M	2.5E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.0E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	5.8E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	7.7E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	9.2E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.6E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	3.7E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.2E-03
	Lead	7.17E-03	mg/L	7.17E-03	mg/L	M	2.0E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	4.8E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	5.0E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	5.1E-04
	Thallium	1.09E-04	mg/L	1.09E-04	mg/L	M	3.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.3E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.9E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.1E-02
	Nitrite/Nitrate-N	5.26E-01	mg/L	5.26E-01	mg/L	M	1.4E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.4E-04
	(total)												**7.3E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	7.64E-04	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	3.97E-10
Aluminum	6.81E+00	i		0.167		1.00E-03		1	1.14E-06
Antimony	1.34E-03	i		0.167		1.00E-03		1	2.23E-10
Arsenic	2.61E-03	i		0.167		1.00E-03		1	4.36E-10
Cadmium	9.21E-04	i		0.167		1.00E-03		1	1.54E-10
Chromium	1.05E-02	i		0.167		2.00E-03		1	3.52E-09
Cobalt	3.33E-02	i		0.167		1.00E-03		1	5.56E-09
Iron	1.36E+01	i		0.167		1.00E-03		1	2.27E-06
Lead	7.17E-03	i		0.167		1.00E-03		1	1.20E-09
Manganese	1.74E+00	i		0.167		1.00E-03		1	2.91E-07
Nickel	7.38E-02	i		0.167		2.00E-04		1	2.47E-09
Thallium	1.09E-04	i		0.167		1.00E-03		1	1.81E-11
Vanadium	1.05E-02	i		0.167		1.00E-03		1	1.75E-09
Nitrite/Nitrate-N	5.26E-01	i		0.167		1.00E-03		1	8.79E-08

TABLE 4.76
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	2	U.S. EPA, May 1993	1.4	U.S. EPA, May 1993	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 9.39E-03
Noncancer Ingestion Intake(RME) = 2.74E-02

Cancer Ingestion Intake(CTE) = 1.28E-03
Noncancer Ingestion Intake(CTE) = 1.28E-02

Cancer Dermal Intake(RME) = 8.45E+01
Noncancer Dermal Intake(RME) = 2.47E+02

Cancer Dermal Intake(CTE) = 1.65E+01
Noncancer Dermal Intake(CTE) = 1.65E+02

TABLE 8.82 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	3.9E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-06
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.7E-05	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.0E-06
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	8.9E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	6.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.4E-04**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-08
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	2.1E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.3E-08
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	6.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.0E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.0E-07
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	1.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	4.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.4E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.4E-04**

TABLE 7.82 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.2E-04	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-01
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	1.1E-04	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.6E-02
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	8.5E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	2.1E-01
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.6E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.7E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.0E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.5E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.0E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.5E+00
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.3E-04	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.3E-01
	(total)												**4.6E+00**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.9E-03
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	6.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.0E-04
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	1.9E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.2E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	5.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.0E-03
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	4.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-03
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.4E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.4E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	3.0E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-02
	(total)												**1.6E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	7.84E-09
RDX	3.90E-03	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	2.48E-09
Antimony	3.10E-03	i		0.25		1.00E-03		1	7.75E-10
Arsenic	9.50E-03	i		0.25		1.00E-03		1	2.38E-09
Iron	7.15E+00	i		0.25		1.00E-03		1	1.79E-06
Manganese	2.19E+00	i		0.25		1.00E-03		1	5.48E-07
Vanadium	4.90E-03	i		0.25		1.00E-03		1	1.23E-09

TABLE 4.82
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	2	U.S. EPA, May 1993	1.4	U.S. EPA, May 1993	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 9.39E-03
Noncancer Ingestion Intake(RME) = 2.74E-02

Cancer Ingestion Intake(CTE) = 1.28E-03
Noncancer Ingestion Intake(CTE) = 1.28E-02

Cancer Dermal Intake(RME) = 8.45E+01
Noncancer Dermal Intake(RME) = 2.47E+02

Cancer Dermal Intake(CTE) = 1.65E+01
Noncancer Dermal Intake(CTE) = 1.65E+02

TABLE 8.82a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	5.4E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-07
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	5.0E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.5E-07
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.2E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-05
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	9.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.9E-05**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.1E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.2E-09
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.3E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.7E-09
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	8.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.6E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.9E-08
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.9E-05**

TABLE 7.82a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	5.4E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-01
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	5.0E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E-02
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	4.0E-05	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	9.9E-02
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.2E-04	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-01
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	9.2E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.1E-01
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.8E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E+00
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	6.3E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	6.3E-02
	(total)												**2.2E+00**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.1E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.1E-03
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.3E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.1E-04
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	8.5E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.4E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.7E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.6E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.0E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	6.3E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.3E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.2E-03
	(total)												**7.3E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	6.41E-09
RDX	3.90E-03	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	2.03E-09
Antimony	3.10E-03	i		0.167		1.00E-03		1	5.18E-10
Arsenic	9.50E-03	i		0.167		1.00E-03		1	1.59E-09
Iron	7.15E+00	i		0.167		1.00E-03		1	1.19E-06
Manganese	2.19E+00	i		0.167		1.00E-03		1	3.66E-07
Vanadium	4.90E-03	i		0.167		1.00E-03		1	8.18E-10

TABLE 4.82
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	2	U.S. EPA, May 1993	1.4	U.S. EPA, May 1993	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 9.39E-03
Noncancer Ingestion Intake(RME) = 2.74E-02

Cancer Ingestion Intake(CTE) = 1.28E-03
Noncancer Ingestion Intake(CTE) = 1.28E-02

Cancer Dermal Intake(RME) = 8.45E+01
Noncancer Dermal Intake(RME) = 2.47E+02

Cancer Dermal Intake(CTE) = 1.65E+01
Noncancer Dermal Intake(CTE) = 1.65E+02

TABLE 8.68 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.2E-05	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.6E-07
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	7.0E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	2.1E-07	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	3.6E-09
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	6.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	7.7E-04	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	8.4E-05
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	9.8E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	1.7E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.6E-05
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	4.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	3.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	9.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	2.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	6.6E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	2.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	5.6E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	3.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	5.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	6.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	4.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	7.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-04**

TABLE 8.68 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.0E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.2E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	2.8E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	4.1E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	6.9E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	4.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	8.8E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.7E-07
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	4.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	7.8E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	8.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	1.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	3.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	5.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-04**

TABLE 7.68 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-06	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	1.6E-02
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	3.5E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.9E-02
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.6E-03
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	2.0E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.0E-01
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	2.0E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	2.0E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	3.5E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.7E-01
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	6.1E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	6.1E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.8E-04	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.6E-03
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	2.2E-03	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.5E-01
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	2.8E-01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.8E-01
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	5.1E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.7E-01
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	1.4E-04	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	7.0E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	9.9E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.0E-01
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	2.6E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.8E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	6.6E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.3E-01
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	1.9E-01	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.5E-01
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	8.0E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	1.6E-01	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	6.8E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.1E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-03
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.7E-02	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	8.3E-01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	1.9E-05	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	3.7E-03
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	3.7E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	5.2E-02
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.2E-02
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	2.2E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.3E-02
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	3.7E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	3.7E-02
	(total)												**1.1E+01**

TABLE 7.68 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	6.8E-08	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	6.8E-04
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-03
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.9E-08	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.9E-05
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	3.7E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.9E-03
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	3.5E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	3.5E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	6.4E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	3.2E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	1.2E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.2E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	1.2E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.4E-05
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	2.6E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.5E-03
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.3E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.3E-03
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.6E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	6.3E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	4.5E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.4E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.8E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	2.4E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.2E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.0E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.5E-03
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	8.7E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.9E-03
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	3.6E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	7.4E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.7E-01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	4.9E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.3E-04
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	1.5E-05	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.9E-02
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	8.4E-08	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.7E-05
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.6E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.4E-04
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	5.6E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.1E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	5.9E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-04
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.6E-05	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.6E-04
	(total)												**8.8E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E+01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
REASONABLE MAXIMUM EXPOSURE (RME) -- ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.25	9.19E-01	1.75E-03	3.73E-05	1	1.85E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	3.17E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.25	1.12E+00	2.07E-03	1.07E-02	1	2.42E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.02E-08
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.25	6.15E-01	8.91E-03	4.01E-02	1	9.66E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.25	1.34E+00	6.41E-04	3.46E-03	1	1.74E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.25	6.16E-01	9.91E-03	4.47E-02	1	3.23E-09
HMX	8.80E-02	o	1.15E+01	0.25	4.78E+00	1.21E-04	8.01E-04	1	3.22E-08
RDX	1.10E+00	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	6.99E-07
Aluminum	1.40E+02	i		0.25		1.00E-03		1	3.50E-05
Arsenic	2.49E-02	i		0.25		1.00E-03		1	6.23E-09
Beryllium	6.85E-02	i		0.25		1.00E-03		1	1.71E-08
Cadmium	4.85E-02	i		0.25		1.00E-03		1	1.21E-08
Chromium	1.30E-02	i		0.25		2.00E-03		1	6.50E-09
Cobalt	3.25E+00	i		0.25		1.00E-03		1	8.13E-07
Iron	9.51E+01	i		0.25		1.00E-03		1	2.38E-05
Lead	3.92E-02	i		0.25		1.00E-03		1	9.80E-09
Manganese	8.03E+01	i		0.25		1.00E-03		1	2.01E-05
Mercury	5.30E-04	i		0.25		1.00E-03		1	1.33E-10
Nickel	8.16E+00	i		0.25		2.00E-04		1	4.08E-07
Selenium	9.20E-03	i		0.25		1.00E-03		1	2.30E-09
Thallium	1.80E-03	i		0.25		1.00E-03		1	4.50E-10
Vanadium	6.10E-03	i		0.25		1.00E-03		1	1.53E-09
Zinc	1.07E+01	i		0.25		6.00E-04		1	1.61E-06
Nitrite/Nitrate-N	1.80E+00	i		0.25		1.00E-03		1	4.50E-07

TABLE 4.68
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 6.98E-04
Noncancer Ingestion Intake(RME) = 2.04E-03

Cancer Ingestion Intake(CTE) = 1.02E-04
Noncancer Ingestion Intake(CTE) = 1.02E-03

Cancer Dermal Intake(RME) = 1.26E+01
Noncancer Dermal Intake(RME) = 3.66E+01

Cancer Dermal Intake(CTE) = 1.83E+00
Noncancer Dermal Intake(CTE) = 1.83E+01

TABLE 8.68a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	5.2E-08
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.0E-08	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	2.3E-09
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	3.1E-08	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	5.2E-10
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	9.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.1E-04	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-05
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.5E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.8E-06
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	9.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	8.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	8.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	9.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	6.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-05**

TABLE 8.68a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.8E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-09
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.4E-09	mg/kg-day	2.30E-01	$(mg/kg\text{-}day)^{-1}$	3.3E-10
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	4.8E-09	mg/kg-day	1.70E-02	$(mg/kg\text{-}day)^{-1}$	8.2E-11
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	4.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.0E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	4.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	7.6E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	8.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	9.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	5.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-05**

TABLE 7.68a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.1E-07	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	8.1E-03
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.5E-02
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	8.1E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.1E-04
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.0E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	5.1E-02
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.0E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.0E-05
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	1.7E-05	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	8.6E-02
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	3.1E-07	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	3.1E-05
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	9.0E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.8E-03
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.1E-03	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-01
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	1.4E-01	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-01
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	2.5E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-02
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	7.0E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.5E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	4.9E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.9E-02
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	1.3E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.4E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	3.3E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.7E-01
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	9.7E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.2E-01
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	4.0E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	8.2E-02	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.4E+00
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	5.4E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.8E-03
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	8.3E-03	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.2E-01
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	9.4E-06	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	1.9E-03
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	1.8E-06	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.6E-02
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	6.2E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	6.2E-03
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	1.1E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.6E-02
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	1.8E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.8E-02
	(total)												**5.3E+00**

TABLE 7.68a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,3-Dinitrobenzene	8.00E-04	mg/L	8.00E-04	mg/L	M	2.8E-08	mg/kg-day	1.00E-04	mg/kg-day	NA	NA	2.8E-04
	2,4,6-Trinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	4.8E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.5E-04
	2,6-Dinitrotoluene	8.00E-04	mg/L	8.00E-04	mg/L	M	3.6E-08	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.6E-05
	2-Amino-4,6-Dinitrotoluene	1.00E-02	mg/L	1.00E-02	mg/L	M	1.5E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	7.7E-04
	2-Nitrotoluene	1.00E-04	mg/L	1.00E-04	mg/L	M	1.4E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	1.4E-06
	4-Amino-2,6-Dinitrotoluene	1.70E-02	mg/L	1.70E-02	mg/L	M	2.6E-07	mg/kg-day	2.00E-04	mg/kg-day	NA	NA	1.3E-03
	4-Nitrotoluene	3.00E-04	mg/L	3.00E-04	mg/L	M	4.8E-08	mg/kg-day	1.00E-02	mg/kg-day	NA	NA	4.8E-06
	HMX	8.80E-02	mg/L	8.80E-02	mg/L	M	4.8E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	9.6E-06
	RDX	1.10E+00	mg/L	1.10E+00	mg/L	M	1.0E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.5E-03
	Aluminum	1.40E+02	mg/L	1.40E+02	mg/L	M	4.3E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	4.3E-04
	Arsenic	2.49E-02	mg/L	2.49E-02	mg/L	M	7.6E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.5E-04
	Beryllium	6.85E-02	mg/L	6.85E-02	mg/L	M	2.1E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.5E-02
	Cadmium	4.85E-02	mg/L	4.85E-02	mg/L	M	1.5E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	5.9E-03
	Chromium	1.30E-02	mg/L	1.30E-02	mg/L	M	8.0E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.1E-03
	Cobalt	3.25E+00	mg/L	3.25E+00	mg/L	M	9.9E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.0E-04
	Iron	9.51E+01	mg/L	9.51E+01	mg/L	M	2.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.7E-04
	Lead	3.92E-02	mg/L	3.92E-02	mg/L	M	1.2E-07	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	8.03E+01	mg/L	8.03E+01	mg/L	M	2.5E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.6E-01
	Mercury	5.30E-04	mg/L	5.30E-04	mg/L	M	1.6E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	7.7E-05
	Nickel	8.16E+00	mg/L	8.16E+00	mg/L	M	5.0E-06	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	6.2E-03
	Selenium	9.20E-03	mg/L	9.20E-03	mg/L	M	2.8E-08	mg/kg-day	5.00E-03	mg/kg-day	NA	NA	5.6E-06
	Thallium	1.80E-03	mg/L	1.80E-03	mg/L	M	5.5E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.9E-05
	Vanadium	6.10E-03	mg/L	6.10E-03	mg/L	M	1.9E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	7.2E-04
	Zinc	1.07E+01	mg/L	1.07E+01	mg/L	M	2.0E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.5E-05
	Nitrite/Nitrate-N	1.80E+00	mg/L	1.80E+00	mg/L	M	5.5E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.5E-05
	(total)												**2.9E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.6E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATEF
CENTRAL TENDENCY EXPOSURE (CTE) -- ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/03/08

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS:
IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
1,3-Dinitrobenzene	8.00E-04	o	2.21E+00	0.167	9.19E-01	1.75E-03	3.73E-05	1	1.51E-09
2,4,6-Trinitrotoluene	1.70E-02	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	2.59E-08
2,6-Dinitrotoluene	8.00E-04	o	2.69E+00	0.167	1.12E+00	2.07E-03	1.07E-02	1	1.98E-09
2-Amino-4,6-Dinitrotoluene	1.00E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	8.36E-09
2-Nitrotoluene	1.00E-04	o	1.48E+00	0.167	6.15E-01	8.91E-03	4.01E-02	1	7.90E-10
4-Amino-2,6-Dinitrotoluene	1.70E-02	o	3.21E+00	0.167	1.34E+00	6.41E-04	3.46E-03	1	1.42E-08
4-Nitrotoluene	3.00E-04	o	1.48E+00	0.167	6.16E-01	9.91E-03	4.47E-02	1	2.64E-09
HMX	8.80E-02	o	1.15E+01	0.167	4.78E+00	1.21E-04	8.01E-04	1	2.63E-08
RDX	1.10E+00	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	5.72E-07
Aluminum	1.40E+02	i		0.167		1.00E-03		1	2.34E-05
Arsenic	2.49E-02	i		0.167		1.00E-03		1	4.16E-09
Beryllium	6.85E-02	i		0.167		1.00E-03		1	1.14E-08
Cadmium	4.85E-02	i		0.167		1.00E-03		1	8.10E-09
Chromium	1.30E-02	i		0.167		2.00E-03		1	4.34E-09
Cobalt	3.25E+00	i		0.167		1.00E-03		1	5.43E-07
Iron	9.51E+01	i		0.167		1.00E-03		1	1.59E-05
Lead	3.92E-02	i		0.167		1.00E-03		1	6.55E-09
Manganese	8.03E+01	i		0.167		1.00E-03		1	1.34E-05
Mercury	5.30E-04	i		0.167		1.00E-03		1	8.85E-11
Nickel	8.16E+00	i		0.167		2.00E-04		1	2.73E-07
Selenium	9.20E-03	i		0.167		1.00E-03		1	1.54E-09
Thallium	1.80E-03	i		0.167		1.00E-03		1	3.01E-10
Vanadium	6.10E-03	i		0.167		1.00E-03		1	1.02E-09
Zinc	1.07E+01	i		0.167		6.00E-04		1	1.07E-06
Nitrite/Nitrate-N	1.80E+00	i		0.167		1.00E-03		1	3.01E-07

TABLE 4.68
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Upper Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 6.98E-04
Noncancer Ingestion Intake(RME) = 2.04E-03

Cancer Ingestion Intake(CTE) = 1.02E-04
Noncancer Ingestion Intake(CTE) = 1.02E-03

Cancer Dermal Intake(RME) = 1.26E+01
Noncancer Dermal Intake(RME) = 3.66E+01

Cancer Dermal Intake(CTE) = 1.83E+00
Noncancer Dermal Intake(CTE) = 1.83E+01

TABLE 8.74 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	5.6E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.1E-08
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	4.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	9.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	1.8E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.7E-06
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	6.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	7.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	2.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	9.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	5.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	7.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	7.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	3.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-06**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.0E-10
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	4.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	8.2E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	2.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	4.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	5.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	3.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.8E-06**

TABLE 7.74 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-04
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	1.4E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-02
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	2.6E-06	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	6.6E-03
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.8E-02
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	1.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.7E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.1E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.1E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	6.8E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.4E-03
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	2.8E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.2E-02
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	1.5E-05	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	3.5E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.5E-01
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	1.5E-04	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.5E-03
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	2.2E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	3.2E-03
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	2.1E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.1E-02
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.1E-03	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.1E-02
	(total)												**3.4E-01**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	1.9E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.2E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.2E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.2E-05
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.2E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.0E-04
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.4E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.9E-05
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	8.4E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.4E-04
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.9E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.6E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.0E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.5E-05
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.2E-04
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	6.6E-08	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.6E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	1.4E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.7E-04
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.4E-05
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	9.6E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.7E-03
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	4.9E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	4.9E-05
	(total)												**2.4E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.6E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	5.09E-10
Aluminum	6.81E+00	i		0.25		1.00E-03		1	1.70E-06
Antimony	1.30E-03	i		0.25		1.00E-03		1	3.25E-10
Arsenic	2.60E-03	i		0.25		1.00E-03		1	6.50E-10
Cadmium	9.20E-04	i		0.25		1.00E-03		1	2.30E-10
Chromium	1.05E-02	i		0.25		2.00E-03		1	5.25E-09
Cobalt	3.33E-02	i		0.25		1.00E-03		1	8.33E-09
Iron	1.36E+01	i		0.25		1.00E-03		1	3.40E-06
Lead	7.20E-03	i		0.25		1.00E-03		1	1.80E-09
Manganese	1.74E+00	i		0.25		1.00E-03		1	4.35E-07
Nickel	7.38E-02	i		0.25		2.00E-04		1	3.69E-09
Thallium	1.10E-04	i		0.25		1.00E-03		1	2.75E-11
Vanadium	1.05E-02	i		0.25		1.00E-03		1	2.63E-09
Nitrite/Nitrate-N	5.30E-01	i		0.25		1.00E-03		1	1.33E-07

TABLE 4.74
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 6.98E-04
Noncancer Ingestion Intake(RME) = 2.04E-03

Cancer Ingestion Intake(CTE) = 1.02E-04
Noncancer Ingestion Intake(CTE) = 1.02E-03

Cancer Dermal Intake(RME) = 1.26E+01
Noncancer Dermal Intake(RME) = 3.66E+01

Cancer Dermal Intake(CTE) = 1.83E+00
Noncancer Dermal Intake(CTE) = 1.83E+01

TABLE 8.74a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	8.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.0E-09
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.6E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.0E-07
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	9.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	7.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	5.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.1E-07**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	7.6E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	8.4E-11
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	4.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	8.0E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	2.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	4.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	5.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	3.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.1E-07**

TABLE 7.74a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	8.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.7E-04
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	6.9E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.9E-03
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	1.3E-06	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	3.3E-03
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	2.6E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.8E-03
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	9.4E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.9E-03
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.1E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.6E-03
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	3.4E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.7E-03
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	1.4E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-02
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	7.3E-06	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	1.8E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.4E-02
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	7.5E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.8E-03
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	1.1E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.6E-03
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	1.1E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.1E-02
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	5.4E-04	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	5.4E-03
	(total)												**1.7E-01**
Dermal	RDX	8.00E-04	mg/L	8.00E-04	mg/L	M	7.6E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.5E-06
	Aluminum	6.81E+00	mg/L	6.81E+00	mg/L	M	2.1E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.1E-05
	Antimony	1.30E-03	mg/L	1.30E-03	mg/L	M	4.0E-09	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	6.6E-05
	Arsenic	2.60E-03	mg/L	2.60E-03	mg/L	M	8.0E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.7E-05
	Cadmium	9.20E-04	mg/L	9.20E-04	mg/L	M	2.8E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.1E-04
	Chromium	1.05E-02	mg/L	1.05E-02	mg/L	M	6.4E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	8.6E-04
	Cobalt	3.33E-02	mg/L	3.33E-02	mg/L	M	1.0E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.1E-06
	Iron	1.36E+01	mg/L	1.36E+01	mg/L	M	4.2E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.4E-04
	Lead	7.20E-03	mg/L	7.20E-03	mg/L	M	2.2E-08	mg/kg-day	NA	mg/kg-day	NA	NA	
	Manganese	1.74E+00	mg/L	1.74E+00	mg/L	M	5.3E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	5.5E-03
	Nickel	7.38E-02	mg/L	7.38E-02	mg/L	M	4.5E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	5.6E-05
	Thallium	1.10E-04	mg/L	1.10E-04	mg/L	M	3.4E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.8E-06
	Vanadium	1.05E-02	mg/L	1.05E-02	mg/L	M	3.2E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-03
	Nitrite/Nitrate-N	5.30E-01	mg/L	5.30E-01	mg/L	M	1.6E-06	mg/kg-day	1.00E-01	mg/kg-day	NA	NA	1.6E-05
	(total)												**8.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.8E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
RDX	8.00E-04	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	4.16E-10
Aluminum	6.81E+00	i		0.167		1.00E-03		1	1.14E-06
Antimony	1.30E-03	i		0.167		1.00E-03		1	2.17E-10
Arsenic	2.60E-03	i		0.167		1.00E-03		1	4.34E-10
Cadmium	9.20E-04	i		0.167		1.00E-03		1	1.54E-10
Chromium	1.05E-02	i		0.167		2.00E-03		1	3.51E-09
Cobalt	3.33E-02	i		0.167		1.00E-03		1	5.56E-09
Iron	1.36E+01	i		0.167		1.00E-03		1	2.27E-06
Lead	7.20E-03	i		0.167		1.00E-03		1	1.20E-09
Manganese	1.74E+00	i		0.167		1.00E-03		1	2.91E-07
Nickel	7.38E-02	i		0.167		2.00E-04		1	2.46E-09
Thallium	1.10E-04	i		0.167		1.00E-03		1	1.84E-11
Vanadium	1.05E-02	i		0.167		1.00E-03		1	1.75E-09
Nitrite/Nitrate-N	5.30E-01	i		0.167		1.00E-03		1	8.85E-08

TABLE 4.74
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Pennsylvanian Middle Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 6.98E-04
Noncancer Ingestion Intake(RME) = 2.04E-03

Cancer Ingestion Intake(CTE) = 1.02E-04
Noncancer Ingestion Intake(CTE) = 1.02E-03

Cancer Dermal Intake(RME) = 1.26E+01
Noncancer Dermal Intake(RME) = 3.66E+01

Cancer Dermal Intake(CTE) = 1.83E+00
Noncancer Dermal Intake(CTE) = 1.83E+01

TABLE 8.80 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.9E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	8.8E-08
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	2.7E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.0E-07
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	6.6E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	9.9E-06
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	5.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.0E-05**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	9.8E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.0E-09
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.4E-09
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	9.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	3.0E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-08
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-05**

TABLE 7.80 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	8.5E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.7E-02
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	7.9E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.6E-03
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	6.3E-06	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	1.6E-02
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	1.9E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	6.4E-02
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	1.5E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.9E-02
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	4.5E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.9E-01
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.0E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.0E-02
	(total)												**3.4E-01**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	2.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	5.7E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	9.1E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.0E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	2.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	4.7E-04
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	8.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.9E-04
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	6.5E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.2E-04
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.0E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.1E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	4.5E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.7E-03
	(total)												**2.4E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.7E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) -- ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.25	1.96E+00	9.64E-04	5.59E-03	1	7.84E-09
RDX	3.90E-03	o	4.42E+00	0.25	1.84E+00	3.39E-04	1.94E-03	1	2.48E-09
Antimony	3.10E-03	i		0.25		1.00E-03		1	7.75E-10
Arsenic	9.50E-03	i		0.25		1.00E-03		1	2.38E-09
Iron	7.15E+00	i		0.25		1.00E-03		1	1.79E-06
Manganese	2.19E+00	i		0.25		1.00E-03		1	5.48E-07
Vanadium	4.90E-03	i		0.25		1.00E-03		1	1.23E-09

TABLE 4.80
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Adult

C

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	Ingestion CDI (mg/kg/day) =
	IRgw	Water Ingestion Rate	L/day	1	Professional Judgement	1	Professional Judgement	Cgw x IRgw x EF x ED
	EF	Exposure Frequency	days/year	52	Professional Judgement	26	Professional Judgement	BW x AT
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	CDI = Chronic Daily Intake
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	U.S. EPA, December 1989
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cgw	Chemical Concentration in Ground Water	mg/L	Average	U.S. EPA, May 2000	Average	U.S. EPA, May 2000	The equations and parameters for
	A	Skin Surface Area	cm^2	18,000	U.S. EPA, July 2004	18,000	U.S. EPA, July 2004	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional Judgement	1	Professional Judgement	water (DAD) are provided in Section 7.3.4.
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	U.S. EPA, May 1993	26	U.S. EPA, May 1993	
	t_{event}	Duration of Event	hour/event	0.25	U.S. EPA, July 2004	0.167	U.S. EPA, July 2004	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 6.98E-04
Noncancer Ingestion Intake(RME) = 2.04E-03

Cancer Ingestion Intake(CTE) = 1.02E-04
Noncancer Ingestion Intake(CTE) = 1.02E-03

Cancer Dermal Intake(RME) = 1.26E+01
Noncancer Dermal Intake(RME) = 3.66E+01

Cancer Dermal Intake(CTE) = 1.83E+00
Noncancer Dermal Intake(CTE) = 1.83E+01

TABLE 8.80a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.3E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	4.0E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.4E-08
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	3.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	9.7E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-06
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	7.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	5.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-06**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.2E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-10
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.7E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.1E-10
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	9.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.9E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-09
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.5E-06**

TABLE 7.80a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Lower and MISS Glen Dean Zone
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	4.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	8.5E-03
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	4.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-03
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	3.2E-06	mg/kg-day	4.00E-04	mg/kg-day	NA	NA	7.9E-03
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	9.7E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.2E-02
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	7.3E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.4E-02
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	2.2E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	9.3E-02
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	5.0E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	5.0E-03
	(total)												**1.7E-01**
Dermal	2,4,6-Trinitrotoluene	4.20E-03	mg/L	4.20E-03	mg/L	M	1.2E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-04
	RDX	3.90E-03	mg/L	3.90E-03	mg/L	M	3.7E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-05
	Antimony	3.10E-03	mg/L	3.10E-03	mg/L	M	9.5E-09	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.6E-04
	Arsenic	9.50E-03	mg/L	9.50E-03	mg/L	M	2.9E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.7E-05
	Iron	7.15E+00	mg/L	7.15E+00	mg/L	M	2.2E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.3E-05
	Manganese	2.19E+00	mg/L	2.19E+00	mg/L	M	6.7E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-03
	Vanadium	4.90E-03	mg/L	4.90E-03	mg/L	M	1.5E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.8E-04
	(total)												**8.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.8E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH GROUNDWATER
CENTRAL TENDENCY EXPOSURE (CTE) -- ADULT RECREATIONAL USERS TO GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SITE NAME: **SWMU 12 (MINE FILL A)**
LOCATION: **NSWC CRANE, CRANE, INDIANA**
DATE: **10/03/08**

REFERENCE: **U.S. EPA, July 2004**

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE:
DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE:
FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	GW CONC. (mg/L)	ORGANIC OR INORGANIC?	t* (HR)	tevent (HR)	T (HR)	Kp (CM/HR)	B	FA	DAevent
2,4,6-Trinitrotoluene	4.20E-03	o	4.71E+00	0.167	1.96E+00	9.64E-04	5.59E-03	1	6.41E-09
RDX	3.90E-03	o	4.42E+00	0.167	1.84E+00	3.39E-04	1.94E-03	1	2.03E-09
Antimony	3.10E-03	i		0.167		1.00E-03		1	5.18E-10
Arsenic	9.50E-03	i		0.167		1.00E-03		1	1.59E-09
Iron	7.15E+00	i		0.167		1.00E-03		1	1.19E-06
Manganese	2.19E+00	i		0.167		1.00E-03		1	3.66E-07
Vanadium	4.90E-03	i		0.167		1.00E-03		1	8.18E-10

TABLE 3.9
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER -PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Upper Zone

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,3-Dinitrobenzene	ug/L	0.6	NA	8.9		ug/L	0.8	Average	(1)	0.8	Average	(1)
2,4,6-Trinitrotoluene	ug/L	11	NA	170		ug/L	17	Average	(1)	17	Average	(1)
2,6-Dinitrotoluene	ug/L	0.5	NA	9.8	J	ug/L	0.8	Average	(1)	0.8	Average	(1)
2-Amino-4,6-Dinitrotoluene	ug/L	6	NA	100	J	ug/L	10	Average	(1)	10	Average	(1)
2-Nitrotoluene	ug/L	0.1	NA	0.45	J	ug/L	0.1	Average	(1)	0.1	Average	(1)
4-Amino-2,6-Dinitrotoluene	ug/L	11	NA	190		ug/L	17	Average	(1)	17	Average	(1)
4-Nitrotoluene	ug/L	0.2	NA	5.8	J	ug/L	0.3	Average	(1)	0.3	Average	(1)
HMX	ug/L	57	NA	530		ug/L	88	Average	(1)	88	Average	(1)
RDX	ug/L	700	NA	7400		ug/L	1100	Average	(1)	1100	Average	(1)
Aluminum	ug/L	14300	NA	190000	J	ug/L	140000	Average	(1)	140000	Average	(1)
Arsenic	ug/L	6.1	NA	91.2	J	ug/L	24.9	Average	(1)	24.9	Average	(1)
Beryllium	ug/L	7.6	NA	97.4	J	ug/L	68.5	Average	(1)	68.5	Average	(1)
Cadmium	ug/L	5.3	NA	83.4	J	ug/L	48.5	Average	(1)	48.5	Average	(1)
Chromium	ug/L	2.6	NA	35.2	J	ug/L	13	Average	(1)	13	Average	(1)
Cobalt	ug/L	434	NA	6060	J	ug/L	3250	Average	(1)	3250	Average	(1)
Iron	ug/L	19100	NA	209000	J	ug/L	95100	Average	(1)	95100	Average	(1)
Lead	ug/L	7.1	NA	104	J	ug/L	39.2	Average	(1)	39.2	Average	(1)
Manganese	ug/L	9290	NA	138000	J	ug/L	80300	Average	(1)	80300	Average	(1)
Mercury	ug/L	0.44	NA	7.3		ug/L	0.53	Average	(1)	0.53	Average	(1)
Nickel	ug/L	1020	NA	14600	J	ug/L	8160	Average	(1)	8160	Average	(1)
Selenium	ug/L	2.5	NA	24.7	J	ug/L	9.2	Average	(1)	9.2	Average	(1)
Thallium	ug/L	0.3	NA	6	J	ug/L	1.8	Average	(1)	1.8	Average	(1)
Vanadium	ug/L	1.8	NA	22.9		ug/L	6.1	Average	(1)	6.1	Average	(1)
Zinc	ug/L	1360	NA	18000		ug/L	10700	Average	(1)	10700	Average	(1)
Nitrite/Nitrate-N	mg/L	1.2	NA	10	J	mg/L	1.8	Average	(1)	1.8	Average	(1)

1 - The EPC for groundwater is the arithmetic average of samples in the most highly contaminated area of the plume (See Section 7.3.3 of text).

Calculations of Preliminary Remediation Goals (PRGs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PRG Equation[1] 1*	PRG Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = Hom	Using Equation 1, GSDi = Het	Using Equation 2, GSDi = Hom	Using Equation 2, GSDi = Het
$PbB_{fetal,\ 0.95}$	X	X	95th percentile PbB in fetus	ug/dL	10	10	10	10
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,\ D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,\ D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,\ D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PRG	**Preliminary Remediation Goal**			**ppm**	**1,235**	**780**	**1,235**	**780**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same PRG.

***Equation 1, based on Eq. 4 in USEPA (1996).**

$$PRG = \frac{([PbB_{95}fetal/(R*(GSD_i^{1.645})])-PbB_0)*AT_{S,D}}{BKSF*(IR_{S+D}*AF_{S,D}*EF_{S,D})}$$

****Equation 2, alternate approach based on Eq. 4 and Eq. A-19 in USEPA (1996).**

$$PRG = \frac{([PbB_{fetal,0.95}/(R*(GSD_i^{1.645})])-PbB_0)*AT_{S,D}}{BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])}$$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 3.15
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Gully Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	16600	18400	25700	J	mg/kg	18500	Gamma	ProUCL (1)	18500	Gamma	ProUCL (1)
Antimony	mg/kg	0.81	1.2	4.2	J	mg/kg	1.2	Gamma	ProUCL (1)	1.2	Gamma	ProUCL (1)
Arsenic	mg/kg	16.1	20.7	36	J	mg/kg	22.6	Gamma	ProUCL (1)	22.6	Gamma	ProUCL (1)
Cadmium	mg/kg	1.2	2	7.4	J	mg/kg	5.9	99% UCL-C	ProUCL (1)	5.9	99% UCL-C	ProUCL (1)
Iron	mg/kg	70000	93100	217000	J	mg/kg	97800	Gamma	ProUCL (1)	97800	Gamma	ProUCL (1)
Manganese	mg/kg	2100	2800	6780	J	mg/kg	3070	Gamma	ProUCL (1)	3070	Gamma	ProUCL (1)
Vanadium	mg/kg	43.5	50.1	71	J	mg/kg	50.1	Student-t	ProUCL (2)	50.1	Student-t	ProUCL (2)

Definitions:
Gamma = Adjusted Gamma 95% UCL.
99 % UCL-C = 99% Chebyshev (Mean, Std) UCL (non-parametric).

Footnotes:
1 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.
2 - ProUCL indicates data are normally distributed.

16,563	18442.6842
1	1.20064452
16.1	20.6568041
1.2	1.98465738
69,958	93050.1521
2,097	2798.65265
44	50.0665791

18534.3095
1.21476355
22.5934036
5.86062691
97798.2105
3068.0972
50.0665791

TABLE 3.16
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - EAST TRIBUTARY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: East Tributary Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	12600	NA	17200	J	mg/kg	17200	Maximum	N < 10 (1)	17200	Maximum	N < 10 (1)
Arsenic	mg/kg	9.3	NA	10.9	J	mg/kg	10.9	Maximum	N < 10	10.9	Maximum	N < 10
Iron	mg/kg	51300	NA	70700	J	mg/kg	70700	Maximum	N < 10	70700	Maximum	N < 10
Manganese	mg/kg	2200	NA	2910	J	mg/kg	2910	Maximum	N < 10	2910	Maximum	N < 10
Vanadium	mg/kg	33.5	NA	36	J	mg/kg	36	Maximum	N < 10	36	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 8.114 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	3.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-06
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	4.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-06**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.1E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.114 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.9E-03
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.5E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	2.6E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	8.7E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	2.9E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.2E-03
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	9.6E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	9.6E-03
	(total)												**1.2E-01**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	9.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.0E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.114
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	0.5	Professional Judgement	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgment	13	Professional Judgment	
	ED	Exposure Duration	years	11	U.S. EPA, December 1989	11	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 3.25E-09
Noncancer Ingestion Intake - CTE = 2.07E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.102 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	8.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.8E-07**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.7E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.102 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	3.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.1E-03
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	2.0E-07	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	5.0E-04
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	9.8E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.0E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	1.6E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.4E-02
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	5.1E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.3E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	8.3E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.3E-03
	(total)												**8.8E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	7.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.5E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	6.4E-09	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	2.6E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.0E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.102
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	0.5	Professional Judgement	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgment	13	Professional Judgment	
	ED	Exposure Duration	years	11	U.S. EPA, December 1989	11	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 3.25E-09
Noncancer Ingestion Intake - CTE = 2.07E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.108 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.3E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	9.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.3E-07**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	5.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.4E-08
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.108 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	2.8E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.8E-03
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.0E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.2E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	3.9E-02
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	4.8E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.9E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	6.0E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	6.0E-03
	(total)												**6.1E-02**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.6E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.108
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	0.5	Professional Judgement	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgment	13	Professional Judgment	
	ED	Exposure Duration	years	11	U.S. EPA, December 1989	11	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 3.25E-09
Noncancer Ingestion Intake - CTE = 2.07E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.114a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	3.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	9.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	5.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	5.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.4E-07**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-08
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.114a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.4E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.4E-04
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	5.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.9E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	3.3E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.1E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	3.6E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	5.2E-04
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.2E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.2E-03
	(total)												**1.5E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	8.6E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-04
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.5E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.114a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	0.5	Professional Judgement	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgment	13	Professional Judgment	
	ED	Exposure Duration	years	11	U.S. EPA, December 1989	11	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 3.25E-09
Noncancer Ingestion Intake - CTE = 2.07E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.102a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	6.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	7.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	3.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	1.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-07**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	9.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.102a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	3.8E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.8E-04
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	2.5E-08	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	6.2E-05
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	4.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.6E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.4E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.0E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	6.8E-03
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	6.4E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	9.1E-04
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.0E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.0E-03
	(total)												**1.1E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	7.0E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.3E-04
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	6.1E-10	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	2.4E-05
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.102a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	0.5	Professional Judgement	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgment	13	Professional Judgment	
	ED	Exposure Duration	years	11	U.S. EPA, December 1989	11	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 3.25E-09
Noncancer Ingestion Intake - CTE = 2.07E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.108a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	5.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-08
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	2.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	9.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.3E-08**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	5.3E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.9E-09
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**6.1E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.108a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	3.6E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.6E-04
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.5E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.5E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.9E-03
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	6.0E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	8.6E-04
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	7.5E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	7.5E-04
	(total)												**7.6E-03**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.4E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.1E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.1E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.7E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.108a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	0.5	Professional Judgement	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgment	13	Professional Judgment	
	ED	Exposure Duration	years	11	U.S. EPA, December 1989	11	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 3.25E-09
Noncancer Ingestion Intake - CTE = 2.07E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.113 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	3.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	9.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-06
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	5.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	5.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.4E-06**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.113 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.1E-03
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.7E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.5E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.9E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.7E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.4E-03
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	5.4E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.4E-03
	(total)												**6.7E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	5.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.7E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.113
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.101 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	6.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	4.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	7.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-06
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	3.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-06**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.3E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.4E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.101 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.7E-03
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	1.1E-07	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	2.8E-04
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.1E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	5.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.1E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	9.2E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	3.1E-02
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.9E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.1E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	4.7E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.7E-03
	(total)												**5.0E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	4.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.7E-09	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.5E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.101
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.107 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	5.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.5E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	2.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	9.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.5E-07**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	7.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.6E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.107 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.6E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-03
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.0E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.4E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	6.6E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.2E-02
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.7E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.9E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	3.4E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	3.4E-03
	(total)												**3.4E-02**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.0E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.8E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**6.8E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.5E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.107
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.113a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	3.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	8.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	4.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	5.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-07**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	3.3E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.0E-09
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.0E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.113a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.7E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.7E-04
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	6.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.2E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	3.7E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.2E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.1E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	5.9E-04
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.4E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.4E-03
	(total)												**1.7E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.6E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.6E-05
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**8.6E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.113a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.101a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	5.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	6.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	3.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	9.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.0E-07**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.7E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.1E-09
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	2.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.101a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.3E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.3E-04
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	2.8E-08	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	7.0E-05
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.8E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.4E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.8E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.3E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	7.7E-03
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.2E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.0E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.2E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.2E-03
	(total)												**1.2E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.1E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-05
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.8E-10	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	7.3E-06
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**7.7E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.101a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.107a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	5.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.9E-08
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	2.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	8.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.9E-08**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.3E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-09
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.0E-09**
										Total Risk Across All Exposure Routes/Pathways	**5.1E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.107a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.0E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.0E-04
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.6E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.5E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.7E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.5E-03
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	6.8E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	9.8E-04
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	8.5E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.5E-04
	(total)												**8.6E-03**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.0E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.4E-05
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.4E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.6E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.107a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgment	12	Professional Judgment	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.117 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	9.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.3E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-06
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.3E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	4.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.4E-06**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	3.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.7E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**4.0E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.117 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.1E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.1E-02
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.8E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.5E-01	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.0E-01
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.7E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.4E-02
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	5.5E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.5E-02
	(total)												**6.7E-01**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.4E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.5E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.5E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.117
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	Professional Judgment	50	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 4.56E-07
Noncancer Dermal Intake - RME = 5.32E-06

Cancer Dermal Intake - CTE = 1.52E-08
Noncancer Dermal Intake - CTE = 5.32E-07

TABLE 8.105 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	9.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.8E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-06
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	4.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	8.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	4.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-06**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.6E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	2.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.6E-07**
										Total Risk Across All Exposure Routes/Pathways	**3.2E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.105 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.8E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.8E-02
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	1.1E-06	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	2.8E-03
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.2E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	5.6E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.1E-02
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	9.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	3.1E-01
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.9E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.2E-02
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	4.8E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.8E-02
	(total)												**5.0E-01**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.1E-08	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.3E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.3E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.105
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	Professional Judgment	50	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 4.56E-07
Noncancer Dermal Intake - RME = 5.32E-06

Cancer Dermal Intake - CTE = 1.52E-08
Noncancer Dermal Intake - CTE = 5.32E-07

TABLE 8.111 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	8.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	5.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-06**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.111 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-02
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.5E-02
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	6.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.2E-01
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.8E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.9E-02
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	3.4E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	3.4E-02
	(total)												**3.5E-01**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.8E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.5E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.111
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	Professional Judgment	50	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 4.56E-07
Noncancer Dermal Intake - RME = 5.32E-06

Cancer Dermal Intake - CTE = 1.52E-08
Noncancer Dermal Intake - CTE = 5.32E-07

TABLE 8.117a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	7.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	3.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-07**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.117a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.7E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.7E-03
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	6.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.2E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	3.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.2E-01
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.2E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.0E-03
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.4E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.4E-02
	(total)												**1.7E-01**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.5E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.117a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	Professional Judgment	50	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 4.56E-07
Noncancer Dermal Intake - RME = 5.32E-06

Cancer Dermal Intake - CTE = 1.52E-08
Noncancer Dermal Intake - CTE = 5.32E-07

TABLE 8.105a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	8.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.3E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	4.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	6.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	3.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-07**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	9.0E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs		GI Abs
		1
		0.15
0.03		1
0.001		0.05
		1
		0.04
		0.026

TABLE 7.105a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.4E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.4E-03
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	2.8E-07	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	7.1E-04
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.8E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.4E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.8E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	7.7E-02
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.3E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.0E-02
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.2E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.2E-02
	(total)												**1.3E-01**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.6E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.1E-09	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.3E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.3E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.105a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	Professional Judgment	50	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 4.56E-07
Noncancer Dermal Intake - RME = 5.32E-06

Cancer Dermal Intake - CTE = 1.52E-08
Noncancer Dermal Intake - CTE = 5.32E-07

TABLE 8.111a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	7.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	4.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-07**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	5.0E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.5E-09
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.111a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.1E-03
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.6E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.6E-02
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	6.9E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	9.9E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	8.5E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.5E-03
	(total)												**8.7E-02**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.8E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.8E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.111a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	Professional Judgment	50	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 4.56E-07
Noncancer Dermal Intake - RME = 5.32E-06

Cancer Dermal Intake - CTE = 1.52E-08
Noncancer Dermal Intake - CTE = 5.32E-07

TABLE 8.115 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	9.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.3E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-06
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.3E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	4.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.4E-06**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**4.1E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs		GI Abs
		1
0.03		1
		1
		0.04
		0.026

TABLE 7.115 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.1E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.1E-02
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.8E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.5E-01	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.0E-01
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.7E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.4E-02
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	5.5E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.5E-02
	(total)												**6.7E-01**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.7E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.115
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.103 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	9.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.8E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-06
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	4.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	8.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	4.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-06**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.5E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**3.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.103 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.8E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.8E-02
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	1.1E-06	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	2.8E-03
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.2E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	5.6E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.1E-02
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	9.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	3.1E-01
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.9E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.2E-02
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	4.8E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.8E-02
	(total)												**5.0E-01**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	4.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.7E-08	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.5E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.6E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.103
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.109 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	8.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	5.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-06**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.6E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.6E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.109 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-02
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.5E-02
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	6.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.2E-01
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.8E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.9E-02
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	3.4E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	3.4E-02
	(total)												**3.5E-01**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.8E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**6.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.6E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.109
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.115a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	7.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	3.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-07**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-08
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.115a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.7E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.7E-03
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	6.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.2E-02
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	3.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.2E-01
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.2E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.0E-03
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.4E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.4E-02
	(total)												**1.7E-01**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	5.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.7E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.115a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.103a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	8.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.3E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	4.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	6.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	3.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-07**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.8E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.103a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.4E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.4E-03
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	2.8E-07	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	7.1E-04
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.8E-02
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.4E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.8E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	7.7E-02
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.3E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.0E-02
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.2E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.2E-02
	(total)												**1.3E-01**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	4.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.7E-09	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.5E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.3E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.103a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.109a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	7.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	4.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-07**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	5.9E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-09
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.8E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.109a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.1E-03
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.6E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.6E-02
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	6.9E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	9.9E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	8.5E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.5E-03
	(total)												**8.7E-02**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.0E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.8E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**6.8E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.109a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.118 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	4.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	9.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-06
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	5.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	6.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-06**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.8E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.118 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-03
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.4E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.6E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.3E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.8E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.6E-03
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	5.9E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.9E-03
	(total)												**7.2E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	6.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.3E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.5E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.118
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	50	Professional Judgment	25	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations
Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 2.78E-07
Noncancer Dermal Intake - RME = 8.12E-07

Cancer Dermal Intake - CTE = 5.80E-09
Noncancer Dermal Intake - CTE = 5.80E-08

TABLE 8.106 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	6.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	7.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-06
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	2.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	3.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-06**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	1.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.5E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.106 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.9E-03
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	1.2E-07	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	3.1E-04
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.7E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	6.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	3.3E-02
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	3.1E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.5E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	5.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.1E-03
	(total)												**5.4E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.8E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	4.8E-09	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.9E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.6E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.106
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	50	Professional Judgment	25	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 2.78E-07
Noncancer Dermal Intake - RME = 8.12E-07

Cancer Dermal Intake - CTE = 5.80E-09
Noncancer Dermal Intake - CTE = 5.80E-08

TABLE 8.112 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	6.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.7E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	2.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.7E-07**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	9.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.4E-07**
										Total Risk Across All Exposure Routes/Pathways	**7.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.112 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.8E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.8E-03
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.7E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	7.2E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.4E-02
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	3.0E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.2E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	3.7E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	3.7E-03
	(total)												**3.7E-02**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.9E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**8.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	50	Professional Judgment	25	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 2.78E-07
Noncancer Dermal Intake - RME = 8.12E-07

Cancer Dermal Intake - CTE = 5.80E-09
Noncancer Dermal Intake - CTE = 5.80E-08

TABLE 8.118a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	4.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-07**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.8E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.3E-09
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.118a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.9E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.9E-04
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.4E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	4.0E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.3E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.4E-04
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.5E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.5E-03
	(total)												**1.8E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.8E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.6E-04
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.118a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	50	Professional Judgment	25	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 2.78E-07
Noncancer Dermal Intake - RME = 8.12E-07

Cancer Dermal Intake - CTE = 5.80E-09
Noncancer Dermal Intake - CTE = 5.80E-08

TABLE 8.106a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.6E-08
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.6E-08**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.9E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.9E-09
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.2E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs		GI Abs
		1
		0.15
0.03		1
0.001		0.05
		1
		0.04
		0.026

TABLE 7.106a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.7E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.7E-04
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.1E-08	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	7.6E-05
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.9E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.0E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.5E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	8.3E-03
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.8E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.1E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.3E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.3E-03
	(total)												**1.3E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.9E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-04
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	3.4E-10	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	1.4E-05
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.4E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.106a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	50	Professional Judgment	25	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 2.78E-07
Noncancer Dermal Intake - RME = 8.12E-07

Cancer Dermal Intake - CTE = 5.80E-09
Noncancer Dermal Intake - CTE = 5.80E-08

TABLE 8.112a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.2E-08
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.2E-08**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.9E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-09
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.4E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs		GI Abs
		1
0.03		1
		1
		0.04
		0.026

TABLE 7.112a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.4E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.4E-04
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.2E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.8E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	6.0E-03
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	7.4E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.1E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	9.2E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	9.2E-04
	(total)												**9.3E-03**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.9E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.3E-05
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**6.3E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.4E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.112a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	50	Professional Judgment	25	Professional Judgment	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 2.78E-07
Noncancer Dermal Intake - RME = 8.12E-07

Cancer Dermal Intake - CTE = 5.80E-09
Noncancer Dermal Intake - CTE = 5.80E-08

TABLE 8.116 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	4.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	9.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-06
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	5.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	6.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-06**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	3.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.5E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.116 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-03
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.4E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	1.6E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.3E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.8E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.6E-03
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	5.9E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.9E-03
	(total)												**7.2E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.6E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.6E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.116
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.104 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	6.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	7.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-06
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	2.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	3.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-06**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	2.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.104 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.9E-03
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	1.2E-07	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	3.1E-04
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.7E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	6.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	3.3E-02
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	3.1E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.5E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	5.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.1E-03
	(total)												**5.4E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	8.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	7.6E-09	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	3.0E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.7E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.104
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.110 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	6.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.8E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.7E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	2.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.7E-07**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**7.9E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.110 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	1.8E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.8E-03
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.7E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	7.2E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.4E-02
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	3.0E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	4.2E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	3.7E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	3.7E-03
	(total)												**3.7E-02**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	4.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-03
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.4E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.9E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.110
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.116a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	4.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-07**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.7E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.116a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.9E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.9E-04
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.4E-03
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M	4.0E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.3E-02
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.4E-04
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M	1.5E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.5E-03
	(total)												**1.8E-02**
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	2.78E+01	mg/kg	2.78E+01	mg/kg	M	7.7E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.6E-04
	Iron	1.57E+05	mg/kg	1.57E+05	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.78E+01	mg/kg	5.78E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1

TABLE 4.116a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.104a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.6E-08
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.6E-08**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	6.3E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.4E-09
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	5.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.4E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.6E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 7.104a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.7E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.7E-04
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M	3.1E-08	mg/kg-day	4.0E-04	mg/kg-day	NA	NA	7.6E-05
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	5.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.9E-03
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	1.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.0E-04
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M	2.5E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	8.3E-03
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M	7.8E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.1E-03
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M	1.3E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.3E-03
	(total)												**1.3E-02**
Dermal	Aluminum	1.85E+04	mg/kg	1.85E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Antimony	1.20E+00	mg/kg	1.20E+00	mg/kg	M		mg/kg-day	6.0E-05	mg/kg-day	NA	NA	
	Arsenic	2.26E+01	mg/kg	2.26E+01	mg/kg	M	6.3E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.1E-04
	Cadmium	5.90E+00	mg/kg	5.90E+00	mg/kg	M	5.4E-10	mg/kg-day	2.5E-05	mg/kg-day	NA	NA	2.2E-05
	Iron	9.78E+04	mg/kg	9.78E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	3.07E+03	mg/kg	3.07E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	5.01E+01	mg/kg	5.01E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.3E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Cadmium - 0.001

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
	0.15
0.03	1
0.001	0.05
	1
	0.04
	0.026

TABLE 4.104a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 Gully Sediment
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Sediment	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csed x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csed x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.110a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.2E-08
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.2E-08**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.0E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-09
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.6E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.110a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SEDIMENT - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M	4.4E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.4E-04
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	2.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.2E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M	1.8E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	6.0E-03
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M	7.4E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.1E-03
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M	9.2E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	9.2E-04
	(total)												**9.3E-03**
Dermal	Aluminum	1.72E+04	mg/kg	1.72E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.09E+01	mg/kg	1.09E+01	mg/kg	M	3.0E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-04
	Iron	7.07E+04	mg/kg	7.07E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	2.91E+03	mg/kg	2.91E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	3.60E+01	mg/kg	3.60E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.0E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.4E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03
Cadmium - 0.001
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 3.17
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - TURKEY CREEK SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Turkey Creek Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	7427	NA	11400	J	mg/kg	11400	Maximum	N < 10 (1)	11400	Maximum	N < 10 (1)
Arsenic	mg/kg	12.4	NA	27.8	J	mg/kg	27.8	Maximum	N < 10	27.8	Maximum	N < 10
Iron	mg/kg	62267	NA	157000	J	mg/kg	157000	Maximum	N < 10	157000	Maximum	N < 10
Manganese	mg/kg	923	NA	1760	J	mg/kg	1760	Maximum	N < 10	1760	Maximum	N < 10
Vanadium	mg/kg	28.8	NA	57.8	J	mg/kg	57.8	Maximum	N < 10	57.8	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 4.22
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

1. Table4

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	7.E-08		6.E-09	7.E-08	2,4,6-Trinitrotoluene	Liver	5.E-02		5.E-03	6.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		3.E-05	2.E-03
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-03		5.E-05	2.E-03
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	5.E-04		9.E-06	5.E-04
			RDX	4.E-07		2.E-08	4.E-07	RDX	Prostate	1.E-02		5.E-04	1.E-02
			Aluminum					Aluminum	CNS	2.E-01			2.E-01
			Arsenic	1.E-05		1.E-06	2.E-05	Arsenic	Skin, CVS	4.E-01		3.E-02	4.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				2.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					7.E-01

Building 152 - Soil			Total
1.5E-05		1.3E-06	1.63E-05
6.2E-01		3.7E-02	

Target Organ Analysis - Building 152

Total Liver HI =	6.E-02	Total CNS HI =	2.E-01
Total CVS HI =	4.E-01	Total Blood HI =	5.E-04
Total Skin HI =	4.E-01	Total Prostate HI =	1.E-02
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	7.E-08		6.E-09	7.E-08	2,4,6-Trinitrotoluene	Liver	5.E-02		5.E-03	6.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-03		6.E-05	4.E-03
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-03		1.E-04	4.E-03
			2-Nitrotoluene	7.E-09		2.E-09	1.E-08	2-Nitrotoluene	Spleen	5.E-04		1.E-04	7.E-04
			HMX					HMX	Liver, Blood	2.E-03		3.E-05	2.E-03
			RDX	3.E-06		1.E-07	3.E-06	RDX	Prostate	1.E-01		4.E-03	1.E-01
			Aluminum					Aluminum	CNS	2.E-01			2.E-01
			Arsenic	2.E-05		2.E-06	2.E-05	Arsenic	Skin, CVS	5.E-01		4.E-02	5.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				2.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					9.E-01

Building 153/154 - Soil			Total
2.2E-05		1.7E-06	2.37E-05
8.3E-01		5.1E-02	

Target Organ Analysis - Building 153/154

Total Liver HI =	7.E-02	Total CNS HI =	2.E-01
Total CVS HI =	5.E-01	Total Blood HI =	2.E-03
Total Skin HI =	5.E-01	Total Prostate HI =	1.E-01
Total Spleen HI =	7.E-04		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	1.E-07		1.E-08	1.E-07	2,4,6-Trinitrotoluene	Liver	1.E-01		9.E-03	1.E-01
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		3.E-05	2.E-03
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-03		5.E-05	2.E-03
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	5.E-04		9.E-06	5.E-04
			RDX	4.E-07		2.E-08	4.E-07	RDX	Prostate	1.E-02		5.E-04	1.E-02
			Aluminum					Aluminum	CNS	2.E-01			2.E-01
			Arsenic	1.E-05		1.E-06	2.E-05	Arsenic	Skin, CVS	4.E-01		3.E-02	4.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				2.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					8.E-01

Building 157 - Soil			Total
1.5E-05		1.3E-06	1.64E-05
7.1E-01		4.2E-02	

Target Organ Analysis - Building 157

Total Liver HI =	1.E-01	Total CNS HI =	2.E-01
Total CVS HI =	4.E-01	Total Blood HI =	5.E-04
Total Skin HI =	4.E-01	Total Prostate HI =	1.E-02
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	1.E-07		9.E-09	1.E-07	2,4,6-Trinitrotoluene	Liver	8.E-02		7.E-03	8.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		3.E-05	2.E-03
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-03		5.E-05	2.E-03
			2-Nitrotoluene	4.E-09		1.E-09	5.E-09	2-Nitrotoluene	Spleen	3.E-04		7.E-05	3.E-04
			HMX					HMX	Liver, Blood	1.E-03		2.E-05	1.E-03
			RDX	2.E-06		8.E-08	2.E-06	RDX	Prostate	6.E-02		3.E-03	7.E-02
			Aluminum					Aluminum	CNS	2.E-01			2.E-01
			Arsenic	3.E-05		2.E-06	3.E-05	Arsenic	Skin, CVS	7.E-01		6.E-02	7.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				3.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					1.E+00

Building 158/159 - Soil			Total
2.9E-05		2.3E-06	3.09E-05
1.0E+00		6.8E-02	

Target Organ Analysis - Building 158/159

Total Liver HI =	9.E-02	Total CNS HI =	2.E-01
Total CVS HI =	7.E-01	Total Blood HI =	1.E-03
Total Skin HI =	7.E-01	Total Prostate HI =	7.E-02
Total Spleen HI =	3.E-04		

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient							
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-08		4.E-09	3.E-08	2,4,6-Trinitrotoluene	Liver	5.E-03		7.E-04	6.E-03			
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-04		5.E-06	2.E-04			
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		7.E-06	2.E-04			
		Building 152	2-Nitrotoluene					2-Nitrotoluene	Spleen							
		Historical Data	HMX					HMX	Liver, Blood	5.E-05		1.E-06	6.E-05			
			RDX	2.E-07		9.E-09	2.E-07	RDX	Prostate	1.E-03		8.E-05	1.E-03	**Building 152 - Soil**		**Total**
			Aluminum					Aluminum	CNS	2.E-02			2.E-02	**6.5E-06**	**7.6E-07**	**7.22E-06**
			Arsenic	6.E-06		8.E-07	7.E-06	Arsenic	Skin, CVS	4.E-02		5.E-03	5.E-02	**6.6E-02**	**5.7E-03**	
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				7.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					7.E-02			

Target Organ Analysis - Building 152

Total Liver HI =	7.E-03	Total CNS HI =	2.E-02
Total CVS HI =	5.E-02	Total Blood HI =	6.E-05
Total Skin HI =	5.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-08		4.E-09	3.E-08	2,4,6-Trinitrotoluene	Liver	5.E-03		7.E-04	6.E-03			
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-04		1.E-05	4.E-04			
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-04		1.E-05	4.E-04			
		Building 153/154	2-Nitrotoluene	3.E-09		1.E-09	4.E-09	2-Nitrotoluene	Spleen	5.E-05		2.E-05	8.E-05			
		Historical Data	HMX					HMX	Liver, Blood	2.E-04		4.E-06	2.E-04			
			RDX	1.E-06		8.E-08	1.E-06	RDX	Prostate	1.E-02		7.E-04	1.E-02	**Building 153/154 - Soil**		**Total**
			Aluminum					Aluminum	CNS	2.E-02			2.E-02	**9.4E-06**	**1.1E-06**	**1.05E-05**
			Arsenic	8.E-06		1.E-06	9.E-06	Arsenic	Skin, CVS	5.E-02		6.E-03	6.E-02	**8.9E-02**	**7.7E-03**	
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				1.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					1.E-01			

Target Organ Analysis - Building 153/154

Total Liver HI =	7.E-03	Total CNS HI =	2.E-02
Total CVS HI =	6.E-02	Total Blood HI =	2.E-04
Total Skin HI =	6.E-02	Total Prostate HI =	1.E-02
Total Spleen HI =	8.E-05		

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	6.E-08		7.E-09	6.E-08	2,4,6-Trinitrotoluene	Liver	1.E-02		1.E-03	1.E-02			
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-04		5.E-06	2.E-04			
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		7.E-06	2.E-04			
		Building 157	2-Nitrotoluene					2-Nitrotoluene	Spleen							
		Historical Data	HMX					HMX	Liver, Blood	5.E-05		1.E-06	6.E-05			
			RDX	2.E-07		9.E-09	2.E-07	RDX	Prostate	1.E-03		8.E-05	1.E-03	**Building 157 - Soil**		**Total**
			Aluminum					Aluminum	CNS	2.E-02			2.E-02	**6.5E-06**	**7.7E-07**	**7.25E-06**
			Arsenic	6.E-06		8.E-07	7.E-06	Arsenic	Skin, CVS	4.E-02		5.E-03	5.E-02	**7.6E-02**	**6.4E-03**	
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				7.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					8.E-02			

Target Organ Analysis - Building 157

Total Liver HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	5.E-02	Total Blood HI =	6.E-05
Total Skin HI =	5.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	4.E-08		5.E-09	5.E-08	2,4,6-Trinitrotoluene	Liver	8.E-03		1.E-03	9.E-03			
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-04		5.E-06	2.E-04			
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		7.E-06	2.E-04			
		Building 158/159	2-Nitrotoluene	2.E-09		6.E-10	2.E-09	2-Nitrotoluene	Spleen	3.E-05		1.E-05	4.E-05			
		Historical Data	HMX					HMX	Liver, Blood	1.E-04		3.E-06	1.E-04			
			RDX	8.E-07		5.E-08	8.E-07	RDX	Prostate	7.E-03		4.E-04	7.E-03	**Building 158/159 - Soil**		**Total**
			Aluminum					Aluminum	CNS	2.E-02			2.E-02	**1.2E-05**	**1.4E-06**	**1.37E-05**
			Arsenic	1.E-05		1.E-06	1.E-05	Arsenic	Skin, CVS	7.E-02		9.E-03	8.E-02	**1.1E-01**	**1.0E-02**	
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				1.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					1.E-01			

Target Organ Analysis - Building 158/159

Total Liver HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	8.E-02	Total Blood HI =	1.E-04
Total Skin HI =	8.E-02	Total Prostate HI =	7.E-03
Total Spleen HI =	4.E-05		

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	7.E-09		2.E-09	9.E-09	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene					2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	4.E-08		5.E-09	4.E-08	RDX	Prostate					Building 152 - Soil			Total
			Aluminum					Aluminum	CNS					1.6E-06		4.0E-07	2.00E-06
			Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data									
Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	7.E-09		2.E-09	9.E-09	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene	8.E-10		7.E-10	1.E-09	2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	3.E-07		4.E-08	4.E-07	RDX	Prostate					Building 153/154 - Soil			Total
			Aluminum					Aluminum	CNS					2.3E-06		5.5E-07	2.88E-06
			Arsenic	2.E-06		5.E-07	3.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				3.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data									
Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	1.E-08		4.E-09	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene					2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	4.E-08		5.E-09	4.E-08	RDX	Prostate					Building 157 - Soil			Total
			Aluminum					Aluminum	CNS					1.6E-06		4.0E-07	2.01E-06
			Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data									
Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	1.E-08		3.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene	4.E-10		3.E-10	7.E-10	2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	2.E-07		2.E-08	2.E-07	RDX	Prostate					Building 158/159 - Soil			Total
			Aluminum					Aluminum	CNS					3.0E-06		7.4E-07	3.77E-06
			Arsenic	3.E-06		7.E-07	4.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				4.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data									

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	5.E-09		1.E-09	6.E-09	2,4,6-Trinitrotoluene	Liver	4.E-03		8.E-04	5.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		6.E-06	1.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		8.E-06	2.E-04
		Building 152	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	4.E-05		2.E-06	4.E-05
			RDX	3.E-08		3.E-09	3.E-08	RDX	Prostate	9.E-04		9.E-05	1.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	3.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					5.E-02

Building 152 - Soil		2.2E-07	Total	1.34E-06
1.1E-06				
4.6E-02		6.5E-03		

Target Organ Analysis - Building 152

Total Liver HI =	5.E-03	Total CNS HI =	1.E-02
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	5.E-09		1.E-09	6.E-09	2,4,6-Trinitrotoluene	Liver	4.E-03		8.E-04	5.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		1.E-05	3.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-04		2.E-05	3.E-04
		Building 153/154	2-Nitrotoluene	6.E-10		4.E-10	9.E-10	2-Nitrotoluene	Spleen	4.E-05		3.E-05	6.E-05
		Historical Data	HMX					HMX	Liver, Blood	1.E-04		5.E-06	1.E-04
			RDX	2.E-07		2.E-08	2.E-07	RDX	Prostate	8.E-03		8.E-04	9.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	4.E-02		7.E-03	4.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					7.E-02

Building 153/154 - Soil		3.0E-07	Total	1.94E-06
1.6E-06				
6.2E-02		8.9E-03		

Target Organ Analysis - Building 153/154

Total Liver HI =	5.E-03	Total CNS HI =	1.E-02
Total CVS HI =	4.E-02	Total Blood HI =	1.E-04
Total Skin HI =	4.E-02	Total Prostate HI =	9.E-03
Total Spleen HI =	6.E-05		

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	1.E-08		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	8.E-03		2.E-03	9.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		6.E-06	1.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		8.E-06	2.E-04
		Building 157	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	4.E-05		2.E-06	4.E-05
			RDX	3.E-08		3.E-09	3.E-08	RDX	Prostate	9.E-04		9.E-05	1.E-03
			Aluminum					Aluminum	CNS	2.E-02			2.E-02
			Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	3.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					6.E-02

Building 157 - Soil		2.2E-07	Total	1.34E-06
1.1E-06				
5.3E-02		7.3E-03		

Target Organ Analysis - Building 157

Total Liver HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	7.E-09		2.E-09	9.E-09	2,4,6-Trinitrotoluene	Liver	6.E-03		1.E-03	7.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		6.E-06	1.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		8.E-06	2.E-04
		Building 158/159	2-Nitrotoluene	3.E-10		2.E-10	5.E-10	2-Nitrotoluene	Spleen	2.E-05		1.E-05	3.E-05
		Historical Data	HMX					HMX	Liver, Blood	8.E-05		3.E-06	8.E-05
			RDX	1.E-07		1.E-08	1.E-07	RDX	Prostate	5.E-03		5.E-04	5.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS	5.E-02		1.E-02	6.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				3.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					9.E-02

Building 158/159 - Soil		4.1E-07	Total	2.53E-06
2.1E-06				
7.6E-02		1.2E-02		

Target Organ Analysis - Building 158/159

Total Liver HI =	7.E-03	Total CNS HI =	1.E-02
Total CVS HI =	6.E-02	Total Blood HI =	8.E-05
Total Skin HI =	6.E-02	Total Prostate HI =	5.E-03
Total Spleen HI =	3.E-05		

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	2.E-09		9.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	4.E-04		2.E-04	6.E-04
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-05		1.E-06	2.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-05		2.E-06	2.E-05
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	4.E-06		3.E-07	4.E-06
			RDX	1.E-08		2.E-09	1.E-08	RDX	Prostate	1.E-04		2.E-05	1.E-04
			Aluminum					Aluminum	CNS	1.E-03			1.E-03
			Arsenic	5.E-07		2.E-07	6.E-07	Arsenic	Skin, CVS	3.E-03		1.E-03	4.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				7.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					6.E-03

Building 152 - Soil			Total
4.8E-07		1.8E-07	6.60E-07
4.9E-03		1.3E-03	

Target Organ Analysis - Building 152

Total Liver HI =	6.E-04	Total CNS HI =	1.E-03
Total CVS HI =	4.E-03	Total Blood HI =	4.E-06
Total Skin HI =	4.E-03	Total Prostate HI =	1.E-04
Total Spleen HI =			

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	2.E-09		9.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	4.E-04		2.E-04	6.E-04
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-05		2.E-06	3.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-05		3.E-06	3.E-05
			2-Nitrotoluene	2.E-10		3.E-10	5.E-10	2-Nitrotoluene	Spleen	4.E-06		5.E-06	9.E-06
			HMX					HMX	Liver, Blood	1.E-05		9.E-07	1.E-05
			RDX	1.E-07		2.E-08	1.E-07	RDX	Prostate	8.E-04		2.E-04	1.E-03
			Aluminum					Aluminum	CNS	1.E-03			1.E-03
			Arsenic	6.E-07		2.E-07	8.E-07	Arsenic	Skin, CVS	4.E-03		1.E-03	5.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				9.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					8.E-03

Building 153/154 - Soil			Total
7.0E-07		2.5E-07	9.49E-07
6.6E-03		1.8E-03	

Target Organ Analysis - Building 153/154

Total Liver HI =	7.E-04	Total CNS HI =	1.E-03
Total CVS HI =	5.E-03	Total Blood HI =	1.E-05
Total Skin HI =	5.E-03	Total Prostate HI =	1.E-03
Total Spleen HI =	9.E-06		

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	4.E-09		2.E-09	6.E-09	2,4,6-Trinitrotoluene	Liver	8.E-04		3.E-04	1.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-05		1.E-06	2.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-05		2.E-06	2.E-05
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	4.E-06		3.E-07	4.E-06
			RDX	1.E-08		2.E-09	1.E-08	RDX	Prostate	1.E-04		2.E-05	1.E-04
			Aluminum					Aluminum	CNS	2.E-03			2.E-03
			Arsenic	5.E-07		2.E-07	6.E-07	Arsenic	Skin, CVS	3.E-03		1.E-03	4.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				7.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					7.E-03

Building 157 - Soil			Total
4.8E-07		1.8E-07	6.63E-07
5.7E-03		1.5E-03	

Target Organ Analysis - Building 157

Total Liver HI =	1.E-03	Total CNS HI =	2.E-03
Total CVS HI =	4.E-03	Total Blood HI =	4.E-06
Total Skin HI =	4.E-03	Total Prostate HI =	1.E-04
Total Spleen HI =			

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	3.E-09		1.E-09	4.E-09	2,4,6-Trinitrotoluene	Liver	6.E-04		2.E-04	9.E-04
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-05		1.E-06	2.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-05		2.E-06	2.E-05
			2-Nitrotoluene	1.E-10		2.E-10	3.E-10	2-Nitrotoluene	Spleen	2.E-06		3.E-06	5.E-06
			HMX					HMX	Liver, Blood	8.E-06		6.E-07	9.E-06
			RDX	6.E-08		1.E-08	7.E-08	RDX	Prostate	5.E-04		1.E-04	6.E-04
			Aluminum					Aluminum	CNS	2.E-03			2.E-03
			Arsenic	8.E-07		3.E-07	1.E-06	Arsenic	Skin, CVS	5.E-03		2.E-03	8.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					1.E-02

Building 158/159 - Soil			Total
9.1E-07		3.4E-07	1.24E-06
8.2E-03		2.4E-03	

Target Organ Analysis - Building 158/159

Total Liver HI =	9.E-04	Total CNS HI =	2.E-03
Total CVS HI =	8.E-03	Total Blood HI =	9.E-06
Total Skin HI =	8.E-03	Total Prostate HI =	6.E-04
Total Spleen HI =	5.E-06		

TABLE 9.4. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ASOLESCENT TRESPASSERS
SWMU 13 (MINE FILL B)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-09		3.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	7.E-04		1.E-04	8.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-05		1.E-06	3.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-05		1.E-06	3.E-05
		Building 152	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	7.E-06		3.E-07	7.E-06
			RDX	9.E-09		8.E-10	9.E-09	RDX	Prostate	2.E-04		2.E-05	2.E-04
			Aluminum					Aluminum	CNS	2.E-03			2.E-03
			Arsenic	3.E-07		7.E-08	4.E-07	Arsenic	Skin, CVS	5.E-03		1.E-03	6.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				4.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					9.E-03

Building 152 - Soil			**Total**
3.6E-07		**7.0E-08**	**4.27E-07**
8.0E-03		**1.1E-03**	

Target Organ Analysis - Building 152

Total Liver HI =	9.E-04	Total CNS HI =	2.E-03
Total CVS HI =	6.E-03	Total Blood HI =	7.E-06
Total Skin HI =	6.E-03	Total Prostate HI =	2.E-04
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-09		3.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	7.E-04		1.E-04	8.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	5.E-05		2.E-06	5.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	5.E-05		3.E-06	5.E-05
		Building 153/154	2-Nitrotoluene	2.E-10		1.E-10	3.E-10	2-Nitrotoluene	Spleen	7.E-06		4.E-06	1.E-05
		Historical Data	HMX					HMX	Liver, Blood	2.E-05		8.E-07	2.E-05
			RDX	7.E-08		7.E-09	8.E-08	RDX	Prostate	1.E-03		1.E-04	2.E-03
			Aluminum					Aluminum	CNS	2.E-03			2.E-03
			Arsenic	4.E-07		9.E-08	5.E-07	Arsenic	Skin, CVS	6.E-03		1.E-03	8.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				6.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					1.E-02

Building 153/154 - Soil			**Total**
5.2E-07		**9.6E-08**	**6.18E-07**
1.1E-02		**1.5E-03**	

Target Organ Analysis - Building 153/154

Total Liver HI =	9.E-04	Total CNS HI =	2.E-03
Total CVS HI =	8.E-03	Total Blood HI =	2.E-05
Total Skin HI =	8.E-03	Total Prostate HI =	2.E-03
Total Spleen HI =	1.E-05		

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-09		7.E-10	4.E-09	2,4,6-Trinitrotoluene	Liver	1.E-03		3.E-04	2.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-05		1.E-06	3.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-05		1.E-06	3.E-05
		Building 157	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	7.E-06		3.E-07	7.E-06
			RDX	9.E-09		8.E-10	9.E-09	RDX	Prostate	2.E-04		2.E-05	2.E-04
			Aluminum					Aluminum	CNS	3.E-03			3.E-03
			Arsenic	3.E-07		7.E-08	4.E-07	Arsenic	Skin, CVS	5.E-03		1.E-03	6.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				4.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					1.E-02

Building 157 - Soil			**Total**
3.6E-07		**7.0E-08**	**4.29E-07**
9.2E-03		**1.3E-03**	

Target Organ Analysis - Building 157

Total Liver HI =	2.E-03	Total CNS HI =	3.E-03
Total CVS HI =	6.E-03	Total Blood HI =	7.E-06
Total Skin HI =	6.E-03	Total Prostate HI =	2.E-04
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-09		5.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	1.E-03		2.E-04	1.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-05		1.E-06	3.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-05		1.E-06	3.E-05
		Building 158/159	2-Nitrotoluene	9.E-11		6.E-11	1.E-10	2-Nitrotoluene	Spleen	3.E-06		2.E-06	5.E-06
		Historical Data	HMX					HMX	Liver, Blood	1.E-05		5.E-07	1.E-05
			RDX	4.E-08		4.E-09	5.E-08	RDX	Prostate	8.E-04		8.E-05	9.E-04
			Aluminum					Aluminum	CNS	2.E-03			2.E-03
			Arsenic	6.E-07		1.E-07	8.E-07	Arsenic	Skin, CVS	9.E-03		2.E-03	1.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				8.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					2.E-02

Building 158/159 - Soil			**Total**
6.8E-07		**1.3E-07**	**8.07E-07**
1.3E-02		**2.1E-03**	

Target Organ Analysis - Building 158/159

Total Liver HI =	1.E-03	Total CNS HI =	2.E-03
Total CVS HI =	1.E-02	Total Blood HI =	1.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	9.E-04
Total Spleen HI =	5.E-06		

TABLE 9.3. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-08		4.E-09	3.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		8.E-04	5.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		6.E-06	2.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		9.E-06	2.E-04
		Building 152	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	4.E-05		2.E-06	4.E-05
			RDX	1.E-07		1.E-08	1.E-07	RDX	Prostate	1.E-03		1.E-04	1.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	5.E-06		9.E-07	6.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	3.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				6.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					5.E-02

Building 152 - Soil			Total
4.8E-06		9.4E-07	5.74E-06
4.7E-02		6.7E-03	

Target Organ Analysis - Building 152

Total Liver HI =	5.E-03	Total CNS HI =	1.E-02
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-08		4.E-09	3.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		8.E-04	5.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		1.E-05	3.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-04		2.E-05	3.E-04
		Building 153/154	2-Nitrotoluene	2.E-09		2.E-09	4.E-09	2-Nitrotoluene	Spleen	4.E-05		3.E-05	6.E-05
		Historical Data	HMX					HMX	Liver, Blood	1.E-04		5.E-06	1.E-04
			RDX	1.E-06		1.E-07	1.E-06	RDX	Prostate	8.E-03		8.E-04	9.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	6.E-06		1.E-06	7.E-06	Arsenic	Skin, CVS	4.E-02		7.E-03	4.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				8.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					7.E-02

Building 153/154 - Soil			Total
7.0E-06		1.3E-06	8.31E-06
6.4E-02		9.1E-03	

Target Organ Analysis - Building 153/154

Total Liver HI =	5.E-03	Total CNS HI =	1.E-02
Total CVS HI =	4.E-02	Total Blood HI =	1.E-04
Total Skin HI =	4.E-02	Total Prostate HI =	9.E-03
Total Spleen HI =	6.E-05		

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	4.E-08		9.E-09	5.E-08	2,4,6-Trinitrotoluene	Liver	8.E-03		2.E-03	9.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		6.E-06	2.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		9.E-06	2.E-04
		Building 157	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	4.E-05		2.E-06	4.E-05
			RDX	1.E-07		1.E-08	1.E-07	RDX	Prostate	1.E-03		1.E-04	1.E-03
			Aluminum					Aluminum	CNS	2.E-02			2.E-02
			Arsenic	5.E-06		9.E-07	6.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	3.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				6.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					6.E-02

Building 157 - Soil			Total
4.8E-06		9.4E-07	5.77E-06
5.4E-02		7.5E-03	

Target Organ Analysis - Building 157

Total Liver HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-08		7.E-09	4.E-08	2,4,6-Trinitrotoluene	Liver	6.E-03		1.E-03	7.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		6.E-06	2.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		9.E-06	2.E-04
		Building 158/159	2-Nitrotoluene	1.E-09		8.E-10	2.E-09	2-Nitrotoluene	Spleen	2.E-05		1.E-05	3.E-05
		Historical Data	HMX					HMX	Liver, Blood	8.E-05		3.E-06	8.E-05
			RDX	6.E-07		6.E-08	6.E-07	RDX	Prostate	5.E-03		5.E-04	5.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	8.E-06		2.E-06	1.E-05	Arsenic	Skin, CVS	5.E-02		1.E-02	6.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				1.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					9.E-02

Building 158/159 - Soil			Total
9.1E-06		1.7E-06	1.08E-05
7.9E-02		1.2E-02	

Target Organ Analysis - Building 158/159

Total Liver HI =	8.E-03	Total CNS HI =	1.E-02
Total CVS HI =	6.E-02	Total Blood HI =	8.E-05
Total Skin HI =	6.E-02	Total Prostate HI =	5.E-03
Total Spleen HI =	3.E-05		

TABLE 9.2. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	2.E-09		4.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	4.E-04		8.E-05	5.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-05		6.E-07	1.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-05		8.E-07	1.E-05				
			2-Nitrotoluene					2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood	4.E-06		1.E-07	4.E-06				
			RDX	1.E-08		1.E-09	1.E-08	RDX	Prostate	9.E-05		9.E-06	1.E-04	**Building 152 - Soil**			**Total**
			Aluminum					Aluminum	CNS	1.E-03		0.E+00	1.E-03	**4.6E-07**		**9.0E-08**	**5.51E-07**
			Arsenic	4.E-07		9.E-08	5.E-07	Arsenic	Skin, CVS	3.E-03		6.E-04	3.E-03	**4.5E-03**		**6.4E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				6.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					5.E-03				

Target Organ Analysis - Building 152

Total Liver HI =	5.E-04	Total CNS HI =	1.E-03
Total CVS HI =	3.E-03	Total Blood HI =	4.E-06
Total Skin HI =	3.E-03	Total Prostate HI =	1.E-04
Total Spleen HI =	0.E+00		

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	2.E-09		4.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	4.E-04		8.E-05	5.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-05		1.E-06	3.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-05		2.E-06	3.E-05				
			2-Nitrotoluene	2.E-10		2.E-10	4.E-10	2-Nitrotoluene	Spleen	4.E-06		2.E-06	6.E-06				
			HMX					HMX	Liver, Blood	1.E-05		4.E-07	1.E-05				
			RDX	9.E-08		9.E-09	1.E-07	RDX	Prostate	8.E-04		8.E-05	9.E-04	**Building 153/154 - Soil**			**Total**
			Aluminum					Aluminum	CNS	1.E-03		0.E+00	1.E-03	**6.7E-07**		**1.2E-07**	**7.97E-07**
			Arsenic	6.E-07		1.E-07	7.E-07	Arsenic	Skin, CVS	4.E-03		7.E-04	4.E-03	**6.1E-03**		**8.8E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				8.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					7.E-03				

Target Organ Analysis - Building 153/154

Total Liver HI =	5.E-04	Total CNS HI =	1.E-03
Total CVS HI =	4.E-03	Total Blood HI =	1.E-05
Total Skin HI =	4.E-03	Total Prostate HI =	9.E-04
Total Spleen HI =	6.E-06		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	4.E-09		9.E-10	5.E-09	2,4,6-Trinitrotoluene	Liver	8.E-04		2.E-04	9.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-05		6.E-07	1.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-05		8.E-07	1.E-05				
			2-Nitrotoluene	0.E+00			0.E+00	2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood	4.E-06		1.E-07	4.E-06				
			RDX	1.E-08		1.E-09	1.E-08	RDX	Prostate	9.E-05		9.E-06	1.E-04	**Building 157 - Soil**			**Total**
			Aluminum					Aluminum	CNS	2.E-03		0.E+00	2.E-03	**4.6E-07**		**9.1E-08**	**5.54E-07**
			Arsenic	4.E-07		9.E-08	5.E-07	Arsenic	Skin, CVS	3.E-03		6.E-04	3.E-03	**5.2E-03**		**7.2E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				6.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					6.E-03				

Target Organ Analysis - Building 157

Total Liver HI =	9.E-04	Total CNS HI =	2.E-03
Total CVS HI =	3.E-03	Total Blood HI =	4.E-06
Total Skin HI =	3.E-03	Total Prostate HI =	1.E-04
Total Spleen HI =	0.E+00		

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	3.E-09		6.E-10	4.E-09	2,4,6-Trinitrotoluene	Liver	6.E-04		1.E-04	7.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-05		6.E-07	1.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-05		8.E-07	1.E-05				
			2-Nitrotoluene	1.E-10		8.E-11	2.E-10	2-Nitrotoluene	Spleen	2.E-06		1.E-06	3.E-06				
			HMX					HMX	Liver, Blood	8.E-06		3.E-07	8.E-06				
			RDX	6.E-08		5.E-09	6.E-08	RDX	Prostate	5.E-04		5.E-05	5.E-04	**Building 158/159 - Soil**			**Total**
			Aluminum					Aluminum	CNS	1.E-03		0.E+00	1.E-03	**8.7E-07**		**1.7E-07**	**1.04E-06**
			Arsenic	8.E-07		2.E-07	1.E-06	Arsenic	Skin, CVS	5.E-03		1.E-03	6.E-03	**7.5E-03**		**1.2E-03**	
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					9.E-03				

Target Organ Analysis - Building 158/159

Total Liver HI =	7.E-04	Total CNS HI =	1.E-03
Total CVS HI =	6.E-03	Total Blood HI =	8.E-06
Total Skin HI =	6.E-03	Total Prostate HI =	5.E-04
Total Spleen HI =	3.E-06		

TABLE 9.1. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient							
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	2.E-09		2.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	8.E-03		7.E-04	8.E-03			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		5.E-06	3.E-04			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-04		8.E-06	3.E-04			
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood	8.E-05		1.E-06	8.E-05			
			RDX	9.E-09		4.E-10	1.E-08	RDX	Prostate	2.E-03		9.E-05	2.E-03	Building 152 - Soil		Total
			Aluminum					Aluminum	CNS	3.E-02			3.E-02	3.8E-07	3.4E-08	4.14E-07
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	6.E-02		5.E-03	6.E-02	9.E-02	6.0E-03	
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				4.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					1.E-01			

Target Organ Analysis - Building 152

Total Liver HI =	9.E-03	Total CNS HI =	3.E-02
Total CVS HI =	6.E-02	Total Blood HI =	8.E-05
Total Skin HI =	6.E-02	Total Prostate HI =	2.E-03
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	2.E-09		2.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	8.E-03		7.E-04	8.E-03			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-04		1.E-05	6.E-04			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-04		2.E-05	6.E-04			
			2-Nitrotoluene	2.E-10		6.E-11	2.E-10	2-Nitrotoluene	Spleen	8.E-05		2.E-05	1.E-04			
			HMX					HMX	Liver, Blood	2.E-04		4.E-06	2.E-04			
			RDX	8.E-08		3.E-09	8.E-08	RDX	Prostate	2.E-02		7.E-04	2.E-02	Building 153/154 - Soil		Total
			Aluminum					Aluminum	CNS	3.E-02			3.E-02	5.6E-07	4.7E-08	6.02E-07
			Arsenic	5.E-07		4.E-08	5.E-07	Arsenic	Skin, CVS	7.E-02		7.E-03	8.E-02	1.3E-01	8.2E-03	
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				6.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					1.E-01			

Target Organ Analysis - Building 153/154

Total Liver HI =	1.E-02	Total CNS HI =	3.E-02
Total CVS HI =	8.E-02	Total Blood HI =	2.E-04
Total Skin HI =	8.E-02	Total Prostate HI =	2.E-02
Total Spleen HI =	1.E-04		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	3.E-09		3.E-10	4.E-09	2,4,6-Trinitrotoluene	Liver	2.E-02		1.E-03	2.E-02			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		5.E-06	3.E-04			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-04		8.E-06	3.E-04			
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood	8.E-05		1.E-06	8.E-05			
			RDX	9.E-09		4.E-10	1.E-08	RDX	Prostate	2.E-03		9.E-05	2.E-03	Building 157 - Soil		Total
			Aluminum					Aluminum	CNS	3.E-02			3.E-02	3.8E-07	3.4E-08	4.16E-07
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	6.E-02		5.E-03	6.E-02	1.1E-01	6.8E-03	
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				4.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					1.E-01			

Target Organ Analysis - Building 157

Total Liver HI =	2.E-02	Total CNS HI =	3.E-02
Total CVS HI =	6.E-02	Total Blood HI =	8.E-05
Total Skin HI =	6.E-02	Total Prostate HI =	2.E-03
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	2.E-09		2.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	1.E-02		1.E-03	1.E-02			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		5.E-06	3.E-04			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-04		8.E-06	3.E-04			
			2-Nitrotoluene	9.E-11		3.E-11	1.E-10	2-Nitrotoluene	Spleen	4.E-05		1.E-05	5.E-05			
			HMX					HMX	Liver, Blood	2.E-04		3.E-06	2.E-04			
			RDX	5.E-08		2.E-09	5.E-08	RDX	Prostate	1.E-02		4.E-04	1.E-02	Building 158/159 - Soil		Total
			Aluminum					Aluminum	CNS	3.E-02			3.E-02	7.2E-07	6.3E-08	7.84E-07
			Arsenic	7.E-07		6.E-08	7.E-07	Arsenic	Skin, CVS	1.E-01		9.E-03	1.E-01	1.6E-01	1.1E-02	
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				8.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					2.E-01			

Target Organ Analysis - Building 158/159

Total Liver HI =	1.E-02	Total CNS HI =	3.E-02
Total CVS HI =	1.E-01	Total Blood HI =	2.E-04
Total Skin HI =	1.E-01	Total Prostate HI =	1.E-02
Total Spleen HI =	5.E-05		

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient							
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	1.E-08		4.E-10	1.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene					2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	6.E-08		9.E-10	6.E-08	RDX	Prostate					Building 152 - Soil			Total
			Aluminum					Aluminum	CNS					2.3E-06		7.7E-08	2.38E-06
			Arsenic	2.E-06		8.E-08	2.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data									
Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	1.E-08		4.E-10	1.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene	1.E-09		1.E-10	1.E-09	2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	5.E-07		8.E-09	5.E-07	RDX	Prostate					Building 153/154 - Soil			Total
			Aluminum					Aluminum	CNS					3.4E-06		1.1E-07	3.48E-06
			Arsenic	3.E-06		1.E-07	3.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				3.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data									
Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	2.E-08		7.E-10	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene					2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	6.E-08		9.E-10	6.E-08	RDX	Prostate					Building 157 - Soil			Total
			Aluminum					Aluminum	CNS					2.3E-06		7.7E-08	2.39E-06
			Arsenic	2.E-06		8.E-08	2.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data									
Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	2.E-08		5.E-10	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			2-Nitrotoluene	6.E-10		6.E-11	6.E-10	2-Nitrotoluene	Spleen								
			HMX					HMX	Liver, Blood								
			RDX	3.E-07		5.E-09	3.E-07	RDX	Prostate					Building 158/159 - Soil			Total
			Aluminum					Aluminum	CNS					4.4E-06		1.4E-07	4.52E-06
			Arsenic	4.E-06		1.E-07	4.E-06	Arsenic	Skin, CVS								
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				5.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data									

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	7.E-09		3.E-10	8.E-09	2,4,6-Trinitrotoluene	Liver	2.E-02		6.E-04	2.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-04		4.E-06	6.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-04		6.E-06	6.E-04
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	2.E-04		1.E-06	2.E-04
			RDX	4.E-08		7.E-10	4.E-08	RDX	Prostate	4.E-03		7.E-05	4.E-03
			Aluminum					Aluminum	CNS	6.E-02			6.E-02
			Arsenic	2.E-06		5.E-08	2.E-06	Arsenic	Skin, CVS	1.E-01		4.E-03	1.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					2.E-01

Building 152 - Soil			**Total**
1.7E-06		**5.6E-08**	**1.73E-06**
2.1E-01		**5.0E-03**	

Target Organ Analysis - Building 152

Total Liver HI =	2.E-02	Total CNS HI =	6.E-02
Total CVS HI =	1.E-01	Total Blood HI =	2.E-04
Total Skin HI =	1.E-01	Total Prostate HI =	4.E-03
Total Spleen HI =			

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	7.E-09		3.E-10	8.E-09	2,4,6-Trinitrotoluene	Liver	2.E-02		6.E-04	2.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-03		9.E-06	1.E-03
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-03		1.E-05	1.E-03
			2-Nitrotoluene	8.E-10		9.E-11	9.E-10	2-Nitrotoluene	Spleen	2.E-04		2.E-05	2.E-04
			HMX					HMX	Liver, Blood	5.E-04		3.E-06	5.E-04
			RDX	3.E-07		6.E-09	3.E-07	RDX	Prostate	4.E-02		6.E-04	4.E-02
			Aluminum					Aluminum	CNS	6.E-02			6.E-02
			Arsenic	2.E-06		7.E-08	2.E-06	Arsenic	Skin, CVS	2.E-01		6.E-03	2.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				3.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					3.E-01

Building 153/154 - Soil			**Total**
2.5E-06		**7.7E-08**	**2.53E-06**
2.8E-01		**6.8E-03**	

Target Organ Analysis - Building 153/154

Total Liver HI =	2.E-02	Total CNS HI =	6.E-02
Total CVS HI =	2.E-01	Total Blood HI =	5.E-04
Total Skin HI =	2.E-01	Total Prostate HI =	4.E-02
Total Spleen HI =	2.E-04		

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	1.E-08		5.E-10	2.E-08	2,4,6-Trinitrotoluene	Liver	3.E-02		1.E-03	4.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-04		4.E-06	6.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-04		6.E-06	6.E-04
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	2.E-04		1.E-06	2.E-04
			RDX	4.E-08		7.E-10	4.E-08	RDX	Prostate	4.E-03		7.E-05	4.E-03
			Aluminum					Aluminum	CNS	7.E-02			7.E-02
			Arsenic	2.E-06		5.E-08	2.E-06	Arsenic	Skin, CVS	1.E-01		4.E-03	1.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				2.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					2.E-01

Building 157 - Soil			**Total**
1.7E-06		**5.6E-08**	**1.74E-06**
2.4E-01		**5.6E-03**	

Target Organ Analysis - Building 157

Total Liver HI =	4.E-02	Total CNS HI =	7.E-02
Total CVS HI =	1.E-01	Total Blood HI =	2.E-04
Total Skin HI =	1.E-01	Total Prostate HI =	4.E-03
Total Spleen HI =			

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	1.E-08		4.E-10	1.E-08	2,4,6-Trinitrotoluene	Liver	3.E-02		9.E-04	3.E-02
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-04		4.E-06	6.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-04		6.E-06	6.E-04
			2-Nitrotoluene	4.E-10		5.E-11	5.E-10	2-Nitrotoluene	Spleen	9.E-05		1.E-05	1.E-04
			HMX					HMX	Liver, Blood	3.E-04		2.E-06	3.E-04
			RDX	2.E-07		3.E-09	2.E-07	RDX	Prostate	2.E-02		4.E-04	2.E-02
			Aluminum					Aluminum	CNS	6.E-02			6.E-02
			Arsenic	3.E-06		1.E-07	3.E-06	Arsenic	Skin, CVS	2.E-01		8.E-03	2.E-01
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				3.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					4.E-01

Building 158/159 - Soil			**Total**
3.2E-06		**1.0E-07**	**3.28E-06**
3.4E-01		**9.1E-03**	

Target Organ Analysis - Building 158/159

Total Liver HI =	3.E-02	Total CNS HI =	6.E-02
Total CVS HI =	2.E-01	Total Blood HI =	3.E-04
Total Skin HI =	2.E-01	Total Prostate HI =	2.E-02
Total Spleen HI =	1.E-04		

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient							
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	3.E-09		1.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	2.E-03		7.E-05	2.E-03			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		5.E-07	7.E-05			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	7.E-05		7.E-07	7.E-05			
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood	2.E-05		1.E-07	2.E-05			
			RDX	2.E-08		3.E-10	2.E-08	RDX	Prostate	5.E-04		8.E-06	5.E-04	**Building 152 - Soil**		**Total**
			Aluminum					Aluminum	CNS	6.E-03			6.E-03	**6.3E-07**	**2.1E-08**	**6.50E-07**
			Arsenic	6.E-07		2.E-08	6.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02	**2.2E-02**	**5.4E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				7.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					2.E-02			

Target Organ Analysis - Building 152

Total Liver HI =	2.E-03	Total CNS HI =	6.E-03
Total CVS HI =	1.E-02	Total Blood HI =	2.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	5.E-04
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	3.E-09		1.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	2.E-03		7.E-05	2.E-03			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		9.E-07	1.E-04			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		1.E-06	1.E-04			
			2-Nitrotoluene	3.E-10		4.E-11	3.E-10	2-Nitrotoluene	Spleen	2.E-05		2.E-06	2.E-05			
			HMX					HMX	Liver, Blood	5.E-05		4.E-07	6.E-05			
			RDX	1.E-07		2.E-09	1.E-07	RDX	Prostate	4.E-03		7.E-05	4.E-03	**Building 153/154 - Soil**		**Total**
			Aluminum					Aluminum	CNS	6.E-03			6.E-03	**9.2E-07**	**2.9E-08**	**9.48E-07**
			Arsenic	8.E-07		3.E-08	8.E-07	Arsenic	Skin, CVS	2.E-02		6.E-04	2.E-02	**3.0E-02**	**7.4E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				9.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					3.E-02			

Target Organ Analysis - Building 153/154

Total Liver HI =	2.E-03	Total CNS HI =	6.E-03
Total CVS HI =	2.E-02	Total Blood HI =	6.E-05
Total Skin HI =	2.E-02	Total Prostate HI =	4.E-03
Total Spleen HI =	2.E-05		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	5.E-09		2.E-10	6.E-09	2,4,6-Trinitrotoluene	Liver	4.E-03		1.E-04	4.E-03			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		5.E-07	7.E-05			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	7.E-05		7.E-07	7.E-05			
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood	2.E-05		1.E-07	2.E-05			
			RDX	2.E-08		3.E-10	2.E-08	RDX	Prostate	5.E-04		8.E-06	5.E-04	**Building 157 - Soil**		**Total**
			Aluminum					Aluminum	CNS	8.E-03			8.E-03	**6.3E-07**	**2.1E-08**	**6.53E-07**
			Arsenic	6.E-07		2.E-08	6.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02	**2.5E-02**	**6.1E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				7.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					3.E-02			

Target Organ Analysis - Building 157

Total Liver HI =	4.E-03	Total CNS HI =	8.E-03
Total CVS HI =	1.E-02	Total Blood HI =	2.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	5.E-04
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	4.E-09		2.E-10	4.E-09	2,4,6-Trinitrotoluene	Liver	3.E-03		1.E-04	3.E-03			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		5.E-07	7.E-05			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	7.E-05		7.E-07	7.E-05			
			2-Nitrotoluene	2.E-10		2.E-11	2.E-10	2-Nitrotoluene	Spleen	9.E-06		1.E-06	1.E-05			
			HMX					HMX	Liver, Blood	4.E-05		3.E-07	4.E-05			
			RDX	8.E-08		1.E-09	8.E-08	RDX	Prostate	2.E-03		4.E-05	2.E-03	**Building 158/159 - Soil**		**Total**
			Aluminum					Aluminum	CNS	7.E-03			7.E-03	**1.2E-06**	**4.0E-08**	**1.23E-06**
			Arsenic	1.E-06		4.E-08	1.E-06	Arsenic	Skin, CVS	2.E-02		8.E-04	3.E-02	**3.7E-02**	**9.9E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					4.E-02			

Target Organ Analysis - Building 158/159

Total Liver HI =	3.E-03	Total CNS HI =	7.E-03
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	2.E-03
Total Spleen HI =	1.E-05		

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	6.E-10		5.E-11	6.E-10	2,4,6-Trinitrotoluene	Liver				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver				
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	3.E-09		1.E-10	3.E-09	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	1.E-07		1.E-08	1.E-07	Arsenic	Skin, CVS				
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					

Building 152 - Soil			Total
1.3E-07		1.1E-08	1.39E-07

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	6.E-10		5.E-11	6.E-10	2,4,6-Trinitrotoluene	Liver				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver				
			2-Nitrotoluene	6.E-11		2.E-11	8.E-11	2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	3.E-08		1.E-09	3.E-08	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS				
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				2.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					

Building 153/154 - Soil			Total
1.9E-07		1.5E-08	2.02E-07

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	1.E-09		1.E-10	1.E-09	2,4,6-Trinitrotoluene	Liver				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver				
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	3.E-09		1.E-10	3.E-09	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	1.E-07		1.E-08	1.E-07	Arsenic	Skin, CVS				
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					

Building 157 - Soil			Total
1.3E-07		1.1E-08	1.40E-07

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	8.E-10		8.E-11	9.E-10	2,4,6-Trinitrotoluene	Liver				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver				
			2-Nitrotoluene	3.E-11		9.E-12	4.E-11	2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood				
			RDX	2.E-08		7.E-10	2.E-08	RDX	Prostate				
			Aluminum					Aluminum	CNS				
			Arsenic	2.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS				
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				3.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					

Building 158/159 - Soil			Total
2.4E-07		2.1E-08	2.63E-07

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	4.E-10		3.E-11	4.E-10	2,4,6-Trinitrotoluene	Liver	9.E-04		8.E-05	1.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-05		6.E-07	4.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-05		8.E-07	4.E-05
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	9.E-06		2.E-07	1.E-05
			RDX	2.E-09		9.E-11	2.E-09	RDX	Prostate	2.E-04		9.E-06	2.E-04
			Aluminum					Aluminum	CNS	3.E-03			3.E-03
			Arsenic	9.E-08		7.E-09	1.E-07	Arsenic	Skin, CVS	7.E-03		6.E-04	8.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					1.E-02

Building 152 - Soil			Total
9.3E-08		7.3E-09	1.01E-07
1.1E-02		6.5E-04	

Target Organ Analysis - Building 152

Total Liver HI =	1.E-03	Total CNS HI =	3.E-03
Total CVS HI =	8.E-03	Total Blood HI =	1.E-05
Total Skin HI =	8.E-03	Total Prostate HI =	2.E-04
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	4.E-10		3.E-11	4.E-10	2,4,6-Trinitrotoluene	Liver	9.E-04		8.E-05	1.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		1.E-06	7.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	7.E-05		2.E-06	7.E-05
			2-Nitrotoluene	5.E-11		1.E-11	6.E-11	2-Nitrotoluene	Spleen	9.E-06		3.E-06	1.E-05
			HMX					HMX	Liver, Blood	3.E-05		5.E-07	3.E-05
			RDX	2.E-08		7.E-10	2.E-08	RDX	Prostate	2.E-03		8.E-05	2.E-03
			Aluminum					Aluminum	CNS	3.E-03			3.E-03
			Arsenic	1.E-07		9.E-09	1.E-07	Arsenic	Skin, CVS	9.E-03		7.E-04	1.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					2.E-02

Building 153/154 - Soil			Total
1.4E-07		1.0E-08	1.46E-07
1.5E-02		8.9E-04	

Target Organ Analysis - Building 153/154

Total Liver HI =	1.E-03	Total CNS HI =	3.E-03
Total CVS HI =	1.E-02	Total Blood HI =	3.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	2.E-03
Total Spleen HI =	1.E-05		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	8.E-10		7.E-11	9.E-10	2,4,6-Trinitrotoluene	Liver	2.E-03		2.E-04	2.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-05		6.E-07	4.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-05		8.E-07	4.E-05
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	9.E-06		2.E-07	1.E-05
			RDX	2.E-09		9.E-11	2.E-09	RDX	Prostate	2.E-04		9.E-06	2.E-04
			Aluminum					Aluminum	CNS	4.E-03			4.E-03
			Arsenic	9.E-08		7.E-09	1.E-07	Arsenic	Skin, CVS	7.E-03		6.E-04	8.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					1.E-02

Building 157 - Soil			Total
9.4E-08		7.3E-09	1.01E-07
1.3E-02		7.3E-04	

Target Organ Analysis - Building 157

Total Liver HI =	2.E-03	Total CNS HI =	4.E-03
Total CVS HI =	8.E-03	Total Blood HI =	1.E-05
Total Skin HI =	8.E-03	Total Prostate HI =	2.E-04
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	6.E-10		5.E-11	7.E-10	2,4,6-Trinitrotoluene	Liver	1.E-03		1.E-04	2.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-05		6.E-07	4.E-05
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-05		8.E-07	4.E-05
			2-Nitrotoluene	2.E-11		6.E-12	3.E-11	2-Nitrotoluene	Spleen	5.E-06		1.E-06	6.E-06
			HMX					HMX	Liver, Blood	2.E-05		3.E-07	2.E-05
			RDX	1.E-08		4.E-10	1.E-08	RDX	Prostate	1.E-03		5.E-05	1.E-03
			Aluminum					Aluminum	CNS	4.E-03			4.E-03
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	1.E-02		1.E-03	1.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				2.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					2.E-02

Building 158/159 - Soil			Total
1.8E-07		1.4E-08	1.90E-07
1.9E-02		1.2E-03	

Target Organ Analysis - Building 158/159

Total Liver HI =	2.E-03	Total CNS HI =	4.E-03
Total CVS HI =	1.E-02	Total Blood HI =	2.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =	6.E-06		

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-10		2.E-11	2.E-10	2,4,6-Trinitrotoluene	Liver	1.E-04		1.E-05	1.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-06		8.E-08	4.E-06
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-06		1.E-07	4.E-06
		Building 152	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	1.E-06		2.E-08	1.E-06
			RDX	8.E-10		5.E-11	9.E-10	RDX	Prostate	3.E-05		1.E-06	3.E-05
			Aluminum					Aluminum	CNS	3.E-04			3.E-04
			Arsenic	3.E-08		4.E-09	4.E-08	Arsenic	Skin, CVS	8.E-04		8.E-05	8.E-04
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				4.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					1.E-03

Building 152 - Soil			Total
3.5E-08		3.8E-09	3.87E-08
1.2E-03		9.6E-05	

Target Organ Analysis - Building 152

Total Liver HI =	1.E-04	Total CNS HI =	3.E-04
Total CVS HI =	8.E-04	Total Blood HI =	1.E-06
Total Skin HI =	8.E-04	Total Prostate HI =	3.E-05
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-10		2.E-11	2.E-10	2,4,6-Trinitrotoluene	Liver	1.E-04		1.E-05	1.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	8.E-06		2.E-07	8.E-06
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	8.E-06		2.E-07	8.E-06
		Building 153/154	2-Nitrotoluene	2.E-11		6.E-12	2.E-11	2-Nitrotoluene	Spleen	1.E-06		4.E-07	1.E-06
		Historical Data	HMX					HMX	Liver, Blood	3.E-06		7.E-08	3.E-06
			RDX	7.E-09		4.E-10	7.E-09	RDX	Prostate	2.E-04		1.E-05	2.E-04
			Aluminum					Aluminum	CNS	3.E-04			3.E-04
			Arsenic	4.E-08		5.E-09	5.E-08	Arsenic	Skin, CVS	1.E-03		1.E-04	1.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				6.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					2.E-03

Building 153/154 - Soil			Total
5.1E-08		5.2E-09	5.62E-08
1.7E-03		1.3E-04	

Target Organ Analysis - Building 153/154

Total Liver HI =	1.E-04	Total CNS HI =	3.E-04
Total CVS HI =	1.E-03	Total Blood HI =	3.E-06
Total Skin HI =	1.E-03	Total Prostate HI =	2.E-04
Total Spleen HI =	1.E-06		

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-10		4.E-11	3.E-10	2,4,6-Trinitrotoluene	Liver	2.E-04		2.E-05	2.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-06		8.E-08	4.E-06
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-06		1.E-07	4.E-06
		Building 157	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	1.E-06		2.E-08	1.E-06
			RDX	8.E-10		5.E-11	9.E-10	RDX	Prostate	3.E-05		1.E-06	3.E-05
			Aluminum					Aluminum	CNS	4.E-04			4.E-04
			Arsenic	3.E-08		4.E-09	4.E-08	Arsenic	Skin, CVS	8.E-04		8.E-05	8.E-04
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				4.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					2.E-03

Building 157 - Soil			Total
3.5E-08		3.8E-09	3.89E-08
1.4E-03		1.1E-04	

Target Organ Analysis - Building 157

Total Liver HI =	2.E-04	Total CNS HI =	4.E-04
Total CVS HI =	8.E-04	Total Blood HI =	1.E-06
Total Skin HI =	8.E-04	Total Prostate HI =	3.E-05
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-10		3.E-11	3.E-10	2,4,6-Trinitrotoluene	Liver	2.E-04		2.E-05	2.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.E-06		8.E-08	4.E-06
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-06		1.E-07	4.E-06
		Building 158/159	2-Nitrotoluene	9.E-12		3.E-12	1.E-11	2-Nitrotoluene	Spleen	5.E-07		2.E-07	7.E-07
		Historical Data	HMX					HMX	Liver, Blood	2.E-06		4.E-08	2.E-06
			RDX	4.E-09		2.E-10	4.E-09	RDX	Prostate	1.E-04		7.E-06	1.E-04
			Aluminum					Aluminum	CNS	4.E-04			4.E-04
			Arsenic	6.E-08		7.E-09	7.E-08	Arsenic	Skin, CVS	1.E-03		1.E-04	2.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				7.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					2.E-03

Building 158/159 - Soil			Total
6.6E-08		7.0E-09	7.32E-08
2.0E-03		1.7E-04	

Target Organ Analysis - Building 158/159

Total Liver HI =	2.E-04	Total CNS HI =	4.E-04
Total CVS HI =	2.E-03	Total Blood HI =	2.E-06
Total Skin HI =	2.E-03	Total Prostate HI =	1.E-04
Total Spleen HI =	7.E-07		

TABLE 9.4. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ASOLESCENT TRESPASSERS
SWMU 13 (MINE FILL B)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient							
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	4.E-10		3.E-11	4.E-10	2,4,6-Trinitrotoluene	Liver	2.E-04		1.E-05	2.E-04			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-06		9.E-08	6.E-06			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-06		1.E-07	6.E-06			
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood	2.E-06		2.E-08	2.E-06			
			RDX	2.E-09		8.E-11	2.E-09	RDX	Prostate	4.E-05		2.E-06	4.E-05	**Building 152 - Soil**		**Total**
			Aluminum					Aluminum	CNS	5.E-04			5.E-04	**8.9E-08**	**6.6E-09**	**9.60E-08**
			Arsenic	9.E-08		6.E-09	9.E-08	Arsenic	Skin, CVS	1.E-03		9.E-05	1.E-03	**2.0E-03**	**1.1E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					2.E-03			

Target Organ Analysis - Building 152

Total Liver HI =	2.E-04	Total CNS HI =	5.E-04
Total CVS HI =	1.E-03	Total Blood HI =	2.E-06
Total Skin HI =	1.E-03	Total Prostate HI =	4.E-05
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	4.E-10		3.E-11	4.E-10	2,4,6-Trinitrotoluene	Liver	2.E-04		1.E-05	2.E-04			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-05		2.E-07	1.E-05			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-05		3.E-07	1.E-05			
			2-Nitrotoluene	4.E-11		1.E-11	6.E-11	2-Nitrotoluene	Spleen	2.E-06		4.E-07	2.E-06			
			HMX					HMX	Liver, Blood	5.E-06		7.E-08	5.E-06			
			RDX	2.E-08		7.E-10	2.E-08	RDX	Prostate	3.E-04		1.E-05	4.E-04	**Building 153/154 - Soil**		**Total**
			Aluminum					Aluminum	CNS	6.E-04			6.E-04	**1.3E-07**	**9.1E-09**	**1.40E-07**
			Arsenic	1.E-07		8.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03	**2.7E-03**	**1.5E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					3.E-03			

Target Organ Analysis - Building 153/154

Total Liver HI =	2.E-04	Total CNS HI =	6.E-04
Total CVS HI =	2.E-03	Total Blood HI =	5.E-06
Total Skin HI =	2.E-03	Total Prostate HI =	4.E-04
Total Spleen HI =	2.E-06		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	8.E-10		6.E-11	8.E-10	2,4,6-Trinitrotoluene	Liver	3.E-04		3.E-05	4.E-04			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-06		9.E-08	6.E-06			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-06		1.E-07	6.E-06			
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood	2.E-06		2.E-08	2.E-06			
			RDX	2.E-09		8.E-11	2.E-09	RDX	Prostate	4.E-05		2.E-06	4.E-05	**Building 157 - Soil**		**Total**
			Aluminum					Aluminum	CNS	7.E-04			7.E-04	**9.0E-08**	**6.6E-09**	**9.64E-08**
			Arsenic	9.E-08		6.E-09	9.E-08	Arsenic	Skin, CVS	1.E-03		9.E-05	1.E-03	**2.3E-03**	**1.2E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				1.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					2.E-03			

Target Organ Analysis - Building 157

Total Liver HI =	4.E-04	Total CNS HI =	7.E-04
Total CVS HI =	1.E-03	Total Blood HI =	2.E-06
Total Skin HI =	1.E-03	Total Prostate HI =	4.E-05
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	6.E-10		5.E-11	6.E-10	2,4,6-Trinitrotoluene	Liver	2.E-04		2.E-05	3.E-04			
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-06		9.E-08	6.E-06			
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-06		1.E-07	6.E-06			
			2-Nitrotoluene	2.E-11		5.E-12	3.E-11	2-Nitrotoluene	Spleen	8.E-07		2.E-07	1.E-06			
			HMX					HMX	Liver, Blood	3.E-06		5.E-08	3.E-06			
			RDX	1.E-08		4.E-10	1.E-08	RDX	Prostate	2.E-04		8.E-06	2.E-04	**Building 158/159 - Soil**		**Total**
			Aluminum					Aluminum	CNS	6.E-04			6.E-04	**1.7E-07**	**1.2E-08**	**1.82E-07**
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	2.E-03	**3.3E-03**	**1.9E-04**	
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				2.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					4.E-03			

Target Organ Analysis - Building 158/159

Total Liver HI =	3.E-04	Total CNS HI =	6.E-04
Total CVS HI =	2.E-03	Total Blood HI =	3.E-06
Total Skin HI =	2.E-03	Total Prostate HI =	2.E-04
Total Spleen HI =	1.E-06		

TABLE 9.3. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-09		1.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	2.E-03		7.E-05	2.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-05		5.E-07	6.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-05		8.E-07	7.E-05
		Building 152	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	2.E-05		1.E-07	2.E-05
			RDX	2.E-08		4.E-10	2.E-08	RDX	Prostate	4.E-04		8.E-06	4.E-04
			Aluminum					Aluminum	CNS	6.E-03			6.E-03
			Arsenic	7.E-07		3.E-08	8.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				8.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					2.E-02

Building 152 - Soil			Total		
7.6E-07		3.0E-08	7.87E-07		
2.1E-02		5.9E-04			

Target Organ Analysis - Building 152

Total Liver HI =	2.E-03	Total CNS HI =	6.E-03
Total CVS HI =	1.E-02	Total Blood HI =	2.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	4.E-04
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-09		1.E-10	3.E-09	2,4,6-Trinitrotoluene	Liver	2.E-03		7.E-05	2.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		1.E-06	1.E-04
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		2.E-06	1.E-04
		Building 153/154	2-Nitrotoluene	4.E-10		5.E-11	4.E-10	2-Nitrotoluene	Spleen	2.E-05		2.E-06	2.E-05
		Historical Data	HMX					HMX	Liver, Blood	5.E-05		4.E-07	5.E-05
			RDX	2.E-07		3.E-09	2.E-07	RDX	Prostate	4.E-03		7.E-05	4.E-03
			Aluminum					Aluminum	CNS	6.E-03			6.E-03
			Arsenic	1.E-06		4.E-08	1.E-06	Arsenic	Skin, CVS	2.E-02		7.E-04	2.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					3.E-02

Building 153/154 - Soil			Total		
1.1E-06		4.1E-08	1.15E-06		
2.8E-02		8.0E-04			

Target Organ Analysis - Building 153/154

Total Liver HI =	2.E-03	Total CNS HI =	6.E-03
Total CVS HI =	2.E-02	Total Blood HI =	5.E-05
Total Skin HI =	2.E-02	Total Prostate HI =	4.E-03
Total Spleen HI =	2.E-05		

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	7.E-09		3.E-10	7.E-09	2,4,6-Trinitrotoluene	Liver	3.E-03		1.E-04	4.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-05		5.E-07	6.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-05		8.E-07	7.E-05
		Building 157	2-Nitrotoluene					2-Nitrotoluene	Spleen				
		Historical Data	HMX					HMX	Liver, Blood	2.E-05		1.E-07	2.E-05
			RDX	2.E-08		4.E-10	2.E-08	RDX	Prostate	4.E-04		8.E-06	4.E-04
			Aluminum					Aluminum	CNS	7.E-03			7.E-03
			Arsenic	7.E-07		3.E-08	8.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				8.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					2.E-02

Building 157 - Soil			Total		
7.6E-07		3.0E-08	7.90E-07		
2.4E-02		6.6E-04			

Target Organ Analysis - Building 157

Total Liver HI =	4.E-03	Total CNS HI =	7.E-03
Total CVS HI =	1.E-02	Total Blood HI =	2.E-05
Total Skin HI =	1.E-02	Total Prostate HI =	4.E-04
Total Spleen HI =			

Soil	Soil	Surface and	2,4,6-Trinitrotoluene	5.E-09		2.E-10	5.E-09	2,4,6-Trinitrotoluene	Liver	3.E-03		1.E-04	3.E-03
		Subsurface	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.E-05		5.E-07	6.E-05
		Soil	4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	6.E-05		8.E-07	7.E-05
		Building 158/159	2-Nitrotoluene	2.E-10		2.E-11	2.E-10	2-Nitrotoluene	Spleen	9.E-06		1.E-06	1.E-05
		Historical Data	HMX					HMX	Liver, Blood	3.E-05		3.E-07	3.E-05
			RDX	9.E-08		2.E-09	9.E-08	RDX	Prostate	2.E-03		4.E-05	2.E-03
			Aluminum					Aluminum	CNS	6.E-03			6.E-03
			Arsenic	1.E-06		5.E-08	1.E-06	Arsenic	Skin, CVS	2.E-02		9.E-04	2.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				1.E-06	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					4.E-02

Building 158/159 - Soil			Total		
1.4E-06		5.5E-08	1.49E-06		
3.4E-02		1.1E-03			

Target Organ Analysis - Building 158/159

Total Liver HI =	3.E-03	Total CNS HI =	6.E-03
Total CVS HI =	2.E-02	Total Blood HI =	3.E-05
Total Skin HI =	2.E-02	Total Prostate HI =	2.E-03
Total Spleen HI =	1.E-05		

TABLE 9.2. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-10		8.E-12	2.E-10	2,4,6-Trinitrotoluene	Liver	9.E-05		4.E-06	1.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene			0.E+00		2-Amino-4,6-dinitrotoluene	Liver	4.E-06		3.E-08	4.E-06
		Soil	4-Amino-2,6-dinitrotoluene			0.E+00		4-Amino-2,6-dinitrotoluene	Liver	4.E-06		4.E-08	4.E-06
		Building 152	2-Nitrotoluene	0.E+00		0.E+00		2-Nitrotoluene	Spleen	0.E+00		0.E+00	0.E+00
		Historical Data	HMX			0.E+00		HMX	Liver, Blood	9.E-07		7.E-09	9.E-07
			RDX	1.E-09		2.E-11	1.E-09	RDX	Prostate	2.E-05		5.E-07	2.E-05
			Aluminum			0.E+00		Aluminum	CNS	3.E-04		0.E+00	3.E-04
			Arsenic	4.E-08		2.E-09	4.E-08	Arsenic	Skin, CVS	7.E-04		3.E-05	7.E-04
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				4.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					1.E-03

Building 152 - Soil			Total
4.1E-08		1.6E-09	4.31E-08
1.1E-03		3.2E-05	

Target Organ Analysis - Building 152

Total Liver HI =	1.E-04	Total CNS HI =	3.E-04
Total CVS HI =	7.E-04	Total Blood HI =	9.E-07
Total Skin HI =	7.E-04	Total Prostate HI =	2.E-05
Total Spleen HI =	0.E+00		

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	2.E-10		8.E-12	2.E-10	2,4,6-Trinitrotoluene	Liver	9.E-05		4.E-06	1.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene			0.E+00		2-Amino-4,6-dinitrotoluene	Liver	7.E-06		6.E-08	7.E-06
		Soil	4-Amino-2,6-dinitrotoluene			0.E+00		4-Amino-2,6-dinitrotoluene	Liver	7.E-06		8.E-08	7.E-06
		Building 153/154	2-Nitrotoluene	2.E-11		3.E-12	2.E-11	2-Nitrotoluene	Spleen	9.E-07		1.E-07	1.E-06
		Historical Data	HMX			0.E+00		HMX	Liver, Blood	3.E-06		2.E-08	3.E-06
			RDX	8.E-09		2.E-10	8.E-09	RDX	Prostate	2.E-04		4.E-06	2.E-04
			Aluminum			0.E+00		Aluminum	CNS	3.E-04		0.E+00	3.E-04
			Arsenic	5.E-08		2.E-09	5.E-08	Arsenic	Skin, CVS	9.E-04		4.E-05	9.E-04
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				6.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					2.E-03

Building 153/154 - Soil			Total
6.1E-08		2.2E-09	6.28E-08
1.5E-03		4.4E-05	

Target Organ Analysis - Building 153/154

Total Liver HI =	1.E-04	Total CNS HI =	3.E-04
Total CVS HI =	9.E-04	Total Blood HI =	3.E-06
Total Skin HI =	9.E-04	Total Prostate HI =	2.E-04
Total Spleen HI =	1.E-06		

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	4.E-10		2.E-11	4.E-10	2,4,6-Trinitrotoluene	Liver	2.E-04		8.E-06	2.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene			0.E+00		2-Amino-4,6-dinitrotoluene	Liver	4.E-06		3.E-08	4.E-06
		Soil	4-Amino-2,6-dinitrotoluene			0.E+00		4-Amino-2,6-dinitrotoluene	Liver	4.E-06		4.E-08	4.E-06
		Building 157	2-Nitrotoluene	0.E+00		0.E+00	0.E+00	2-Nitrotoluene	Spleen	0.E+00		0.E+00	0.E+00
		Historical Data	HMX			0.E+00		HMX	Liver, Blood	9.E-07		7.E-09	9.E-07
			RDX	1.E-09		2.E-11	1.E-09	RDX	Prostate	2.E-05		5.E-07	2.E-05
			Aluminum			0.E+00		Aluminum	CNS	4.E-04		0.E+00	4.E-04
			Arsenic	4.E-08		2.E-09	4.E-08	Arsenic	Skin, CVS	7.E-04		3.E-05	7.E-04
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				4.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					1.E-03

Building 157 - Soil			Total
4.2E-08		1.6E-09	4.33E-08
1.3E-03		3.6E-05	

Target Organ Analysis - Building 157

Total Liver HI =	2.E-04	Total CNS HI =	4.E-04
Total CVS HI =	7.E-04	Total Blood HI =	9.E-07
Total Skin HI =	7.E-04	Total Prostate HI =	2.E-05
Total Spleen HI =	0.E+00		

Medium	Exposure Medium	Exposure Point	Chemical	Ingestion	Inhalation	Dermal	Exposure Routes Total	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and	2,4,6-Trinitrotoluene	3.E-10		1.E-11	3.E-10	2,4,6-Trinitrotoluene	Liver	1.E-04		6.E-06	1.E-04
		Subsurface	2-Amino-4,6-dinitrotoluene			0.E+00		2-Amino-4,6-dinitrotoluene	Liver	4.E-06		3.E-08	4.E-06
		Soil	4-Amino-2,6-dinitrotoluene			0.E+00		4-Amino-2,6-dinitrotoluene	Liver	4.E-06		4.E-08	4.E-06
		Building 158/159	2-Nitrotoluene	1.E-11		1.E-12	1.E-11	2-Nitrotoluene	Spleen	5.E-07		6.E-08	5.E-07
		Historical Data	HMX			0.E+00		HMX	Liver, Blood	2.E-06		1.E-08	2.E-06
			RDX	5.E-09		1.E-10	5.E-09	RDX	Prostate	1.E-04		2.E-06	1.E-04
			Aluminum			0.E+00		Aluminum	CNS	3.E-04		0.E+00	3.E-04
			Arsenic	7.E-08		3.E-09	8.E-08	Arsenic	Skin, CVS	1.E-03		5.E-05	1.E-03
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				8.E-08	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					2.E-03

Building 158/159 - Soil			Total
7.9E-08		3.0E-09	8.16E-08
1.9E-03		5.9E-05	

Target Organ Analysis - Building 158/159

Total Liver HI =	2.E-04	Total CNS HI =	3.E-04
Total CVS HI =	1.E-03	Total Blood HI =	2.E-06
Total Skin HI =	1.E-03	Total Prostate HI =	1.E-04
Total Spleen HI =	5.E-07		

TABLE 9.1. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	8.E-10		5.E-11	9.E-10	2,4,6-Trinitrotoluene	Liver	4.E-03		2.E-04	4.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		2.E-06	1.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		3.E-06	1.E-04
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	4.E-05		5.E-07	4.E-05
			RDX	5.E-09		1.E-10	5.E-09	RDX	Prostate	1.E-03		3.E-05	1.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	3.E-02		2.E-03	3.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				2.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data					5.E-02

Building 152 - Soil			Total
1.9E-07		1.1E-08	2.01E-07
4.7E-02		2.0E-03	

Target Organ Analysis - Building 152

Total Liver HI =	4.E-03	Total CNS HI =	1.E-02
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	8.E-10		5.E-11	9.E-10	2,4,6-Trinitrotoluene	Liver	4.E-03		2.E-04	4.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-06	3.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	3.E-04		5.E-06	3.E-04
			2-Nitrotoluene	9.E-11		2.E-11	1.E-10	2-Nitrotoluene	Spleen	4.E-05		8.E-06	5.E-05
			HMX					HMX	Liver, Blood	1.E-04		1.E-06	1.E-04
			RDX	4.E-08		1.E-09	4.E-08	RDX	Prostate	8.E-03		2.E-04	8.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	2.E-07		1.E-08	3.E-07	Arsenic	Skin, CVS	4.E-02		2.E-03	4.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				3.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data					7.E-02

Building 153/154 - Soil			Total
2.8E-07		1.6E-08	2.93E-07
6.3E-02		2.7E-03	

Target Organ Analysis - Building 153/154

Total Liver HI =	5.E-03	Total CNS HI =	1.E-02
Total CVS HI =	4.E-02	Total Blood HI =	1.E-04
Total Skin HI =	4.E-02	Total Prostate HI =	8.E-03
Total Spleen HI =	5.E-05		

Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	2.E-09		1.E-10	2.E-09	2,4,6-Trinitrotoluene	Liver	8.E-03		5.E-04	8.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		2.E-06	1.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		3.E-06	1.E-04
			2-Nitrotoluene					2-Nitrotoluene	Spleen				
			HMX					HMX	Liver, Blood	4.E-05		5.E-07	4.E-05
			RDX	5.E-09		1.E-10	5.E-09	RDX	Prostate	1.E-03		3.E-05	1.E-03
			Aluminum					Aluminum	CNS	2.E-02			2.E-02
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	3.E-02		2.E-03	3.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				2.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data					6.E-02

Building 157 - Soil			Total
1.9E-07		1.1E-08	2.02E-07
5.4E-02		2.3E-03	

Target Organ Analysis - Building 157

Total Liver HI =	9.E-03	Total CNS HI =	2.E-02
Total CVS HI =	3.E-02	Total Blood HI =	4.E-05
Total Skin HI =	3.E-02	Total Prostate HI =	1.E-03
Total Spleen HI =			

Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	1.E-09		8.E-11	1.E-09	2,4,6-Trinitrotoluene	Liver	6.E-03		4.E-04	6.E-03
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-04		2.E-06	1.E-04
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-04		3.E-06	1.E-04
			2-Nitrotoluene	5.E-11		9.E-12	6.E-11	2-Nitrotoluene	Spleen	2.E-05		4.E-06	2.E-05
			HMX					HMX	Liver, Blood	8.E-05		9.E-07	8.E-05
			RDX	2.E-08		7.E-10	2.E-08	RDX	Prostate	5.E-03		1.E-04	5.E-03
			Aluminum					Aluminum	CNS	1.E-02			1.E-02
			Arsenic	3.E-07		2.E-08	4.E-07	Arsenic	Skin, CVS	5.E-02		3.E-03	6.E-02
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				4.E-07	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data					8.E-02

Building 158/159 - Soil			Total
3.6E-07		2.1E-08	3.81E-07
7.8E-02		3.7E-03	

Target Organ Analysis - Building 158/159

Total Liver HI =	7.E-03	Total CNS HI =	1.E-02
Total CVS HI =	6.E-02	Total Blood HI =	8.E-05
Total Skin HI =	6.E-02	Total Prostate HI =	5.E-03
Total Spleen HI =	2.E-05		

TABLE 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 158/159 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 158/159

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	3	NA	262		mg/kg	3	Average	(1)	3	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	NA	1.82		mg/kg	0.3	Average	(1)	0.3	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.3	NA	3.17		mg/kg	0.3	Average	(1)	0.3	Average	(1)
2-Nitrotoluene	mg/kg	0.2	NA	0.939		mg/kg	0.2	Average	(1)	0.2	Average	(1)
HMX	mg/kg	4	NA	87.9		mg/kg	4	Average	(1)	4	Average	(1)
RDX	mg/kg	15	NA	752		mg/kg	15	Average	(1)	15	Average	(1)
Aluminum	mg/kg	14900	NA	21300		mg/kg	14900	Average	(1)	14900	Average	(1)
Arsenic	mg/kg	16.2	NA	57.3		mg/kg	16.2	Average	(1)	16.2	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

2.54E+00
2.55E-01
2.72E-01
2.33E-01
4.19E+00
1.52E+01
1.49E+04
1.62E+01

TABLE 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 157 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 157

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	4	NA	260		mg/kg	4	Average	(1)	4	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	NA	1.28		mg/kg	0.3	Average	(1)	0.3	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.3	NA	1.62		mg/kg	0.3	Average	(1)	0.3	Average	(1)
HMX	mg/kg	2	NA	6.93		mg/kg	2	Average	(1)	2	Average	(1)
RDX	mg/kg	3	NA	19.4		mg/kg	3	Average	(1)	3	Average	(1)
Aluminum	mg/kg	16600	NA	18890		mg/kg	16600	Average	(1)	16600	Average	(1)
Arsenic	mg/kg	8.9	NA	1300		mg/kg	8.9	Average	(1)	8.9	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

4.00E+00
3.01E-01
3.42E-01
1.87E+00
2.80E+00
1.66E+04
8.92E+00

TABLE 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 153/154 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 153/154

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	2	NA	793		mg/kg	2	Average	(1)	2	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.6	NA	2.33		mg/kg	0.6	Average	(1)	0.6	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.6	NA	5.8		mg/kg	0.6	Average	(1)	0.6	Average	(1)
2-Nitrotoluene	mg/kg	0.4	NA	0.074		mg/kg	0.4	Average	(1)	0.4	Average	(1)
HMX	mg/kg	6	NA	752		mg/kg	6	Average	(1)	6	Average	(1)
RDX	mg/kg	25	NA	5940		mg/kg	25	Average	(1)	25	Average	(1)
Aluminum	mg/kg	13700	NA	35200		mg/kg	13700	Average	(1)	13700	Average	(1)
Arsenic	mg/kg	11.5	NA	25.9		mg/kg	11.5	Average	(1)	11.5	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

1.98E+00
6.31E-01
6.44E-01
4.19E-01
6.45E+00
2.51E+01
1.37E+04
1.15E+01

TABLE 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 152 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 152

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	2	NA	53.9		mg/kg	2	Average	(1)	2	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	NA	0.845		mg/kg	0.3	Average	(1)	0.3	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.3	NA	1.12		mg/kg	0.3	Average	(1)	0.3	Average	(1)
HMX	mg/kg	2	NA	10.7		mg/kg	2	Average	(1)	2	Average	(1)
RDX	mg/kg	3	NA	40.3		mg/kg	3	Average	(1)	3	Average	(1)
Aluminum	mg/kg	13100	NA	18100		mg/kg	13100	Average	(1)	13100	Average	(1)
Arsenic	mg/kg	8.9	NA	14		mg/kg	8.9	Average	(1)	8.9	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

2.29E+00
2.68E-01
2.98E-01
2.39E+00
3.44E+00
1.31E+04
8.89E+00

TABLE 8.44 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.3E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	5.2E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	8.9E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.9E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.3E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	3.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.3E-07
	(total)										**6.8E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.6E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.9E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.4E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	5.8E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.8E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.2E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	8.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	(total)										**1.3E-07**
										Total Risk Across All Exposure Routes/Pathways	**8.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.44 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	9.9E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.3E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.3E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.6E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.3E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.5E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.3E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	2.5E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.5E-03
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.9E-03
	(total)												**1.3E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.1E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.8E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.2E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.2E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.6E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.2E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.4E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.2E-05
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	5.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.8E-03
	(total)												**2.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.5E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.44
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.44a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.9E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.3E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.2E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	9.8E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	9.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-07
	(total)										**1.7E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.5E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.6E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.2E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	5.5E-12
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.6E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.0E-10
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	7.8E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	(total)										**1.2E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.8E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.44a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.5E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.2E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	8.3E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	8.3E-07
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.3E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.2E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.1E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	6.2E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.2E-04
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	6.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.2E-03
	(total)												**3.3E-03**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	9.9E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.0E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.8E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.2E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-07
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.1E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.1E-07
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.5E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.9E-08
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.3E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.7E-06
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	5.0E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.7E-04
	(total)												**1.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.5E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.44a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.43 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	7.0E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	5.2E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.8E-07
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	5.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	5.7E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-06
	(total)										**9.1E-06**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.2E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.6E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	4.6E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	7.8E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	5.2E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.7E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.7E-06
	(total)										**1.7E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.43 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.9E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.0E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.0E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.8E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.5E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.9E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.5E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.5E-02
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.3E-02
	(total)												**7.9E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	6.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.8E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.7E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.3E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.3E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.5E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.1E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.5E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.8E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.2E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.43
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.43a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.0E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.1E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.9E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	8.3E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.1E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	8.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	8.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	(total)										**1.4E-06**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.5E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.5E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.6E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-08
	(total)										**5.5E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.5E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.43a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.6E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	8.6E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	8.6E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.4E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.1E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	6.4E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.4E-03
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	6.9E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.3E-02
	(total)												**3.4E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.4E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.1E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.1E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.6E-07
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.1E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.1E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.7E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.3E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.2E-05
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.2E-04
	(total)												**1.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.5E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.43a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.42 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.0E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	6.7E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.1E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	5.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.5E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	5.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	5.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.2E-07
	(total)										**8.7E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.1E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.4E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	4.4E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	7.5E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	5.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.5E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-07
	(total)										**1.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.42 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.6E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.9E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.9E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.8E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.5E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.7E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.4E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.4E-03
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.1E-03
	(total)												**7.5E-03**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	6.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.4E-07
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.2E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.2E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.5E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.0E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.4E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.6E-05
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-03
	(total)												**1.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.7E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.42
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.42a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	9.1E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.7E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	6.0E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	4.5E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.0E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	4.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.3E-08
	(total)										**7.9E-08**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.8E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.1E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.2E-12	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	8.0E-11	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-12
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	9.6E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	9.0E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.9E-11
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.9E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-09
	(total)										**3.0E-09**
										Total Risk Across All Exposure Routes/Pathways	**8.2E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.42a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.4E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	4.7E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	4.7E-07
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	9.4E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.9E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.5E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.2E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	3.5E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.5E-04
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-03
	(total)												**1.9E-03**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.0E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.0E-06
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.6E-11	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.4E-11	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.2E-08
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	6.2E-10	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	6.2E-08
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.4E-10	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-08
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	7.0E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.3E-06
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.5E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.0E-05
	(total)												**5.9E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.9E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.42a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.41 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.3E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.5E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	5.5E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	9.4E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	4.2E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	4.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-07
	(total)										**7.2E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.4E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.7E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.9E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.1E-08
	(total)										**6.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**7.8E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.41 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.8E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.9E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.9E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.7E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-04
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.9E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.7E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	2.9E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.9E-02
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.1E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-01
	(total)												**1.6E-01**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.6E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.1E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.6E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.8E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.2E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.2E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.8E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.3E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.4E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.4E-03
	(total)												**1.1E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.41
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.41a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.8E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	4.7E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.1E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.3E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	2.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-07
	(total)										**3.6E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.7E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.0E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	5.5E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	9.4E-12
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.2E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	6.9E-10
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-08
	(total)										**2.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.8E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.41a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.8E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.9E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.9E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.7E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.5E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.8E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.4E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.2E-02
	(total)												**7.8E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.9E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.7E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.2E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.6E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.9E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.9E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.6E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	9.3E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	4.4E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.5E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	9.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.1E-03
	(total)												**3.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.41a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.47 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.3E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	9.9E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.2E-07	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.7E-09
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.6E-05	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-06
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.6E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.8E-05	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.7E-05
	(total)										**2.9E-05**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.8E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	6.1E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.9E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.6E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.5E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-06
	(total)										**2.3E-06**
										Total Risk Across All Exposure Routes/Pathways	**3.1E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.47 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.8E-05	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.7E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.8E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.9E-03
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.8E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.9E-03
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.6E-06	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.6E-04
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.1E-05	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.0E-03
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.9E-04	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	6.4E-02
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.9E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.9E-01
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.1E-04	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.9E-01
	(total)												**1.0E+00**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.4E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.9E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.4E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.2E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.8E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	7.2E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	7.2E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	8.6E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	8.1E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.7E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.8E-02
	(total)												**6.8E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E+00**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.47
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.47a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.4E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.8E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-07
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.0E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.0E-06
	(total)										**3.2E-06**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.9E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.7E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	4.7E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.1E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.4E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	6.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	(total)										**1.0E-07**
										Total Risk Across All Exposure Routes/Pathways	**3.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.47a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-05	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.6E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-04
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	8.5E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	8.5E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-05	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.4E-04
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.4E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.1E-02
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	6.4E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.4E-02
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	6.9E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.3E-01
	(total)												**3.4E-01**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.6E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	9.2E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.3E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.5E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	9.6E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	9.6E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.1E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.3E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.1E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.6E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.8E-03
	(total)												**9.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.5E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.47a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.45 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.3E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.6E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.2E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-07
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.3E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-06
	(total)										**2.1E-06**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.1E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.2E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.9E-07
	(total)										**4.1E-07**
										Total Risk Across All Exposure Routes/Pathways	**2.5E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.45 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.9E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.9E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.8E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.6E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.4E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.7E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.4E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.1E-02
	(total)												**7.6E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	6.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.5E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.3E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.3E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.5E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.0E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.7E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.0E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.2E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.45
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.45a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.1E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.4E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.3E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-07
	(total)										**1.8E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.7E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.2E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.8E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.6E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	6.1E-12
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	4.0E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.4E-10
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	8.7E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	(total)										**1.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.9E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.45a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.4E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.6E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.6E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	4.7E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	4.7E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	9.5E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.9E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.6E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.2E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	3.5E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.5E-03
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-02
	(total)												**1.9E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	6.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.5E-07
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.3E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.3E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.5E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.0E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.4E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.7E-05
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-03
	(total)												**1.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.0E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.45a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.48 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	9.4E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	7.0E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.7E-07
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	7.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	7.6E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-05
	(total)										**1.2E-05**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.8E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.4E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	3.7E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	6.4E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	4.2E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	9.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-06
	(total)										**1.4E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.4E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 7.48 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.1E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.2E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.1E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.1E-04
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.7E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.7E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.5E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.1E-04
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.1E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	6.8E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	2.0E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.0E-02
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.4E-02
	(total)												**1.1E-01**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.0E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.8E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.9E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.4E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.1E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.1E-05
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.6E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.2E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.1E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.9E-03
	(total)												**1.0E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.48
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.48 - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.1E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	9.2E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.9E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.6E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	6.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	7.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-06
	(total)										**1.2E-06**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.0E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-11
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.2E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.8E-08
	(total)										**4.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.48 - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.9E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.9E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	9.2E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	9.2E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.8E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.7E-05
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	6.9E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.3E-03
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	6.8E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.8E-03
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	7.4E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.5E-02
	(total)												**3.7E-02**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.0E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.4E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.7E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.0E-07
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.0E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.0E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.5E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.2E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.9E-05
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.5E-04
	(total)												**9.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.48
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.46 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	7.0E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	5.2E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.8E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	5.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	5.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-07
	(total)										**9.1E-07**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.3E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.3E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	8.9E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	2.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.2E-07
	(total)										**3.4E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.2E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.46 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.1E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.0E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.0E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.1E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	8.1E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	1.5E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	5.1E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	1.5E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.5E-03
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.5E-03
	(total)												**8.2E-03**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.5E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.3E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	2.6E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.6E-06
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.1E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	6.2E-07
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.9E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.7E-05
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	6.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.1E-03
	(total)												**2.4E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.46
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 7.46a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.6E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.3E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	5.1E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	8.6E-12
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.8E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.2E-09
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	3.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.2E-08
	(total)										**6.6E-08**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.9E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.7E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.8E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-12
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.1E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.3E-10
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.5E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-09
	(total)										**7.0E-09**
										Total Risk Across All Exposure Routes/Pathways	**7.3E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.46a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.6E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.5E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-06
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	5.1E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	5.1E-07
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.0E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.0E-06
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	3.8E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.3E-04
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M	3.8E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.8E-04
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-03
	(total)												**2.0E-03**
Dermal	2,4,6-Trinitrotoluene	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.9E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.8E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.3E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-07
	2-Nitrotoluene	2.00E-01	mg/kg	2.00E-01	mg/kg	M	1.8E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.8E-07
	HMX	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.2E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.4E-08
	RDX	1.50E+01	mg/kg	1.50E+01	mg/kg	M	2.1E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	6.9E-06
	Aluminum	1.49E+04	mg/kg	1.49E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.62E+01	mg/kg	1.62E+01	mg/kg	M	4.5E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.5E-04
	(total)												**1.7E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 7.46 - CENTRAL TENDENCY EXPOSURE (CTE)
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.36 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.8E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.6E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	4.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	(total)										**3.6E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.6E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.7E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.5E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.8E-08
	(total)										**7.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.3E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.36 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.6E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.3E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	6.6E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.0E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.7E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	2.7E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.7E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.9E-03
	(total)												**9.2E-03**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.8E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.8E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.6E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.9E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.6E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.7E-04
	(total)												**1.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.0E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.36
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.36a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.6E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.8E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.7E-08
	(total)										**9.0E-08**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.1E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.2E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.3E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.0E-11
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.3E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.5E-09
	(total)										**6.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.6E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.36a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.3E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.2E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.2E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.1E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	6.9E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.9E-04
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	(total)												**2.3E-03**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.6E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.8E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.2E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.2E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.5E-08
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.6E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.5E-06
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.7E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.1E-05
	(total)												**1.2E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.4E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.36a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.35 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	5.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-06
	(total)										**4.8E-06**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.9E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	6.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.2E-07
	(total)										**9.4E-07**
										Total Risk Across All Exposure Routes/Pathways	**5.8E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.35 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.8E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.9E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.8E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-02
	(total)												**5.4E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	8.3E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.8E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.7E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.7E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.7E-03
	(total)												**7.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.35
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.35a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.2E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.6E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	9.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.4E-07
	(total)										**7.6E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	9.3E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.3E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.6E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-08
	(total)										**3.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**7.9E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.35a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.4E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.6E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.3E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	7.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.1E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-02
	(total)												**2.4E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.2E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.4E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.1E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.6E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.8E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.4E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.5E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.5E-06
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.0E-04
	(total)												**6.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.35a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.34 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.3E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.0E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	5.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	(total)										**4.6E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.5E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.9E-08
	(total)										**9.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 7.34 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.8E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.5E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.8E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.4E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.6E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-03
	(total)												**5.2E-03**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.9E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.6E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.4E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.4E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.3E-06
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.5E-04
	(total)												**7.2E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.9E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.34
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.34a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.6E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	9.1E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	5.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.0E-08
	(total)										**4.2E-08**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.1E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.2E-12	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.8E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.8E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-11
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.1E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	(total)										**1.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.3E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 7.34a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	9.4E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.9E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	9.4E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.0E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.3E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	3.9E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.9E-04
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-04
	(total)												**1.3E-03**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.0E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.9E-06
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.6E-11	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.4E-11	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.2E-08
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.7E-10	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.4E-09
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.6E-07
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.3E-09	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-05
	(total)												**3.6E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.3E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.34a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.33 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.1E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.3E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.3E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.1E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	4.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-07
	(total)										**3.8E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.1E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.2E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.7E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.1E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.3E-08
	(total)										**3.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.33 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.7E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.5E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.7E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.8E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.9E-03
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	3.2E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.2E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.7E-02
	(total)												**1.1E-01**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.4E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.5E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.6E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.8E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.4E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.6E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.7E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.2E-03
	(total)												**6.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.33
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.33a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.5E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	2.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07
	(total)										**1.9E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.5E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.1E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.2E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	7.4E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										**1.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.33a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.9E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.7E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-02
	(total)												**5.4E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.0E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.2E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.6E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.6E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.7E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.9E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.7E-03
	(total)												**2.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.6E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.33a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 4.39
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.39a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.9E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.0E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	2.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-06
	(total)										**1.7E-06**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.3E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	6.2E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	6.8E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.5E-08
	(total)										**5.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.39a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-05	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.4E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.5E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-04
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.3E-03
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	7.1E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.1E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.8E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-01
	(total)												**2.4E-01**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.3E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.1E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.2E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.2E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.3E-03
	(total)												**5.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.4E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.39a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.37 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.3E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	9.8E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.4E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.7E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	7.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-06
	(total)										**1.1E-06**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.9E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.4E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	(total)										**2.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.37 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	3.8E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.6E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.8E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.5E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.6E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-02
	(total)												**5.3E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	8.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.6E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.5E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.4E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-03
	(total)												**7.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.0E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.37
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.37a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.7E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.1E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	6.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.1E-08
	(total)										**9.4E-08**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.3E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.9E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.8E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.1E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.9E-11
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.8E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.2E-09
	(total)										**7.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.37a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	9.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.9E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.6E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.6E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	9.5E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.1E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.4E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	3.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.9E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-03
	(total)												**1.3E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	8.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.6E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.5E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.5E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.4E-06
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-04
	(total)												**7.3E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.37a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.40 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.9E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.6E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-07
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	7.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.2E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.3E-06
	(total)										**6.5E-06**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	2.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.2E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.4E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.3E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.5E-07
	(total)										**7.7E-07**
										Total Risk Across All Exposure Routes/Pathways	**7.2E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.40 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.5E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.1E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.1E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.1E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.7E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.5E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.1E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.4E-03
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	2.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.3E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.1E-02
	(total)												**7.6E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	7.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.4E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.8E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.9E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.4E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.6E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.3E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.5E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.2E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.9E-03
	(total)												**6.4E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.3E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.40
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.40a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.8E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.5E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	7.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.1E-07
	(total)										**6.3E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.7E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.3E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.6E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-08
	(total)										**2.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.40a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.8E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.9E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.9E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.8E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.6E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	7.6E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.6E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-02
	(total)												**2.5E-02**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	6.7E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.3E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.4E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.7E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.0E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.3E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.3E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.3E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.8E-06
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.6E-04
	(total)												**6.1E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.6E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.40a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.38 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	5.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-07
	(total)										**4.8E-07**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	5.7E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07
	(total)										**1.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.6E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.38 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	4.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.1E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.1E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.1E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.0E-04
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.7E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	9.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.0E-03
	(total)												**5.7E-03**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.7E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.3E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.3E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.1E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.8E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.9E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	(total)												**1.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.2E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.38
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.38a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.0E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.6E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.4E-10
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	4.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	(total)										**3.5E-08**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.2E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-11
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.5E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-09
	(total)										**3.8E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.9E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.38a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.0E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.0E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.6E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.5E-05
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M	4.2E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.2E-04
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.5E-04
	(total)												**1.4E-03**
Dermal	2,4,6-Trinitrotoluene	4.00E+00	mg/kg	4.00E+00	mg/kg	M	1.2E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.4E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.3E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.2E-08
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.4E-06
	Aluminum	1.66E+04	mg/kg	1.66E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.5E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.2E-05
	(total)												**1.1E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.5E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.38a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 157
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.28 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.0E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.5E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.2E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	3.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	(total)										**5.2E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.3E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	9.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	6.8E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	6.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.4E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.0E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	5.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-08
	(total)										**9.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.28 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.6E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	9.9E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.0E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	9.9E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.0E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	6.6E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	6.6E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	9.9E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.0E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	4.1E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.4E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	2.3E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.3E-03
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.4E-03
	(total)												**1.1E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.4E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.9E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.0E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.9E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	4.3E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	4.3E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.9E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.8E-07
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	4.1E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.4E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	(total)												**1.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.28
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.28a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.3E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.9E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.6E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	4.4E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.6E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	8.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	7.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	(total)										**1.3E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-11
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.8E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.7E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	6.5E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.1E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	5.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.1E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	6.7E-10
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	5.6E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.4E-09
	(total)										**9.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.28a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.7E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.7E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.5E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.0E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.0E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.5E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	5.7E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.7E-04
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.6E-03
	(total)												**2.7E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.6E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.3E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.7E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.8E-07
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.5E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-07
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	4.1E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	4.1E-07
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.7E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.4E-08
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.9E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.3E-05
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.5E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-04
	(total)												**1.5E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.28
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.27 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-08
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.4E-07	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.4E-09
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	8.7E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.6E-07
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	4.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.0E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.0E-06
	(total)										**7.0E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.4E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	9.2E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	8.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	8.6E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.5E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	8.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-06
	(total)										**1.3E-06**
										Total Risk Across All Exposure Routes/Pathways	**8.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.27 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.9E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.9E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	5.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.2E-04
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.4E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.2E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.8E-02
	(total)												**6.4E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.3E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.3E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.6E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.6E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.3E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.6E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.1E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.4E-03
	(total)												**9.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.3E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.27
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.27a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.3E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.2E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.7E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.4E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-07
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	7.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	6.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.5E-07
	(total)										**1.1E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.9E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	4.9E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.7E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.0E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.8E-08
	(total)										**4.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.27a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.6E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.6E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.3E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.6E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.3E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.7E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.7E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.6E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.1E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.6E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	5.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.9E-03
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.9E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.6E-02
	(total)												**2.8E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.6E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.2E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.0E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.3E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.3E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.0E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.1E-07
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.1E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.1E-05
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.0E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.5E-04
	(total)												**8.0E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.9E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.27
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.26 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.7E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.3E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.3E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	8.4E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.2E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	4.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.8E-07
	(total)										**6.7E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.4E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.3E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	8.9E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	8.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	8.3E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.1E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	7.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	(total)										**1.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**8.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.26 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.8E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.6E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.6E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.8E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.8E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	5.6E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.1E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.3E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.8E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-03
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.6E-03
	(total)												**6.1E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.9E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.2E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.1E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.3E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.5E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.5E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.2E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.5E-07
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.3E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.7E-05
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.1E-04
	(total)												**8.8E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.0E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.26
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.26a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.2E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	7.5E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.3E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.5E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.2E-08
	(total)										**6.1E-08**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.6E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.7E-12
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.6E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.7E-12
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.5E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.4E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	(total)										**2.2E-09**
										Total Risk Across All Exposure Routes/Pathways	**6.3E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.26a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	9.4E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.4E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.0E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.4E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.0E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	9.4E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	9.4E-07
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.4E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.8E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	5.9E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.0E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	3.2E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.2E-04
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.0E-04
	(total)												**1.5E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	4.0E-06
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.1E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-08
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.7E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.4E-08
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.2E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.2E-07
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.1E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.2E-08
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.2E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.9E-06
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.1E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.6E-05
	(total)												**4.4E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.26
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.25 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.5E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.1E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.9E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.9E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.6E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	3.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.8E-07
	(total)										**5.6E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.3E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.3E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	5.6E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.1E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.4E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.3E-08
	(total)										**4.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.25 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.7E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.2E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.8E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.2E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.8E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	7.7E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	7.7E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.2E-05	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.3E-04
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	4.8E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.6E-02
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	2.7E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.7E-02
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.4E-02
	(total)												**1.3E-01**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.7E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.4E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.0E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.6E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.3E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.3E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.1E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.2E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.2E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.3E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.7E-03
	(total)												**8.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.3E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.25
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.25a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.3E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	5.5E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	9.4E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	8.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.5E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.8E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.4E-07
	(total)										**2.8E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.8E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.3E-11
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.1E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.9E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	9.5E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	(total)										**1.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.9E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.25a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.9E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.9E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	5.8E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.2E-04
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.4E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.1E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.7E-02
	(total)												**6.3E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.5E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.2E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	7.7E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	7.7E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	7.0E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.4E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	7.3E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.4E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	6.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.2E-03
	(total)												**2.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.6E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.25
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.31 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.2E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.6E-08
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	4.4E-07	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	7.5E-09
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	6.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.7E-05	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.0E-06
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.5E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.3E-05	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-05
	(total)										**2.2E-05**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.9E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.2E-07	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.2E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-07
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-06
	(total)										**1.7E-06**
										Total Risk Across All Exposure Routes/Pathways	**2.4E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.31 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.6E-05	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.1E-02
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.7E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-03
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.7E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-03
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	5.1E-06	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	5.1E-04
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	7.7E-05	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-03
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.2E-04	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.1E-01
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.8E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.8E-01
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.5E-04	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.9E-01
	(total)												**8.3E-01**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.3E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	4.6E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.7E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.4E-06	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.4E-04
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.3E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.6E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.3E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.5E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.1E-02
	(total)												**5.1E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.8E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.31
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.32a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.3E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	4.9E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	8.3E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	7.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.1E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.4E-07
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.4E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-06
	(total)										**2.5E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.8E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.6E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	5.5E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	9.3E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	4.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	5.1E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.1E-08
	(total)										**7.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.5E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.32a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.5E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-02
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.6E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.3E-03
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.6E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.3E-03
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.7E-06	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.7E-04
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.6E-05	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.1E-04
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.1E-04	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.6E-02
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	5.9E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.9E-02
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.9E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.6E-01
	(total)												**2.8E-01**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.1E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.6E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.6E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.3E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.9E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.9E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.7E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.4E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.8E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	6.0E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.5E-03
	(total)												**6.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.9E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.32
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.29 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.9E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.3E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	5.5E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	4.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.0E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	9.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-06
	(total)										**1.6E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.4E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.1E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.7E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-07
	(total)										**3.0E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.9E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.29 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.8E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.7E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.7E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.8E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.8E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	5.7E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.1E-04
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.4E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.9E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.6E-02
	(total)												**6.2E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.0E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.3E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.1E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.4E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.5E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.5E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.3E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.5E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.8E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.2E-03
	(total)												**8.9E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.29
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.29a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.4E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.1E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.7E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	4.6E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	4.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	9.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	7.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	(total)										**1.4E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-11
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	9.7E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	7.2E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	6.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.7E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.4E-10
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	6.2E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.3E-09
	(total)										**1.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 7.29a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	9.5E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.1E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.1E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	9.5E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	9.5E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.4E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.8E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	5.9E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.0E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	3.3E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.3E-03
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.1E-03
	(total)												**1.5E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.0E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.3E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.1E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.4E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.5E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.5E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.5E-07
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.4E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.8E-05
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.2E-04
	(total)												**8.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.29
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.32 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-08
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.9E-07	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.2E-09
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.2E-05	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	6.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	5.4E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.1E-06
	(total)										**9.4E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.2E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.6E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	7.5E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.3E-09
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	6.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	7.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.7E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	6.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.7E-07
	(total)										**1.1E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.32 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.7E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.5E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.2E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.1E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	8.2E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.1E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	5.5E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	5.5E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	8.2E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.6E-04
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.4E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.1E-02
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.9E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.9E-02
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.3E-02
	(total)												**8.9E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.0E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.8E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.2E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.2E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.0E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.9E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.0E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	6.8E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.3E-03
	(total)												**7.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.7E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.32
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.32a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.8E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.1E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-07
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	6.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	5.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.9E-07
	(total)										**9.2E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.1E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.7E-08
	(total)										**2.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**9.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.32a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.8E-03
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.7E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.7E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.8E-07	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.8E-05
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.7E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.5E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	3.8E-03
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	6.3E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.3E-03
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	5.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.8E-02
	(total)												**3.0E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.7E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.9E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.4E-07
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.8E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	2.1E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	2.1E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.9E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.8E-07
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.0E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	6.5E-05
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.0E-04
	(total)												**7.4E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.32
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.30 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.4E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	2.4E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	2.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	8.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.6E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	4.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.0E-07
	(total)										**7.0E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.5E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	2.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.8E-08	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	3.0E-10
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	1.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.3E-07
	(total)										**2.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**9.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.30 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	4.1E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.1E-05
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	6.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.1E-05
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	4.1E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	4.1E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	6.1E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.2E-05
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	2.5E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.5E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	1.4E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.4E-03
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	1.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.9E-03
	(total)												**6.6E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	4.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.3E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	5.2E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	5.2E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	4.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	9.3E-07
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	4.8E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.6E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	4.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.5E-03
	(total)												**1.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**8.5E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.30
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.30a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.0E-09	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-11
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.4E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	7.0E-09
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	3.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-08
	(total)										**5.1E-08**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.9E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-11
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.3E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.0E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.7E-10	mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	6.3E-12
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.5E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.8E-10
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.2E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.8E-09
	(total)										**5.2E-09**
										Total Risk Across All Exposure Routes/Pathways	**5.6E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.30a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.0E-04
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.6E-06
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	1.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.6E-06
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	1.0E-08	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	1.0E-06
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	1.5E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.1E-06
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	6.4E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.1E-04
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M	3.5E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.5E-04
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.8E-04
	(total)												**1.7E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.9E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-05
	2-Amino-4,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	3.3E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-07
	4-Amino-2,6-dinitrotoluene	6.00E-01	mg/kg	6.00E-01	mg/kg	M	5.0E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-07
	2-Nitrotoluene	4.00E-01	mg/kg	4.00E-01	mg/kg	M	3.7E-09	mg/kg-day	1.0E-02	mg/kg-day	NA	NA	3.7E-07
	HMX	6.00E+00	mg/kg	6.00E+00	mg/kg	M	3.3E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	6.6E-08
	RDX	2.50E+01	mg/kg	2.50E+01	mg/kg	M	3.5E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.2E-05
	Aluminum	1.37E+04	mg/kg	1.37E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	1.15E+01	mg/kg	1.15E+01	mg/kg	M	3.2E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.1E-04
	(total)												**1.3E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.8E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.30
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 153/154
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.20 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.8E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.6E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	3.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	(total)										**3.6E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.3E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.7E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.5E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.8E-08
	(total)										**7.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.3E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.20 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.6E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.5E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	6.6E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.0E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.7E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.2E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.9E-03
	(total)												**8.0E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.4E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.8E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.6E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.9E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.6E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.7E-04
	(total)												**1.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.1E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.20
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.20a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.3E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.9E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	8.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.7E-08
	(total)										**8.9E-08**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.3E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.0E-11
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.3E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.5E-09
	(total)										**6.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.6E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.20a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE /SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.2E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.2E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.1E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	5.4E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.4E-04
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	(total)												**2.0E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.6E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.3E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.8E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	9.2E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.2E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.5E-08
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.6E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.5E-06
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.7E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.1E-05
	(total)												**1.1E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.20
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.19 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	4.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-06
	(total)										**4.8E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.4E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	6.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.2E-07
	(total)										**9.4E-07**
										Total Risk Across All Exposure Routes/Pathways	**5.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 7.19 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.9E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.8E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-02
	(total)												**4.7E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.3E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.8E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.7E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.7E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.7E-03
	(total)												**6.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.19
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.19a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.3E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	7.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.4E-07
	(total)										**7.6E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.3E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.6E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-08
	(total)										**3.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**7.9E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.19a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.6E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.6E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.3E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	5.6E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.6E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-02
	(total)												**2.1E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.6E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.2E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.1E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.6E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.8E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.4E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.5E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.5E-06
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.0E-04
	(total)												**5.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.19
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.18 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.7E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	4.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	(total)										**4.6E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.4E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.3E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.9E-08
	(total)										**9.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.18 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.8E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.8E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.4E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-03
	(total)												**4.5E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.9E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.4E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.4E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.3E-06
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.5E-04
	(total)												**6.4E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.2E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.18
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.18a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.0E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	9.1E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	4.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.0E-08
	(total)										**4.1E-08**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.6E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.7E-12
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.2E-12	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.8E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.8E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-11
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.1E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	(total)										**1.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.3E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.18a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	9.4E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.0E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	9.4E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.0E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.3E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	3.1E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.1E-04
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-04
	(total)												**1.1E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	4.0E-06
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.6E-11	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.8E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.4E-11	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.2E-08
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.7E-10	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.4E-09
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.6E-07
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.3E-09	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-05
	(total)												**3.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.18
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.17 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.5E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.3E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.1E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	3.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-07
	(total)										**3.8E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.3E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.6E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.7E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.1E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.3E-08
	(total)										**3.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.17 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.7E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.9E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	7.7E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.8E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.9E-03
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	2.5E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.5E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.7E-02
	(total)												**9.3E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.7E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.4E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.6E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.8E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.4E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.6E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.7E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.2E-03
	(total)												**6.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.9E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.17
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.17a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE/SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.3E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07
	(total)										**1.9E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.8E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.3E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.0E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.2E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	7.4E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										**1.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.17 - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.9E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.9E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.9E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.7E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-02
	(total)												**4.7E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	2.5E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.2E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.6E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.3E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.6E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.7E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.9E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.7E-03
	(total)												**2.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.9E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.17a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.23 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.2E-06	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	6.6E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.3E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	3.6E-07
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	9.8E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-05
	(total)										**1.5E-05**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	5.9E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-06
	(total)										**1.3E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.23 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.6E-05	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.1E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.8E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.9E-03
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.8E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.9E-03
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.6E-05	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.1E-04
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.8E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.3E-02
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.7E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.7E-01
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.1E-04	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.8E-01
	(total)												**6.2E-01**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.3E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	4.6E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.4E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.2E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.8E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.3E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	8.6E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.6E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	5.4E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	9.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.2E-02
	(total)												**3.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.5E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.23
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.23a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	7.3E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.7E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.0E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-06
	(total)										**1.7E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.8E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.6E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	6.2E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	6.8E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.5E-08
	(total)										**5.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.23a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.5E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-02
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-06	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.4E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.5E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.7E-04
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.3E-05	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.3E-03
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	5.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.6E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.8E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-01
	(total)												**2.1E-01**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.1E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.1E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.3E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.3E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.7E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.1E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.2E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.2E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.3E-03
	(total)												**5.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.23
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.21 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.9E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.4E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.7E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	7.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-06
	(total)										**1.1E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.4E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.4E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	(total)										**2.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.21 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	3.8E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.8E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.4E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.9E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.8E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.5E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.2E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	8.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-02
	(total)												**4.6E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.0E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.5E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.5E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.4E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-03
	(total)												**6.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.21
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.21a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.4E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	4.1E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	8.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	6.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.1E-08
	(total)										**9.3E-08**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.8E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.1E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.9E-11
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.8E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.2E-09
	(total)										**7.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.21a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	9.5E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.6E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.6E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.7E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	9.5E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.1E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.4E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	3.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.1E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-03
	(total)												**1.1E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	4.0E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	8.0E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.1E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	5.6E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.5E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.5E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.5E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	9.4E-06
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-04
	(total)												**6.5E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.21
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.24 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.4E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.8E-08
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-06	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-07
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	6.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.2E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.3E-06
	(total)										**6.5E-06**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.2E-07	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	3.6E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	8.4E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	9.3E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.5E-07
	(total)										**7.6E-07**
										Total Risk Across All Exposure Routes/Pathways	**7.2E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.24 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.7E-06	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	5.5E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.1E-04
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	2.1E-04
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.7E-06	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	5.5E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.1E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.4E-03
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.8E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.8E-02
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.1E-02
	(total)												**6.6E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.5E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	7.0E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.8E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.9E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.5E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.4E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.6E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.3E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.5E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	8.2E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.9E-03
	(total)												**5.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**7.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

		dermal abs	GI Abs
2,4,6-Trinitrotoluene - 0.032	HMX - 0.006	0.032	1
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015	0.006	1
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03	0.009	1
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.	0.1	1
		0.006	1
		0.015	1
			1
		0.03	1

TABLE 4.24
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.24a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	6.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.1E-07
	(total)										**6.3E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.4E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.3E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.6E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-08
	(total)										**2.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.24a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.8E-03
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.9E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-07	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	6.9E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	9.2E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.8E-05
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.4E-06	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	4.6E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	6.0E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.0E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	4.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-02
	(total)												**2.2E-02**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	3.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	6.7E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.4E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	4.7E-07
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.4E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	7.0E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	6.3E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.3E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.3E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	7.8E-06
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.6E-04
	(total)												**5.4E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.3E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1

TABLE 4.24
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 158/159
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.22 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	2.1E-09
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	7.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	1.0E-07	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-08
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	4.6E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-07
	(total)										**4.8E-07**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	8.5E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	8.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07
	(total)										**1.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.6E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.22 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-07	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	4.1E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.1E-08	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.5E-05
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	2.0E-07	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	4.1E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	3.1E-07	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.0E-04
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-03
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	9.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.0E-03
	(total)												**4.9E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	8.3E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.7E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.3E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.5E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.7E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.6E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	3.1E-07
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	5.8E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.9E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	(total)												**1.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.2E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 4.22
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.22a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-09	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.6E-09	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	8.4E-10
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	3.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	(total)										**3.5E-08**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.9E-10	mg/kg-day	3.0E-02	$(mg/kg\text{-}day)^{-1}$	1.8E-11
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.7E-02	$(mg/kg\text{-}day)^{-1}$	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-10	mg/kg-day	1.1E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-11
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.5E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-09
	(total)										**3.8E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.9E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032
2-Amino-4,6-dinitrotoluene - 0.006
4-Amino-2,6-dinitrotoluene - 0.009
Semivolatiles - 0.1
HMX - 0.006
RDX - 0.015
Arsenic - 0.03
Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 7.22a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE / SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Surface and Subsurface Soil
Exposure Point: Building 152
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-08	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.0E-04
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-06
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.6E-09	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	3.8E-06
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.1E-08	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	1.0E-06
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	7.6E-08	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	2.5E-05
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M	3.3E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.3E-04
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.5E-04
	(total)												**1.2E-03**
Dermal	2,4,6-Trinitrotoluene	2.00E+00	mg/kg	2.00E+00	mg/kg	M	5.9E-09	mg/kg-day	5.0E-04	mg/kg-day	NA	NA	1.2E-05
	2-Amino-4,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.7E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	8.3E-08
	4-Amino-2,6-dinitrotoluene	3.00E-01	mg/kg	3.00E-01	mg/kg	M	2.5E-10	mg/kg-day	2.0E-03	mg/kg-day	NA	NA	1.2E-07
	2-Nitrotoluene		mg/kg		mg/kg	M		mg/kg-day	1.0E-02	mg/kg-day	NA	NA	
	HMX	2.00E+00	mg/kg	2.00E+00	mg/kg	M	1.1E-09	mg/kg-day	5.0E-02	mg/kg-day	NA	NA	2.2E-08
	RDX	3.00E+00	mg/kg	3.00E+00	mg/kg	M	4.2E-09	mg/kg-day	3.0E-03	mg/kg-day	NA	NA	1.4E-06
	Aluminum	1.31E+04	mg/kg	1.31E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.5E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.2E-05
	(total)												**9.6E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.3E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

2,4,6-Trinitrotoluene - 0.032	HMX - 0.006
2-Amino-4,6-dinitrotoluene - 0.006	RDX - 0.015
4-Amino-2,6-dinitrotoluene - 0.009	Arsenic - 0.03
Semivolatiles - 0.1	Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
0.032	1
0.006	1
0.009	1
0.1	1
0.006	1
0.015	1
	1
0.03	1

TABLE 9.10. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient							
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Surface and Subsurface Soil Building 152 Historical Data	2,4,6-Trinitrotoluene	9.E-08		9.E-09	1.E-07	2,4,6-Trinitrotoluene	Liver							
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver							
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver							
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood							
			RDX	5.E-07		2.E-08	5.E-07	RDX	Prostate					Building 152 - Soil		Total
			Aluminum					Aluminum	CNS					2.2E-05	2.0E-06	2.35E-05
			Arsenic	2.E-05		2.E-06	2.E-05	Arsenic	Skin, CVS							
			Total Risk Across Surface/Subsurface Soil - Bldg 152 - Historical Data				2.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 152 - Historical Data								
Soil	Soil	Surface and Subsurface Soil Building 153/154 Historical Data	2,4,6-Trinitrotoluene	9.E-08		9.E-09	1.E-07	2,4,6-Trinitrotoluene	Liver							
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver							
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver							
			2-Nitrotoluene	1.E-08		3.E-09	1.E-08	2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood							
			RDX	4.E-06		2.E-07	5.E-06	RDX	Prostate					Building 153/154 - Soil		Total
			Aluminum					Aluminum	CNS					3.1E-05	2.8E-06	3.42E-05
			Arsenic	3.E-05		3.E-06	3.E-05	Arsenic	Skin, CVS							
			Total Risk Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data				3.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 153/154 - Historical Data								
Soil	Soil	Surface and Subsurface Soil Building 157 Historical Data	2,4,6-Trinitrotoluene	2.E-07		2.E-08	2.E-07	2,4,6-Trinitrotoluene	Liver							
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver							
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver							
			2-Nitrotoluene					2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood							
			RDX	5.E-07		2.E-08	5.E-07	RDX	Prostate					Building 157 - Soil		Total
			Aluminum					Aluminum	CNS					2.2E-05	2.0E-06	2.36E-05
			Arsenic	2.E-05		2.E-06	2.E-05	Arsenic	Skin, CVS							
			Total Risk Across Surface/Subsurface Soil - Bldg 157 - Historical Data				2.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 157 - Historical Data								
Soil	Soil	Surface and Subsurface Soil Building 158/159 Historical Data	2,4,6-Trinitrotoluene	1.E-07		1.E-08	2.E-07	2,4,6-Trinitrotoluene	Liver							
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver							
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver							
			2-Nitrotoluene	5.E-09		2.E-09	7.E-09	2-Nitrotoluene	Spleen							
			HMX					HMX	Liver, Blood							
			RDX	3.E-06		1.E-07	3.E-06	RDX	Prostate					Building 158/159 - Soil		Total
			Aluminum					Aluminum	CNS					4.1E-05	3.7E-06	4.45E-05
			Arsenic	4.E-05		4.E-06	4.E-05	Arsenic	Skin, CVS							
			Total Risk Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data				4.E-05	Total Hazard Index Across Surface/Subsurface Soil - Bldg 158/159 - Historical Data								

TABLE 4.14
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
`	Soil	Surface Soil	Aluminum					Aluminum	CNS	4.E-01			4.E-01
		SWMU 12 Proper	Arsenic	1.E-05		1.E-06	2.E-05	Arsenic	Skin, CVS	4.E-01		3.E-02	4.E-01
			Iron					Iron	NA	1.E+00			1.E+00
			Manganese					Manganese	CNS	2.E-01			2.E-01
			Vanadium					Vanadium	Kidney	6.E-01			6.E-01
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-05	Total Hazard Index Across Surface Soil - SWMU 12 Proper					3.E+00
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-01			3.E-01
		SWMU 12 Proper	Arsenic	1.E-05		1.E-06	1.E-05	Arsenic	Skin, CVS	3.E-01		3.E-02	3.E-01
			Barium					Barium	Kidney	1.E-02			1.E-02
			Iron					Iron	NA	1.E+00			1.E+00
			Manganese					Manganese	CNS	1.E-01			1.E-01
			Vanadium					Vanadium	Kidney	5.E-01			5.E-01
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-05	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					3.E+00

Target Organ Analysis - Surface Soil

Total CNS HI =	6.E-01	Total Skin HI =	4.E-01
Total CVS HI =	4.E-01	Total Kidney HI =	6.E-01

Target Organ Analysis - Subsurface Soil

Total CNS HI =	4.E-01	Total Skin HI =	3.E-01
Total CVS HI =	3.E-01	Total Kidney HI =	5.E-01

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	4.E-02			4.E-02
		SWMU 12 Proper	Arsenic	6.E-06		8.E-07	7.E-06	Arsenic	Skin, CVS	4.E-02		5.E-03	5.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	2.E-02			2.E-02
			Vanadium					Vanadium	Kidney	7.E-02			7.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				7.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					3.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	4.E-02			4.E-02
		SWMU 12 Proper	Arsenic	5.E-06		6.E-07	6.E-06	Arsenic	Skin, CVS	3.E-02		4.E-03	4.E-02
			Barium					Barium	Kidney	1.E-03			1.E-03
			Iron					Iron	NA	2.E-01			2.E-01
			Manganese					Manganese	CNS	1.E-02			1.E-02
			Vanadium					Vanadium	Kidney	6.E-02			6.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				6.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					3.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	6.E-02	Total Skin HI =	5.E-02
Total CVS HI =	5.E-02	Total Kidney HI =	7.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	5.E-02	Total Skin HI =	4.E-02
Total CVS HI =	4.E-02	Total Kidney HI =	6.E-02

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	3.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	1.E-02			1.E-02
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				1.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	9.E-07		2.E-07	1.E-06	Arsenic	Skin, CVS	2.E-02		5.E-03	3.E-02
			Barium					Barium	Kidney	9.E-04			9.E-04
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	7.E-03			7.E-03
			Vanadium					Vanadium	Kidney	4.E-02			4.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	5.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	4.E-02

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-03			3.E-03
		SWMU 12 Proper	Arsenic	5.E-07		2.E-07	7.E-07	Arsenic	Skin, CVS	3.E-03		1.E-03	4.E-03
			Iron					Iron	NA	1.E-02			1.E-02
			Manganese					Manganese	CNS	2.E-03			2.E-03
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				7.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-03			3.E-03
		SWMU 12 Proper	Arsenic	4.E-07		1.E-07	5.E-07	Arsenic	Skin, CVS	3.E-03		1.E-03	4.E-03
			Barium					Barium	Kidney	9.E-05			9.E-05
			Iron					Iron	NA	1.E-02			1.E-02
			Manganese					Manganese	CNS	8.E-04			8.E-04
			Vanadium					Vanadium	Kidney	4.E-03			4.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	5.E-03	Total Skin HI =	4.E-03
Total CVS HI =	4.E-03	Total Kidney HI =	5.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	4.E-03	Total Skin HI =	4.E-03
Total CVS HI =	4.E-03	Total Kidney HI =	4.E-03

TABLE 9.4. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ASOLESCENT TRESPASSERS
SWMU 13 (MINE FILL B)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	5.E-03			5.E-03
		SWMU 12 Proper	Arsenic	4.E-07		7.E-08	4.E-07	Arsenic	Skin, CVS	5.E-03		1.E-03	6.E-03
			Iron					Iron	NA	2.E-02			2.E-02
			Manganese					Manganese	CNS	3.E-03			3.E-03
			Vanadium					Vanadium	Kidney	8.E-03			8.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					4.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	4.E-03			4.E-03
		SWMU 12 Proper	Arsenic	3.E-07		6.E-08	4.E-07	Arsenic	Skin, CVS	4.E-03		8.E-04	5.E-03
			Barium					Barium	Kidney	2.E-04			2.E-04
			Iron					Iron	NA	2.E-02			2.E-02
			Manganese					Manganese	CNS	1.E-03			1.E-03
			Vanadium					Vanadium	Kidney	7.E-03			7.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				4.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					4.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	7.E-03	Total Skin HI =	6.E-03
Total CVS HI =	6.E-03	Total Kidney HI =	8.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	6.E-03	Total Skin HI =	5.E-03
Total CVS HI =	5.E-03	Total Kidney HI =	7.E-03

TABLE 9.3. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	5.E-06		9.E-07	6.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	4.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	2.E-02			2.E-02
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				6.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	4.E-06		8.E-07	5.E-06	Arsenic	Skin, CVS	2.E-02		5.E-03	3.E-02
			Barium					Barium	Kidney	9.E-04			9.E-04
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	8.E-03			8.E-03
			Vanadium					Vanadium	Kidney	4.E-02			4.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-02	Total Skin HI =	4.E-02
Total CVS HI =	4.E-02	Total Kidney HI =	5.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	4.E-02

TABLE 9.2. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-03		0.E+00	3.E-03
		SWMU 12 Proper	Arsenic	5.E-07		9.E-08	5.E-07	Arsenic	Skin, CVS	3.E-03		6.E-04	3.E-03
			Iron					Iron	NA	1.E-02		0.E+00	1.E-02
			Manganese					Manganese	CNS	1.E-03		0.E+00	1.E-03
			Vanadium					Vanadium	Kidney	5.E-03		0.E+00	5.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-03		0.E+00	3.E-03
		SWMU 12 Proper	Arsenic	4.E-07		7.E-08	5.E-07	Arsenic	Skin, CVS	2.E-03		5.E-04	3.E-03
			Barium					Barium	Kidney	9.E-05		0.E+00	9.E-05
			Iron					Iron	NA	1.E-02		0.E+00	1.E-02
			Manganese					Manganese	CNS	7.E-04		0.E+00	7.E-04
			Vanadium					Vanadium	Kidney	4.E-03		0.E+00	4.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-03	Total Skin HI =	3.E-03
Total CVS HI =	3.E-03	Total Kidney HI =	5.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-03	Total Skin HI =	3.E-03
Total CVS HI =	3.E-03	Total Kidney HI =	4.E-03

TABLE 9.1. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	6.E-02			6.E-02
		SWMU 12 Proper	Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	6.E-02		5.E-03	6.E-02
			Iron					Iron	NA	2.E-01			2.E-01
			Manganese					Manganese	CNS	3.E-02			3.E-02
			Vanadium					Vanadium	Kidney	9.E-02			9.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					4.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	5.E-02			5.E-02
		SWMU 12 Proper	Arsenic	3.E-07		3.E-08	3.E-07	Arsenic	Skin, CVS	5.E-02		4.E-03	5.E-02
			Barium					Barium	Kidney	2.E-03			2.E-03
			Iron					Iron	NA	2.E-01			2.E-01
			Manganese					Manganese	CNS	2.E-02			2.E-02
			Vanadium					Vanadium	Kidney	8.E-02			8.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				3.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					4.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	9.E-02	Total Skin HI =	6.E-02
Total CVS HI =	6.E-02	Total Kidney HI =	9.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	7.E-02	Total Skin HI =	5.E-02
Total CVS HI =	5.E-02	Total Kidney HI =	8.E-02

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-06		8.E-08	2.E-06	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-06		6.E-08	2.E-06	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
`	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-01			1.E-01
		SWMU 12 Proper	Arsenic	2.E-06		6.E-08	2.E-06	Arsenic	Skin, CVS	1.E-01		4.E-03	1.E-01
			Iron					Iron	NA	4.E-01			4.E-01
			Manganese					Manganese	CNS	7.E-02			7.E-02
			Vanadium					Vanadium	Kidney	2.E-01			2.E-01
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-06	Total Hazard Index Across Surface Soil - SWMU 12 Proper					1.E+00
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-01			1.E-01
		SWMU 12 Proper	Arsenic	1.E-06		5.E-08	1.E-06	Arsenic	Skin, CVS	1.E-01		4.E-03	1.E-01
			Barium					Barium	Kidney	4.E-03			4.E-03
			Iron					Iron	NA	5.E-01			5.E-01
			Manganese					Manganese	CNS	3.E-02			3.E-02
			Vanadium					Vanadium	Kidney	2.E-01			2.E-01
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-06	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					9.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-01	Total Skin HI =	1.E-01
Total CVS HI =	1.E-01	Total Kidney HI =	2.E-01

Target Organ Analysis - Subsurface Soil

Total CNS HI =	1.E-01	Total Skin HI =	1.E-01
Total CVS HI =	1.E-01	Total Kidney HI =	2.E-01

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	6.E-07		2.E-08	6.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02
			Iron					Iron	NA	5.E-02			5.E-02
			Manganese					Manganese	CNS	7.E-03			7.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				6.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					1.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	5.E-07		2.E-08	5.E-07	Arsenic	Skin, CVS	1.E-02		4.E-04	1.E-02
			Barium					Barium	Kidney	4.E-04			4.E-04
			Iron					Iron	NA	5.E-02			5.E-02
			Manganese					Manganese	CNS	4.E-03			4.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				5.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					1.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	2.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	1.E-07		1.E-08	1.E-07	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				1.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	1.E-07		9.E-09	1.E-07	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				1.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	7.E-03			7.E-03
		SWMU 12 Proper	Arsenic	9.E-08		7.E-09	1.E-07	Arsenic	Skin, CVS	7.E-03		6.E-04	8.E-03
			Iron					Iron	NA	2.E-02			2.E-02
			Manganese					Manganese	CNS	4.E-03			4.E-03
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				1.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					5.E-02
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	6.E-03			6.E-03
		SWMU 12 Proper	Arsenic	8.E-08		6.E-09	8.E-08	Arsenic	Skin, CVS	6.E-03		5.E-04	6.E-03
			Barium					Barium	Kidney	2.E-04			2.E-04
			Iron					Iron	NA	3.E-02			3.E-02
			Manganese					Manganese	CNS	2.E-03			2.E-03
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				8.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					5.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	1.E-02	Total Skin HI =	8.E-03
Total CVS HI =	8.E-03	Total Kidney HI =	1.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	8.E-03	Total Skin HI =	6.E-03
Total CVS HI =	6.E-03	Total Kidney HI =	1.E-02

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	8.E-04			8.E-04
		SWMU 12 Proper	Arsenic	3.E-08		4.E-09	4.E-08	Arsenic	Skin, CVS	8.E-04		8.E-05	8.E-04
			Iron					Iron	NA	3.E-03			3.E-03
			Manganese					Manganese	CNS	4.E-04			4.E-04
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-08	Total Hazard Index Across Surface Soil - SWMU 12 Proper					6.E-03
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	7.E-04			7.E-04
		SWMU 12 Proper	Arsenic	3.E-08		3.E-09	3.E-08	Arsenic	Skin, CVS	6.E-04		7.E-05	7.E-04
			Barium					Barium	Kidney	2.E-05			2.E-05
			Iron					Iron	NA	3.E-03			3.E-03
			Manganese					Manganese	CNS	2.E-04			2.E-04
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				3.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					6.E-03

Target Organ Analysis - Surface Soil

Total CNS HI =	1.E-03	Total Skin HI =	8.E-04
Total CVS HI =	8.E-04	Total Kidney HI =	1.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	9.E-04	Total Skin HI =	7.E-04
Total CVS HI =	7.E-04	Total Kidney HI =	1.E-03

TABLE 9.4. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ASOLESCENT TRESPASSERS
SWMU 13 (MINE FILL B)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-03			1.E-03
		SWMU 12 Proper	Arsenic	9.E-08		7.E-09	9.E-08	Arsenic	Skin, CVS	1.E-03		9.E-05	1.E-03
			Iron					Iron	NA	4.E-03			4.E-03
			Manganese					Manganese	CNS	6.E-04			6.E-04
			Vanadium					Vanadium	Kidney	2.E-03			2.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				9.E-08	Total Hazard Index Across Surface Soil - SWMU 12 Proper					9.E-03
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-03			1.E-03
		SWMU 12 Proper	Arsenic	7.E-08		5.E-09	8.E-08	Arsenic	Skin, CVS	1.E-03		8.E-05	1.E-03
			Barium					Barium	Kidney	4.E-05			4.E-05
			Iron					Iron	NA	5.E-03			5.E-03
			Manganese					Manganese	CNS	3.E-04			3.E-04
			Vanadium					Vanadium	Kidney	2.E-03			2.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				8.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					9.E-03

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-03	Total Skin HI =	1.E-03
Total CVS HI =	1.E-03	Total Kidney HI =	2.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	1.E-03	Total Skin HI =	1.E-03
Total CVS HI =	1.E-03	Total Kidney HI =	2.E-03

TABLE 9.3. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - OCCUPATIONAL WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Occupational Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	7.E-07		3.E-08	8.E-07	Arsenic	Skin, CVS	1.E-02		5.E-04	1.E-02
			Iron					Iron	NA	4.E-02			4.E-02
			Manganese					Manganese	CNS	7.E-03			7.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				8.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					1.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	1.E-02			1.E-02
		SWMU 12 Proper	Arsenic	6.E-07		2.E-08	6.E-07	Arsenic	Skin, CVS	1.E-02		4.E-04	1.E-02
			Barium					Barium	Kidney	4.E-04			4.E-04
			Iron					Iron	NA	5.E-02			5.E-02
			Manganese					Manganese	CNS	3.E-03			3.E-03
			Vanadium					Vanadium	Kidney	2.E-02			2.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				6.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					9.E-02

Target Organ Analysis - Surface Soil

Total CNS HI =	2.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	1.E-02	Total Skin HI =	1.E-02
Total CVS HI =	1.E-02	Total Kidney HI =	2.E-02

TABLE 9.2. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	7.E-04		0.E+00	7.E-04
		SWMU 12 Proper	Arsenic	4.E-08		2.E-09	4.E-08	Arsenic	Skin, CVS	7.E-04		3.E-05	7.E-04
			Iron					Iron	NA	2.E-03		0.E+00	2.E-03
			Manganese					Manganese	CNS	4.E-04		0.E+00	4.E-04
			Vanadium					Vanadium	Kidney	1.E-03		0.E+00	1.E-03
			Total Risk Across Surface Soil - SWMU 12 Proper				4.E-08	Total Hazard Index Across Surface Soil - SWMU 12 Proper					5.E-03
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	6.E-04		0.E+00	6.E-04
		SWMU 12 Proper	Arsenic	3.E-08		1.E-09	4.E-08	Arsenic	Skin, CVS	6.E-04		2.E-05	6.E-04
			Barium					Barium	Kidney	2.E-05		0.E+00	2.E-05
			Iron					Iron	NA	3.E-03		0.E+00	3.E-03
			Manganese					Manganese	CNS	2.E-04		0.E+00	2.E-04
			Vanadium					Vanadium	Kidney	1.E-03		0.E+00	1.E-03
			Total Risk Across Subsurface Soil - SWMU 12 Proper				4.E-08	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					5.E-03

Target Organ Analysis - Surface Soil

Total CNS HI =	1.E-03	Total Skin HI =	7.E-04
Total CVS HI =	7.E-04	Total Kidney HI =	1.E-03

Target Organ Analysis - Subsurface Soil

Total CNS HI =	8.E-04	Total Skin HI =	6.E-04
Total CVS HI =	6.E-04	Total Kidney HI =	1.E-03

TABLE 9.1. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION/EXCAVATION WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Construction/Excavation Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	3.E-02		2.E-03	3.E-02
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	1.E-02			1.E-02
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-07	Total Hazard Index Across Surface Soil - SWMU 12 Proper					2.E-01
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS	3.E-02			3.E-02
		SWMU 12 Proper	Arsenic	2.E-07		9.E-09	2.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	3.E-02
			Barium					Barium	Kidney	9.E-04			9.E-04
			Iron					Iron	NA	1.E-01			1.E-01
			Manganese					Manganese	CNS	8.E-03			8.E-03
			Vanadium					Vanadium	Kidney	4.E-02			4.E-02
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-07	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					2.E-01

Target Organ Analysis - Surface Soil

Total CNS HI =	4.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	5.E-02

Target Organ Analysis - Subsurface Soil

Total CNS HI =	3.E-02	Total Skin HI =	3.E-02
Total CVS HI =	3.E-02	Total Kidney HI =	4.E-02

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	23400	NA	29800	J	mg/kg	29800	Maximum	N < 10 (1)	29800	Maximum	N < 10 (1)
Arsenic	mg/kg	6.8	NA	9	J	mg/kg	9	Maximum	N < 10	9	Maximum	N < 10
Iron	mg/kg	24400	NA	30600	J	mg/kg	30600	Maximum	N < 10	30600	Maximum	N < 10
Manganese	mg/kg	404	NA	1080	J	mg/kg	1080	Maximum	N < 10	1080	Maximum	N < 10
Vanadium	mg/kg	39.4	NA	48.6	J	mg/kg	48.6	Maximum	N < 10	48.6	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

23,378
6.8
24,389
404
39

TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	24000	26900	37000	J	mg/kg	26900	Student-t	ProUCL (1)	26900	Student-t	ProUCL (1)
Arsenic	mg/kg	6	7.5	12.3	J	mg/kg	7.5	Student-t	ProUCL (1)	7.5	Student-t	ProUCL (1)
Barium	mg/kg	130	185	568	J	mg/kg	183	Gamma	ProUCL (2)	183	Gamma	ProUCL (2)
Iron	mg/kg	29000	34200	49600	J	mg/kg	34200	Student-t	ProUCL (1)	34200	Student-t	ProUCL (1)
Manganese	mg/kg	300	477	1600	J	mg/kg	542	Gamma	ProUCL (2)	542	Gamma	ProUCL (2)
Vanadium	mg/kg	37	41.6	50.5	J	mg/kg	41.6	Student-t	ProUCL (1)	41.6	Student-t	ProUCL (1)

Definitions:
Gamma = Approximate Gamma 95% UCL.

1 - ProUCL indicates data are normally distributed.
2 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.

23,871	26865.0072
6.3	7.47213082
133.1	185.340062
29,481	34170.8091
304	476.835948
37	41.6448372

26865.0072
7.47213082
182.772988
34170.8091
541.703316
41.6448372

Definitions:
95 % UCL-C = 95% Chebyshev UCL (non-parametric).
99 % UCL-C = 99% Chebyshev UCL (non-parametric).
Gamma = Approximate Gamma 95% UCL.
97.5 % UCL-C = 97.5% Chebyshev UCL (log-normal).
95 % UCL-T = 95% UCL of Log-transformed Data.

1 - UCL is greater than the maximum concentration. Therefore, the maximum concentration is used as the EPC.
2 - EPC statistic is recommended by U.S. EPA's ProUCL software.
3 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).
4 - Shapiro-Wilk W Test indicates data are log-normally distributed.

TABLE 8.4 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.5E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	8.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.5E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.9E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.2E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.4 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	4.9E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.9E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.0E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	5.1E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.7E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.8E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.6E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	8.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.1E-03
	(total)												**3.7E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.8E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**9.8E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.8E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.4
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.4a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	5.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	3.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**8.8E-08**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.4E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.5E-09
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.5E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.4E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.4a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSSERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.3E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.2E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.4E-04
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.0E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	2.0E-03
	(total)												**9.4E-03**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.8E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.2E-05
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**9.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.4E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.4
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.3 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.0E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-06
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.1E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.7E-06**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	6.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.3E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.3E-07**
										Total Risk Across All Exposure Routes/Pathways	**5.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.3 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.9E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.9E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.9E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	3.0E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.0E-01
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.1E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.5E-02
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.8E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.8E-02
	(total)												**2.2E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.8E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.3E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.3
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.3a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	5.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.4E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	6.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.4E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.9E-08**
										Total Risk Across All Exposure Routes/Pathways	**7.7E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.3a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.9E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.4E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.6E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.6E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.1E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	2.1E-02
	(total)												**9.7E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.1E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.1E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.7E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.3
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.2 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.5E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	6.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.0E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.0E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.2 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.8E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.8E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.9E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	9.6E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.0E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.4E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.6E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.6E-03
	(total)												**2.1E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.2
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.2a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	9.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.1E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	9.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.1E-08**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.1E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-09**
										Total Risk Across All Exposure Routes/Pathways	**4.2E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.2a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.0E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.0E-04
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.0E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	7.2E-04	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.4E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.6E-04
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.1E-03
	(total)												**5.3E-03**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.4E-09	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-05
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.8E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.3E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.2
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.1 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CONSTRUCTION WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	8.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	8.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.7E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.1E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.1 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CONSTRUCTION WORKERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	5.8E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.8E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.8E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	5.9E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.0E-01
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.1E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.0E-02
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	9.4E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	9.4E-02
	(total)												**4.4E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.2E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.4E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.1
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 4.1
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF / BW x AT
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED / BW x AT
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.7 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	3.3E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	9.9E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-05
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	3.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	5.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-05**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-06
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.7 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	3.8E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.8E-01
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.2E-04	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.8E-01
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	3.9E-01	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.3E+00
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.4E-02	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.0E-01
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	6.2E-04	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	6.2E-01
	(total)												**2.9E+00**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	9.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.2E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.2E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.9E+00**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.7
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.7a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	3.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-06
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	3.7E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	5.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-06**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.7E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.5E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.5E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.7a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.3E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.3E-01
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.8E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.3E-01
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.3E-01	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.4E-01
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.6E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	6.6E-02
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.1E-04	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	2.1E-01
	(total)												**9.7E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.3E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.7E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.7
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.5 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	7.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-06
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	8.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-06**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.5 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.8E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.8E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	8.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.8E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.9E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	9.7E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.0E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.5E-02
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.6E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.6E-02
	(total)												**2.1E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.5
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.5a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	2.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	6.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.2E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	2.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	7.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.2E-08**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.8E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.3E-09
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**9.9E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.5a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.1E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.1E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	7.3E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.4E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.6E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.7E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.2E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.2E-02
	(total)												**5.4E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.6E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**5.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.5
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.8 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.2E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.3E-06
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.4E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	5.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.3E-06**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	5.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.6E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.6E-07**
										Total Risk Across All Exposure Routes/Pathways	**7.1E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.8 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	4.1E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.1E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.1E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	4.2E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.4E-01
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.5E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.1E-02
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	6.7E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	6.7E-02
	(total)												**3.1E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.9E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.9E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.1E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.8
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.8a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.2E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.2E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.4E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.1E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.8a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.4E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	4.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.4E-02
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.4E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.7E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	4.9E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.1E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	2.2E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	2.2E-02
	(total)												**1.0E-01**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.7E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.7E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.0E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.8
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.6 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	1.0E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.7E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	3.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.7E-07**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.6 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	3.0E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.0E-03
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	9.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.1E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	3.1E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.0E-02
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	1.1E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.6E-03
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	4.9E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.9E-03
	(total)												**2.3E-02**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	3.5E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.2E-03
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.2E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.4E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.6
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.6a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	7.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.4E-08**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.5E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.7E-09
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.7E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.8E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 7.6a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M	7.6E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	7.6E-04
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.6E-04
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M	7.8E-04	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.6E-03
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M	2.7E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.9E-04
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M	1.2E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.2E-03
	(total)												**5.7E-03**
Dermal	Aluminum	2.98E+04	mg/kg	2.98E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	9.00E+00	mg/kg	9.00E+00	mg/kg	M	2.5E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.3E-05
	Iron	3.06E+04	mg/kg	3.06E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	1.08E+03	mg/kg	1.08E+03	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.86E+01	mg/kg	4.86E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**8.3E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.8E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	1
	0.04
	0.026

TABLE 4.6
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.12 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	7.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	4.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	8.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.9E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.8E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.8E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.8E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.12 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	4.5E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	4.5E-03
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.1E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	3.0E-05	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	1.5E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	5.7E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.9E-02
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	9.0E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.3E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	6.9E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	6.9E-03
	(total)												**3.6E-02**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	8.2E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**8.2E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.7E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.12
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.12a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	4.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.3E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	2.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	3.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	2.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.3E-08**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.6E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.4E-09
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.4E-09**
										Total Risk Across All Exposure Routes/Pathways	**7.9E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.12a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.1E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.1E-03
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.1E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.0E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	7.6E-06	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	3.8E-05
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.4E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.7E-03
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	2.2E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.2E-04
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.7E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.7E-03
	(total)												**9.0E-03**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.3E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	7.7E-05
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**7.7E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.0E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.12
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADOLESCENT TRESPASSERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	26	Professional Judgement	13	Professional Judgement	
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.60E-08
Noncancer Ingestion Intake - RME = 1.66E-07

Cancer Ingestion Intake - CTE = 6.51E-09
Noncancer Ingestion Intake - CTE = 4.14E-08

Cancer Dermal Intake - RME = 1.71E-07
Noncancer Dermal Intake - RME = 1.09E-06

Cancer Dermal Intake - CTE = 1.61E-08
Noncancer Dermal Intake - CTE = 1.03E-07

TABLE 8.11 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	9.4E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.6E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.9E-06
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	6.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.2E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.9E-06**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	5.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.8E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**4.7E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.11 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.6E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	7.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.4E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.8E-04	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	9.0E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	3.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.1E-01
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	5.3E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.6E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	4.1E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.1E-02
	(total)												**2.1E-01**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.8E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.8E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.11
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.11a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.5E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	4.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.2E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.9E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	3.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	2.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.2E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.6E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.5E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.5E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.11a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF OCCUPATIONAL WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.2E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.1E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	7.8E-05	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	3.9E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.5E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.9E-02
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	2.3E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.3E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.8E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.8E-02
	(total)												**9.3E-02**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.3E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.2E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.2E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.3E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.11
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF OCCUPATIONAL WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Occupational Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	250	U.S. EPA, May 1993	219	U.S. EPA, May 1993	
	ED	Exposure Duration	years	25	U.S. EPA, December 1989	9	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-07
Noncancer Ingestion Intake - RME = 9.78E-07

Cancer Ingestion Intake - CTE = 5.51E-08
Noncancer Ingestion Intake - CTE = 4.29E-07

Cancer Dermal Intake - RME = 2.31E-06
Noncancer Dermal Intake - RME = 6.46E-06

Cancer Dermal Intake - CTE = 7.27E-08
Noncancer Dermal Intake - CTE = 5.66E-07

TABLE 8.10 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	9.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.5E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.8E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	6.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.1E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.8E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	5.0E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.5E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.5E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.5E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.10 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.5E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.5E-03
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	7.0E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.3E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.7E-05	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	8.6E-05
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	3.2E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.1E-02
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	5.1E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.3E-04
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	3.9E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	3.9E-03
	(total)												**2.0E-02**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.6E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.10
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.23a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	8.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.3E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	5.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.4E-08**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	9.0E-10	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-09
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.5E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.10a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	6.3E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.3E-04
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.8E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.9E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	4.3E-06	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	2.1E-05
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	8.0E-04	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.7E-03
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.3E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.8E-04
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	9.8E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	9.8E-04
	(total)												**5.1E-03**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	7.0E-09	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.3E-05
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.3E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.1E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.10
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.02	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	24	Professional Judgement	12	Professional Judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.35E-08
Noncancer Ingestion Intake - RME = 9.39E-08

Cancer Ingestion Intake - CTE = 3.02E-09
Noncancer Ingestion Intake - CTE = 2.35E-08

Cancer Dermal Intake - RME = 2.21E-07
Noncancer Dermal Intake - RME = 6.20E-07

Cancer Dermal Intake - CTE = 3.99E-09
Noncancer Dermal Intake - CTE = 3.10E-08

TABLE 8.9 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CONSTRUCTION WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	7.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.1E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	5.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	9.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.1E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.9 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CONSTRUCTION WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	5.2E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	5.2E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.8E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	3.5E-04	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	1.8E-03
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	6.6E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.2E-01
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.1E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.5E-02
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	8.1E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	8.1E-02
	(total)												**4.2E-01**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.4E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.4E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.2E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.9
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.9a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CONSTRUCTION WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	3.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	2.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	4.7E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	7.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	5.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.6E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	6.2E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.3E-09
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.3E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.9a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CONSTRUCTION WORKERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.6E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	7.3E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.4E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.8E-04	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	8.9E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	3.3E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.1E-01
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	5.3E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.5E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	4.0E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.0E-02
	(total)												**2.1E-01**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	4.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.5E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**1.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.9
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	330	U.S. EPA, December 2002	165	Professional Judgement	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	U.S. EPA, December 1989
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	U.S. EPA, December 2002	3,300	U.S. EPA, December 2002	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 2002	0.1	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	150	Professional Judgement	150	Professional Judgement	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	U.S. EPA, December 1989	365	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 2.77E-08
Noncancer Ingestion Intake - RME = 1.94E-06

Cancer Ingestion Intake - CTE = 1.38E-08
Noncancer Ingestion Intake - CTE = 9.69E-07

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Cancer Dermal Intake - CTE = 2.77E-08
Noncancer Dermal Intake - CTE = 1.94E-06

TABLE 8.15 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.9E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	8.2E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.2E-05
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	2.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	3.7E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	5.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	4.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-05**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	6.9E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-06
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.0E-06**
										Total Risk Across All Exposure Routes/Pathways	**1.3E-05**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.15 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	3.4E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.4E-01
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	9.6E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.2E-01
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	2.3E-03	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	1.2E-02
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	4.4E-01	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.5E+00
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	6.9E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	9.9E-02
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	5.3E-04	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.3E-01
	(total)												**2.8E+00**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	8.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.7E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**2.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E+00**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.15
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.15a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	3.3E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	9.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-06
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	2.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	4.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	6.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	5.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.4E-06**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.6E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**4.6E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.4E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.15a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.1E-01	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.1E-01
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.2E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.1E-01
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	7.8E-04	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	3.9E-03
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.5E-01	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	4.9E-01
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	2.3E-03	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.3E-02
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.8E-04	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.8E-01
	(total)												**9.2E-01**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.6E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.3E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.15
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE CHILD RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	2,800	U.S. EPA, July 2004	2,800	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 1.10E-06
Noncancer Ingestion Intake - RME = 1.28E-05

Cancer Ingestion Intake - CTE = 1.22E-07
Noncancer Ingestion Intake - CTE = 4.27E-06

Cancer Dermal Intake - RME = 3.07E-06
Noncancer Dermal Intake - RME = 3.58E-05

Cancer Dermal Intake - CTE = 1.37E-07
Noncancer Dermal Intake - CTE = 4.79E-06

TABLE 8.13 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	6.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	9.2E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	2.8E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.2E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**1.1E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.13 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.6E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.6E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	7.1E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.4E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.7E-04	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	8.7E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	3.2E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.1E-01
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	5.1E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.4E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	4.0E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.0E-02
	(total)												**2.1E-01**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.7E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.13
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.13a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	5.1E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	7.6E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	2.3E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	2.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**7.6E-08**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	4.0E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.0E-09
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.0E-09**
										Total Risk Across All Exposure Routes/Pathways	**8.2E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.13a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	6.4E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.4E-03
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	5.9E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	4.3E-05	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	2.2E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	8.1E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.7E-02
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.3E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.8E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	9.9E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	9.9E-03
	(total)												**5.1E-02**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.7E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.7E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.2E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.13
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CHILD RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	200	U.S. EPA, May 1993	100	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	U.S. EPA, July 2004	0.04	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	6	U.S. EPA, December 1989	2	U.S. EPA, December 1989	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 8.14E-08
Noncancer Ingestion Intake - RME = 9.50E-07

Cancer Ingestion Intake - CTE = 6.78E-09
Noncancer Ingestion Intake - CTE = 2.37E-07

Cancer Dermal Intake - RME = 5.37E-07
Noncancer Dermal Intake - RME = 6.27E-06

Cancer Dermal Intake - CTE = 1.79E-08
Noncancer Dermal Intake - CTE = 6.27E-07

TABLE 8.16 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.3E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.5E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-06
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	8.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.6E-02	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	2.5E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.3E-06**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	4.2E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	6.3E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**6.3E-07**
										Total Risk Across All Exposure Routes/Pathways	**5.9E-06**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.16 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	3.7E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	3.7E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.4E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	2.5E-04	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	1.3E-03
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	4.7E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.6E-01
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	7.4E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	1.1E-02
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	5.7E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	5.7E-02
	(total)												**3.0E-01**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.2E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	4.1E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**4.1E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.0E-01**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.16
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.16a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.2E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	8.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.6E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	2.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**5.2E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.2E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.8E-08**
										Total Risk Across All Exposure Routes/Pathways	**5.3E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.16a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	1.2E-02	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	1.2E-02
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	1.1E-02
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	8.4E-05	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	4.2E-04
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.6E-02	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	5.2E-02
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	2.5E-04	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	3.5E-03
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.9E-05	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.9E-02
	(total)												**9.9E-02**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.2E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	3.9E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**3.9E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.9E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.16
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF FUTURE ADULT RESIDENTS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	1.0	U.S. EPA, May 1993	1.0	U.S. EPA, May 1993	BW x AT
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	5,700	U.S. EPA, July 2004	5,700	U.S. EPA, July 2004	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	350	U.S. EPA, May 1993	234	U.S. EPA, May 1993	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 4.70E-07
Noncancer Ingestion Intake - RME = 1.37E-06

Cancer Ingestion Intake - CTE = 4.58E-08
Noncancer Ingestion Intake - CTE = 4.58E-07

Cancer Dermal Intake - RME = 1.87E-06
Noncancer Dermal Intake - RME = 5.47E-06

Cancer Dermal Intake - CTE = 5.22E-08
Noncancer Dermal Intake - CTE = 5.22E-07

TABLE 8.14 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	9.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.9E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	6.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.9E-07**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.0E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-07
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
										Total Risk Across All Exposure Routes/Pathways	**5.4E-07**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.14 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	2.7E-03	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	2.7E-03
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	7.6E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	2.5E-03
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	1.9E-05	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	9.3E-05
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	3.5E-03	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	1.2E-02
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	5.5E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	7.9E-04
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	4.2E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	4.2E-03
	(total)												**2.2E-02**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	9.7E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**9.7E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.3E-02**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 4.14
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF ADULT RECREATIONAL USERS TO SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Ingestion CDI[1] (mg/kg/day) =
	IR	Ingestion Rate of Soil	mg/day	100	U.S. EPA, May 1993	50	U.S. EPA, May 1993	Csoil x IR x Fi x EF x ED x CF
	Fi	Fraction Ingested	unitless	0.5	Professional Judgment	0.5	Professional Judgment	BW x AT
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	U.S. EPA, December 1989
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	U.S. EPA, December 2002	95% UCL or Max	U.S. EPA, December 2002	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA, December 1989	1.0E-06	U.S. EPA, December 1989	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	9,070	U.S. EPA, August 1997	9,070	U.S. EPA, August 1997	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.07	U.S. EPA, July 2004	0.01	U.S. EPA, July 2004	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	U.S. EPA, July 2004	chemical specific	U.S. EPA, July 2004	
	EF	Exposure Frequency	days/year	52	Professional Judgment	26	Professional Judgment	
	ED	Exposure Duration	years	24	U.S. EPA, December 1989	7	U.S. EPA, December 1989	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME = 3.49E-08
Noncancer Ingestion Intake - RME = 1.02E-07

Cancer Ingestion Intake - CTE = 2.54E-09
Noncancer Ingestion Intake - CTE = 2.54E-08

Cancer Dermal Intake - RME = 4.43E-07
Noncancer Dermal Intake - RME = 1.29E-06

Cancer Dermal Intake - CTE = 9.23E-09
Noncancer Dermal Intake - CTE = 9.23E-08

TABLE 8.14a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	6.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.9E-08	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.9E-08
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	4.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	8.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.9E-08**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.1E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.1E-09
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.2E-08**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03 Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 7.14a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SUBSURFACE SOIL - SWMU 12 PROPER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Proper
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M	6.8E-04	mg/kg-day	1.0E+00	mg/kg-day	NA	NA	6.8E-04
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	1.9E-07	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.4E-04
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M	4.7E-06	mg/kg-day	2.0E-01	mg/kg-day	NA	NA	2.3E-05
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M	8.7E-04	mg/kg-day	3.0E-01	mg/kg-day	NA	NA	2.9E-03
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M	1.4E-05	mg/kg-day	7.0E-02	mg/kg-day	NA	NA	2.0E-04
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M	1.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	NA	1.1E-03
	(total)												**5.5E-03**
Dermal	Aluminum	2.69E+04	mg/kg	2.69E+04	mg/kg	M		mg/kg-day	1.0E+00	mg/kg-day	NA	NA	
	Arsenic	7.50E+00	mg/kg	7.50E+00	mg/kg	M	2.1E-08	mg/kg-day	3.0E-04	mg/kg-day	NA	NA	6.9E-05
	Barium	1.83E+02	mg/kg	1.83E+02	mg/kg	M		mg/kg-day	1.4E-02	mg/kg-day	NA	NA	
	Iron	3.42E+04	mg/kg	3.42E+04	mg/kg	M		mg/kg-day	3.0E-01	mg/kg-day	NA	NA	
	Manganese	5.42E+02	mg/kg	5.42E+02	mg/kg	M		mg/kg-day	2.8E-03	mg/kg-day	NA	NA	
	Vanadium	4.16E+01	mg/kg	4.16E+01	mg/kg	M		mg/kg-day	2.6E-05	mg/kg-day	NA	NA	
	(total)												**6.9E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.6E-03**

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

Arsenic - 0.03

Other Metals - not evaluated for dermal contact with soil.

dermal abs	GI Abs
	1
0.03	1
	0.07
	1
	0.04
	0.026

TABLE 9.10. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Surface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-05		2.E-06	2.E-05	Arsenic	Skin, CVS				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Surface Soil - SWMU 12 Proper				2.E-05	Total Hazard Index Across Surface Soil - SWMU 12 Proper					
Soil	Soil	Subsurface Soil	Aluminum					Aluminum	CNS				
		SWMU 12 Proper	Arsenic	2.E-05		2.E-06	2.E-05	Arsenic	Skin, CVS				
			Barium					Barium	Kidney				
			Iron					Iron	NA				
			Manganese					Manganese	CNS				
			Vanadium					Vanadium	Kidney				
			Total Risk Across Subsurface Soil - SWMU 12 Proper				2.E-05	Total Hazard Index Across Subsurface Soil - SWMU 12 Proper					

TABLE 4.92a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Maximum	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 3.12
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Gully Surface water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	ug/L	3	7	79		ug/L	24	99% UCL-C	ProUCL (1)	24	99% UCL-C	ProUCL (1)
2-Amino-4,6-dinitrotoluene	ug/L	1	2	19	J	ug/L	7	99% UCL-C	ProUCL (1)	7	99% UCL-C	ProUCL (1)
4-Amino-2,6-dinitrotoluene	ug/L	4	7	74		ug/L	23	99% UCL-C	ProUCL (1)	23	99% UCL-C	ProUCL (1)
Rdx	ug/L	15	23	140		ug/L	25	Gamma	ProUCL (1)	25	Gamma	ProUCL (1)
Aluminum	ug/L	3490	6470	67700		ug/L	7570	95% UCL-CL	ProUCL (1)	7570	95% UCL-CL	ProUCL (1)
Arsenic	ug/L	2.6	3.7	20.3		ug/L	5.3	H-UCL	ProUCL (2)	5.3	H-UCL	ProUCL (2)
Barium	ug/L	92.9	123	589	J	ug/L	273	99% UCL-C	ProUCL (1)	273	99% UCL-C	ProUCL (1)
Beryllium	ug/L	0.23	0.46	5.2		ug/L	1.6	99% UCL-C	ProUCL (1)	1.6	99% UCL-C	ProUCL (1)
Cadmium	ug/L	1.7	3.6	43.7	J	ug/L	2.6	95% UCL-CL	ProUCL (1)	2.6	95% UCL-CL	ProUCL (1)
Chromium	ug/L	4.9	9.4	105	J	ug/L	8	95% UCL-CL	ProUCL (1)	8	95% UCL-CL	ProUCL (1)
Cobalt	ug/L	5.9	11.2	123		ug/L	7.8	H-UCL	ProUCL (2)	7.8	H-UCL	ProUCL (2)
Copper	ug/L	48.5	120	1650	J	ug/L	468	99% UCL-C	ProUCL (1)	468	99% UCL-C	ProUCL (1)
Iron	ug/L	5230	9400	95400	J	ug/L	7260	H-UCL	ProUCL (2)	7260	H-UCL	ProUCL (2)
Lead	ug/L	15	34.7	458		ug/L	15	Average	(3)	15	Average	(3)
Manganese	ug/L	1130	2210	24200	J	ug/L	3620	97.5% UCL-C	ProUCL (1)	3620	97.5% UCL-C	ProUCL (1)
Mercury	ug/L	0.067	0.14	1.7		ug/L	0.26	95% UCL-CNP	ProUCL (1)	0.26	95% UCL-CNP	ProUCL (1)
Nickel	ug/L	9.1	15	140	J	ug/L	24.4	95% UCL-CNP	ProUCL (1)	24.4	95% UCL-CNP	ProUCL (1)
Thallium	ug/L	0.081	0.11	0.67	J	ug/L	0.16	95% UCL-C	ProUCL (1)	0.16	95% UCL-C	ProUCL (1)
Vanadium	ug/L	7.7	13.7	138		ug/L	43.4	99% UCL-C	ProUCL (1)	43.4	99% UCL-C	ProUCL (1)
Zinc	ug/L	158	383	5220		ug/L	1480	99% UCL-C	ProUCL (1)	1480	99% UCL-C	ProUCL (1)
Nitrite/Nitrate-N	mg/L	0.99	1.5	8.2		mg/L	3.8	99% UCL-C	ProUCL (1)	3.8	99% UCL-C	ProUCL (1)

Definitions:
95 % UCL-CL = 95% Chebyshev (MVUE) UCL (lognormal).
95 % UCL-CNP = 95% Chebyshev (Mean, Std)) UCL (non-parametric).
97.5 % UCL-C = 97.5% Chebyshev (MVUE) UCL (lognormal).
99 % UCL-C = 99% Chebyshev (Mean, Std) UCL (non-parametric).
Gamma = Adjusted Gamma 95% UCL.

Footnotes:
1 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.
2 - ProUCL indicates data are lognormally distributed.
3 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).

2,4,6-TRINITROTOLUENE	3.0767436	6.62	23.9603965
2-AMINO-4,6-DINITROTOLUENE	1.3388205	2.32	7.11609522
4-AMINO-2,6-DINITROTOLUENE	3.6546667	7.02	23.4949684
RDX	15.269077	22.68	25.3792464
ALUMINUM	3491.2859	6470.99	7572.41204
ARSENIC	2.5776923	3.66	5.33283481
BARIUM	92.915	123.38	272.685611
BERYLLIUM	0.2314103	0.46	1.55504007
CADMIUM	1.6714744	3.55	2.55908315
CHROMIUM	4.8974359	9.41	8.03271389
COBALT	5.8679487	11.19	7.77708171
COPPER	48.475897	119.55	467.950307
IRON	5229.2564	9402.57	7261.38381
LEAD	14.98391	34.72	14.9839103
MANGANESE	1125.259	2208.21	3620.32264
MERCURY	0.0665385	0.14	0.25535759
NICKEL	9.0512821	14.98	24.3766245
THALLIUM	0.0809103	0.11	0.16056061
VANADIUM	7.654359	13.72	43.4342538
ZINC	158.14744	382.92	1484.65195
NITRITE/NITRATE-N	0.9906154	1.46	3.75678099

3 - FOD - Less than 50 percent positive detections. Maximum concentration is used as the EPC.
4 - ProUCL indicates data are log-normally distributed.

TABLE 3.13
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - EAST TRIBUTARY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: East Tributary Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
RDX	ug/L	0.5	NA	0.8		ug/L	0.8	Maximum	N < 10 (1)	0.8	Maximum	N < 10 (1)
Arsenic	ug/L	0.14	NA	0.33	J	ug/L	0.33	Maximum	N < 10	0.33	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 8.96 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.96 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.3E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.8E-03
	(total)												**1.8E-03**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.8E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	3.0E-03
	(total)												**3.0E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADOLESCENT TRESPASSERS - REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.96
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.84 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-02	$(mg/kg-day)^{-1}$	3.7E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.6E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.3E-06	mg/kg-day	1.10E-01	$(mg/kg-day)^{-1}$	1.4E-07
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.9E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.8E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	4.1E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	8.3E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.4E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	4.1E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.4E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.8E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.8E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.9E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	8.3E-09	mg/kg-day		$(mg/kg-day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.3E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.7E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.0E-04	mg/kg-day		$(mg/kg-day)^{-1}$	
	(total)										**5.9E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.5E-07	mg/kg-day	3.00E-02	$(mg/kg-day)^{-1}$	4.6E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	8.4E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.4E-08	mg/kg-day	1.10E-01	$(mg/kg-day)^{-1}$	6.0E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.6E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.8E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	2.7E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	9.3E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.5E-09	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.9E-09	mg/kg-day		$(mg/kg-day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	5.5E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.7E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.6E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.5E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	5.1E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.9E-10	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg-day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.5E-10	mg/kg-day		$(mg/kg-day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.5E-07	mg/kg-day		$(mg/kg-day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg-day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg-day)^{-1}$	
	(total)										**3.8E-08**
										Total Risk Across All Exposure Routes/Pathways	**6.3E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.84 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	8.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.6E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.3E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.2E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	7.6E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.8E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	8.3E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.8E-03
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.5E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.5E-03
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.8E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.9E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	9.0E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	4.5E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.7E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.6E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.7E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.7E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.8E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.6E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.3E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.6E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	3.9E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	8.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	5.0E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.2E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	5.0E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.6E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.9E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	8.1E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.0E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.6E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.4E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	1.4E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.6E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.3E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	7.9E-04
	(total)												**1.2E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	9.7E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.9E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.6E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	8.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	5.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.7E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.5E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.6E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.8E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.9E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	4.2E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.5E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.5E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.7E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	2.3E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.5E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	4.6E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.7E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	8.5E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.0E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.5E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.6E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.3E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.3E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.9E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	8.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.7E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.7E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.3E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.5E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	5.0E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	9.4E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.6E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.9E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	6.4E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	8.3E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	5.2E-05
	(total)												**1.3E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.5E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
ADOLESCENT TRESPASSERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.84
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.90 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	4.2E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.6E-08
	(total)										**3.0E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.7E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.1E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	(total)										**1.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**3.2E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.90 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.7E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.8E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.1E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-04
	(total)												**4.5E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	7.2E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.4E-05
	(total)												**2.8E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
ADOLESCENT TRESPASSERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.90
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.96a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.96a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.5E-04
	(total)												**4.5E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.7E-07	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-04
	(total)												**7.0E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADOLESCENT TRESPASSERS - CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.96a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.84a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.1E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	9.4E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.6E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	6.9E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	6.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.1E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	8.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.8E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.3E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.4E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.1E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**9.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.6E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.84a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.8E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.9E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.9E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.5E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.1E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.9E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.3E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.3E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.4E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.5E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.3E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	1.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.6E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.2E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.3E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.5E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.9E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	9.7E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	6.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.0E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.2E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.2E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.0E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.0E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.6E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.6E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.1E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	2.0E-04
	(total)												**2.9E-02**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.5E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.2E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.6E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	8.5E-05
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.8E-05
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.9E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.9E-05
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.1E-05
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.4E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.0E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	8.2E-09	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	5.9E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.3E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	5.3E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	8.2E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.1E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	4.0E-08	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.0E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.4E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	6.0E-05
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.7E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.2E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.7E-08	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.9E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.9E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.3E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	6.4E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.5E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	3.1E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	8.2E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.2E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	8.6E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.6E-06	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.0E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.2E-05
	(total)												**3.2E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.0E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
ADOLESCENT TRESPASSERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.84a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 8.90a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.3E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.4E-09
	(total)										**7.6E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	5.8E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.4E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.0E-10
	(total)										**4.6E-10**
										Total Risk Across All Exposure Routes/Pathways	**8.1E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.90a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.1E-05
	(total)												**1.1E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.7E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.7E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.6E-06
	(total)												**6.9E-06**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
ADOLESCENT TRESPASSERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.90a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADOLESCENT TRESPASSERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Trespasser
Receptor Age: Adolescent (age 6 - 17)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	26	Professional judgement	13	Professional judgement	
	ED	Exposure Duration	(years)	11	6 - 17 years of age	11	6 - 17 years of age	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	4015	U.S. EPA, December 1989	4,015	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,280	U.S. EPA, August 1997	3,100	U.S. EPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	11	6 - 17 years of age	11	6 - 17 years of age	of the text.
	EF	Exposure Frequency	days/year	26	Professional judgement	13	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	43	U.S. EPA, August 1997	43	U.S. EPA, August 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	4,015	U.S. EPA, December 1989	4,015	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 5.21E-05
Noncancer Ingestion Intake(RME) = 3.31E-04

Cancer Ingestion Intake(CTE) = 1.30E-05
Noncancer Ingestion Intake(CTE) = 8.28E-05

Cancer Dermal Intake(RME) = 8.54E-01
Noncancer Dermal Intake(RME) = 5.43E+00

Cancer Dermal Intake(CTE) = 4.03E-01
Noncancer Dermal Intake(CTE) = 2.57E+00

TABLE 9.10. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	4.E-06		7.E-07	5.E-06	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.9E-06		7.5E-07	4.69E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		5.E-08	2.E-07	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	5.E-07		6.E-08	6.E-07	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					2.2E-06		4.0E-07	2.58E-06
							Total Risk Across Gully Sediment										
							Total Risk Across Gully Surface Water										
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		4.E-07	2.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					East Tributary Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					1.9E-06		3.6E-07	2.26E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-08		2.E-09	2.E-08	Rdx	Prostate					East Tributary SW			
			Arsenic	9.E-08		2.E-08	1.E-07	Arsenic	Skin, CVS								
							Total Risk Across East Tributary Sediment							1.1E-07		2.0E-08	1.31E-07
							Total Risk Across East Tributary Surface Water										
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS								
			Arsenic	5.E-06		9.E-07	6.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					Turkey Creek Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					4.8E-06		9.2E-07	5.77E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS					Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment				
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Antimony					Antimony	Blood	3.E-03			3.E-03				
			Arsenic	3.E-06		5.E-07	3.E-06	Arsenic	Skin, CVS	7.E-02		1.E-02	8.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-03	1.E-02				
			Iron					Iron	NA	3.E-01			3.E-01	Gully Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	5.0E-01		1.3E-02	5.15E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	2.8E-06		4.6E-07	3.22E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		1.E-08	1.E-07	2,4,6-Trinitrotoluene	Liver	9.E-02		1.E-02	1.E-01				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-03		5.E-04	7.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-02		2.E-03	2.E-02				
			Rdx	4.E-07		2.E-08	5.E-07	Rdx	Prostate	2.E-02		7.E-04	2.E-02				
			Aluminum					Aluminum	CNS	1.E-02		9.E-04	2.E-02				
			Arsenic	1.E-06		9.E-08	1.E-06	Arsenic	Skin, CVS	3.E-02		2.E-03	4.E-02				
			Barium					Barium	Kidney	3.E-03		2.E-03	5.E-03				
			Beryllium					Beryllium	Gastrointestinal	2.E-03		1.E-02	2.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-02	2.E-02				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-03		3.E-02	3.E-02				
			Cobalt					Cobalt	NA	7.E-04		5.E-05	8.E-04				
			Copper					Copper	Gastrointestinal	2.E-02		1.E-03	2.E-02				
			Iron					Iron	NA	5.E-02		3.E-03	5.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-01		5.E-01	8.E-01				
			Mercury					Mercury	CNS	2.E-03		2.E-03	3.E-03				
			Nickel					Nickel	Body Weight	2.E-03		8.E-04	3.E-03				
			Thallium					Thallium	Liver	4.E-03		3.E-04	5.E-03				
			Vanadium					Vanadium	Kidney	8.E-02		2.E-01	3.E-01	Gully SW			
			Zinc					Zinc	Blood	9.E-03		4.E-04	1.E-02	6.6E-01		7.E-01	1.43E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-03		3.E-04	5.E-03	1.9E-06		1.2E-07	1.98E-06
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Arsenic	1.E-06		2.E-07	2.E-06	Arsenic	Skin, CVS	3.E-02		6.E-03	4.E-02				
			Iron					Iron	NA	2.E-01			2.E-01	East Tributary Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	3.5E-01		5.8E-03	3.54E-01
			Vanadium					Vanadium	Kidney	3.E-02			3.E-02	1.3E-06		2.2E-07	1.55E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-08		6.E-10	1.E-08	Rdx	Prostate	5.E-04		2.E-05	5.E-04	East Tributary SW			
			Arsenic	8.E-08		5.E-09	9.E-08	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03	2.6E-03		1.6E-04	2.76E-03
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	9.5E-08		5.9E-09	1.01E-07
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-02			1.E-02				
			Arsenic	3.E-06		6.E-07	4.E-06	Arsenic	Skin, CVS	9.E-02		1.E-02	1.E-01				
			Iron					Iron	NA	5.E-01			5.E-01	Turkey Creek Sed			
			Manganese					Manganese	CNS	2.E-02			2.E-02	6.7E-01		1.5E-02	6.89E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	3.4E-06		5.7E-07	3.97E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-02		2.E-02	3.E-02	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	1.0E-02		1.7E-02	2.75E-02
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.4E-01	Total CNS HI =	8.E-01
Total Kidney HI =	8.8E-02	Total Fetotoxicity HI =	3.E-02
Total CVS HI =	1.2E-01	Total Prostate HI =	2.E-02
Total GI Tract HI =	7.1E-02	Total Bone HI =	3.E-02
Total Skin HI =	1.2E-01	Total Blood HI =	2.E-02
Total Body Weight HI =	3.1E-03		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	3.E-02	Total CNS HI =	6.E-02
Total CVS HI =	4.E-02	Total Prostate HI =	5.E-04
Total Skin HI =	4.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	5.E-02	Total CNS HI =	6.E-02
Total CVS HI =	1.E-01	Total Skin HI =	1.E-01

TABLE 9.9. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Antimony					Antimony	Blood	3.E-04			3.E-04				
			Arsenic	1.E-06		3.E-07	1.E-06	Arsenic	Skin, CVS	8.E-03		2.E-03	1.E-02				
			Cadmium					Cadmium	Kidney	1.E-03		2.E-04	1.E-03				
			Iron					Iron	NA	3.E-02			3.E-02	Gully Sed			
			Manganese					Manganese	CNS	4.E-03			4.E-03	5.4E-02		2.0E-03	5.58E-02
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	1.2E-06		2.8E-07	1.47E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	2.E-08		3.E-08	5.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		7.E-03	1.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-04	6.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	9.E-04		9.E-04	2.E-03				
			Rdx	8.E-08		4.E-08	1.E-07	Rdx	Prostate	7.E-04		4.E-04	1.E-03				
			Aluminum					Aluminum	CNS	6.E-04		6.E-04	1.E-03				
			Arsenic	2.E-07		2.E-07	4.E-07	Arsenic	Skin, CVS	1.E-03		1.E-03	3.E-03				
			Barium					Barium	Kidney	1.E-04		1.E-03	2.E-03				
			Beryllium					Beryllium	Gastrointestinal	7.E-05		8.E-03	9.E-03				
			Cadmium					Cadmium	Kidney	4.E-04		8.E-03	8.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-04		2.E-02	2.E-02				
			Cobalt					Cobalt	NA	3.E-05		3.E-05	6.E-05				
			Copper					Copper	Gastrointestinal	1.E-03		9.E-04	2.E-03				
			Iron					Iron	NA	2.E-03		2.E-03	4.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	1.E-02		3.E-01	3.E-01				
			Mercury					Mercury	CNS	7.E-05		9.E-04	1.E-03				
			Nickel					Nickel	Body Weight	1.E-04		5.E-04	5.E-04				
			Thallium					Thallium	Liver	2.E-04		2.E-04	4.E-04				
			Vanadium					Vanadium	Kidney	4.E-03		1.E-01	1.E-01	Gully SW			
			Zinc					Zinc	Blood	4.E-04		2.E-04	6.E-04	2.8E-02		4.5E-01	4.78E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-04		2.E-04	4.E-04	3.2E-07		2.8E-07	5.98E-07
							Total Risk Across Gully Sediment 1.E-06						Total Hazard Index Across Gully Sediment 6.E-02				
							Total Risk Across Gully Surface Water 6.E-07						Total Hazard Index Across Gully Surface water 5.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	6.E-07		1.E-07	7.E-07	Arsenic	Skin, CVS	4.E-03		9.E-04	5.E-03				
			Iron					Iron	NA	2.E-02			2.E-02	East Tributary Sed			
			Manganese					Manganese	CNS	4.E-03			4.E-03	3.7E-02		8.9E-04	3.82E-02
			Vanadium					Vanadium	Kidney	4.E-03			4.E-03	5.7E-07		1.4E-07	7.07E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-09		1.E-09	4.E-09	Rdx	Prostate	2.E-05		1.E-05	3.E-05	East Tributary SW			
			Arsenic	1.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	9.E-05		8.E-05	2.E-04	1.1E-04		9.4E-05	2.05E-04
							Total Risk Across East Tributary Sediment 7.E-07						Total Hazard Index Across East Tributary Sediment 4.E-02	1.6E-08		1.4E-08	3.02E-08
							Total Risk Across East Tributary Surface Water 3.E-08						Total Hazard Index Across East Tributary Surface water 2.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-03			1.E-03				
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	9.E-03		2.E-03	1.E-02				
			Iron					Iron	NA	5.E-02			5.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	3.E-03			3.E-03	7.2E-02		2.3E-03	7.45E-02
			Vanadium					Vanadium	Kidney	6.E-03			6.E-03	1.5E-06		3.5E-07	1.80E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	4.E-04		1.E-02	1.E-02	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment 2.E-06						Total Hazard Index Across Turkey Creek Sediment 7.E-02	4.4E-04		1.0E-02	1.05E-02
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water 1.E-02				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.3E-02	Total CNS HI =	3.E-01
Total Kidney HI =	1.6E-02	Total Fetotoxicity HI =	2.E-02
Total CVS HI =	1.2E-02	Total Prostate HI =	1.E-03
Total GI Tract HI =	2.6E-02	Total Bone HI =	2.E-02
Total Skin HI =	1.2E-02	Total Blood HI =	1.E-03
Total Body Weight HI =	5.5E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	4.E-03	Total CNS HI =	6.E-03
Total CVS HI =	5.E-03	Total Prostate HI =	3.E-05
Total Skin HI =	5.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	6.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Skin HI =	1.E-02

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	4.E-06		1.E-06	5.E-06	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.9E-06		1.0E-06	4.94E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		5.E-08	2.E-07	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	5.E-07		6.E-08	6.E-07	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					2.2E-06		4.0E-07	2.58E-06
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS								
			Arsenic	2.E-06		5.E-07	2.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					East Tributary Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					1.9E-06		4.8E-07	2.38E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-08		2.E-09	2.E-08	Rdx	Prostate					East Tributary SW			
			Arsenic	9.E-08		2.E-08	1.E-07	Arsenic	Skin, CVS								
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	1.1E-07		2.0E-08	1.31E-07
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS								
			Arsenic	5.E-06		1.E-06	6.E-06	Arsenic	Skin, CVS								
			Iron					Iron	NA					Turkey Creek Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					4.8E-06		1.2E-06	6.08E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS					Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment				
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Antimony					Antimony	Blood	3.E-03			3.E-03				
			Arsenic	3.E-06		5.E-07	3.E-06	Arsenic	Skin, CVS	7.E-02		1.E-02	9.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-03	1.E-02				
			Iron					Iron	NA	3.E-01			3.E-01	Gully Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	5.0E-01		1.6E-02	5.18E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	2.8E-06		5.5E-07	3.31E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-07		1.E-08	1.E-07	2,4,6-Trinitrotoluene	Liver	9.E-02		1.E-02	1.E-01				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-03		5.E-04	7.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-02		2.E-03	2.E-02				
			Rdx	4.E-07		2.E-08	5.E-07	Rdx	Prostate	2.E-02		7.E-04	2.E-02				
			Aluminum					Aluminum	CNS	1.E-02		9.E-04	2.E-02				
			Arsenic	1.E-06		9.E-08	1.E-06	Arsenic	Skin, CVS	3.E-02		2.E-03	4.E-02				
			Barium					Barium	Kidney	3.E-03		2.E-03	5.E-03				
			Beryllium					Beryllium	Gastrointestinal	2.E-03		1.E-02	2.E-02				
			Cadmium					Cadmium	Kidney	1.E-02		1.E-02	2.E-02				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-03		3.E-02	3.E-02				
			Cobalt					Cobalt	NA	7.E-04		5.E-05	8.E-04				
			Copper					Copper	Gastrointestinal	2.E-02		1.E-03	2.E-02				
			Iron					Iron	NA	5.E-02		3.E-03	5.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-01		5.E-01	8.E-01				
			Mercury					Mercury	CNS	2.E-03		2.E-03	3.E-03				
			Nickel					Nickel	Body Weight	2.E-03		8.E-04	3.E-03				
			Thallium					Thallium	Liver	4.E-03		3.E-04	5.E-03				
			Vanadium					Vanadium	Kidney	8.E-02		2.E-01	3.E-01	Gully SW			
			Zinc					Zinc	Blood	9.E-03		4.E-04	1.E-02	6.6E-01		7.E-01	1.43E+00
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-03		3.E-04	5.E-03	1.9E-06		1.2E-07	1.98E-06
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment	5.E-01			
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water	1.E+00			
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-02			2.E-02				
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	3.E-02		7.E-03	4.E-02				
			Iron					Iron	NA	2.E-01			2.E-01	East Tributary Sed			
			Manganese					Manganese	CNS	4.E-02			4.E-02	3.5E-01		6.8E-03	3.55E-01
			Vanadium					Vanadium	Kidney	3.E-02			3.E-02	1.3E-06		2.6E-07	1.59E-06
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-08		6.E-10	1.E-08	Rdx	Prostate	5.E-04		2.E-05	5.E-04	East Tributary SW			
			Arsenic	8.E-08		5.E-09	9.E-08	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03	2.6E-03		1.6E-04	2.76E-03
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	4.E-01	9.5E-08	5.9E-09	1.01E-07
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water	3.E-03			
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-02			1.E-02				
			Arsenic	3.E-06		7.E-07	4.E-06	Arsenic	Skin, CVS	9.E-02		2.E-02	1.E-01				
			Iron					Iron	NA	5.E-01			5.E-01	Turkey Creek Sed			
			Manganese					Manganese	CNS	2.E-02			2.E-02	6.7E-01		1.7E-02	6.92E-01
			Vanadium					Vanadium	Kidney	5.E-02			5.E-02	3.4E-06		6.7E-07	4.07E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-02		2.E-02	3.E-02	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	7.E-01	1.0E-02	1.7E-02	2.75E-02
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water	3.E-02			
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.4E-01	Total CNS HI =	8.E-01
Total Kidney HI =	8.8E-02	Total Fetotoxicity HI =	3.E-02
Total CVS HI =	1.2E-01	Total Prostate HI =	2.E-02
Total GI Tract HI =	7.1E-02	Total Bone HI =	3.E-02
Total Skin HI =	1.2E-01	Total Blood HI =	2.E-02
Total Body Weight HI =	3.1E-03		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	3.E-02	Total CNS HI =	6.E-02
Total CVS HI =	4.E-02	Total Prostate HI =	5.E-04
Total Skin HI =	4.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	5.E-02	Total CNS HI =	6.E-02
Total CVS HI =	1.E-01	Total Skin HI =	1.E-01

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Antimony					Antimony	Blood	3.E-04			3.E-04				
			Arsenic	1.E-06		5.E-07	2.E-06	Arsenic	Skin, CVS	8.E-03		3.E-03	1.E-02				
			Cadmium					Cadmium	Kidney	1.E-03		3.E-04	2.E-03				
			Iron					Iron	NA	3.E-02			3.E-02	**Gully Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**5.4E-02**		**3.2E-03**	**5.70E-02**
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	**1.2E-06**		**4.5E-07**	**1.63E-06**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	2.E-08		3.E-08	5.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		7.E-03	1.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-04	6.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	9.E-04		9.E-04	2.E-03				
			Rdx	8.E-08		4.E-08	1.E-07	Rdx	Prostate	7.E-04		4.E-04	1.E-03				
			Aluminum					Aluminum	CNS	6.E-04		6.E-04	1.E-03				
			Arsenic	2.E-07		2.E-07	4.E-07	Arsenic	Skin, CVS	1.E-03		1.E-03	3.E-03				
			Barium					Barium	Kidney	1.E-04		1.E-03	2.E-03				
			Beryllium					Beryllium	Gastrointestinal	7.E-05		8.E-03	9.E-03				
			Cadmium					Cadmium	Kidney	4.E-04		8.E-03	8.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-04		2.E-02	2.E-02				
			Cobalt					Cobalt	NA	3.E-05		3.E-05	6.E-05				
			Copper					Copper	Gastrointestinal	1.E-03		9.E-04	2.E-03				
			Iron					Iron	NA	2.E-03		2.E-03	4.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	1.E-02		3.E-01	3.E-01				
			Mercury					Mercury	CNS	7.E-05		9.E-04	1.E-03				
			Nickel					Nickel	Body Weight	1.E-04		5.E-04	5.E-04				
			Thallium					Thallium	Liver	2.E-04		2.E-04	4.E-04				
			Vanadium					Vanadium	Kidney	4.E-03		1.E-01	1.E-01	**Gully SW**			
			Zinc					Zinc	Blood	4.E-04		2.E-04	6.E-04	**2.8E-02**		**4.5E-01**	**4.78E-01**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-04		2.E-04	4.E-04	**3.2E-07**		**2.8E-07**	**5.98E-07**
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment	6.E-02			
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water	5.E-01			
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	6.E-07		2.E-07	8.E-07	Arsenic	Skin, CVS	4.E-03		1.E-03	5.E-03				
			Iron					Iron	NA	2.E-02			2.E-02	**East Tributary Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**3.7E-02**		**1.4E-03**	**3.87E-02**
			Vanadium					Vanadium	Kidney	4.E-03			4.E-03	**5.7E-07**		**2.2E-07**	**7.88E-07**
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-09		1.E-09	4.E-09	Rdx	Prostate	2.E-05		1.E-05	3.E-05	**East Tributary SW**			
			Arsenic	1.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	9.E-05		8.E-05	2.E-04	**1.1E-04**		**9.4E-05**	**2.05E-04**
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	4.E-02	**1.6E-08**	**1.4E-08**	**3.02E-08**
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water	2.E-04			
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-03			1.E-03				
			Arsenic	1.E-06		6.E-07	2.E-06	Arsenic	Skin, CVS	9.E-03		4.E-03	1.E-02				
			Iron					Iron	NA	5.E-02			5.E-02	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	3.E-03			3.E-03	**7.2E-02**		**3.6E-03**	**7.59E-02**
			Vanadium					Vanadium	Kidney	6.E-03			6.E-03	**1.5E-06**		**5.5E-07**	**2.01E-06**
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	4.E-04		1.E-02	1.E-02	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	8.E-02	**4.4E-04**	**1.0E-02**	**1.05E-02**
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water	1.E-02			
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	1.3E-02	Total CNS HI =	3.E-01
Total Kidney HI =	1.6E-02	Total Fetotoxicity HI =	2.E-02
Total CVS HI =	1.3E-02	Total Prostate HI =	1.E-03
Total GI Tract HI =	2.6E-02	Total Bone HI =	2.E-02
Total Skin HI =	1.3E-02	Total Blood HI =	1.E-03
Total Body Weight HI =	5.5E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	4.E-03	Total CNS HI =	6.E-03
Total CVS HI =	5.E-03	Total Prostate HI =	3.E-05
Total Skin HI =	5.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	6.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Skin HI =	1.E-02

TABLE 9.4. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADOLESCENT TRESPASSERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Antimony					Antimony	Blood	5.E-04			5.E-04				
			Arsenic	9.E-07		2.E-07	1.E-06	Arsenic	Skin, CVS	1.E-02		2.E-03	1.E-02				
			Cadmium					Cadmium	Kidney	2.E-03		3.E-04	2.E-03				
			Iron					Iron	NA	5.E-02			5.E-02	Gully Sed			
			Manganese					Manganese	CNS	7.E-03			7.E-03	8.8E-02		2.7E-03	9.03E-02
			Vanadium					Vanadium	Kidney	8.E-03			8.E-03	8.8E-07		1.7E-07	1.06E-06
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	4.E-08		5.E-09	4.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		2.E-03	2.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.E-03		8.E-05	1.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	4.E-03		3.E-04	4.E-03				
			Rdx	1.E-07		6.E-09	1.E-07	Rdx	Prostate	3.E-03		1.E-04	3.E-03				
			Aluminum					Aluminum	CNS	3.E-03		2.E-04	3.E-03				
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	6.E-03		4.E-04	6.E-03				
			Barium					Barium	Kidney	5.E-04		4.E-04	9.E-04				
			Beryllium					Beryllium	Gastrointestinal	3.E-04		2.E-03	3.E-03				
			Cadmium					Cadmium	Kidney	2.E-03		2.E-03	4.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	9.E-04		5.E-03	6.E-03				
			Cobalt					Cobalt	NA	1.E-04		8.E-06	1.E-04				
			Copper					Copper	Gastrointestinal	4.E-03		3.E-04	4.E-03				
			Iron					Iron	NA	8.E-03		5.E-04	9.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	5.E-02		8.E-02	1.E-01				
			Mercury					Mercury	CNS	3.E-04		3.E-04	6.E-04				
			Nickel					Nickel	Body Weight	4.E-04		1.E-04	5.E-04				
			Thallium					Thallium	Liver	8.E-04		5.E-05	8.E-04				
			Vanadium					Vanadium	Kidney	1.E-02		4.E-02	5.E-02	Gully SW			
			Zinc					Zinc	Blood	2.E-03		6.E-05	2.E-03	1.2E-01		1.3E-01	2.48E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	8.E-04		5.E-05	8.E-04	5.9E-07		3.8E-08	6.32E-07
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	9.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	2.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Arsenic	4.E-07		8.E-08	5.E-07	Arsenic	Skin, CVS	6.E-03		1.E-03	7.E-03				
			Iron					Iron	NA	4.E-02			4.E-02	East Tributary Sed			
			Manganese					Manganese	CNS	7.E-03			7.E-03	6.1E-02		1.2E-03	6.19E-02
			Vanadium					Vanadium	Kidney	6.E-03			6.E-03	4.3E-07		8.4E-08	5.09E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	5.E-09		2.E-10	5.E-09	Rdx	Prostate	9.E-05		4.E-06	9.E-05	East Tributary SW			
			Arsenic	3.E-08		2.E-09	3.E-08	Arsenic	Skin, CVS	4.E-04		2.E-05	4.E-04	4.5E-04		2.8E-05	4.80E-04
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	6.E-02	3.0E-08		1.9E-09	3.22E-08
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	5.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	2.E-02		3.E-03	2.E-02				
			Iron					Iron	NA	9.E-02			9.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	4.E-03			4.E-03	1.2E-01		3.0E-03	1.21E-01
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	1.1E-06		2.1E-07	1.30E-06
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	2.E-03		3.E-03	5.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	1.E-01	1.8E-03		3.0E-03	4.77E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	5.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	2.4E-02	Total CNS HI =	1.E-01
Total Kidney HI =	1.5E-02	Total Fetotoxicity HI =	6.E-03
Total CVS HI =	2.1E-02	Total Prostate HI =	3.E-03
Total GI Tract HI =	1.2E-02	Total Bone HI =	6.E-03
Total Skin HI =	2.1E-02	Total Blood HI =	3.E-03
Total Body Weight HI =	5.4E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	6.E-03	Total CNS HI =	1.E-02
Total CVS HI =	8.E-03	Total Prostate HI =	9.E-05
Total Skin HI =	8.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-02	Total CNS HI =	1.E-02
Total CVS HI =	2.E-02	Total Skin HI =	2.E-02

TABLE 9.2. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Antimony					Antimony	Blood	3.E-04			3.E-04				
			Arsenic	1.E-06		2.E-07	1.E-06	Arsenic	Skin, CVS	7.E-03		1.E-03	8.E-03				
			Cadmium					Cadmium	Kidney	1.E-03		1.E-04	1.E-03				
			Iron					Iron	NA	3.E-02			3.E-02	**Gully Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**5.0E-02**		**1.5E-03**	**5.12E-02**
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	**1.1E-06**		**2.3E-07**	**1.36E-06**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene			4.E-09	4.E-09	2,4,6-Trinitrotoluene	Liver			8.E-04	8.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver			3.E-05	3.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver			1.E-04	1.E-04				
			Rdx			5.E-09	5.E-09	Rdx	Prostate			5.E-05	5.E-05				
			Aluminum					Aluminum	CNS			5.E-05	5.E-05				
			Arsenic			2.E-08	2.E-08	Arsenic	Skin, CVS			1.E-04	1.E-04				
			Barium					Barium	Kidney			1.E-04	1.E-04				
			Beryllium					Beryllium	Gastrointestinal			7.E-04	7.E-04				
			Cadmium					Cadmium	Kidney			6.E-04	6.E-04				
			Chromium					Chromium	Fetotoxicity/GS/Bone			1.E-03	1.E-03				
			Cobalt					Cobalt	NA			2.E-06	2.E-06				
			Copper					Copper	Gastrointestinal			7.E-05	7.E-05				
			Iron					Iron	NA			2.E-04	2.E-04				
			Lead					Lead	NA								
			Manganese					Manganese	CNS			2.E-02	2.E-02				
			Mercury					Mercury	CNS			8.E-05	8.E-05				
			Nickel					Nickel	Body Weight			4.E-05	4.E-05				
			Thallium					Thallium	Liver			1.E-05	1.E-05				
			Vanadium					Vanadium	Kidney			1.E-02	1.E-02	**Gully SW**			
			Zinc					Zinc	Blood			2.E-05	2.E-05			**3.8E-02**	**3.80E-02**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			1.E-05	1.E-05			**2.7E-08**	**2.73E-08**
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	5.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	4.E-02				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	2.E-03			2.E-03				
			Arsenic	5.E-07		1.E-07	7.E-07	Arsenic	Skin, CVS	3.E-03		7.E-04	4.E-03				
			Iron					Iron	NA	2.E-02			2.E-02	**East Tributary Sed**			
			Manganese					Manganese	CNS	4.E-03			4.E-03	**3.4E-02**		**6.8E-04**	**3.51E-02**
			Vanadium					Vanadium	Kidney	3.E-03			3.E-03	**5.5E-07**		**1.1E-07**	**6.57E-07**
Surface Water	Surface Water	East Tributary Surface Water	RDX			2.E-10	2.E-10	RDX	Prostate			2.E-06	2.E-06	**East Tributary SW**			
			ARSENIC			2.E-09	2.E-09	ARSENIC	Skin, CVS			1.E-05	1.E-05			**1.6E-05**	**1.57E-05**
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	4.E-02			**2.4E-09**	**2.44E-09**
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	2.E-05				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	1.E-03			1.E-03				
			Arsenic	1.E-06		3.E-07	2.E-06	Arsenic	Skin, CVS	9.E-03		2.E-03	1.E-02				
			Iron					Iron	NA	5.E-02			5.E-02	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	2.E-03			2.E-03	**6.7E-02**		**1.7E-03**	**6.84E-02**
			Vanadium					Vanadium	Kidney	5.E-03			5.E-03	**1.4E-06**		**2.8E-07**	**1.68E-06**
Surface Water	Surface Water	Turkey Creek	MANGANESE					MANGANESE	CNS			2.E-03	2.E-03	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	7.E-02			**1.7E-03**	**1.69E-03**
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	2.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	9.3E-04	Total CNS HI =	3.E-02
Total Kidney HI =	6.7E-03	Total Fetotoxicity HI =	1.E-03
Total CVS HI =	8.6E-03	Total Prostate HI =	5.E-05
Total GI Tract HI =	2.1E-03	Total Bone HI =	1.E-03
Total Skin HI =	8.6E-03	Total Blood HI =	3.E-04
Total Body Weight HI =	3.8E-05		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	3.E-03	Total CNS HI =	6.E-03
Total CVS HI =	4.E-03	Total Prostate HI =	2.E-06
Total Skin HI =	4.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	5.E-03	Total CNS HI =	5.E-03
Total CVS HI =	1.E-02	Total Skin HI =	1.E-02

TABLE 9.10. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RESIDENTIAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	3.E-07		2.E-08	3.E-07	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.2E-07		2.1E-08	3.38E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		5.E-09	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	4.E-08		7.E-09	5.E-08	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	1.E-07		2.E-08	1.E-07	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					1.8E-07		3.4E-08	2.12E-07
							Total Risk Across Gully Sediment						Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water						Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS	9.E-04		6.E-05	1.E-03				
			Iron					Iron	NA	6.E-03			6.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	9.3E-03		6.3E-05	9.39E-03
			Vanadium					Vanadium	Kidney	9.E-04			9.E-04	1.5E-07		1.0E-08	1.63E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		2.E-10	2.E-09	Rdx	Prostate	5.E-06		4.E-06	1.E-05	East Tributary SW			
			Arsenic	8.E-09		1.E-09	9.E-09	Arsenic	Skin, CVS	2.E-05		2.E-05	4.E-05	2.8E-05		2.5E-05	5.25E-05
							Total Risk Across East Tributary Sediment						Total Hazard Index Across East Tributary Sediment	9.E-03	9.1E-09	1.6E-09	1.07E-08
							Total Risk Across East Tributary Surface Water						Total Hazard Index Across East Tributary Surface water	5.E-05			
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	3.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-04			6.E-04	1.8E-02		1.6E-04	1.82E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	3.9E-07		2.6E-08	4.15E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-04		3.E-03	3.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment						Total Hazard Index Across Turkey Creek Sediment	2.E-02	1.1E-04	2.5E-03	2.63E-03
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water	3.E-03			
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.8. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0 to 6 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Antimony					Antimony	Blood	7.E-04			7.E-04				
			Arsenic	2.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	2.E-02				
			Cadmium					Cadmium	Kidney	3.E-03		1.E-04	3.E-03				
			Iron					Iron	NA	8.E-02			8.E-02	Gully Sed			
			Manganese					Manganese	CNS	1.E-02			1.E-02	1.3E-01		1.3E-03	1.27E-01
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	2.3E-07		1.5E-08	2.45E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		4.E-03	3.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		2.E-04	2.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	5.E-03		5.E-04	6.E-03				
			Rdx	4.E-08		2.E-09	4.E-08	Rdx	Prostate	4.E-03		2.E-04	4.E-03				
			Aluminum					Aluminum	CNS	4.E-03		2.E-04	4.E-03				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	8.E-03		6.E-04	9.E-03				
			Barium					Barium	Kidney	6.E-04		6.E-04	1.E-03				
			Beryllium					Beryllium	Gastrointestinal	4.E-04		4.E-03	4.E-03				
			Cadmium					Cadmium	Kidney	2.E-03		3.E-03	6.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-03		7.E-03	8.E-03				
			Cobalt					Cobalt	NA	2.E-04		1.E-05	2.E-04				
			Copper					Copper	Gastrointestinal	6.E-03		4.E-04	6.E-03				
			Iron					Iron	NA	1.E-02		8.E-04	1.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	7.E-02		1.E-01	2.E-01				
			Mercury					Mercury	CNS	4.E-04		4.E-04	8.E-04				
			Nickel					Nickel	Body Weight	6.E-04		2.E-04	8.E-04				
			Thallium					Thallium	Liver	1.E-03		7.E-05	1.E-03				
			Vanadium					Vanadium	Kidney	2.E-02		5.E-02	7.E-02	Gully SW			
			Zinc					Zinc	Blood	2.E-03		9.E-05	2.E-03	1.7E-01		1.9E-01	3.58E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-03		7.E-05	1.E-03	1.5E-07		1.1E-08	1.66E-07
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-01				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	4.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	9.E-03		6.E-04	9.E-03				
			Iron					Iron	NA	6.E-02			6.E-02	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-02			1.E-02	8.7E-02		5.8E-04	8.77E-02
			Vanadium					Vanadium	Kidney	9.E-03			9.E-03	1.1E-07		7.5E-09	1.18E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		7.E-11	1.E-09	Rdx	Prostate	1.E-04		8.E-06	1.E-04	East Tributary SW			
			Arsenic	7.E-09		4.E-10	7.E-09	Arsenic	Skin, CVS	5.E-04		3.E-05	6.E-04	6.5E-04		4.2E-05	6.91E-04
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	9.E-02	7.9E-09		5.1E-10	8.42E-09
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	7.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Arsenic	3.E-07		2.E-08	3.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	2.E-02				
			Iron					Iron	NA	1.E-01			1.E-01	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-03			6.E-03	1.7E-01		1.5E-03	1.70E-01
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	2.8E-07		1.9E-08	3.02E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	3.E-03		4.E-03	7.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	2.E-01	2.6E-03		4.3E-03	6.87E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	7.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	3.6E-02	Total CNS HI =	2.E-01
Total Kidney HI =	2.2E-02	Total Fetotoxicity HI =	8.E-03
Total CVS HI =	2.8E-02	Total Prostate HI =	4.E-03
Total GI Tract HI =	1.8E-02	Total Bone HI =	8.E-03
Total Skin HI =	2.8E-02	Total Blood HI =	4.E-03
Total Body Weight HI =	7.7E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Prostate HI =	1.E-04
Total Skin HI =	1.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	2.E-02	Total Skin HI =	2.E-02

TABLE 9.9. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	5.E-04			5.E-04				
			Antimony					Antimony	Blood	8.E-05			8.E-05				
			Arsenic	9.E-08		6.E-09	9.E-08	Arsenic	Skin, CVS	2.E-03		1.E-04	2.E-03				
			Cadmium					Cadmium	Kidney	3.E-04		1.E-05	3.E-04				
			Iron					Iron	NA	8.E-03			8.E-03	Gully Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	1.3E-02		1.4E-04	1.36E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	8.6E-08		5.9E-09	9.21E-08
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-09		4.E-09	5.E-09	2,4,6-Trinitrotoluene	Liver	1.E-03		2.E-03	3.E-03				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		9.E-05	2.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		3.E-04	5.E-04				
			Rdx	6.E-09		5.E-09	1.E-08	Rdx	Prostate	2.E-04		1.E-04	3.E-04				
			Aluminum					Aluminum	CNS	2.E-04		1.E-04	3.E-04				
			Arsenic	2.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	4.E-04		3.E-04	7.E-04				
			Barium					Barium	Kidney	3.E-05		4.E-04	4.E-04				
			Beryllium					Beryllium	Gastrointestinal	2.E-05		2.E-03	2.E-03				
			Cadmium					Cadmium	Kidney	1.E-04		2.E-03	2.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-05		4.E-03	4.E-03				
			Cobalt					Cobalt	NA	8.E-06		7.E-06	2.E-05				
			Copper					Copper	Gastrointestinal	2.E-04		2.E-04	5.E-04				
			Iron					Iron	NA	5.E-04		4.E-04	9.E-04				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-03		7.E-02	7.E-02				
			Mercury					Mercury	CNS	2.E-05		2.E-04	2.E-04				
			Nickel					Nickel	Body Weight	2.E-05		1.E-04	1.E-04				
			Thallium					Thallium	Liver	5.E-05		4.E-05	9.E-05				
			Vanadium					Vanadium	Kidney	9.E-04		3.E-02	3.E-02	Gully SW			
			Zinc					Zinc	Blood	1.E-04		5.E-05	2.E-04	7.1E-03		1.1E-01	1.20E-01
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-05		4.E-05	9.E-05	2.3E-08		2.3E-08	4.60E-08
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	1.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	4.E-08		3.E-09	4.E-08	Arsenic	Skin, CVS	9.E-04		6.E-05	1.E-03				
			Iron					Iron	NA	6.E-03			6.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	9.3E-03		6.3E-05	9.39E-03
			Vanadium					Vanadium	Kidney	9.E-04			9.E-04	4.2E-08		2.8E-09	4.44E-08
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-10		1.E-10	3.E-10	Rdx	Prostate	5.E-06		4.E-06	1.E-05	East Tributary SW			
			Arsenic	1.E-09		9.E-10	2.E-09	Arsenic	Skin, CVS	2.E-05		2.E-05	4.E-05	2.8E-05		2.5E-05	5.25E-05
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	9.E-03	1.2E-09		1.1E-09	2.25E-09
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	5.E-05				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	3.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-04			6.E-04	1.8E-02		1.6E-04	1.82E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.1E-07		7.3E-09	1.13E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-04		3.E-03	3.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	2.E-02	1.1E-04		2.5E-03	2.63E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	3.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	4.1E-03	Total CNS HI =	7.E-02
Total Kidney HI =	4.0E-03	Total Fetotoxicity HI =	4.E-03
Total CVS HI =	2.7E-03	Total Prostate HI =	3.E-04
Total GI Tract HI =	6.6E-03	Total Bone HI =	4.E-03
Total Skin HI =	2.7E-03	Total Blood HI =	3.E-04
Total Body Weight HI =	1.4E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-04	Total CNS HI =	1.E-03
Total CVS HI =	1.E-03	Total Prostate HI =	1.E-05
Total Skin HI =	1.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	4.E-03
Total CVS HI =	3.E-03	Total Skin HI =	3.E-03

TABLE 9.7. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - TOTAL RECREATIONAL ILCRS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child + Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS								
			Antimony					Antimony	Blood								
			Arsenic	3.E-07		3.E-08	3.E-07	Arsenic	Skin, CVS								
			Cadmium					Cadmium	Kidney								
			Iron					Iron	NA					Gully Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.2E-07		2.8E-08	3.44E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		5.E-09	2.E-08	2,4,6-Trinitrotoluene	Liver								
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver								
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver								
			Rdx	4.E-08		7.E-09	5.E-08	Rdx	Prostate								
			Aluminum					Aluminum	CNS								
			Arsenic	1.E-07		2.E-08	1.E-07	Arsenic	Skin, CVS								
			Barium					Barium	Kidney								
			Beryllium					Beryllium	Gastrointestinal								
			Cadmium					Cadmium	Kidney								
			Chromium					Chromium	Fetotoxicity/GS/Bone								
			Cobalt					Cobalt	NA								
			Copper					Copper	Gastrointestinal								
			Iron					Iron	NA								
			Lead					Lead	NA								
			Manganese					Manganese	CNS								
			Mercury					Mercury	CNS								
			Nickel					Nickel	Body Weight								
			Thallium					Thallium	Liver								
			Vanadium					Vanadium	Kidney					Gully SW			
			Zinc					Zinc	Blood								
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood					1.8E-07		3.4E-08	2.12E-07
							Total Risk Across Gully Sediment	3.E-07					Total Hazard Index Across Gully Sediment				
							Total Risk Across Gully Surface Water	2.E-07					Total Hazard Index Across Gully Surface water				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS								
			Arsenic	2.E-07		1.E-08	2.E-07	Arsenic	Skin, CVS								
			Iron					Iron	NA					East Tributary Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					1.5E-07		1.3E-08	1.66E-07
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		2.E-10	2.E-09	Rdx	Prostate					East Tributary SW			
			Arsenic	8.E-09		1.E-09	9.E-09	Arsenic	Skin, CVS								
							Total Risk Across East Tributary Sediment	2.E-07					Total Hazard Index Across East Tributary Sediment	9.1E-09		1.6E-09	1.07E-08
							Total Risk Across East Tributary Surface Water	1.E-08					Total Hazard Index Across East Tributary Surface water				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS								
			Arsenic	4.E-07		3.E-08	4.E-07	Arsenic	Skin, CVS								
			Iron					Iron	NA					Turkey Creek Sed			
			Manganese					Manganese	CNS								
			Vanadium					Vanadium	Kidney					3.9E-07		3.4E-08	4.23E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS					Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment	4.E-07					Total Hazard Index Across Turkey Creek Sediment				
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

TABLE 9.5. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child (3 to 12 years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Antimony					Antimony	Blood	7.E-04			7.E-04				
			Arsenic	2.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS	2.E-02		1.E-03	2.E-02				
			Cadmium					Cadmium	Kidney	3.E-03		1.E-04	3.E-03				
			Iron					Iron	NA	8.E-02			8.E-02	**Gully Sed**			
			Manganese					Manganese	CNS	1.E-02			1.E-02	**1.3E-01**		**1.6E-03**	**1.27E-01**
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	**2.3E-07**		**1.8E-08**	**2.48E-07**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-08		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	2.E-02		4.E-03	3.E-02				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.E-03		2.E-04	2.E-03				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	5.E-03		5.E-04	6.E-03				
			Rdx	4.E-08		2.E-09	4.E-08	Rdx	Prostate	4.E-03		2.E-04	4.E-03				
			Aluminum					Aluminum	CNS	4.E-03		2.E-04	4.E-03				
			Arsenic	1.E-07		7.E-09	1.E-07	Arsenic	Skin, CVS	8.E-03		6.E-04	9.E-03				
			Barium					Barium	Kidney	6.E-04		6.E-04	1.E-03				
			Beryllium					Beryllium	Gastrointestinal	4.E-04		4.E-03	4.E-03				
			Cadmium					Cadmium	Kidney	2.E-03		3.E-03	6.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	1.E-03		7.E-03	8.E-03				
			Cobalt					Cobalt	NA	2.E-04		1.E-05	2.E-04				
			Copper					Copper	Gastrointestinal	6.E-03		4.E-04	6.E-03				
			Iron					Iron	NA	1.E-02		8.E-04	1.E-02				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	7.E-02		1.E-01	2.E-01				
			Mercury					Mercury	CNS	4.E-04		4.E-04	8.E-04				
			Nickel					Nickel	Body Weight	6.E-04		2.E-04	8.E-04				
			Thallium					Thallium	Liver	1.E-03		7.E-05	1.E-03				
			Vanadium					Vanadium	Kidney	2.E-02		5.E-02	7.E-02	**Gully SW**			
			Zinc					Zinc	Blood	2.E-03		9.E-05	2.E-03	**1.7E-01**		**1.9E-01**	**3.58E-01**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	1.E-03		7.E-05	1.E-03	**1.5E-07**		**1.1E-08**	**1.66E-07**
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-01				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	4.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-03			4.E-03				
			Arsenic	1.E-07		9.E-09	1.E-07	Arsenic	Skin, CVS	9.E-03		7.E-04	9.E-03				
			Iron					Iron	NA	6.E-02			6.E-02	**East Tributary Sed**			
			Manganese					Manganese	CNS	1.E-02			1.E-02	**8.7E-02**		**6.8E-04**	**8.78E-02**
			Vanadium					Vanadium	Kidney	9.E-03			9.E-03	**1.1E-07**		**8.8E-09**	**1.20E-07**
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		7.E-11	1.E-09	Rdx	Prostate	1.E-04		8.E-06	1.E-04	**East Tributary SW**			
			Arsenic	7.E-09		4.E-10	7.E-09	Arsenic	Skin, CVS	5.E-04		3.E-05	6.E-04	**6.5E-04**		**4.2E-05**	**6.91E-04**
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	9.E-02	**7.9E-09**		**5.1E-10**	**8.42E-09**
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	7.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-03			3.E-03				
			Arsenic	3.E-07		2.E-08	3.E-07	Arsenic	Skin, CVS	2.E-02		2.E-03	2.E-02				
			Iron					Iron	NA	1.E-01			1.E-01	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	6.E-03			6.E-03	**1.7E-01**		**1.7E-03**	**1.70E-01**
			Vanadium					Vanadium	Kidney	1.E-02			1.E-02	**2.8E-07**		**2.2E-08**	**3.05E-07**
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	3.E-03		4.E-03	7.E-03	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	2.E-01	**2.6E-03**		**4.3E-03**	**6.87E-03**
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	7.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	3.6E-02	Total CNS HI =	2.E-01
Total Kidney HI =	2.2E-02	Total Fetotoxicity HI =	8.E-03
Total CVS HI =	2.8E-02	Total Prostate HI =	4.E-03
Total GI Tract HI =	1.8E-02	Total Bone HI =	8.E-03
Total Skin HI =	2.8E-02	Total Blood HI =	4.E-03
Total Body Weight HI =	7.7E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-03	Total CNS HI =	1.E-02
Total CVS HI =	1.E-02	Total Prostate HI =	1.E-04
Total Skin HI =	1.E-02		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-02	Total CNS HI =	2.E-02
Total CVS HI =	2.E-02	Total Skin HI =	2.E-02

TABLE 9.6. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	5.E-04			5.E-04				
			Antimony					Antimony	Blood	8.E-05			8.E-05				
			Arsenic	9.E-08		9.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	2.E-03				
			Cadmium					Cadmium	Kidney	3.E-04		2.E-05	3.E-04				
			Iron					Iron	NA	8.E-03			8.E-03	**Gully Sed**			
			Manganese					Manganese	CNS	1.E-03			1.E-03	**1.3E-02**		**2.3E-04**	**1.37E-02**
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	**8.6E-08**		**9.4E-09**	**9.56E-08**
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	1.E-09		4.E-09	5.E-09	2,4,6-Trinitrotoluene	Liver	1.E-03		2.E-03	3.E-03				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.E-05		9.E-05	2.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	2.E-04		3.E-04	5.E-04				
			Rdx	6.E-09		5.E-09	1.E-08	Rdx	Prostate	2.E-04		1.E-04	3.E-04				
			Aluminum					Aluminum	CNS	2.E-04		1.E-04	3.E-04				
			Arsenic	2.E-08		1.E-08	3.E-08	Arsenic	Skin, CVS	4.E-04		3.E-04	7.E-04				
			Barium					Barium	Kidney	3.E-05		4.E-04	4.E-04				
			Beryllium					Beryllium	Gastrointestinal	2.E-05		2.E-03	2.E-03				
			Cadmium					Cadmium	Kidney	1.E-04		2.E-03	2.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	5.E-05		4.E-03	4.E-03				
			Cobalt					Cobalt	NA	8.E-06		7.E-06	2.E-05				
			Copper					Copper	Gastrointestinal	2.E-04		2.E-04	5.E-04				
			Iron					Iron	NA	5.E-04		4.E-04	9.E-04				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	3.E-03		7.E-02	7.E-02				
			Mercury					Mercury	CNS	2.E-05		2.E-04	2.E-04				
			Nickel					Nickel	Body Weight	2.E-05		1.E-04	1.E-04				
			Thallium					Thallium	Liver	5.E-05		4.E-05	9.E-05				
			Vanadium					Vanadium	Kidney	9.E-04		3.E-02	3.E-02	**Gully SW**			
			Zinc					Zinc	Blood	1.E-04		5.E-05	2.E-04	**7.1E-03**		**1.1E-01**	**1.20E-01**
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	5.E-05		4.E-05	9.E-05	**2.3E-08**		**2.3E-08**	**4.60E-08**
							Total Risk Across Gully Sediment 1.E-07						Total Hazard Index Across Gully Sediment 1.E-02				
							Total Risk Across Gully Surface Water 5.E-08						Total Hazard Index Across Gully Surface water 1.E-01				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	4.E-08		5.E-09	5.E-08	Arsenic	Skin, CVS	9.E-04		1.E-04	1.E-03				
			Iron					Iron	NA	6.E-03			6.E-03	**East Tributary Sed**			
			Manganese					Manganese	CNS	1.E-03			1.E-03	**9.3E-03**		**1.0E-04**	**9.43E-03**
			Vanadium					Vanadium	Kidney	9.E-04			9.E-04	**4.2E-08**		**4.5E-09**	**4.61E-08**
Surface Water	Surface Water	East Tributary Surface Water	Rdx	2.E-10		1.E-10	3.E-10	Rdx	Prostate	5.E-06		4.E-06	1.E-05	**East Tributary SW**			
			Arsenic	1.E-09		9.E-10	2.E-09	Arsenic	Skin, CVS	2.E-05		2.E-05	4.E-05	**2.8E-05**		**2.5E-05**	**5.25E-05**
							Total Risk Across East Tributary Sediment 5.E-08						Total Hazard Index Across East Tributary Sediment 9.E-03	**1.2E-09**		**1.1E-09**	**2.25E-09**
							Total Risk Across East Tributary Surface Water 2.E-09						Total Hazard Index Across East Tributary Surface water 5.E-05				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	1.E-07		1.E-08	1.E-07	Arsenic	Skin, CVS	2.E-03		3.E-04	3.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	**Turkey Creek Sed**			
			Manganese					Manganese	CNS	6.E-04			6.E-04	**1.8E-02**		**2.6E-04**	**1.83E-02**
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	**1.1E-07**		**1.2E-08**	**1.18E-07**
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	1.E-04		3.E-03	3.E-03	**Turkey Creek SW**			
							Total Risk Across Turkey Creek Sediment 1.E-07						Total Hazard Index Across Turkey Creek Sediment 2.E-02	**1.1E-04**		**2.5E-03**	**2.63E-03**
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water 3.E-03				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	4.1E-03	Total CNS HI =	7.E-02
Total Kidney HI =	4.0E-03	Total Fetotoxicity HI =	4.E-03
Total CVS HI =	2.8E-03	Total Prostate HI =	3.E-04
Total GI Tract HI =	6.6E-03	Total Bone HI =	4.E-03
Total Skin HI =	2.8E-03	Total Blood HI =	3.E-04
Total Body Weight HI =	1.4E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	9.E-04	Total CNS HI =	1.E-03
Total CVS HI =	1.E-03	Total Prostate HI =	1.E-05
Total Skin HI =	1.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	4.E-03
Total CVS HI =	3.E-03	Total Skin HI =	3.E-03

TABLE 9.4. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADOLESCENT TRESPASSERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Antimony					Antimony	Blood	6.E-05			6.E-05				
			Arsenic	1.E-07		2.E-08	1.E-07	Arsenic	Skin, CVS	2.E-03		2.E-04	2.E-03				
			Cadmium					Cadmium	Kidney	2.E-04		2.E-05	3.E-04				
			Iron					Iron	NA	7.E-03			7.E-03	Gully Sed			
			Manganese					Manganese	CNS	9.E-04			9.E-04	1.1E-02		2.6E-04	1.12E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.1E-07		1.6E-08	1.27E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene	9.E-09		2.E-09	1.E-08	2,4,6-Trinitrotoluene	Liver	4.E-03		7.E-04	5.E-03				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.E-04		3.E-05	3.E-04				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver	1.E-03		9.E-05	1.E-03				
			Rdx	4.E-08		2.E-09	4.E-08	Rdx	Prostate	7.E-04		4.E-05	7.E-04				
			Aluminum					Aluminum	CNS	6.E-04		4.E-05	7.E-04				
			Arsenic	1.E-07		6.E-09	1.E-07	Arsenic	Skin, CVS	1.E-03		9.E-05	2.E-03				
			Barium					Barium	Kidney	1.E-04		1.E-04	2.E-04				
			Beryllium					Beryllium	Gastrointestinal	7.E-05		6.E-04	7.E-04				
			Cadmium					Cadmium	Kidney	4.E-04		5.E-04	1.E-03				
			Chromium					Chromium	Fetotoxicity/GS/Bone	2.E-04		1.E-03	1.E-03				
			Cobalt					Cobalt	NA	3.E-05		2.E-06	3.E-05				
			Copper					Copper	Gastrointestinal	1.E-03		6.E-05	1.E-03				
			Iron					Iron	NA	2.E-03		1.E-04	2.E-03				
			Lead					Lead	NA								
			Manganese					Manganese	CNS	1.E-02		2.E-02	3.E-02				
			Mercury					Mercury	CNS	7.E-05		6.E-05	1.E-04				
			Nickel					Nickel	Body Weight	1.E-04		3.E-05	1.E-04				
			Thallium					Thallium	Liver	2.E-04		1.E-05	2.E-04				
			Vanadium					Vanadium	Kidney	4.E-03		9.E-03	1.E-02	Gully SW			
			Zinc					Zinc	Blood	4.E-04		2.E-05	4.E-04	2.9E-02		3.2E-02	6.04E-02
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood	2.E-04		1.E-05	2.E-04	1.5E-07		9.E-09	1.59E-07
							Total Risk Across Gully Sediment					Total Hazard Index Across Gully Sediment	1.E-02				
							Total Risk Across Gully Surface Water					Total Hazard Index Across Gully Surface water	6.E-02				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	5.E-08		8.E-09	6.E-08	Arsenic	Skin, CVS	8.E-04		1.E-04	9.E-04				
			Iron					Iron	NA	5.E-03			5.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	9.E-04			9.E-04	7.6E-03		1.1E-04	7.71E-03
			Vanadium					Vanadium	Kidney	7.E-04			7.E-04	5.3E-08		7.9E-09	6.11E-08
Surface Water	Surface Water	East Tributary Surface Water	Rdx	1.E-09		6.E-11	1.E-09	Rdx	Prostate	2.E-05		1.E-06	2.E-05	East Tributary SW			
			Arsenic	6.E-09		4.E-10	7.E-09	Arsenic	Skin, CVS	9.E-05		6.E-06	1.E-04	1.1E-04		6.9E-06	1.20E-04
							Total Risk Across East Tributary Sediment					Total Hazard Index Across East Tributary Sediment	8.E-03	7.6E-09		4.6E-10	8.05E-09
							Total Risk Across East Tributary Surface Water					Total Hazard Index Across East Tributary Surface water	1.E-04				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	2.E-04			2.E-04				
			Arsenic	1.E-07		2.E-08	2.E-07	Arsenic	Skin, CVS	2.E-03		3.E-04	2.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	5.E-04			5.E-04	1.5E-02		2.9E-04	1.50E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.4E-07		2.0E-08	1.56E-07
Surface Water	Surface Water	Turkey Creek	Manganese					Manganese	CNS	5.E-04		7.E-04	1.E-03	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment					Total Hazard Index Across Turkey Creek Sediment	1.E-02	4.5E-04		7.0E-04	1.15E-03
							Total Risk Across Turkey Creek Surface Water					Total Hazard Index Across Turkey Creek Surface water	1.E-03				
							Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	6.2E-03	Total CNS HI =	3.E-02
Total Kidney HI =	2.5E-03	Total Fetotoxicity HI =	1.E-03
Total CVS HI =	3.3E-03	Total Prostate HI =	7.E-04
Total GI Tract HI =	3.0E-03	Total Bone HI =	1.E-03
Total Skin HI =	3.3E-03	Total Blood HI =	7.E-04
Total Body Weight HI =	1.3E-04		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	7.E-04	Total CNS HI =	1.E-03
Total CVS HI =	1.E-03	Total Prostate HI =	2.E-05
Total Skin HI =	1.E-03		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	2.E-03
Total CVS HI =	2.E-03	Total Skin HI =	2.E-03

TABLE 9.2. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE WORKERS
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total				
Sediment	Sediment	Sediment in Gullies	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Antimony					Antimony	Blood	7.E-05			7.E-05				
			Arsenic	1.E-07		4.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		7.E-05	2.E-03				
			Cadmium					Cadmium	Kidney	3.E-04		7.E-06	3.E-04				
			Iron					Iron	NA	8.E-03			8.E-03	Gully Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	1.2E-02		7.7E-05	1.25E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.0E-07		4.1E-09	1.06E-07
Surface Water	Surface Water	Surface Water in Gullies	2,4,6-Trinitrotoluene			5.E-10	5.E-10	2,4,6-Trinitrotoluene	Liver			3.E-04	3.E-04				
			2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver			1.E-05	1.E-05				
			4-Amino-2,6-dinitrotoluene					4-Amino-2,6-dinitrotoluene	Liver			4.E-05	4.E-05				
			Rdx			7.E-10	7.E-10	Rdx	Prostate			2.E-05	2.E-05				
			Aluminum					Aluminum	CNS			1.E-05	1.E-05				
			Arsenic			2.E-09	2.E-09	Arsenic	Skin, CVS			3.E-05	3.E-05				
			Barium					Barium	Kidney			3.E-05	3.E-05				
			Beryllium					Beryllium	Gastrointestinal			2.E-04	2.E-04				
			Cadmium					Cadmium	Kidney			2.E-04	2.E-04				
			Chromium					Chromium	Fetotoxicity/GS/Bone			3.E-04	3.E-04				
			Cobalt					Cobalt	NA			6.E-07	6.E-07				
			Copper					Copper	Gastrointestinal			2.E-05	2.E-05				
			Iron					Iron	NA			4.E-05	4.E-05				
			Lead					Lead	NA								
			Manganese					Manganese	CNS			6.E-03	6.E-03				
			Mercury					Mercury	CNS			2.E-05	2.E-05				
			Nickel					Nickel	Body Weight			9.E-06	9.E-06				
			Thallium					Thallium	Liver			4.E-06	4.E-06				
			Vanadium					Vanadium	Kidney			3.E-03	3.E-03	Gully SW			
			Zinc					Zinc	Blood			5.E-06	5.E-06			9.6E-03	9.61E-03
			Nitrite/Nitrate-N					Nitrite/Nitrate-N	Blood			4.E-06	4.E-06			2.8E-09	2.82E-09
							Total Risk Across Gully Sediment 1.E-07						Total Hazard Index Across Gully Sediment 1.E-02				
							Total Risk Across Gully Surface Water 3.E-09						Total Hazard Index Across Gully Surface water 1.E-02				
Sediment	Sediment	East Tributary Sediment	Aluminum					Aluminum	CNS	4.E-04			4.E-04				
			Arsenic	5.E-08		2.E-09	5.E-08	Arsenic	Skin, CVS	9.E-04		3.E-05	9.E-04				
			Iron					Iron	NA	6.E-03			6.E-03	East Tributary Sed			
			Manganese					Manganese	CNS	1.E-03			1.E-03	8.6E-03		3.4E-05	8.65E-03
			Vanadium					Vanadium	Kidney	8.E-04			8.E-04	4.9E-08		2.0E-09	5.13E-08
Surface Water	Surface Water	East Tributary Surface Water	RDX			3.E-11	3.E-11	RDX	Prostate			7.E-07	7.E-07	East Tributary SW			
			ARSENIC			2.E-10	2.E-10	ARSENIC	Skin, CVS			3.E-06	3.E-06			4.2E-06	4.15E-06
							Total Risk Across East Tributary Sediment 5.E-08						Total Hazard Index Across East Tributary Sediment 9.E-03			2.3E-10	2.29E-10
							Total Risk Across East Tributary Surface Water 2.E-10						Total Hazard Index Across East Tributary Surface water 4.E-06				
Sediment	Sediment	Turkey Creek Sediment	Aluminum					Aluminum	CNS	3.E-04			3.E-04				
			Arsenic	1.E-07		5.E-09	1.E-07	Arsenic	Skin, CVS	2.E-03		9.E-05	2.E-03				
			Iron					Iron	NA	1.E-02			1.E-02	Turkey Creek Sed			
			Manganese					Manganese	CNS	6.E-04			6.E-04	1.7E-02		8.6E-05	1.68E-02
			Vanadium					Vanadium	Kidney	1.E-03			1.E-03	1.3E-07		5.0E-09	1.31E-07
Surface Water	Surface Water	Turkey Creek	MANGANESE					MANGANESE	CNS			4.E-04	4.E-04	Turkey Creek SW			
							Total Risk Across Turkey Creek Sediment 1.E-07						Total Hazard Index Across Turkey Creek Sediment 2.E-02			4.2E-04	4.23E-04
							Total Risk Across Turkey Creek Surface Water						Total Hazard Index Across Turkey Creek Surface water 4.E-04				
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes				

Total Target Organ Hazard Index for Gully Surface Water and Sediment

Total Liver HI =	3.3E-04	Total CNS HI =	7.E-03
Total Kidney HI =	1.7E-03	Total Fetotoxicity HI =	3.E-04
Total CVS HI =	1.9E-03	Total Prostate HI =	2.E-05
Total GI Tract HI =	5.3E-04	Total Bone HI =	3.E-04
Total Skin HI =	1.9E-03	Total Blood HI =	8.E-05
Total Body Weight HI =	9.5E-06		

Total Target Organ Hazard Index for East Tributary Surface Water and Sediment

Total Kidney HI =	8.E-04	Total CNS HI =	1.E-03
Total CVS HI =	9.E-04	Total Prostate HI =	7.E-07
Total Skin HI =	9.E-04		

Total Target Organ Hazard Index for Turkey Creek Surface Water and Sediment

Total Kidney HI =	1.E-03	Total CNS HI =	1.E-03
Total CVS HI =	2.E-03	Total Skin HI =	2.E-03

TABLE 8.95 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	5.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.95 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.6E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-03
	(total)												**1.7E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.7E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
MIANTENANCE WORKERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.95
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.83 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.4E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	4.2E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	7.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.5E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.7E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	6.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	8.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.5E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	9.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	8.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.7E-08**
										Total Risk Across All Exposure Routes/Pathways	**2.7E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.83 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	7.9E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	6.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.1E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.0E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.4E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.6E-05
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	4.7E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	4.7E-05
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	3.3E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.1E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.7E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.2E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	9.9E-09	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	7.1E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.6E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	6.4E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	9.9E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.3E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	4.8E-08	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.4E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.9E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	7.3E-05
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	4.5E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.5E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	9.3E-08	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.2E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.3E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.6E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	7.7E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	3.8E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	9.9E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.4E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.7E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.0E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	5.5E-06	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.4E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.5E-05
	(total)												**3.8E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.8E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
MAINTENANCE WORKERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.83
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.89 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	(total)										**2.4E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.4E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.89 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.3E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.1E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-05
	(total)												**1.6E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.6E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
MIANTENANCE WORKERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.89
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.95a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

TABLE 7.95a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.1E-07	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.2E-04
	(total)												**4.2E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.2E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
MIANTENANCE WORKERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT ($MG/CM^2/EVENT$)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = $2FA \times Kp \times C \times CF \times (6T \times tevent/3.1416)^{0.5}$

IF tevent > t*, DAevent = $FA \times Kp \times C \times CF \times ((tevent/(1 + B)) + (2T \times ((1+3B+3B^2)/(1 + B)^2)))$

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.95a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.83a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.8E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	5.4E-10
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.9E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	9.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	6.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.0E-10
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.2E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.7E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.2E-11	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.8E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.83a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.4E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.8E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.2E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	7.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.6E-05
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.9E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-05
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.2E-05	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.2E-05
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	8.2E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.7E-05
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	4.2E-07	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	3.0E-05
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.5E-09	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.8E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.0E-09	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.6E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.5E-08	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.3E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.2E-08	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	6.0E-07
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	7.3E-07	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	1.8E-05
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.1E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.8E-05
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.3E-08	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	5.6E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	5.8E-03
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.0E-10	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.9E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	7.6E-09	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	9.5E-06
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.5E-10	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	3.5E-06
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	6.7E-08	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.6E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.4E-06	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-06
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	5.9E-06	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	3.7E-06
	(total)												**9.6E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**9.6E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
MAINTENANCE WORKERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	1.00E+00	1.96E+00		9.64E-04		5.59E-03	1	8.96E-08
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	1.00E+00	1.34E+00		6.41E-04		3.46E-03	1	1.43E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	1.00E+00	1.34E+00		6.41E-04		3.46E-03	1	4.71E-08
Rdx	2.50E-02		o		4.42E+00	1.00E+00	1.84E+00		3.39E-04		1.94E-03	1	3.18E-08
Aluminum	7.57E+00		i			1.00E+00			1.00E-03			1	7.57E-06
Arsenic	5.30E-03		i			1.00E+00			1.00E-03			1	5.30E-09
Barium	2.73E-01		i			1.00E+00			1.00E-03			1	2.73E-07
Beryllium	1.60E-03		i			1.00E+00			1.00E-03			1	1.60E-09
Cadmium	2.60E-03		i			1.00E+00			1.00E-03			1	2.60E-09
Chromium	8.00E-03		i			1.00E+00			2.00E-03			1	1.60E-08
Cobalt	7.80E-03		i			1.00E+00			1.00E-03			1	7.80E-09
Copper	4.68E-01		i			1.00E+00			1.00E-03			1	4.68E-07
Iron	7.26E+00		i			1.00E+00			1.00E-03			1	7.26E-06
Lead	1.50E-02		i			1.00E+00			1.00E-03			1	1.50E-08
Manganese	3.62E+00		i			1.00E+00			1.00E-03			1	3.62E-06
Mercury	2.60E-04		i			1.00E+00			1.00E-03			1	2.60E-10
Nickel	2.44E-02		i			1.00E+00			2.00E-04			1	4.88E-09
Thallium	1.60E-04		i			1.00E+00			1.00E-03			1	1.60E-10
Vanadium	4.34E-02		i			1.00E+00			1.00E-03			1	4.34E-08
Zinc	1.48E+00		i			1.00E+00			6.00E-04			1	8.88E-07
Nitrite/Nitrate-N	3.80E+00		i			1.00E+00			1.00E-03			1	3.80E-06

TABLE 4.83a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.89a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.9E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.2E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.3E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-10
	(total)										**2.3E-10**
										Total Risk Across All Exposure Routes/Pathways	**2.3E-10**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.89a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.4E-07
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.0E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-06
	(total)												**4.2E-06**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.2E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
MIANTENANCE WORKERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.89
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF MAINTENANCE WORKERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for for estimating DAevent and the chemical-specific dermally absorbed dose from water (DAD) are provided in Section 7.3.4. of the text.
	A	Skin Surface Area	cm^2	3,300	U.S. EPA, July 2004	3,300	U.S. EPA, July 2004	
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	
	ED	Exposure Duration	years	25	U.S. EPA, May 1993	9	U.S. EPA, May 1993	
	EF	Exposure Frequency	days/year	24	Professional judgement	12	Professional judgement	
	t_{event}	Duration of Event	hour/event	2	Professional judgement	1	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	U.S. EPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Dermal Intake(RME) = 1.11E+00
Noncancer Dermal Intake(RME) = 3.10E+00

Cancer Dermal Intake(CTE) = 1.99E-01
Noncancer Dermal Intake(CTE) = 1.55E+00

TABLE 8.99 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.99 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.5E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.6E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-02
	(total)												**1.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.7E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE CHILD RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.99
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.87 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.9E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	8.6E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	5.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	7.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	6.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.9E-06**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.8E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.7E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	8.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	5.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	8.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	7.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	4.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	9.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.87 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.6E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.3E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.6E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.4E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.2E-02
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.7E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-02
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.0E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-02
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.2E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.6E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.5E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.5E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.4E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.9E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-02
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.4E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-05	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.9E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.9E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.6E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.3E-03
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.3E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.4E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.2E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.5E-03
	(total)												**6.6E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.6E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	4.7E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.6E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	9.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	9.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.4E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	2.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.0E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.4E-02
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.3E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.3E-02
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.0E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.7E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	9.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.9E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	1.5E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.9E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.5E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.7E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.3E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	7.6E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.0E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.1E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.7E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	3.0E-04
	(total)												**7.6E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE CHILD RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.87
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.93 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	5.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.1E-08
	(total)										**9.5E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	5.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.0E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-09
	(total)										**5.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.93 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.5E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.1E-03
	(total)												**2.6E-03**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-04
	(total)												**1.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE CHILD RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.93
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.99a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.99a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.2E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.6E-03
	(total)												**2.6E-03**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.1E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.3E-03
	(total)												**4.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE CHILD RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.99a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.87a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	9.8E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.4E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	7.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	5.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.7E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.7E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.1E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	7.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	6.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	8.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.87a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.3E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.7E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.1E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.0E-03
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.6E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.6E-03
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.3E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	6.5E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	7.6E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.8E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.5E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	3.7E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.9E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.2E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	5.6E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.7E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.8E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	7.6E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.1E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.1E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.8E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.1E-03
	(total)												**1.7E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.2E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.2E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.7E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.5E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	8.6E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	6.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	3.6E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.1E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.3E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	5.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	6.7E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	3.7E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.6E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.7E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.1E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.2E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.1E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	3.9E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.5E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.9E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.3E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.2E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	7.4E-05
	(total)												**1.9E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.6E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE CHILD RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.87a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.93a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-09
	(total)										**7.9E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.0E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-10
	(total)										**5.1E-10**
										Total Risk Across All Exposure Routes/Pathways	**8.4E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.93a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.2E-04
	(total)												**6.5E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.5E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.0E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-05
	(total)												**4.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE CHILD RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.93a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE CHILD RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 200	3,300	1/2 total body area (EPA 200	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004		U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04 Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(RME) = 1.90E-03 Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00 Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(RME) = 3.13E+01 Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.97 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.97 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.5E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.6E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.7E-02
	(total)												**1.7E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.7E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
CHILD RECREATIONAL USERS - REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.97
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.85 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.9E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.2E-07
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.5E-07
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	8.6E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-06
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	4.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	7.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.2E-03	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	5.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	7.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.4E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	6.2E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.9E-06**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.8E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	2.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.7E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.9E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	8.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	5.7E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	8.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	7.8E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.7E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	4.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	9.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.2E-07**
										Total Risk Across All Exposure Routes/Pathways	**2.0E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.85 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.6E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.3E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.6E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.4E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.2E-02
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.7E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-02
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-02	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-02
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.0E-05	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-02
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.2E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.6E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.9E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.5E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.5E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.4E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.9E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-02
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.4E-02	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.6E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-05	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.9E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.9E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.6E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.3E-03
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-07	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.3E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.2E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.4E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.2E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.5E-03
	(total)												**6.6E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.6E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	4.7E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.6E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	9.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	9.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	6.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.4E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	2.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.0E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	1.4E-02
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.3E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.3E-02
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.0E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	2.7E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	9.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	4.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	5.9E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	1.5E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.9E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.5E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.7E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.3E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	1.6E-03
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.1E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	7.6E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.0E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	2.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	2.1E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.1E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	3.7E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	4.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	3.0E-04
	(total)												**7.6E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
CHILD RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.85
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.91 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	5.4E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.1E-08
	(total)										**9.5E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	5.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.0E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.3E-09
	(total)										**5.9E-09**
										Total Risk Across All Exposure Routes/Pathways	**1.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.91 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.5E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.1E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.1E-03
	(total)												**2.6E-03**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.1E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-04
	(total)												**1.6E-04**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
CHILD RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME]

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.91
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.97a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.97a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	6.2E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	2.6E-03
	(total)												**2.6E-03**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	4.1E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	4.3E-03
	(total)												**4.3E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
CHILD RECREATIONAL USERS - CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT ($MG/CM^2/EVENT$)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = $2FA \times Kp \times C \times CF \times (6T \times tevent/3.1416)^{0.5}$

IF tevent > t*, DAevent = $FA \times Kp \times C \times CF \times ((tevent/(1 + B)) + (2T \times ((1+3B+3B^2)/(1 + B)^2)))$

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.97a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.85a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	9.8E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	3.4E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	7.2E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	2.2E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	3.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	6.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	9.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	4.9E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	3.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.3E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	2.2E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	5.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.0E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	5.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.5E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	5.7E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	9.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.2E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.8E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.7E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.1E-09
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	7.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	6.5E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	3.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	4.4E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.4E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	8.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**1.1E-08**
										Total Risk Across All Exposure Routes/Pathways	**1.7E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.85a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-05	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-02
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.3E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.7E-03
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.1E-05	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.5E-03
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.0E-03
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	3.6E-03	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	3.6E-03
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	2.5E-06	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	1.3E-04	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	6.5E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	7.6E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.8E-04
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.5E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.8E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	3.7E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.9E-04
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	2.2E-04	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	5.6E-03
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	3.4E-03	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.1E-02
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	7.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.7E-03	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	7.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.2E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	4.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-05	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	5.8E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	7.6E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.1E-03
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	2.1E-05	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	2.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	7.0E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.3E-03
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.8E-03	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.1E-03
	(total)												**1.7E-01**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.0E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	3.2E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.0E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	5.2E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	2.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.7E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.5E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	8.6E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	6.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	5.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	3.6E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	8.1E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	3.3E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	5.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	6.7E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	1.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	3.7E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	7.6E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.7E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.1E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.2E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	8.1E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	3.9E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.5E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.9E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	5.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	7.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.4E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	5.2E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.8E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	9.3E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.2E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	7.4E-05
	(total)												**1.9E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**3.6E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
CHILD RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.85a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.91a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	4.5E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.7E-09
	(total)										**7.9E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.4E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-11
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	3.0E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.4E-10
	(total)										**5.1E-10**
										Total Risk Across All Exposure Routes/Pathways	**8.4E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.91a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-04
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.6E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	5.2E-04
	(total)												**6.5E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	7.5E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	1.0E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.4E-05
	(total)												**4.2E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**6.9E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
CHILD RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.91a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
CHILD RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.05	U.S. EPA Region 4, May 2000	0.05	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2190	U.S. EPA, December 1989	730	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	3,300	1/2 total body area (EPA 2004)	3,300	1/2 total body area (EPA 2004)	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	6	U.S. EPA, May 1993	2	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	15	U.S. EPA, May 1993	15	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	U.S. EPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 1.63E-04
Noncancer Ingestion Intake(RME) = 1.90E-03

Cancer Ingestion Intake(CTE) = 1.36E-05
Noncancer Ingestion Intake(CTE) = 4.75E-04

Cancer Dermal Intake(RME) = 2.69E+00
Noncancer Dermal Intake(RME) = 3.13E+01

Cancer Dermal Intake(CTE) = 4.48E-01
Noncancer Dermal Intake(CTE) = 1.57E+01

TABLE 8.100 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.100 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.4E-04
	(total)												**4.4E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	9.7E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE ADULT RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.100
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.88 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	6.7E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	2.0E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.5E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.2E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	7.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.5E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	7.3E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.0E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	7.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.5E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.2E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.1E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.1E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**3.2E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-06	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.0E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.4E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.9E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.3E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	6.9E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	6.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	4.1E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.8E-04	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.8E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	9.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	6.6E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.1E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.1E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.2E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	9.6E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.88 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.9E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.8E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.2E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.2E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	1.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.5E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.2E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	6.5E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.3E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.8E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	9.5E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.9E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.1E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.0E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	9.9E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.5E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.5E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.9E-04
	(total)												**2.8E-02**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.6E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.5E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.8E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.9E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	5.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.6E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	3.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.3E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.0E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.2E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	8.4E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.9E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	7.7E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.2E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.6E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	5.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	8.6E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.7E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.8E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.9E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	9.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.6E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	4.5E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.2E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.7E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.2E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	6.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.2E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.8E-04
	(total)												**4.5E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE ADULT RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.88
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.94 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	9.2E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	(total)										**1.6E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	8.4E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	(total)										**1.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.0E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.94 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.0E-05
	(total)												**1.1E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.4E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.1E-05
	(total)												**9.4E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE ADULT RESIDENTS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.94
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.100a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
FUTURE ADULT RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.100a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.88a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.6E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.88a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.8E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	7.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.3E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-06	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.8E-05
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-08	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-05
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.9E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.4E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.9E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.1E-03
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.8E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.5E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.7E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.8E-04
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.8E-05
	(total)												**7.1E-03**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.4E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.3E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	3.6E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.1E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.9E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.2E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.5E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.3E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.1E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.5E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.4E-05
	(total)												**1.1E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULL'
FUTURE ADULT RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.88a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.94a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	(total)										**1.2E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	9.1E-10
	(total)										**1.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.2E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.94a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-05
	(total)												**2.8E-05**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.0E-05
	(total)												**2.5E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.3E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
FUTURE ADULT RESIDENTS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 4.94a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
FUTURE ADULT RESIDENTS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.98 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	3.3E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.98 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	1.1E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	4.4E-04
	(total)												**4.4E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	9.7E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	1.0E-02
	(total)												**1.0E-02**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-02**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADULT RECREATIONAL USERS - REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			4.00E+00			1.00E-03			1	5.24E-07

TABLE 4.98
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.86 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	6.7E-07	mg/kg-day	3.00E-02	(mg/kg-day)$^{-1}$	2.0E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	2.0E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.4E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	7.0E-07	mg/kg-day	1.10E-01	(mg/kg-day)$^{-1}$	7.7E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	2.1E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.5E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.2E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	7.6E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.5E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	7.3E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	2.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.3E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	2.0E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	4.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	1.0E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	7.3E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	6.8E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.5E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.2E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	4.1E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	1.1E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	(total)										**3.2E-07**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.1E-06	mg/kg-day	3.00E-02	(mg/kg-day)$^{-1}$	3.4E-08
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.0E-07	mg/kg-day	1.10E-01	(mg/kg-day)$^{-1}$	4.4E-08
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.9E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.3E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.0E-07
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	6.9E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	4.1E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	6.6E-08	mg/kg-day		(mg/kg-day)$^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	4.1E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	2.0E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	1.2E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.8E-04	mg/kg-day		(mg/kg-day)$^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.8E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	9.2E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	6.6E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	1.2E-07	mg/kg-day		(mg/kg-day)$^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	4.1E-09	mg/kg-day		(mg/kg-day)$^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	1.1E-06	mg/kg-day		(mg/kg-day)$^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	2.2E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	9.6E-05	mg/kg-day		(mg/kg-day)$^{-1}$	
	(total)										**2.8E-07**
										Total Risk Across All Exposure Routes/Pathways	**6.0E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.86 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	2.0E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	3.9E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.9E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	2.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.8E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	6.2E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	6.2E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	4.3E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.4E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.2E-05	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	1.1E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.3E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	6.5E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	2.1E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	4.2E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	6.5E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-04
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	6.3E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	3.2E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.8E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	9.5E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.9E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.0E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.2E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.9E-04	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.2E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	2.1E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	7.1E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	2.0E-06	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	9.9E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.3E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.9E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.5E-06	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	3.5E-03
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.2E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	3.1E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.9E-04
	(total)												**2.8E-02**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	3.3E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	6.6E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	5.5E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.8E-04
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	1.8E-06	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	1.2E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.9E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	5.6E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	5.6E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	3.9E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.3E-03
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	2.0E-05	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	1.4E-03
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	1.2E-07	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	8.4E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	1.9E-07	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	7.7E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.2E-06	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	1.6E-02
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	5.8E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.9E-05
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	3.5E-05	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	8.6E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	5.4E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.8E-03
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	1.1E-06	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	2.7E-04	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.8E-01
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	1.9E-08	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	9.1E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	3.6E-07	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	4.5E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	1.2E-08	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	1.7E-04
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	3.2E-06	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	1.2E-01
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	6.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	2.2E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	2.8E-04	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	1.8E-04
	(total)												**4.5E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**4.8E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
ADULT RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	4.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.79E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.99E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	4.00E+00	1.34E+00		6.41E-04		3.46E-03	1	9.83E-08
Rdx	2.50E-02		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	6.36E-08
Aluminum	7.57E+00		i			4.00E+00			1.00E-03			1	3.03E-05
Arsenic	5.30E-03		i			4.00E+00			1.00E-03			1	2.12E-08
Barium	2.73E-01		i			4.00E+00			1.00E-03			1	1.09E-06
Beryllium	1.60E-03		i			4.00E+00			1.00E-03			1	6.40E-09
Cadmium	2.60E-03		i			4.00E+00			1.00E-03			1	1.04E-08
Chromium	8.00E-03		i			4.00E+00			2.00E-03			1	6.40E-08
Cobalt	7.80E-03		i			4.00E+00			1.00E-03			1	3.12E-08
Copper	4.68E-01		i			4.00E+00			1.00E-03			1	1.87E-06
Iron	7.26E+00		i			4.00E+00			1.00E-03			1	2.90E-05
Lead	1.50E-02		i			4.00E+00			1.00E-03			1	6.00E-08
Manganese	3.62E+00		i			4.00E+00			1.00E-03			1	1.45E-05
Mercury	2.60E-04		i			4.00E+00			1.00E-03			1	1.04E-09
Nickel	2.44E-02		i			4.00E+00			2.00E-04			1	1.95E-08
Thallium	1.60E-04		i			4.00E+00			1.00E-03			1	6.40E-10
Vanadium	4.34E-02		i			4.00E+00			1.00E-03			1	1.74E-07
Zinc	1.48E+00		i			4.00E+00			6.00E-04			1	3.55E-06
Nitrite/Nitrate-N	3.80E+00		i			4.00E+00			1.00E-03			1	1.52E-05

TABLE 4.86
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.92 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	2.2E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	9.2E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	(total)										**1.6E-08**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.4E-09
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	8.4E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	(total)										**1.4E-08**
										Total Risk Across All Exposure Routes/Pathways	**3.0E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.92 - REASONABLE MAXIMUM EXPOSURE (RME)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	6.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.2E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.7E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	9.0E-05
	(total)												**1.1E-04**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	3.8E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.3E-05
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	2.4E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	8.1E-05
	(total)												**9.4E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.1E-04**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTAR'
ADULT RECREATIONAL USERS- REASONABLE MAXIMUM EXPOSURE (RME

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$

IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	4.00E+00	1.84E+00		3.39E-04		1.94E-03	1	2.03E-09
Arsenic	3.30E-04		i			4.00E+00			1.00E-03			1	1.32E-09

TABLE 4.92
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.98a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.7E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.4E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**0.0E+00**
										Total Risk Across All Exposure Routes/Pathways	**0.0E+00**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.98a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.7E-06	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	1.1E-04
	(total)												**1.1E-04**
Dermal	Manganese	1.31E-01	mg/L	1.31E-01	mg/L	M	2.4E-06	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	2.5E-03
	(total)												**2.5E-03**
												Total Hazard Index Across All Exposure Routes/Pathways	**2.6E-03**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - TURKEY CREEK
ADULT RECREATIONAL USERS - CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT ($MG/CM^2/EVENT$)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = $2FA \times Kp \times C \times CF \times (6T \times tevent/3.1416)^{0.5}$

IF tevent > t*, DAevent = $FA \times Kp \times C \times CF \times ((tevent/(1 + B)) + (2T \times ((1+3B+3B^2)/(1 + B)^2)))$

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Manganese	1.31E-01		i			2.00E+00			1.00E-03			1	2.62E-07

TABLE 4.98a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER - TURKEY CREEK
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - Turkey Creek
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED / BW x AT
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.86a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-08	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	1.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.6E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-07	mg/kg-day	3.00E-02	$(mg/kg\text{-}day)^{-1}$	3.5E-09
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-09
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-09	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.5E-08
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-07	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-05	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-09	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-10	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-08	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-06	mg/kg-day		$(mg/kg\text{-}day)^{-1}$	
	(total)										**2.3E-08**
										Total Risk Across All Exposure Routes/Pathways	**4.6E-08**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.86a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	4.9E-07	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	9.8E-04
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	7.1E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	4.7E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	2.3E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	5.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.7E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.5E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.5E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	1.1E-07	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.6E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.6E-06	mg/kg-day	2.00E-01	mg/kg-day	NA	NA	2.8E-05
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.3E-08	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	1.6E-05
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	5.3E-08	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	1.1E-04
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	1.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-05
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.6E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.9E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	9.5E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.4E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.5E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.9E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	3.1E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	7.4E-05	mg/kg-day	2.40E-02	mg/kg-day	NA	NA	3.1E-03
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	5.3E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	1.8E-05
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	5.0E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	2.5E-05
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.3E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.7E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.8E-07	mg/kg-day	1.00E-03	mg/kg-day	NA	NA	8.8E-04
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	3.0E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	1.0E-04
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.7E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.8E-05
	(total)												**7.1E-03**
Dermal	2,4,6-Trinitrotoluene	2.40E-02	mg/L	2.40E-02	mg/L	M	1.2E-06	mg/kg-day	5.00E-04	mg/kg-day	NA	NA	2.3E-03
	2-Amino-4,6-dinitrotoluene	7.00E-03	mg/L	7.00E-03	mg/L	M	1.9E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	9.4E-05
	4-Amino-2,6-dinitrotoluene	2.30E-02	mg/L	2.30E-02	mg/L	M	6.1E-07	mg/kg-day	2.00E-03	mg/kg-day	NA	NA	3.1E-04
	Rdx	2.50E-02	mg/L	2.50E-02	mg/L	M	4.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.4E-04
	Aluminum	7.57E+00	mg/L	7.57E+00	mg/L	M	1.4E-04	mg/kg-day	1.00E+00	mg/kg-day	NA	NA	1.4E-04
	Arsenic	5.30E-03	mg/L	5.30E-03	mg/L	M	9.8E-08	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	3.3E-04
	Barium	2.73E-01	mg/L	2.73E-01	mg/L	M	5.0E-06	mg/kg-day	1.40E-02	mg/kg-day	NA	NA	3.6E-04
	Beryllium	1.60E-03	mg/L	1.60E-03	mg/L	M	3.0E-08	mg/kg-day	1.40E-05	mg/kg-day	NA	NA	2.1E-03
	Cadmium	2.60E-03	mg/L	2.60E-03	mg/L	M	4.8E-08	mg/kg-day	2.50E-05	mg/kg-day	NA	NA	1.9E-03
	Chromium	8.00E-03	mg/L	8.00E-03	mg/L	M	3.0E-07	mg/kg-day	7.50E-05	mg/kg-day	NA	NA	3.9E-03
	Cobalt	7.80E-03	mg/L	7.80E-03	mg/L	M	1.4E-07	mg/kg-day	2.00E-02	mg/kg-day	NA	NA	7.2E-06
	Copper	4.68E-01	mg/L	4.68E-01	mg/L	M	8.6E-06	mg/kg-day	4.00E-02	mg/kg-day	NA	NA	2.2E-04
	Iron	7.26E+00	mg/L	7.26E+00	mg/L	M	1.3E-04	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	4.5E-04
	Lead	1.50E-02	mg/L	1.50E-02	mg/L	M	2.8E-07	mg/kg-day		mg/kg-day	NA	NA	
	Manganese	3.62E+00	mg/L	3.62E+00	mg/L	M	6.7E-05	mg/kg-day	9.60E-04	mg/kg-day	NA	NA	7.0E-02
	Mercury	2.60E-04	mg/L	2.60E-04	mg/L	M	4.8E-09	mg/kg-day	2.10E-05	mg/kg-day	NA	NA	2.3E-04
	Nickel	2.44E-02	mg/L	2.44E-02	mg/L	M	9.0E-08	mg/kg-day	8.00E-04	mg/kg-day	NA	NA	1.1E-04
	Thallium	1.60E-04	mg/L	1.60E-04	mg/L	M	3.0E-09	mg/kg-day	7.00E-05	mg/kg-day	NA	NA	4.2E-05
	Vanadium	4.34E-02	mg/L	4.34E-02	mg/L	M	8.0E-07	mg/kg-day	2.60E-05	mg/kg-day	NA	NA	3.1E-02
	Zinc	1.48E+00	mg/L	1.48E+00	mg/L	M	1.6E-05	mg/kg-day	3.00E-01	mg/kg-day	NA	NA	5.5E-05
	Nitrite/Nitrate-N	3.80E+00	mg/L	3.80E+00	mg/L	M	7.0E-05	mg/kg-day	1.60E+00	mg/kg-day	NA	NA	4.4E-05
	(total)												**1.1E-01**
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E-01**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - GULLY
ADULT RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
2,4,6-Trinitrotoluene	2.40E-02		o		4.71E+00	2.00E+00	1.96E+00		9.64E-04		5.59E-03	1	1.27E-07
2-Amino-4,6-dinitrotoluene	7.00E-03		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	2.03E-08
4-Amino-2,6-dinitrotoluene	2.30E-02		o		3.21E+00	2.00E+00	1.34E+00		6.41E-04		3.46E-03	1	6.66E-08
Rdx	2.50E-02		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	4.50E-08
Aluminum	7.57E+00		i			2.00E+00			1.00E-03			1	1.51E-05
Arsenic	5.30E-03		i			2.00E+00			1.00E-03			1	1.06E-08
Barium	2.73E-01		i			2.00E+00			1.00E-03			1	5.46E-07
Beryllium	1.60E-03		i			2.00E+00			1.00E-03			1	3.20E-09
Cadmium	2.60E-03		i			2.00E+00			1.00E-03			1	5.20E-09
Chromium	8.00E-03		i			2.00E+00			2.00E-03			1	3.20E-08
Cobalt	7.80E-03		i			2.00E+00			1.00E-03			1	1.56E-08
Copper	4.68E-01		i			2.00E+00			1.00E-03			1	9.36E-07
Iron	7.26E+00		i			2.00E+00			1.00E-03			1	1.45E-05
Lead	1.50E-02		i			2.00E+00			1.00E-03			1	3.00E-08
Manganese	3.62E+00		i			2.00E+00			1.00E-03			1	7.24E-06
Mercury	2.60E-04		i			2.00E+00			1.00E-03			1	5.20E-10
Nickel	2.44E-02		i			2.00E+00			2.00E-04			1	9.76E-09
Thallium	1.60E-04		i			2.00E+00			1.00E-03			1	3.20E-10
Vanadium	4.34E-02		i			2.00E+00			1.00E-03			1	8.68E-08
Zinc	1.48E+00		i			2.00E+00			6.00E-04			1	1.78E-06
Nitrite/Nitrate-N	3.80E+00		i			2.00E+00			1.00E-03			1	7.60E-06

TABLE 4.86a
VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF
ADULT RECREATIONAL USERS TO SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 Gullies
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	(mg/L)	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR	Ingestion Rate of Surface Water	(L/hr)	0.01	U.S. EPA Region 4, May 2000	0.01	U.S. EPA Region 4, May 2000	Cw x IR x ET x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional judgement	26	Professional judgement	BW x AT
	ED	Exposure Duration	(years)	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	
	ET	Exposure Time	(hr/day)	4	Professional judgement	2	Professional judgement	
	BW	Body Weight	(kg)	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	(days)	25550	U.S. EPA, December 1989	25550	U.S. EPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8760	U.S. EPA, December 1989	2,555	U.S. EPA, December 1989	
Dermal	Cw	Chemical Concentration in Water	mg/L	Max or 95% UCL	U.S. EPA, December 2002	Max or 95% UCL	U.S. EPA, December 2002	The equations and parameters for
	A	Skin Surface Area	cm^2	9,070	USEPA, August 1997	9,070	USEPA, August 1997	for estimating DAevent and the chemical-
	DAevent	Absorbed Dose per Event	mg/cm^2-event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	specific dermally absorbed dose from
	EV	Event Frequency	event/day	1	Professional judgement	1	Professional judgement	water (DAD) are provided in Section 7.3.4.3
	ED	Exposure Duration	years	24	U.S. EPA, May 1993	7	U.S. EPA, May 1993	of the text.
	EF	Exposure Frequency	days/year	52	Professional judgement	26	Professional judgement	
	t_{event}	Duration of Event	hour/event	4	Professional judgement	2	Professional judgement	USEPA, July 2004
	t*	Time to reach steady state	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	T	Lag Time	hour/event	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	B	Bunge Model Constant	dimensionless	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	Kp	Permeability Coefficient from Water	cm/hour	chemical-specific	U.S. EPA, July 2004	chemical-specific	U.S. EPA, July 2004	
	BW	Body Weight	kg	70	U.S. EPA, May 1993	70	U.S. EPA, May 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	U.S. EPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations
Ingestion Intake = (IRgw x EF x ED) / (BW x AT)
Dermal Intake = (A x EV x ED x EF) / (BW x AT)

Cancer Ingestion Intake(RME) = 2.79E-05
Noncancer Ingestion Intake(RME) = 8.14E-05

Cancer Ingestion Intake(CTE) = 2.04E-06
Noncancer Ingestion Intake(CTE) = 2.04E-05

Cancer Dermal Intake(RME) = 6.33E+00
Noncancer Dermal Intake(RME) = 1.85E+01

Cancer Dermal Intake(CTE) = 9.23E-01
Noncancer Dermal Intake(CTE) = 9.23E+00

TABLE 8.92a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF CANCER RISKS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.8E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-09
	(total)										**1.2E-09**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-10
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-10	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	9.1E-10
	(total)										**1.1E-09**
										Total Risk Across All Exposure Routes/Pathways	**2.2E-09**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 7.92a - CENTRAL TENDENCY EXPOSURE (CTE)
CALCULATION OF NON-CANCER HAZARDS FROM EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE WATER - EAST TRIBUTARY
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: SWMU 12 - East Tributary
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.6E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.7E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.2E-05
	(total)												**2.8E-05**
Dermal	Rdx	8.00E-04	mg/L	8.00E-04	mg/L	M	1.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.4E-06
	Arsenic	3.30E-04	mg/L	3.30E-04	mg/L	M	6.1E-09	mg/kg-day	3.00E-04	mg/kg-day	NA	NA	2.0E-05
	(total)												**2.5E-05**
												Total Hazard Index Across All Exposure Routes/Pathways	**5.3E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

CALCULATION OF DAevent - EXPOSURES THROUGH DERMAL CONTACT WITH SURFACE WATER - EAST TRIBUTARY
ADULT RECREATIONAL USERS- CENTRAL TENDENCY EXPOSURE (CTE)

SITE NAME: SWMU 12 (MINE FILL A)
LOCATION: NSWC CRANE, CRANE, INDIANA
DATE: 10/16/08

REFERENCES: U.S. EPA, July 2004

DERMAL CONTACT: DAD = (DAevent x EV x ED x EF x A)/(BW x AT)

WHERE: DAD = DERMALLY ABSORBED DOSE (MG/KG/DAY)
DAevent = ABSORBED DOSE PER EVENT (MG/CM^2/EVENT)
A = SKIN SURFACE AREA AVAILABLE FOR CONTACT(CM^2)
EV = EVENT FREQUENCY (EVENTS/DAY)
ED = EXPOSURE DURATION (YEARS)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
BW = BODY WEIGHT(KG)
AT = AVERAGING TIME (DAYS)

FOR INORGANICS: DAevent = Kp x C x tevent x CF

FOR ORGANICS: IF tevent < t*, DAevent = 2FA x Kp x C x CF x (6T x tevent/3.1416)$^{0.5}$
IF tevent > t*, DAevent = FA x Kp x C x CF x ((tevent/(1 + B)) + (2T x ((1+3B+3B^2)/(1 + B)^2)))

WHERE: FA = FRACTION ABSORBED (DIMENSIONLESS)
Kp = PERMEABILITY COEFFICIENT FROM WATER (CM/HR)
C = CONCENTRATION OF CHEMICAL IN WATER (MG/L)
tevent = DURATION OF EVENT (HR/EVENT)
CF = CONVERSION FACTOR (1L/1000 CM^3)
t* = TIME IT TAKES TO REACH STEADY-STATE (HOUR/EVENT)
T = LAG TIME (HOUR/EVENT)
B = BUNGE MODEL CONSTANT (DIMENSIONLESS)

CHEMICAL	SW CONC. (mg/L)		ORGANIC OR INORGANIC?		t* (HR)	tevent	T (HR)		Kp (CM/HR)		B	FA	DAevent
Rdx	8.00E-04		o		4.42E+00	2.00E+00	1.84E+00		3.39E-04		1.94E-03	1	1.44E-09
Arsenic	3.30E-04		i			2.00E+00			1.00E-03			1	6.60E-10

TABLE 3.14
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - TURKEY CREEK SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Tureky Creek Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Manganese	ug/L	87.1	NA	131	J	ug/L	131	Maximum	N < 10 (1)	131	Maximum	N < 10 (1)

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FUTURE ADULT RESIDENT		
BASED ON: U.S. EPA, DECEMBER 1989 AND JULY 2004		
BY: T.JACKMAN	CHECKED BY:	DATE: 10/17/08

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with groundwater by the future adult resident.

EQUATION:

$$DAD = \frac{DAevent \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

DAD	=	dermally absorbed dose (mg/kg/day)
DAevent	=	absorbed does per event (mg/cm^2/event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
A	=	skin surface available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = DAD (mg/kg/day) x CSFd (mg/kg/day)$^{-1}$
HQ (Noncarcinogens) = DAD (mg/kg/day) / RFDd (mg/kg/day)

EQUATIONS for DAevent:

For Inorganics:

$$DA_{event} = (K_p)(C_{gw})(t_{event})$$

For Organics:

$$If\ t_{event} < t^*, then:\ DA_{event} = FA(2K_p)(C_{gw})(CF)\left(\sqrt{\frac{6\tau t_{event}}{\pi}}\right)$$

$$If\ t_{event} > t^*, then:\ DA_{event} = FA(K_p)(C_{gw})(CF)\left(\frac{t_{event}}{1+B} + 2\tau\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right)$$

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FUTURE ADULT RESIDENT		
BASED ON: U.S. EPA, DECEMBER 1989 AND JULY 2004		
BY: T.JACKMAN	CHECKED BY:	DATE: 10/17/08

Where:

FA	=	fraction absorbed (dimensionless)
Kp	=	permeability coefficient from water (cm/hr)
Cgw	=	concentration of chemical in groundwater (mg/L)
tevent	=	duration of event (hr/event)
CF	=	conversion factor (0.001 L/cm^3)
t*	=	time it takes to reach steady-state (hr/event)
τ	=	lag time (hr/event)
B	=	Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

Cgw	=	1.1	mg/L	RDX (PUZ Groundwater)
Kp	=	3.39E-04	cm/hr	
tevent	=	0.25	hr/event	
CF	=	0.001	L/cm^3	
t*	=	4.42E+00	hr/event	
τ	=	1.84E+00	hr/event	
B	=	1.94E-03		
FA	=	1		

tevent < t*, therefore,

DAevent = 1 x (2 x 0.000339 cm/hr) (1.1 mg/L) (0.001 L/cm3) x

$$\sqrt{\frac{6 \times 1.84\ hr/event \times 0.25\ hr/event}{\pi}}$$

DAevent = 6.99E-07 mg/cm^2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	18,000	cm^2/day
EV	=	1	event/day
ED	=	24	years
EF	=	350	days/year
BW	=	70	kg
ATc	=	25550	days
ATnc	=	8760	days
CSFd	=	1.10E-01	(mg/kg/day)$^{-1}$
RfDd	=	3.00E-03	(mg/kg/day)

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER FUTURE ADULT RESIDENT		
BASED ON: U.S. EPA, DECEMBER 1989 AND JULY 2004		
BY: T.JACKMAN	CHECKED BY:	DATE: 10/17/08

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{6.99E\text{-}07\ mg/cm2\text{-}event \times 1\ event/day \times 24\ years \times 350\ days/year \times 18000\ cm2/day}{70\ kg \times 25550\ days}$$

DADc = 5.9E-05 mg/kg/day

DADc = 5.91E-05 mg/kg/day x 0.11 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR = 6.5E-06

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{6.99E\text{-}07\ mg/cm2\text{-}event \times 1\ event/day \times 24\ years \times 350\ days/year \times 18000\ cm2/day}{70\ kg \times 8760\ days}$$

DADnc = 1.7E-04 mg/kg/day

HQ = 1.72E-04 mg/kg/day / 0.003 (mg/kg/day) = Hazard Quotient

HQ = 5.7E-02

TABLE 5.1

NON-CANCER TOXICITY DATA - ORAL/DERMAL
SWMU 12 MINE FILL A
NSWC CRANE, CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source	Date
Energetics										
1,3-Dinitrobenzene	Chronic	$1x10^{-4}$	mg/kg/day	1	$1x10^{-4}$	mg/kg/day	Spleen	3000/1	IRIS	9/01/2005
2,4,6-Trinitrotoluene	Chronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day	Liver	1000/1	IRIS	9/01/2005
2,6-Dinitrotoluene	Chronic	1.0E-03	mg/kg/day	1	1.0E-03	mg/kg/day	CNS, Blood, Kidney	3000/1	HEAST	7/1997
2-Amino-4,6-Dinitrotoluene	Chronic	2.00E-04	mg/kg/day	1	2.0E-04	mg/kg/day	Liver	NA	NCEA	10//2004
2-Nitrotoluene	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Spleen	10000/1	HEAST	7/1997
4-Nitrotoluene	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Spleen	10000/1	HEAST	7/1997
4-Amino-2,6-Dinitrotoluene	Chronic	2.00E-04	mg/kg/day	1	2.0E-04	mg/kg/day	Liver	NA	NCEA	10//2004
HMX	Chronic	5.0E-02	mg/kg/day	1	5.0E-02	mg/kg/day	Liver, Blood	1000/1	IRIS	9/01/2005
RDX	Chronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Prostate	100/1	IRIS	9/01/2005
Inorganics										
Aluminum	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	100	NCEA	10/19/2004
Antimony	Chronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	IRIS	9/01/2005
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	9/01/2005
Barium	Chronic	7.0E-02	mg/kg/day	0.07	4.9E-03	mg/kg/day	Kidney	3/1	IRIS	9/01/2005
Beryllium	Chronic	2.0E-03	mg/kg/day	0.007	1.4E-05	mg/kg/day	GS	300/1	IRIS	9/01/2005
Cadmium[3]	Chronic	5.0E-04	mg/kg/day	0.05	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	9/01/2005
Chromium III	Chronic	1.5E+00	mg/kg/day	0.013	2.0E-02	mg/kg/day	NOEL	100/10	IRIS	9/01/2005
Chromium VI	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	Fetotoxicity/GS/Bone	300/3	IRIS	9/01/2005
Cobalt	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	NA	NA	EPA 9	10/2004
Copper	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	GS	NA	HEAST	7/1997
Iron	Chronic	3.0E-01	mg/kg/day	1	3.0E-01	mg/kg/day	NA	1	NCEA	10//2004
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lithium	Chronic	2.0E-03	mg/kg/day	1	2.0E-03	mg/kg/day	NA	NA	NCEA	10/2004
Manganese (Soil)	Chronic	7.0E-02	mg/kg/day	0.04	2.8E-03	mg/kg/day	CNS	1/1	IRIS	9/01/2005
Manganese (Water)	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	CNS	3/1	IRIS	9/01/2005
Mercury[4]	Chronic	3.0E-04	mg/kg/day	0.07	2.1E-05	mg/kg/day	CNS	1000/1	IRIS	9/01/2005
Nickel	Chronic	2.0E-02	mg/kg/day	0.04	8.0E-04	mg/kg/day	Body Weight	300/1	IRIS	9/01/2005
Selenium	Chronic	5.0E-03	mg/kg/day	1	5.0E-03	mg/kg/day	NOEL	3/1	IRIS	9/01/2005
Thallium	Chronic	7.0E-05	mg/kg/day	1	7.0E-05	mg/kg/day	Liver	NA	IRIS	9/1/2005
Vanadium	Chronic	1.0E-03	mg/kg/day	0.026	2.6E-05	mg/kg/day	Kidney	300	NCEA	10/19/2004
Zinc	Chronic	3.0E-01	mg/kg/day	1	3.0E-01	mg/kg/day	Blood	3/1	IRIS	9/01/2005
Nitrate	Chronic	1.6E+00	mg/kg/day	1	1.6E+00	mg/kg/day	Blood	1/1	IRIS	9/01/2005
Nitrite	Chronic	1.0E-01	mg/kg/day	1	1.0E-01	mg/kg/day	Blood	1/10	IRIS	9/01/2005

Notes:

1 - U.S. EPA, 2004a.

2 - Adjusted dermal RfD = Oral RfD x Oral absorption efficiency for dermal.

3 - Water value for cadmium is listed.

4 - Values are for mercuric chloride.

Definitions:

CNS = Central nervous system.

CVS = Cardiovascular system.

EPA 9 = U.S. EPA Region 9 PRG Table, October, 2004, updated December 25, 2004.

GS = Gastrointestinal system.

HEAST= Health Effects Assessment Summary Tables.

IRIS = Integrated Risk Information System.

NA = Not applicable.

NOEL = No observed effect level.

TABLE 3.17
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - TURKEY CREEK SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Turkey Creek Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	7427	NA	11400	J	mg/kg	11400	Maximum	N < 10 (1)	11400	Maximum	N < 10 (1)
Arsenic	mg/kg	12.4	NA	27.8	J	mg/kg	27.8	Maximum	N < 10	27.8	Maximum	N < 10
Iron	mg/kg	62267	NA	157000	J	mg/kg	157000	Maximum	N < 10	157000	Maximum	N < 10
Manganese	mg/kg	923	NA	1760	J	mg/kg	1760	Maximum	N < 10	1760	Maximum	N < 10
Vanadium	mg/kg	28.8	NA	57.8	J	mg/kg	57.8	Maximum	N < 10	57.8	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 3.16
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - EAST TRIBUTARY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: East Tributary Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	12600	NA	17200	J	mg/kg	17200	Maximum	N < 10 (1)	17200	Maximum	N < 10 (1)
Arsenic	mg/kg	9.3	NA	10.9	J	mg/kg	10.9	Maximum	N < 10	10.9	Maximum	N < 10
Iron	mg/kg	51300	NA	70700	J	mg/kg	70700	Maximum	N < 10	70700	Maximum	N < 10
Manganese	mg/kg	2200	NA	2910	J	mg/kg	2910	Maximum	N < 10	2910	Maximum	N < 10
Vanadium	mg/kg	33.5	NA	36	J	mg/kg	36	Maximum	N < 10	36	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 3.15
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GULLY SEDIMENT
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Gully Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	16600	18400	25700	J	mg/kg	18500	Gamma	ProUCL (1)	18500	Gamma	ProUCL (1)
Antimony	mg/kg	0.81	1.2	4.2	J	mg/kg	1.2	Gamma	ProUCL (1)	1.2	Gamma	ProUCL (1)
Arsenic	mg/kg	16.1	20.7	36	J	mg/kg	22.6	Gamma	ProUCL (1)	22.6	Gamma	ProUCL (1)
Cadmium	mg/kg	1.2	2	7.4	J	mg/kg	5.9	99% UCL-C	ProUCL (1)	5.9	99% UCL-C	ProUCL (1)
Iron	mg/kg	70000	93100	217000	J	mg/kg	97800	Gamma	ProUCL (1)	97800	Gamma	ProUCL (1)
Manganese	mg/kg	2100	2800	6780	J	mg/kg	3070	Gamma	ProUCL (1)	3070	Gamma	ProUCL (1)
Vanadium	mg/kg	43.5	50.1	71	J	mg/kg	50.1	Student-t	ProUCL (2)	50.1	Student-t	ProUCL (2)

Definitions:
Gamma = Adjusted Gamma 95% UCL.
99 % UCL-C = 99% Chebyshev (Mean, Std) UCL (non-parametric).

Footnotes:
1 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.
2 - ProUCL indicates data are normally distributed.

16,563	18442.684
1	1.2006445
16.1	20.656804
1.2	1.9846574
69,958	93050.152
2,097	2798.6527
44	50.066579

18534.3095
1.214763551
22.59340359
5.860626911
97798.21054
3068.097205
50.06657906

TABLE 3.14
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - TURKEY CREEK SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Tureky Creek Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Manganese	ug/L	87.1	NA	131	J	ug/L	131	Maximum	N < 10 (1)	131	Maximum	N < 10 (1)

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 3.13
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - EAST TRIBUTARY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: East Tributary Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
RDX	ug/L	0.5	NA	0.8		ug/L	0.8	Maximum	N < 10 (1)	0.8	Maximum	N < 10 (1)
Arsenic	ug/L	0.14	NA	0.33	J	ug/L	0.33	Maximum	N < 10	0.33	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 3.12
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GULLY SURFACE WATER
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Gully Surface water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	ug/L	3	7	79		ug/L	24	99% UCL-C	ProUCL (1)	24	99% UCL-C	ProUCL (1)
2-Amino-4,6-dinitrotoluene	ug/L	1	2	19	J	ug/L	7	99% UCL-C	ProUCL (1)	7	99% UCL-C	ProUCL (1)
4-Amino-2,6-dinitrotoluene	ug/L	4	7	74		ug/L	23	99% UCL-C	ProUCL (1)	23	99% UCL-C	ProUCL (1)
Rdx	ug/L	15	23	140		ug/L	25	Gamma	ProUCL (1)	25	Gamma	ProUCL (1)
Aluminum	ug/L	3490	6470	67700		ug/L	7570	95% UCL-CL	ProUCL (1)	7570	95% UCL-CL	ProUCL (1)
Arsenic	ug/L	2.6	3.7	20.3		ug/L	5.3	H-UCL	ProUCL (2)	5.3	H-UCL	ProUCL (2)
Barium	ug/L	92.9	123	589	J	ug/L	273	99% UCL-C	ProUCL (1)	273	99% UCL-C	ProUCL (1)
Beryllium	ug/L	0.23	0.46	5.2		ug/L	1.6	99% UCL-C	ProUCL (1)	1.6	99% UCL-C	ProUCL (1)
Cadmium	ug/L	1.7	3.6	43.7	J	ug/L	2.6	95% UCL-CL	ProUCL (1)	2.6	95% UCL-CL	ProUCL (1)
Chromium	ug/L	4.9	9.4	105	J	ug/L	8	95% UCL-CL	ProUCL (1)	8	95% UCL-CL	ProUCL (1)
Cobalt	ug/L	5.9	11.2	123		ug/L	7.8	H-UCL	ProUCL (2)	7.8	H-UCL	ProUCL (2)
Copper	ug/L	48.5	120	1650	J	ug/L	468	99% UCL-C	ProUCL (1)	468	99% UCL-C	ProUCL (1)
Iron	ug/L	5230	9400	95400	J	ug/L	7260	H-UCL	ProUCL (2)	7260	H-UCL	ProUCL (2)
Lead	ug/L	15	34.7	458		ug/L	15	Average	(3)	15	Average	(3)
Manganese	ug/L	1130	2210	24200	J	ug/L	3620	97.5% UCL-C	ProUCL (1)	3620	97.5% UCL-C	ProUCL (1)
Mercury	ug/L	0.067	0.14	1.7		ug/L	0.26	95% UCL-CNP	ProUCL (1)	0.26	95% UCL-CNP	ProUCL (1)
Nickel	ug/L	9.1	15	140	J	ug/L	24.4	95% UCL-CNP	ProUCL (1)	24.4	95% UCL-CNP	ProUCL (1)
Thallium	ug/L	0.081	0.11	0.67	J	ug/L	0.16	95% UCL-C	ProUCL (1)	0.16	95% UCL-C	ProUCL (1)
Vanadium	ug/L	7.7	13.7	138		ug/L	43.4	99% UCL-C	ProUCL (1)	43.4	99% UCL-C	ProUCL (1)
Zinc	ug/L	158	383	5220		ug/L	1480	99% UCL-C	ProUCL (1)	1480	99% UCL-C	ProUCL (1)
Nitrite/Nitrate-N	mg/L	0.99	1.5	8.2		mg/L	3.8	99% UCL-C	ProUCL (1)	3.8	99% UCL-C	ProUCL (1)

Definitions:
95 % UCL-CL = 95% Chebyshev (MVUE) UCL (lognormal).
95 % UCL-CNP = 95% Chebyshev (Mean, Std)) UCL (non-parametric).
97.5 % UCL-C = 97.5% Chebyshev (MVUE) UCL (lognormal).
99 % UCL-C = 99% Chebyshev (Mean, Std) UCL (non-parametric).
Gamma = Adjusted Gamma 95% UCL.

Footnotes:
1 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.
2 - ProUCL indicates data are lognormally distributed.
3 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).

2,4,6-TRINITROTOLUENE	3.0767436	6.62	23.96039647
2-AMINO-4,6-DINITROTOLUENE	1.3388205	2.32	7.116095222
4-AMINO-2,6-DINITROTOLUENE	3.6546667	7.02	23.49496843
RDX	15.269077	22.68	25.37924645
ALUMINUM	3491.2859	6470.99	7572.412035
ARSENIC	2.5776923	3.66	5.332834814
BARIUM	92.915	123.38	272.6856112
BERYLLIUM	0.2314103	0.46	1.555040069
CADMIUM	1.6714744	3.55	2.559083149
CHROMIUM	4.8974359	9.41	8.032713887
COBALT	5.8679487	11.19	7.777081709
COPPER	48.475897	119.55	467.9503066
IRON	5229.2564	9402.57	7261.383807
LEAD	14.98391	34.72	14.98391026
MANGANESE	1125.259	2208.21	3620.322645
MERCURY	0.0665385	0.14	0.255357589
NICKEL	9.0512821	14.98	24.37662449
THALLIUM	0.0809103	0.11	0.160560609
VANADIUM	7.654359	13.72	43.43425382
ZINC	158.14744	382.92	1484.651953
NITRITE/NITRATE-N	0.9906154	1.46	3.756780993

3 - FOD - Less than 50 percent positive detections. Maximum concentration is used as the EPC.
4 - ProUCL indicates data are log-normally distributed.

TABLE 3.11

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: MISS Glen Dean Zone

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	ug/L	0.9	NA	4.2		ug/L	4.2	Maximum	N < 10 (1)	4.2	Maximum	N < 10 (1)
RDX	ug/L	0.9	NA	3.9		ug/L	3.9	Maximum	N < 10	3.9	Maximum	N < 10
Antimony	ug/L	0.74	NA	3.1	J	ug/L	3.1	Maximum	N < 10	3.1	Maximum	N < 10
Arsenic	ug/L	3.8	NA	9.5	J	ug/L	9.5	Maximum	N < 10	9.5	Maximum	N < 10
Iron	ug/L	3850	NA	7150	J	ug/L	7150	Maximum	N < 10	7150	Maximum	N < 10
Manganese	ug/L	1260	NA	2190	J	ug/L	2190	Maximum	N < 10	2190	Maximum	N < 10
Vanadium	ug/L	1.4	NA	4.9		ug/L	4.9	Maximum	N < 10	4.9	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

TABLE 3.10
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER -PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Middle Zone

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
RDX	ug/L	0.5	NA	4.2	J	ug/L	0.8	Average	(1)	0.8	Average	(1)
Aluminum	ug/L	5620	NA	31000	J	ug/L	6810	Average	(1)	6810	Average	(1)
Antimony	ug/L	0.55	NA	2.9	J	ug/L	1.3	Average	(1)	1.3	Average	(1)
Arsenic	ug/L	3.9	NA	11.4	J	ug/L	2.6	Average	(1)	2.6	Average	(1)
Cadmium	ug/L	0.5	NA	2.3	J	ug/L	0.92	Average	(1)	0.92	Average	(1)
Chromium	ug/L	9.8	NA	47.9	J	ug/L	10.5	Average	(1)	10.5	Average	(1)
Cobalt	ug/L	20.9	NA	79.7	J	ug/L	33.3	Average	(1)	33.3	Average	(1)
Iron	ug/L	12900	NA	48900	J	ug/L	13600	Average	(1)	13600	Average	(1)
Lead	ug/L	5.9	NA	24.7	J	ug/L	7.2	Average	(1)	7.2	Average	(1)
Manganese	ug/L	1360	NA	7570		ug/L	1740	Average	(1)	1740	Average	(1)
Nickel	ug/L	57.4	NA	178		ug/L	73.8	Average	(1)	73.8	Average	(1)
Thallium	ug/L	0.075	NA	0.32	J	ug/L	0.11	Average	(1)	0.11	Average	(1)
Vanadium	ug/L	9.7	NA	49.4	J	ug/L	10.5	Average	(1)	10.5	Average	(1)
Nitrite/Nitrate-N	mg/L	0.3	NA	2		mg/L	0.53	Average	(1)	0.53	Average	(1)

1 - The EPC for groundwater is the arithmetic average of samples in the most highly contaminated area of the plume (See Section 7.3.3 of text).

0.76383333
6807.35
1.336875
2.61277778
0.9205
10.545
33.2666667
13584.2222
7.17233333
1740.65556
73.8444444
0.10861111
10.4911111
0.52638889

TABLE 3.9
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER -PENNSYLVANIAN UPPER ZONE
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: PA Upper Zone

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,3-Dinitrobenzene	ug/L	0.6	NA	8.9		ug/L	0.8	Average	(1)	0.8	Average	(1)
2,4,6-Trinitrotoluene	ug/L	11	NA	170		ug/L	17	Average	(1)	17	Average	(1)
2,6-Dinitrotoluene	ug/L	0.5	NA	9.8	J	ug/L	0.8	Average	(1)	0.8	Average	(1)
2-Amino-4,6-Dinitrotoluene	ug/L	6	NA	100	J	ug/L	10	Average	(1)	10	Average	(1)
2-Nitrotoluene	ug/L	0.1	NA	0.45	J	ug/L	0.1	Average	(1)	0.1	Average	(1)
4-Amino-2,6-Dinitrotoluene	ug/L	11	NA	190		ug/L	17	Average	(1)	17	Average	(1)
4-Nitrotoluene	ug/L	0.2	NA	5.8	J	ug/L	0.3	Average	(1)	0.3	Average	(1)
HMX	ug/L	57	NA	530		ug/L	88	Average	(1)	88	Average	(1)
RDX	ug/L	700	NA	7400		ug/L	1100	Average	(1)	1100	Average	(1)
Aluminum	ug/L	14300	NA	190000	J	ug/L	140000	Average	(1)	140000	Average	(1)
Arsenic	ug/L	6.1	NA	91.2	J	ug/L	24.9	Average	(1)	24.9	Average	(1)
Beryllium	ug/L	7.6	NA	97.4	J	ug/L	68.5	Average	(1)	68.5	Average	(1)
Cadmium	ug/L	5.3	NA	83.4	J	ug/L	48.5	Average	(1)	48.5	Average	(1)
Chromium	ug/L	2.6	NA	35.2	J	ug/L	13	Average	(1)	13	Average	(1)
Cobalt	ug/L	434	NA	6060	J	ug/L	3250	Average	(1)	3250	Average	(1)
Iron	ug/L	19100	NA	209000	J	ug/L	95100	Average	(1)	95100	Average	(1)
Lead	ug/L	7.1	NA	104	J	ug/L	39.2	Average	(1)	39.2	Average	(1)
Manganese	ug/L	9290	NA	138000	J	ug/L	80300	Average	(1)	80300	Average	(1)
Mercury	ug/L	0.44	NA	7.3		ug/L	0.53	Average	(1)	0.53	Average	(1)
Nickel	ug/L	1020	NA	14600	J	ug/L	8160	Average	(1)	8160	Average	(1)
Selenium	ug/L	2.5	NA	24.7	J	ug/L	9.2	Average	(1)	9.2	Average	(1)
Thallium	ug/L	0.3	NA	6	J	ug/L	1.8	Average	(1)	1.8	Average	(1)
Vanadium	ug/L	1.8	NA	22.9		ug/L	6.1	Average	(1)	6.1	Average	(1)
Zinc	ug/L	1360	NA	18000		ug/L	10700	Average	(1)	10700	Average	(1)
Nitrite/Nitrate-N	mg/L	1.2	NA	10	J	mg/L	1.8	Average	(1)	1.8	Average	(1)

1 - The EPC for groundwater is the arithmetic average of samples in the most highly contaminated area of the plume (See Section 7.3.3 of text).

1,3-Dinitrobenzene	8.22E-01
2,4,6-Trinitrotoluene	1.66E+01
2,6-Dinitrotoluene	7.70E-01
2-Amino-4,6-Dinitrotc	1.00E+01
2-Nitrotoluene	1.41E-01
4-Amino-2,6-Dinitrotc	1.68E+01
4-Nitrotoluene	2.71E-01
HMX	8.82E+01
RDX	1.10E+03
Aluminum	1.40E+05
Antimony	4.71E-01
Arsenic	2.49E+01
Beryllium	6.85E+01
Cadmium	4.85E+01
Chromium	1.30E+01
Cobalt	3.25E+03
Iron	9.51E+04
Lead	3.92E+01
Manganese	8.03E+04
Mercury	5.28E-01
Nickel	8.16E+03
Selenium	9.18E+00
Thallium	1.78E+00
Vanadium	6.15E+00
Zinc	1.07E+04
Nitrite/Nitrate-N	1.77E+00

TABLE 3.8
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
SWMU 12 (MINE FILL A) - BATTERY SITE
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil
Exposure Point: SWMU 12 Battery Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	17700	19700	24700	J	mg/kg	19700	Student-t	ProUCL (1)	19700	Student-t	ProUCL (1)
Arsenic	mg/kg	3	3.8	6.4	J	mg/kg	3.8	Student-t	ProUCL (1)	3.8	Student-t	ProUCL (1)
Barium	mg/kg	119	229	792	J	mg/kg	387	95% UCL-C	ProUCL (2)	387	95% UCL-C	ProUCL (2)
Iron	mg/kg	41100	54400	93300	J	mg/kg	54400	Student-t	ProUCL (1)	54400	Student-t	ProUCL (1)
Manganese	mg/kg	210	321	796	J	mg/kg	355	Gamma	ProUCL (2)	355	Gamma	ProUCL (2)
Vanadium	mg/kg	27.3	29.5	34	J	mg/kg	29.5	Student-t	ProUCL (1)	29.5	Student-t	ProUCL (1)

Definitions:
95 % UCL-C = 95% Chebyshev (Mean, Std) UCL (non-parametric).
Gamma = Approximate Gamma 95% UCL.

Footnotes:
1 - ProUCL indicates data are normally distributed.
2 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.

17717	19693.85018
3.04	3.830781925
119	229.3184888
41098	54446.09065
210	320.8535221
27.308333	29.46015672

19693.85018
3.830781925
387.1649335
54446.09065
354.9024245
29.46015672

TABLE 3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
SWMU 12 (MINE FILL A) - BATTERY SITE
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Battery Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)pyrene	mg/kg	0.02	0.03	0.11		mg/kg	0.08	97.5% UCL-C	ProUCL (1)	0.08	97.5% UCL-C	ProUCL (1)
RDX	mg/kg	0.7	2	6.1		mg/kg	6	99% UCL-C	ProUCL (1)	6	99% UCL-C	ProUCL (1)
Aluminum	mg/kg	16800	19000	23700		mg/kg	19000	Student-t	ProUCL (2)	19000	Student-t	ProUCL (2)
Antimony	mg/kg	352	943	3610	J	mg/kg	3600	99% UCL-C	ProUCL (1)	3600	99% UCL-C	ProUCL (1)
Arsenic	mg/kg	27.4	55.2	158	J	mg/kg	123	97.5% UCL-C	ProUCL (1)	123	97.5% UCL-C	ProUCL (1)
Cadmium	mg/kg	1.3	2.6	6.3	J	mg/kg	6.3	Maximum	FOD (3)	6.3	Maximum	FOD (3)
Copper	mg/kg	70.7	138	345	J	mg/kg	303	97.5% UCL-C	ProUCL (1)	303	97.5% UCL-C	ProUCL (1)
Iron	mg/kg	26700	36300	65900	J	mg/kg	38400	Gamma	ProUCL (1)	38400	Gamma	ProUCL (1)
Lead	mg/kg	39400	110000	429000	J	mg/kg	39400	Average	(4)	39400	Average	(4)
Manganese	mg/kg	566	828	1400		mg/kg	828	Student-t	ProUCL (2)	828	Student-t	ProUCL (2)
Thallium	mg/kg	0.69	1.7	6.4	J	mg/kg	6.4	99% UCL-C	ProUCL (1)	6.4	99% UCL-C	ProUCL (1)
Vanadium	mg/kg	30.4	34.9	42.8	J	mg/kg	34.9	Student-t	ProUCL (2)	34.9	Student-t	ProUCL (2)
Zinc	mg/kg	494	978	2490	J	mg/kg	2160	97.5% UCL-C	ProUCL (1)	2160	97.5% UCL-C	ProUCL (1)

Definitions:
97.5 % UCL-C = 97.5% Chebyshev (Mean, Std) UCL (non-parametric).
99 % UCL-C = 99% Chebyshev (Mean, Std) UCL (non-parametric).
Gamma = Approximate Gamma 95% UCL.

Footnotes:
2 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.
2 - ProUCL indicates data are normally distributed.
3 - FOD - Less than 50 percent positive detections. Maximum concentration is used as the EPC.
4 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).

0.0150745	0.03257279
0.6681818	1.65267774
16825.455	18979.1814
351.825	943.364535
27.372727	55.1845934
1.2622727	2.5585271
70.718182	138.088282
26705.455	36251.9835
39382.282	110000.893
566.39091	828.009641
0.6904545	1.72542268
30.4	34.8955546
493.97273	978.116977

0.07536631
6.07277267
18979.1814
3599.20176
123.201017
6.3
302.847932
38407.0079
427057.529
828.009641
6.37212291
34.8955546
2162.13535

1 - UCL is greater than the maximum concentration. Therefore, the maximum concentration is used as the EPC.

TABLE 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 158/159 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 158/159

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	3	NA	262		mg/kg	3	Average	(1)	3	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	NA	1.82		mg/kg	0.3	Average	(1)	0.3	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.3	NA	3.17		mg/kg	0.3	Average	(1)	0.3	Average	(1)
2-Nitrotoluene	mg/kg	0.2	NA	0.939		mg/kg	0.2	Average	(1)	0.2	Average	(1)
HMX	mg/kg	4	NA	87.9		mg/kg	4	Average	(1)	4	Average	(1)
RDX	mg/kg	15	NA	752		mg/kg	15	Average	(1)	15	Average	(1)
Aluminum	mg/kg	14900	NA	21300		mg/kg	14900	Average	(1)	14900	Average	(1)
Arsenic	mg/kg	16.2	NA	57.3		mg/kg	16.2	Average	(1)	16.2	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

2.54E+00
2.55E-01
2.72E-01
2.33E-01
4.19E+00
1.52E+01
1.49E+04
1.62E+01

TABLE 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 157 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 157

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	4	NA	260		mg/kg	4	Average	(1)	4	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	NA	1.28		mg/kg	0.3	Average	(1)	0.3	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.3	NA	1.62		mg/kg	0.3	Average	(1)	0.3	Average	(1)
HMX	mg/kg	2	NA	6.93		mg/kg	2	Average	(1)	2	Average	(1)
RDX	mg/kg	3	NA	19.4		mg/kg	3	Average	(1)	3	Average	(1)
Aluminum	mg/kg	16600	NA	18890		mg/kg	16600	Average	(1)	16600	Average	(1)
Arsenic	mg/kg	8.9	NA	1300		mg/kg	8.9	Average	(1)	8.9	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

4.00E+00
3.01E-01
3.42E-01
1.87E+00
2.80E+00
1.66E+04
8.92E+00

TABLE 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 153/154 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 153/154

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	2	NA	793		mg/kg	2	Average	(1)	2	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.6	NA	2.33		mg/kg	0.6	Average	(1)	0.6	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.6	NA	5.8		mg/kg	0.6	Average	(1)	0.6	Average	(1)
2-Nitrotoluene	mg/kg	0.4	NA	0.074		mg/kg	0.4	Average	(1)	0.4	Average	(1)
HMX	mg/kg	6	NA	752		mg/kg	6	Average	(1)	6	Average	(1)
RDX	mg/kg	25	NA	5940		mg/kg	25	Average	(1)	25	Average	(1)
Aluminum	mg/kg	13700	NA	35200		mg/kg	13700	Average	(1)	13700	Average	(1)
Arsenic	mg/kg	11.5	NA	25.9		mg/kg	11.5	Average	(1)	11.5	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

1.98E+00
6.31E-01
6.44E-01
4.19E-01
6.45E+00
2.51E+01
1.37E+04
1.15E+01

TABLE 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE/SUBSURFACE SOIL - BUILDING 152 - HISTORICAL DATA

SWMU 12 (MINE FILL A)

NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface / Subsurface Soil
Exposure Medium: Surface / SubSurface Soil
Exposure Point: Building 152

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2,4,6-Trinitrotoluene	mg/kg	2	NA	53.9		mg/kg	2	Average	(1)	2	Average	(1)
2-Amino-4,6-dinitrotoluene	mg/kg	0.3	NA	0.845		mg/kg	0.3	Average	(1)	0.3	Average	(1)
4-Amino-2,6-dinitrotoluene	mg/kg	0.3	NA	1.12		mg/kg	0.3	Average	(1)	0.3	Average	(1)
HMX	mg/kg	2	NA	10.7		mg/kg	2	Average	(1)	2	Average	(1)
RDX	mg/kg	3	NA	40.3		mg/kg	3	Average	(1)	3	Average	(1)
Aluminum	mg/kg	13100	NA	18100		mg/kg	13100	Average	(1)	13100	Average	(1)
Arsenic	mg/kg	8.9	NA	14		mg/kg	8.9	Average	(1)	8.9	Average	(1)

1 - Weighted average was used as the EPC for historical and bioremediated samples (See Section 7.3.3 of text).

2.29E+00
2.68E-01
2.98E-01
2.39E+00
3.44E+00
1.31E+04
8.89E+00

TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	24000	26900	37000	J	mg/kg	26900	Student-t	ProUCL (1)	26900	Student-t	ProUCL (1)
Arsenic	mg/kg	6	7.5	12.3	J	mg/kg	7.5	Student-t	ProUCL (1)	7.5	Student-t	ProUCL (1)
Barium	mg/kg	130	185	568	J	mg/kg	183	Gamma	ProUCL (2)	183	Gamma	ProUCL (2)
Iron	mg/kg	29000	34200	49600	J	mg/kg	34200	Student-t	ProUCL (1)	34200	Student-t	ProUCL (1)
Manganese	mg/kg	300	477	1600	J	mg/kg	542	Gamma	ProUCL (2)	542	Gamma	ProUCL (2)
Vanadium	mg/kg	37	41.6	50.5	J	mg/kg	41.6	Student-t	ProUCL (1)	41.6	Student-t	ProUCL (1)

Definitions:
Gamma = Approximate Gamma 95% UCL.

1 - ProUCL indicates data are normally distributed.
2 - EPC statistic is recommended by U.S. EPA's ProUCL guidance.

23,871	26865.0072
6.3	7.47213082
133.1	185.340062
29,481	34170.8091
304	476.835948
37	41.6448372

26865.0072
7.47213082
182.772988
34170.8091
541.703316
41.6448372

Definitions:
95 % UCL-C = 95% Chebyshev UCL (non-parametric).
99 % UCL-C = 99% Chebyshev UCL (non-parametric).
Gamma = Approximate Gamma 95% UCL.
97.5 % UCL-C = 97.5% Chebyshev UCL (log-normal).
95 % UCL-T = 95% UCL of Log-transformed Data.

1 - UCL is greater than the maximum concentration. Therefore, the maximum concentration is used as the EPC.
2 - EPC statistic is recommended by U.S. EPA's ProUCL software.
3 - The EPC for lead is the arithmetic average, as recommended by U.S. EPA guidance (U.S. EPA, 1999c).
4 - Shapiro-Wilk W Test indicates data are log-normally distributed.

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
SWMU 12 (MINE FILL A)
NSWC CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: SWMU 12 Proper

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	23400	NA	29800	J	mg/kg	29800	Maximum	N < 10 (1)	29800	Maximum	N < 10 (1)
Arsenic	mg/kg	6.8	NA	9	J	mg/kg	9	Maximum	N < 10	9	Maximum	N < 10
Iron	mg/kg	24400	NA	30600	J	mg/kg	30600	Maximum	N < 10	30600	Maximum	N < 10
Manganese	mg/kg	404	NA	1080	J	mg/kg	1080	Maximum	N < 10	1080	Maximum	N < 10
Vanadium	mg/kg	39.4	NA	48.6	J	mg/kg	48.6	Maximum	N < 10	48.6	Maximum	N < 10

(1) Dataset consists of less than 10 samples. Therefore, the maximum concentration is used as the EPC.

23,378
6.8
24,389
404
39

TABLE 2.19

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - TURKEY CREEK SEDIMENT
SWMU 12 (MINE FIELD A) - BATTERY AREA
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration in Upgradient Sample (4)	EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)			
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	5360 J	11400 J	mg/kg	12SD270004	3/3	---	11400	6760	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-38-2	**ARSENIC**	4.5 J	27.8 J	mg/kg	12SD270004	3/3	---	27.8	ND	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	BARIUM	51.6 J	82.4 J	mg/kg	12SD270004	3/3	---	82.4	45.1	540	N	23000	IDEM	No	BSL	540	BSL	BSL
7440-41-7	BERYLLIUM	0.43 J	0.49 J	mg/kg	13SD4401	2/3	2.6	0.49	ND	15	N	680	IDEM	No	BSL	15	BSL	BSL
7440-43-9	CADMIUM	0.17 J	0.19 J	mg/kg	13SD4401	2/3	0.81	0.19	ND	3.7	N	12	IDEM	No	BSL	3.7	BSL	BSL
7440-70-2	CALCIUM	703 J	1830 J	mg/kg	12SD270004	3/3	---	1830	64000	NA		NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	11.8 J	70.4 J	mg/kg	12SD270004	3/3	---	70.4	26.4	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	7 J	27.1 J	mg/kg	12SD270004	3/3	---	27.1	ND	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	COPPER	6.3 J	19.8 J	mg/kg	12SD270004	3/3	---	19.8	ND	310	N	13000	IDEM	No	BSL	310	BSL	BSL
7439-89-6	**IRON**	14100 J	157000 J	mg/kg	12SD270004	3/3	---	157000	40000	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	LEAD	9.4 J	39.6 J	mg/kg	12SD270004	3/3	---	39.6	12.4	400		400	IDEM	No	BSL	400	BSL	BSL
7439-95-4	MAGNESIUM	565 J	748 J	mg/kg	12SD270004	3/3	---	748	6620	NA		NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	444	1760 J	mg/kg	12SD270004	3/3	---	1760	708	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.01 J	0.01 J	mg/kg	12SD270004	1/1	---	0.01	ND	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	10.7 J	52.1 J	mg/kg	12SD270004	3/3	---	52.1	22.8	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	748 J	810 J	mg/kg	12SD270004	3/3	---	810	903	NA		NA	IDEM	No	NUT		BSL	NUT
7782-49-2	SELENIUM	0.13 J	0.16 J	mg/kg	13SD4401	2/3	0.54	0.16	ND	39	N	1700	IDEM	No	BSL	39	BSL	BSL
7440-62-2	**VANADIUM**	14 J	57.8 J	mg/kg	12SD270004	3/3	---	57.8	24.8	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	ZINC	27.2 J	32 J	mg/kg	13SD4401	2/3	204	32	55.6	2300	N	100000	IDEM	No	BSL	2300	BSL	BSL

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in sediment relative to upgradient locations is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NTX = No toxicity data
NUT = Essential nutrient

Associated Sample
12SD270004

ALUMINUM	6760 J
ARSENIC	14.4 U
BARIUM	45.1 J
BERYLLIUM	0.87 U
CADMIUM	0.43 U
CALCIUM	64000 J
CHROMIUM	26.4 J
COBALT	10.4 U
COPPER	6.8 U
IRON	40000 J
LEAD	12.4 J
MAGNESIUM	6620 J
MANGANESE	708 J
MERCURY	0.007 U
NICKEL	22.8 J
POTASSIUM	903 J
SELENIUM	0.26 U
VANADIUM	24.8 J
ZINC	55.6 J

TABLE 2.18

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - EAST TRIBUTARY SEDIMENT
SWMU 12 (MINE FIELD A) - BATTERY AREA
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration in Upgradient Sample (4)	EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)			
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	8080 J	17200 J	mg/kg	12SD230004	2/2	---	17200	10900	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-36-0	ANTIMONY	1.2 J	1.2 J	mg/kg	12SD230004	1/2	1.5	1.2	0.81	3.1	N	140	IDEM	No	BSL	3.1	BSL	BSL
7440-38-2	**ARSENIC**	10.9 J	10.9 J	mg/kg	12SD230004	1/2	15.5	10.9	15.3	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	BARIUM	65 J	65 J	mg/kg	12SD240004	1/2	177	65	108	540	N	23000	IDEM	No	BSL	540	BSL	BSL
7440-70-2	CALCIUM	897 J	1920 J	mg/kg	12SD230004	2/2	---	1920	9270	NA		NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	26.8 J	32.8 J	mg/kg	12SD240004	2/2	---	32.8	29	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	19.4 J	40.4 J	mg/kg	12SD230004	2/2	---	40.4	28.3	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	COPPER	13 J	29.4 J	mg/kg	12SD240004	2/2	---	29.4	11.5	310	N	13000	IDEM	No	BSL	310	BSL	BSL
7439-89-6	**IRON**	31900 J	70700 J	mg/kg	12SD240004	2/2	---	70700	44600	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	LEAD	22.8 J	58.2 J	mg/kg	12SD240004	2/2	---	58.2	25.2	400		400	IDEM	No	BSL	400	BSL	BSL
7439-95-4	MAGNESIUM	710 J	1340 J	mg/kg	12SD230004	2/2	---	1340	2090	NA		NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	1480 J	2910 J	mg/kg	12SD230004	2/2	---	2910	2060	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.012 J	0.038 J	mg/kg	12SD230004	2/2	---	0.038	0.027	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	26 J	32.1 J	mg/kg	12SD230004	2/2	---	32.1	31.3	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	838 J	1210 J	mg/kg	12SD230004	2/2	---	1210	1200	NA		NA	IDEM	No	NUT		BSL	NUT
7440-62-2	**VANADIUM**	31 J	36 J	mg/kg	12SD240004	2/2	---	36	30.7	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	ZINC	75.7 J	75.7 J	mg/kg	12SD230004	1/2	158	75.7	71.2	2300	N	100000	IDEM	No	BSL	2300	BSL	BSL

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in sediment relative to upgradient locations is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level .

Associated Samples
12SD230004
12SD240004

ALUMINUM	10900
ANTIMONY	0.81
ARSENIC	15.3
BARIUM	108
CALCIUM	9270
CHROMIUM	29
COBALT	28.3
COPPER	11.5
IRON	44600
LEAD	25.2
MAGNESIUM	2090
MANGANESE	2060
MERCURY	0.027
NICKEL	31.3
POTASSIUM	1200
VANADIUM	30.7
ZINC	71.2

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NTX = No toxicity data
NUT = Essential nutrient

TABLE 2.17

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GULLY SEDIMENT
SWMU 12 (MINE FIELD A) - BATTERY AREA
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentrations in Upgradient Samples (4)	U.S. EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)			
Semivolatile Organics (ug/kg)																		
56-55-3	BENZO(A)ANTHRACENE	9	9	ug/kg	12SD030004	1/3	3.65 - 4.28	9	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
50-32-8	BENZO(A)PYRENE	10	10	ug/kg	12SD030004	1/3	3.65 - 4.28	10	NA	62	C	500	IDEM	No	BSL	62	BSL	BSL
205-99-2	BENZO(B)FLUORANTHENE	15	15	ug/kg	12SD030004	1/3	3.65 - 4.28	15	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
207-08-9	BENZO(K)FLUORANTHENE	7 J	7 J	ug/kg	12SD030004	1/3	3.65 - 4.28	7	NA	6200	C	50000	IDEM	No	BSL	6200	BSL	BSL
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	340 J	340 J	ug/kg	12SD070004	1/3	74.1 - 85.7	340	NA	35000	C	300000	IDEM	No	BSL	35000	BSL	BSL
218-01-9	CHRYSENE	11	11	ug/kg	12SD030004	1/3	3.65 - 4.28	11	NA	62000	C	500000	IDEM	No	BSL	62000	BSL	BSL
206-44-0	FLUORANTHENE	4 J	15	ug/kg	12SD030004	3/3	---	15	NA	230000	N	6300000	IDEM	No	BSL	230000	BSL	BSL
91-20-3	NAPHTHALENE	7 J	7 J	ug/kg	12SD070004	1/3	3.65 - 4.22	7	NA	5600	N	3200000	IDEM	No	BSL	5600	BSL	BSL
85-01-8	PHENANTHRENE	6 J	10	ug/kg	12SD030004	2/3	3.65	10	NA	230000	N	470000	IDEM	No	BSL	230000	BSL	BSL
129-00-0	PYRENE	6 J	18	ug/kg	12SD030004	2/3	3.65	18	NA	230000	N	4700000	IDEM	No	BSL	230000	BSL	BSL
Energetics (mg/kg)																		
118-96-7	2,4,6-TRINITROTOLUENE	0.4 J	2.4 J	mg/kg	12SD020004	4/19	0.25	2.4	NA	3.1	N	NA	IDEM	No	BSL	3.1	BSL	BSL
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	10300 J	25700 J	mg/kg	12SD120004	19/19	---	25700	12900 - 23800	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-36-0	**ANTIMONY**	0.85 J	4.2 J	mg/kg	12SD130004	4/19	0.24 - 2.3	4.2	ND	**3.1**	N	140	IDEM	**Yes**	**ASL**	3.1	ASL	ASL
7440-38-2	**ARSENIC**	9.3 J	36 J	mg/kg	12SD170004	12/19	5.1 - 15.5	36	12.2 - 34.5	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	BARIUM	64.6 J	182 J	mg/kg	12SD090004	16/19	138 - 220	182	70.1 - 196	540	N	23000	IDEM	No	BSL	540	BSL	BSL
7440-43-9	**CADMIUM**	6.2 J	7.4 J	mg/kg	12SD150004	2/19	0.37 - 4.9	7.4	ND	**3.7**	N	12	IDEM	**Yes**	**ASL**	3.7	ASL	ASL
7440-70-2	CALCIUM	893 J	65300 J	mg/kg	12SD030004	19/19	---	65300	1610 - 46900	NA		NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	19.1 J	141 J	mg/kg	12SD210004	16/19	14.7 - 17.8	141	22.1 - 72.6	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	5.5 J	108 J	mg/kg	12SD130004	14/19	6.9 - 17.3	108	7.9 - 65.9	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	COPPER	10.6 J	22.5 J	mg/kg	12SD140004, 12SD170004	14/19	10.5 - 13.9	22.5	14.8 - 41.9	310	N	13000	IDEM	No	BSL	310	BSL	BSL
7439-89-6	**IRON**	14100 J	217000 J	mg/kg	12SD100004	19/19	---	217000	22900 - 210000	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	LEAD	12.6 J	178 J	mg/kg	12SD170004	19/19	---	178	23.9 - 43.9	400		400	IDEM	No	BSL	400	BSL	BSL
7439-95-4	MAGNESIUM	670 J	8190 J	mg/kg	12SD140004	19/19	---	8190	1130 - 4670	NA		NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	217 J	6780 J	mg/kg	12SD130004	17/19	473 - 545	6780	253 - 4430	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.019 J	0.063 J	mg/kg	12SD140004	19/19	---	0.063	0.029 - 0.059	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	14.9 J	80.9 J	mg/kg	12SD130004	16/19	11.7 - 13.5	80.9	16.1 - 63.9	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	969 J	2440 J	mg/kg	12SD140004	19/19	---	2440	866 - 2200	NA		NA	IDEM	No	NUT		BSL	NUT
7440-23-5	SODIUM	89.7 J	102 J	mg/kg	12SD020004	2/19	25.5 - 154	102	ND	NA		NA	IDEM	No	NUT		BSL	NUT
7440-31-5	TIN	2.6 J	3.1 J	mg/kg	12SD100004	3/19	0.33 - 0.63	3.1	ND	4700	N	NA	IDEM	No	BSL	4700	BSL	BSL
7440-62-2	**VANADIUM**	23.4 J	71 J	mg/kg	12SD090004	17/19	19.3 - 133	71	29.6 - 62.4	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	ZINC	46.1 J	263 J	mg/kg	12SD120004	16/19	121 - 528	263	57.6 - 363	2300	N	100000	IDEM	No	BSL	2300	BSL	BSL

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in sediment relative to upgradient locations is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Associated Samples

12SD010004	12SD060004	12SD120004	12SD180004
12SD020004	12SD070004	12SD130004	12SD190004
12SD030004	12SD090004	12SD140004	12SD200004
12SD040004	12SD100004	12SD150004	12SD210004
12SD050004	12SD110004	12SD170004	

ALUMINUM	12900 J	23800 J	12900 - 23800
ARSENIC	12.2 J	34.5 J	12.2 - 34.5
BARIUM	70.1 J	196 J	70.1 - 196
CALCIUM	1610 J	46900 J	1610 - 46900
CHROMIUM	22.1 J	72.6 J	22.1 - 72.6
COBALT	7.9 J	65.9 J	7.9 - 65.9
COPPER	14.8 J	41.9 J	14.8 - 41.9
IRON	22900 J	210000 J	22900 - 210000
LEAD	23.9 J	43.9 J	23.9 - 43.9
MAGNESIUM	1130 J	4670 J	1130 - 4670
MANGANESE	253 J	4430 J	253 - 4430
MERCURY	0.029 J	0.059 J	0.029 - 0.059
NICKEL	16.1 J	63.9 J	16.1 - 63.9
POTASSIUM	866 J	2200 J	866 - 2200
VANADIUM	29.6 J	62.4 J	29.6 - 62.4
ZINC	57.6 J	363 J	57.6 - 363

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
sat = Soil saturation concentration
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NTX = No toxicity data
NUT = Essential nutrient

TABLE 2.16

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - TURKEY CREEK SURFACE WATER
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Location of Maximum Concentration	Frequency of Detection	Range of Nondetections[2]	Concentration Used for Screening[3]	Concentrations in Upgradient Samples [4]	Screening Toxicity Value[5]	Potential ARAR/TBC[6]	Potential ARAR/TBC Source[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]					Exposure Point
Total Metals																			
7429-90-5	Aluminum	24.1 J	24.1 J	ug/L	12SW2701	1/2	49.7	24.1	59.3	3600 N	NA NA	NA NA	No	BSL,BKG	3600	BSL	**BKG**	BSL,BKG	
7440-39-3	Barium	41 J	69.8 J	ug/L	12SW2701	2/2	---	69.8	35.4 - 75	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL		BSL	
7440-41-7	Beryllium	0.02 J	0.02 J	ug/L	12SW2701	1/2	0.02	0.02	0.04	7.3 N	4 4	FED-MCL IDEM	No	BSL,BKG	4	BSL	**BKG**	BSL,BKG	
7440-70-2	Calcium	34800 J	54500 J	ug/L	12SW2701	2/2	---	54500	31100 - 61000	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-48-4	Cobalt	0.22 J	0.22 J	ug/L	12SW2702	1/2	0.31	0.22	0.15	73 N	NA NA	NA NA	No	BSL	73	BSL		BSL	
7439-89-6	Iron	275 J	456 J	ug/L	12SW2701	2/2	---	456	230 - 510	1100 N	NA NA	NA NA	No	BSL	1100	BSL		BSL	
7439-95-4	Magnesium	5120 J	9220 J	ug/L	12SW2701	2/2	---	9220	4260 - 9410	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7439-96-5	**Manganese**	43.1 J	131 J	ug/L	12SW2701	2/2	---	131	22 - 77.3	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL		ASL	
7440-02-0	Nickel	1.7 J	1.7 J	ug/L	12SW2701	1/2	0.1	1.7	2	73 N	NA 730	NA IDEM	No	BSL,BKG	73	BSL	**BKG**	BSL,BKG	
7440-09-7	Potassium	915 J	1600 J	ug/L	12SW2701	2/2	---	1600	663 - 1670	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-23-5	Sodium	4630 J	9630 J	ug/L	12SW2701	2/2	---	9630	3570 - 10300	NA	NA NA	NA NA	No	NUT		BSL		NUT	
Dissolved Metals																			
7440-39-3	Barium, Filtered	36.9 J	64.4 J	ug/L	12SW2701-F	2/2	---	64.4	34.7 - 59.5	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL		BSL	
7440-70-2	Calcium, Filtered	25500 J	53900 J	ug/L	12SW2701-F	2/2	---	53900	23900 - 57700	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-48-4	Cobalt, Filtered	0.18 J	0.18 J	ug/L	12SW2702-F	1/2	0.28	0.18	ND	73 N	NA NA	NA NA	No	BSL	73	BSL		BSL	
7440-50-8	Copper, Filtered	0.41 J	0.41 J	ug/L	12SW2702-F	1/2	0.78	0.41	0.3	150 N	1300 1300	FED-MCL[8] IDEM	No	BSL	150	BSL		BSL	
7439-89-6	Iron, Filtered	172 J	288 J	ug/L	12SW2701-F	2/2	---	288	149 - 249	1100 N	NA NA	NA NA	No	BSL	1100	BSL		BSL	
7439-95-4	Magnesium, Filtered	5800 J	8900 J	ug/L	12SW2701-F	2/2	---	8900	5250 - 8210	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7439-96-5	**Manganese, Filtered**	33.5 J	124 J	ug/L	12SW2701-F	2/2	---	124	18 - 49.2	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL		ASL	
7440-02-0	Nickel, Filtered	1.7 J	1.8 J	ug/L	12SW2702-F	2/2	---	1.8	1.5	73 N	NA 730	NA IDEM	No	BSL	73	BSL		BSL	
7440-09-7	Potassium, Filtered	875 J	1600 J	ug/L	12SW2701-F	2/2	---	1600	741 - 1490	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-23-5	Sodium, Filtered	5240 J	9440 J	ug/L	12SW2701-F	2/2	---	9440	4640 - 9090	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-66-6	Zinc, Filtered	1.9 J	1.9 J	ug/L	12SW2702-F	1/2	2.7	1.9	3.9	1100 N	NA 11000	NA IDEM	No	BSL,BKG	1100	BSL	**BKG**	BSL,BKG	
Miscellaneous Parameters (mg/L)																			
NA	Ammonia-N	0.18 J	0.18 J	mg/L	12SW2701	1/2	0.005	0.18	NA	NA	NA NA	NA NA	No	NTX		BSL		NTX	

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in surface water relative to upgradient locations is presented in Section 5.0.
5 - The U.S. EPA Region 9 tap water screening level is presented. Value represents the risk-based tap water screening level divided by 10 to correspond to a target Hazard Quotient of 0.1 for non-carcinogens (denoted with a "N" flag), or an incremental lifetime cancer risk of $1x10^{-6}$ for carcinogens (denoted with a "C" flag) (U.S. EPA Region 9, October 2004).
6 - U.S. EPA Primary Drinking Water Standard (U.S. EPA, 2004b).
Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for groundwater (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - The MCL for this parameter is actually a treatment technique. The Safe Drinking Water Act (SDWA) action level (at the tap) has been presented.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Non-carcinogen
NA = Not applicable/not available
ND = Not detected
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level.

For elimination as a COPC:
BSL = Below screening level
NUT = Essential nutrient
NTX = No toxicity data

Associated Samples
12SW2701
12SW2701-F
12SW2702
12SW2702-F

ALUMINUM	59.3	59.3		59.3
BARIUM	35.4 J	75 J	35.4 - 75	
BERYLLIUM	0.04 J	0.04 J		0.04
CALCIUM	31100 J	61000 J	31100 - 61000	
COBALT	0.15 J	0.15 J		0.15
IRON	230 J	510 J	230 - 510	
MAGNESIUM	4260 J	9410 J	4260 - 9410	
MANGANESE	22 J	77.3 J	22 - 77.3	
NICKEL	2 J	2 J		2
POTASSIUM	663 J	1670 J	663 - 1670	
SODIUM	3570 J	10300 J	3570 - 10300	
Dissolved Metals (ug/L)				
ALUMINUM, FILTERED	9.9 J	9.9 J		9.9
BARIUM, FILTERED	34.7 J	59.5 J	34.7 - 59.5	
CALCIUM, FILTERED	23900 J	57700 J	23900 - 57700	
COPPER, FILTERED	0.3 J	0.3 J		0.3
IRON, FILTERED	149 J	249 J	149 - 249	
MAGNESIUM, FILTERED	5250 J	8210 J	5250 - 8210	
MANGANESE, FILTERED	18 J	49.2 J	18 - 49.2	
NICKEL, FILTERED	1.5 J	1.5 J		1.5
POTASSIUM, FILTERED	741 J	1490 J	741 - 1490	
SODIUM, FILTERED	4640 J	9090 J	4640 - 9090	
ZINC, FILTERED	3.9 J	3.9 J		3.9

TABLE 2.15

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - EAST TRIBUTARY SURFACE WATER
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Location of Maximum Concentration	Frequency of Detection	Range of Nondetections[2]	Concentration Used for Screening[3]	Concentrations in Upgradient Samples [4]	Screening Toxicity Value[5]	Potential ARAR/TBC[6]	Potential ARAR/TBC Source[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]				Exposure Point
Energetics																		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.252 J	0.56	ug/L	12SW2401	3/4	0.245	0.56	NA	0.73 N[8]	NA NA	NA NA	No	BSL	0.73	BSL		BSL	
2691-41-0	HMX	0.28 J	0.55	ug/L	12SW2401	3/4	0.245	0.55	NA	180 N	NA NA	NA NA	No	BSL	180	BSL		BSL	
121-82-4	**RDX**	0.39 J	0.8	ug/L	12SW2401	3/4	0.245	0.8	NA	**0.61** C	NA NA	NA NA	**Yes**	**ASL**	0.61	ASL		ASL	
Total Metals																			
7429-90-5	Aluminum	40.7 J	257 J	ug/L	12SW2401	2/4	52.8 - 85.1	257	102	3600 N	NA NA	NA NA	No	BSL	3600	BSL		BSL	
7440-38-2	**Arsenic**	0.33 J	0.33 J	ug/L	12SW2401	1/4	0.11 - 0.24	0.33	ND	**0.045** C	10 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL		ASL	
7440-39-3	Barium	38.2 J	64.2 J	ug/L	12SW2301	4/4	---	64.2	39 - 41.8	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL		BSL	
7440-70-2	Calcium	40400	59300 J	ug/L	12SW2301	4/4	---	59300	47200 - 63500	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-48-4	Cobalt	0.15 J	0.26 J	ug/L	12SW2401	3/4	0.2	0.26	0.18	73 N	NA NA	NA NA	No	BSL	73	BSL		BSL	
7440-50-8	Copper	1.4 J	3.4 J	ug/L	12SW2401	2/4	0.58 - 1.4	3.4	0.89 - 1.5	150 N	1300 1300	FED-MCL[9] IDEM	No	BSL	150	BSL		BSL	
7439-89-6	Iron	252 J	584 J	ug/L	12SW2401	4/4	---	584	337 - 345	1100 N	NA NA	NA NA	No	BSL	1100	BSL		BSL	
7439-92-1	Lead	0.136 J	0.136 J	ug/L	12SW2402	1/4	0.069 - 0.48	0.136	0.28	NA	15 15	FED-MCL[9] IDEM	No	BSL,BKG	15	BSL	**BKG**	BSL,BKG	
7439-95-4	Magnesium	6740 J	10400 J	ug/L	12SW2301	4/4	---	10400	9130 - 11100	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7439-96-5	Manganese	1.2 J	7.1 J	ug/L	12SW2301	4/4	---	7.1	2.1 - 7.5	88 N	NA NA	NA NA	No	BSL	88	BSL		BSL	
7440-02-0	Nickel	1.6 J	2.4 J	ug/L	12SW2401	4/4	---	2.4	1.9 - 2.4	73 N	NA 730	NA IDEM	No	BSL	73	BSL		BSL	
7440-09-7	Potassium	1140 J	2940 J	ug/L	12SW2301	4/4	---	2940	1170 - 2730	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-23-5	Sodium	11600 J	25000 J	ug/L	12SW2301	4/4	---	25000	19700 - 28000	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-28-0	Thallium	0.07 J	0.07 J	ug/L	12SW2301, 12SW2302, 12SW2402	3/4	0.043	0.07	0.06 - 0.09	0.24 N	2 2	FED-MCL IDEM	No	BSL	0.24	BSL		BSL	
Dissolved Metals																			
7429-90-5	Aluminum, Filtered	8.7 J	9.6 J	ug/L	12SW2302	2/4	8.6 - 18.6	9.6	ND	3600 N	NA NA	NA NA	No	BSL	3600	BSL		BSL	
7440-38-2	**Arsenic, Filtered**	0.21 J	0.21 J	ug/L	12SW2401	1/4	0.1 - 0.16	0.21	ND	**0.045** C	10 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL		ASL	
7440-39-3	Barium, Filtered	44.4 J	66.8 J	ug/L	12SW2301	4/4	---	66.8	43.2 - 44.8	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL		BSL	
7440-70-2	Calcium, Filtered	36200 J	57500 J	ug/L	12SW2301	4/4	---	57500	49300 - 50700	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-47-3	Chromium, Filtered	1.2 J	1.6 J	ug/L	12SW2302	2/4	0.65 - 0.82	1.6	1.4	11 N[10]	100 100	FED-MCL IDEM[10]	No	BSL	11	BSL		BSL	
7440-48-4	Cobalt, Filtered	0.17 J	0.17 J	ug/L	12SW2302, 12SW2401	2/4	0.14 - 0.17	0.17	0.18	73 N	NA NA	NA NA	No	BSL	73	BSL		BSL	
7440-50-8	Copper, Filtered	1.3 J	2.8 J	ug/L	12SW2401	3/4	1.3	2.8	0.89	150 N	1300 1300	FED-MCL[9] IDEM	No	BSL	150	BSL		BSL	
7439-89-6	Iron, Filtered	229 J	305 J	ug/L	12SW2301	4/4	---	305	251 - 321	1100 N	NA NA	NA NA	No	BSL	1100	BSL		BSL	
7439-92-1	Lead, Filtered	0.2 J	0.254 J	ug/L	12SW2302	2/4	0.198 - 0.39	0.254	0.24	NA	15 15	FED-MCL[9] IDEM	No	BSL	15	BSL		BSL	
7439-95-4	Magnesium, Filtered	6920 J	10600 J	ug/L	12SW2301	4/4	---	10600	9370 - 12300	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7439-96-5	Manganese, Filtered	0.82 J	3.5 J	ug/L	12SW2401	3/4	4.2	3.5	1.2	88 N	NA NA	NA NA	No	BSL	88	BSL		BSL	
7440-02-0	Nickel, Filtered	2.2 J	2.8 J	ug/L	12SW2302	4/4	---	2.8	2.7 - 3.3	73 N	NA 730	NA IDEM	No	BSL	73	BSL		BSL	
7440-09-7	Potassium, Filtered	1240 J	3040 J	ug/L	12SW2301	4/4	---	3040	1330 - 2820	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-23-5	Sodium, Filtered	12000 J	23800 J	ug/L	12SW2301	4/4	---	23800	21900 - 24100	NA	NA NA	NA NA	No	NUT		BSL		NUT	
7440-28-0	Thallium, Filtered	0.07 J	0.07 J	ug/L	12SW2301	1/4	0.043 - 0.11	0.07	0.07	0.24 N	2 2	FED-MCL IDEM	No	BSL	0.24	BSL		BSL	
7440-66-6	Zinc, Filtered	2.1 J	5.2 J	ug/L	12SW2402	2/4	3.3 - 6.5	5.2	1.5	1100 N	NA 11000	NA IDEM	No	BSL	1100	BSL		BSL	
Miscellaneous Parameters (mg/L)																			
NA	Ammonia-N	0.021 J	0.13 J	mg/L	12SW2301	2/4	0.005	0.13	0.12	NA	NA NA	NA NA	No	NTX		BSL		NTX	
NA	Nitrite/Nitrate-N	0.1	0.11	mg/L	12SW2301	2/4	0.025	0.11	0.1	1 N	1 NA	FED-MCL[9] NA	No	BSL	1	BSL		BSL	

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in surface water relative to upgradient locations is presented in Section 5.0.
5 - The U.S. EPA Region 9 tap water screening level is presented. Value represents the risk-based tap water screening level divided by 10 to correspond to a target Hazard Quotient of 0.1 for non-carcinogens (denoted with a "N" flag), or an incremental lifetime cancer risk of 1×10^{-6} for carcinogens (denoted with a "C" flag) (U.S. EPA Region 9, October 2004).
6 - U.S. EPA Primary Drinking Water Standard (U.S. EPA, 2004b).
Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for groundwater (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for aminodinitrotoluene.
9 - The MCL for this parameter is actually a treatment technique. The Safe Water Drinking Act (SDWA) action level (at the tap) has been presented.
10 - Value is for hexavalent chromium.

Associated Samples

12SW2301	12SW2401
12SW2301-F	12SW2401-F
12SW2302	12SW2402
12SW2302-F	12SW2402-F

ALUMINUM	102	102		102
BARIUM	39 J	41.8 J	39 - 41.8	
BERYLLIUM	0.02 J	0.02 J		0.02
CALCIUM	47200 J	63500 J	47200 - 63500	
COBALT	0.18 J	0.18 J		0.18
COPPER	0.89 J	1.5 J	0.89 - 1.5	
IRON	337 J	345 J	337 - 345	
LEAD	0.28 J	0.28 J		0.28
MAGNESIUM	9130 J	11100 J	9130 - 11100	
MANGANESE	2.1 J	7.5 J	2.1 - 7.5	
NICKEL	1.9 J	2.4 J	1.9 - 2.4	
POTASSIUM	1170 J	2730 J	1170 - 2730	
SODIUM	19700 J	28000 J	19700 - 28000	
THALLIUM	0.06 J	0.09 J	0.06 - 0.09	
Dissolved Metals (ug/L)				
BARIUM, FILTERED	43.2 J	44.8 J	43.2 - 44.8	
CALCIUM, FILTERED	49300 J	50700 J	49300 - 50700	
CHROMIUM, FILTERED	1.4 J	1.4 J		1.4
COBALT, FILTERED	0.18 J	0.18 J		0.18
COPPER, FILTERED	0.89 J	0.89 J		0.89
IRON, FILTERED	251 J	321 J	251 - 321	
LEAD, FILTERED	0.24 J	0.24 J		0.24
MAGNESIUM, FILTERED	9370 J	12300 J	9370 - 12300	
MANGANESE, FILTERED	1.2 J	1.2 J		1.2
NICKEL, FILTERED	2.7 J	3.3 J	2.7 - 3.3	
POTASSIUM, FILTERED	1330 J	2820 J	1330 - 2820	
SODIUM, FILTERED	21900 J	24100 J	21900 - 24100	
THALLIUM, FILTERED	0.07 J	0.07 J		0.07
ZINC, FILTERED	1.5 J	1.5 J		1.5
AMMONIA-N	0.12 J	0.12 J		0.12
NITRITE/NITRATE-N	0.1 J	0.1		0.1

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Non-carcinogen
NA = Not applicable/not available
ND = Not detected
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NUT = Essential nutrient
NTX = No toxicity data

TABLE 2.14

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GULLY SURFACE WATER
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Location of Maximum Concentration	Frequency of Detection	Range of Nondetections[2]	Concentration Used for Screening[3]	Concentrations in Upgradient Samples [4]	Screening Toxicity Value[5]	Potential ARAR/TBC[6]	Potential ARAR/TBC Source[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]				Exposure Point
Energetics																		
99-35-4	1,3,5-Trinitrobenzene	0.96 J	0.96 J	ug/L	12SW3101	1/39	0.238 - 0.278	0.96	NA	110 N	NA NA	NA NA	No	BSL	110	BSL	BSL	Upper Aquifer
118-96-7	**2,4,6-Trinitrotoluene**	0.56	79	ug/L	12SW3101	4/39	0.238 - 0.278	79	NA	**1.8** N	NA NA	NA NA	**Yes**	**ASL**	1.8	ASL	ASL	
6629-29-4	2,4-Diamino-6-Nitrotoluene	0.79 J	1.6 J	ug/L	12SW3101	3/39	0.238 - 0.278	1.6	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
121-14-2	2,4-Dinitrotoluene	0.27 J	0.47 J	ug/L	12SW1201	3/39	0.238 - 0.278	0.47	NA	7.3 N	NA NA	NA NA	No	BSL	7.3	BSL	BSL	
59229-75-3	2,6-Diamino-4-Nitrotoluene	0.27 J	0.27 J	ug/L	12SW3601	1/39	0.238 - 0.278	0.27	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
606-20-2	2,6-Dinitrotoluene	0.27 J	0.27 J	ug/L	12SW1201	1/39	0.238 - 0.278	0.27	NA	3.6 N	NA NA	NA NA	No	BSL	3.6	BSL	BSL	
35572-78-2	**2-Amino-4,6-Dinitrotoluene**	0.27 J	19 J	ug/L	12SW1201	12/39	0.238 - 0.278	19	NA	**0.73** N[8]	NA NA	NA NA	**Yes**	**ASL**	0.73	ASL	ASL	
618-87-1	3,5-Dinitroaniline	0.6	1.9	ug/L	12SW1301	3/39	0.238 - 0.278	1.9	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
99-08-1	3-Nitrotoluene	0.71 J	0.71 J	ug/L	12SW1401	1/39	0.238 - 0.278	0.71	NA	12 N	NA NA	NA NA	No	BSL	12	BSL	BSL	
19406-51-0	**4-Amino-2,6-Dinitrotoluene**	0.28 J	74	ug/L	12SW1201	17/39	0.238 - 0.278	74	NA	**0.73** N[8]	NA NA	NA NA	**Yes**	**ASL**	0.73	ASL	ASL	
2691-41-0	HMX	0.9	98	ug/L	12SW3401	29/39	0.24 - 0.264	98	NA	180 N	NA NA	NA NA	No	BSL	180	BSL	BSL	
NA	MNX	0.32 J	1.9	ug/L	12SW3401	10/39	0.238 - 0.278	1.9	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
121-82-4	**RDX**	0.36 J	140	ug/L	12SW3401	30/39	0.24 - 0.264	140	NA	**0.61** C	NA NA	NA NA	**Yes**	**ASL**	0.61	ASL	ASL	
Total Metals																		
7429-90-5	**Aluminum**	90.6	67700	ug/L	12SW3501	33/39	32 - 163	67700	102 - 8920	**3600** N	NA NA	NA NA	**Yes**	**ASL**	3600	ASL	ASL	
7440-38-2	**Arsenic**	0.16 J	20.3	ug/L	12SW3501	35/39	0.11 - 0.32	20.3	0.21 - 8.6	**0.045** C	**10** 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	**Barium**	17.9 J	589 J	ug/L	12SW3501	38/39	0.37	589	33.9 - 112	**260** N	2000 2000	FED-MCL IDEM	**Yes**	**ASL**	260	ASL	ASL	
7440-41-7	**Beryllium**	0.02 J	5.2	ug/L	12SW3501	19/39	0.02 - 0.17	5.2	0.03 - 0.31	7.3 N	**4** **4**	FED-MCL IDEM	**Yes**	**ASL**	4	ASL	ASL	
7440-43-9	**Cadmium**	0.06 J	43.7 J	ug/L	12SW3501	18/39	0.039 - 1.5	43.7	0.11 - 1.6	**1.8** N	**5** **5**	FED-MCL IDEM	**Yes**	**ASL**	1.8	ASL	ASL	
7440-70-2	Calcium	1100 J	119000 J	ug/L	12SW3501	39/39	---	119000	19100 - 75500	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	**Chromium**	1.6 J	105 J	ug/L	12SW3501	17/39	0.08 - 2	105	3 - 13.9	**11** N[9]	**100** **100**	FED-MCL IDEM[9]	**Yes**	**ASL**	11	ASL	ASL	
7440-48-4	**Cobalt**	0.14 J	123	ug/L	12SW3501	39/39	---	123	0.23 - 9.2	**73** N	NA NA	NA NA	**Yes**	**ASL**	73	ASL	ASL	
7440-50-8	**Copper**	0.74 J	1650 J	ug/L	12SW3501	38/39	0.98	1650	0.74 - 20.6	**150** N	**1300** **1300**	FED-MCL[10] IDEM	**Yes**	**ASL**	150	ASL	ASL	
Total Metals (Continued)																		
7439-89-6	**Iron**	161 J	95400 J	ug/L	12SW3501	39/39	---	95400	178 - 14300	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	**Lead**	0.095 J	458	ug/L	12SW3501	30/39	0.069 - 0.77	458	0.08 - 25.3	NA	**15** **15**	FED-MCL[10] IDEM	**Yes**	**ASL**	15	ASL	ASL	
7439-95-4	Magnesium	315	34500	ug/L	12SW3501	39/39	---	34500	5720 - 11100	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese**	1.7 J	24200 J	ug/L	12SW0101	39/39	---	24200	8.3 - 347	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7439-97-6	**Mercury**	0.06 J	1.7	ug/L	12SW3501	4/39	0.03	1.7	0.66 - 0.66	**1.1** N	2 2	FED-MCL IDEM	**Yes**	**ASL**	1.1	ASL	ASL	
7440-02-0	**Nickel**	1.6 J	140 J	ug/L	12SW3501	39/39	---	140	0.57 - 20.5	**73** N	NA 730	NA IDEM	**Yes**	**ASL**	73	ASL	ASL	
7440-09-7	Potassium	107 J	167000 J	ug/L	12SW1401	38/39	5.55	167000	551 - 2240	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium	1 J	9.6 J	ug/L	12SW3501	3/39	0.11 - 0.92	9.6	0.73 - 0.73	18 N	50 50	FED-MCL IDEM	No	BSL	18	BSL	BSL	
7440-22-4	Silver	2.6 J	2.6 J	ug/L	12SW3501	1/39	0.028 - 0.18	2.6	ND	18 N	NA 180	FED-MCL IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium	571 J	30900 J	ug/L	12SW1401	36/39	897 - 28100	30900	2260 - 24000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-28-0	**Thallium**	0.05 J	0.67 J	ug/L	12SW3501	22/39	0.043	0.67	0.05 - 0.21	**0.24** N	2 2	FED-MCL IDEM	**Yes**	**ASL**	0.24	ASL	ASL	
7440-31-5	Tin	2.1 J	2.1 J	ug/L	12SW3501	1/39	0.048 - 0.56	2.1	ND	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-62-2	**Vanadium**	1.3 J	138	ug/L	12SW3501	23/39	1.14	138	2.9 - 21.6	**3.6** N	NA NA	NA NA	**Yes**	**ASL**	3.6	ASL	ASL	
7440-66-6	**Zinc**	1.6 J	5220	ug/L	12SW3501	27/39	1.3 - 8.9	5220	5.3 - 532	**1100** N	NA 11000	NA IDEM	**Yes**	**ASL**	1100	ASL	ASL	
Dissolved Metals																		
7429-90-5	Aluminum, Filtered	9.9 J	966	ug/L	12SW0202	16/39	8.35 - 137	966	24.7 - 138	3600 N	NA NA	NA NA	No	BSL	3600	BSL	BSL	
7440-38-2	**Arsenic, Filtered**	0.06 J	16.2 J	ug/L	12SW1701	24/39	0.047 - 0.56	16.2	0.11 - 1	**0.045** C	**10** 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium, Filtered	17.1 J	227 J	ug/L	12SW1101	39/39	---	227	36.5 - 72	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
7440-41-7	Beryllium, Filtered	0.03 J	0.14 J	ug/L	12SW1301	3/39	0.02 - 0.09	0.14	0.1 - 0.1	7.3 N	4 4	FED-MCL IDEM	No	BSL	4	BSL	BSL	
7440-43-9	Cadmium, Filtered	0.07 J	1.2	ug/L	12SW1402	15/39	0.039 - 0.64	1.2	0.06 - 0.16	1.8 N	5 5	FED-MCL IDEM	No	BSL	1.8	BSL	BSL	
7440-70-2	Calcium, Filtered	3080 J	103000 J	ug/L	12SW1802	39/39	---	103000	19200 - 57500	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	Chromium, Filtered	0.96 J	1.4 J	ug/L	12SW1702, 12SW3101	9/39	0.33 - 1.9	1.4	0.92 - 0.92	11 N[9]	100 100	FED-MCL IDEM[9]	No	BSL	11	BSL	BSL	
7440-48-4	Cobalt, Filtered	0.1 J	8.5 J	ug/L	12SW3201	33/39	0.088 - 0.27	8.5	0.12 - 8.9	73 N	NA NA	NA NA	No	BSL	73	BSL	BSL	
Dissolved Metals (Continued)																		
7440-50-8	Copper, Filtered	0.57 J	16.5 J	ug/L	12SW1401	34/39	0.6 - 2.3	16.5	0.5 - 3.6	150 N	1300 1300	FED-MCL[10] IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron, Filtered**	85 J	1320 J	ug/L	12SW3201	39/39	---	1320	125 - 868	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	Lead, Filtered	0.125 J	1.8	ug/L	12SW0202	30/39	0.069 - 0.3	1.8	0.12 - 0.28	NA	15 15	FED-MCL[10] IDEM	No	BSL	15	BSL	BSL	
7439-95-4	Magnesium, Filtered	1480 J	21300	ug/L	12SW3401	39/39	---	21300	5620 - 8490	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese, Filtered**	0.77 J	7170 J	ug/L	12SW1101	33/39	0.752 - 4.6	7170	1 - 235	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7439-97-6	Mercury, Filtered	0.053 J	0.27	ug/L	12SW3401	6/39	0.03	0.27	ND	1.1 N	2 2	FED-MCL IDEM	No	BSL	1.1	BSL	BSL	
7440-02-0	Nickel, Filtered	1.5 J	9.9 J	ug/L	12SW1301	39/39	---	9.9	1.7 - 20.6	73 N	NA 730	NA IDEM	No	BSL	73	BSL	BSL	
7440-09-7	Potassium, Filtered	356 J	168000 J	ug/L	12SW1401	39/39	---	168000	553 - 2270	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium, Filtered	0.61 J	1.1 J	ug/L	12SW0201	5/39	0.094 - 0.84	1.1	ND	18 N	NA 50	NA IDEM	No	BSL	18	BSL	BSL	
7440-22-4	Silver, Filtered	0.04 J	0.04 J	ug/L	12SW1802	1/39	0.028 - 0.14	0.04	ND	18 N	NA 180	FED-MCL IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium, Filtered	1630 J	40100 J	ug/L	12SW1402	36/39	948 - 28400	40100	2100 - 27800	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-28-0	Thallium, Filtered	0.05 J	0.06 J	ug/L	12SW1401	4/32	0.043 - 0.09	0.06	0.06 - 0.06	0.24 N	2 2	FED-MCL IDEM	No	BSL	0.24	BSL	BSL	
7440-31-5	Tin, Filtered	0.08 J	7.4 J	ug/L	12SW1701	4/39	0.048 - 0.26	7.4	ND	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-62-2	**Vanadium, Filtered**	1.6 J	6.3	ug/L	12SW0201	6/39	1.14	6.3	ND	**3.6** N	NA NA	NA NA	**Yes**	**ASL**	3.6	ASL	ASL	
7440-66-6	Zinc, Filtered	1.2 J	34.9 J	ug/L	12SW0202	27/39	2.1 - 16.6	34.9	2.2 - 41.2	1100 N	NA 11000	NA IDEM	No	BSL	1100	BSL	BSL	
Miscellaneous Parameters (mg/L)																		
TTNUS493	Ammonia-N	0.019 J	4.2 J	mg/L	12SW1101	34/39	0.005	4.2	0.013 - 0.037	NA	NA NA	NA NA	No	NTX		BSL	NTX	
TTNUS494	**Nitrite/Nitrate-N**	0.044 J	8.2	mg/L	12SW0601	26/39	0.025 - 0.05	8.2	0.05 - 0.6	**1** N	**1** NA	FED-MCL[10] NA	**Yes**	**ASL**	1	ASL	ASL	

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in surface water relative to upgradient locations is presented in Section 5.0.
5 - The U.S. EPA Region 9 tap water screening level is presented. Value represents the risk-based tap water screening level divided by 10 to correspond to a target Hazard Quotient of 0.1 for non-carcinogens (denoted with a "N" flag), or an incremental lifetime cancer risk of $1x10^{-6}$ for carcinogens (denoted with a "C" flag) (U.S. EPA Region 9, 2004).
6 - U.S. EPA Primary Drinking Water Standard (U.S. EPA, 2004b).
Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for groundwater (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for aminodinitrotoluene.
9 - Values are for hexavalent chromium.
10 - The MCL for this parameter is actually a treatment technique. The Safe Drinking Water Act (SDWA) action level (at the tap) has been presented.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Non-carcinogen
NA = Not applicable/not available
ND = Not detected
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NUT = Essential nutrient
NTX = No toxicity data

Associated Samples

12SW0101	12SW0402-F	12SW0902-F	12SW1302	12SW1802	12SW3201-F
12SW0101-F	12SW0501	12SW1001	12SW1302-F	12SW1802-F	12SW3401
12SW0102	12SW0501-F	12SW1001-F	12SW1401	12SW1901	12SW3401-F
12SW0102-F	12SW0502	12SW1002	12SW1401-F	12SW1901-F	12SW3501
12SW0201	12SW0502-F	12SW1002-F	12SW1402	12SW1902	12SW3501-F
12SW0201-F	12SW0601	12SW1101	12SW1402-F	12SW2001	12SW3601
12SW0202	12SW0601-F	12SW1101-F	12SW1501	12SW2001-F	12SW3601-F
12SW0202-F	12SW0602	12SW1102	12SW1501-F	12SW2002	
12SW0301	12SW0602-F	12SW1102-F	12SW1502	12SW2002-F	
12SW0301-F	12SW0701	12SW1201	12SW1701	12SW2101	
12SW0302	12SW0701-F	12SW1201-F	12SW1701-F	12SW2101-F	
12SW0302-F	12SW0702	12SW1202	12SW1702	12SW2102	
12SW0401	12SW0901	12SW1202-F	12SW1702-F	12SW3101	
12SW0401-F	12SW0901-F	12SW1301	12SW1801	12SW3101-F	
12SW0402	12SW0902	12SW1301-F	12SW1801-F	12SW3201	

ALUMINUM	102 J	8920 J	102 - 8920
ARSENIC	0.21 J	8.6	0.21 - 8.6
BARIUM	33.9 J	112 J	33.9 - 112
BERYLLIUM	0.03 J	0.31 J	0.03 - 0.31
CADMIUM	0.11 J	1.6	0.11 - 1.6
CALCIUM	19100 J	75500 J	19100 - 75500
CHROMIUM	3 J	13.9 J	3 - 13.9
COBALT	0.23 J	9.2 J	0.23 - 9.2
COPPER	0.74 J	20.6 J	0.74 - 20.6
IRON	178 J	14300 J	178 - 14300
LEAD	0.08 J	25.3	0.08 - 25.3
MAGNESIUM	5720 J	11100	5720 - 11100
MANGANESE	8.3 J	347 J	8.3 - 347
MERCURY	0.66	0.66	0.66 - 0.66
NICKEL	0.57 J	20.5 J	0.57 - 20.5
POTASSIUM	551 J	2240 J	551 - 2240
SELENIUM	0.73 J	0.73 J	0.73 - 0.73
SODIUM	2260 J	24000 J	2260 - 24000
THALLIUM	0.05 J	0.21 J	0.05 - 0.21
VANADIUM	2.9	21.6	2.9 - 21.6
ZINC	5.3 J	532 J	5.3 - 532
Dissolved Metals (ug/L)			
ALUMINUM, FILTERED	24.7 J	138 J	24.7 - 138
ARSENIC, FILTERED	0.11 J	1	0.11 - 1
BARIUM, FILTERED	36.5 J	72 J	36.5 - 72
BERYLLIUM, FILTERED	0.1 J	0.1 J	0.1 - 0.1
CADMIUM, FILTERED	0.06 J	0.16 J	0.06 - 0.16
CALCIUM, FILTERED	19200 J	57500 J	19200 - 57500
CHROMIUM, FILTERED	0.92 J	0.92 J	0.92 - 0.92
COBALT, FILTERED	0.12 J	8.9 J	0.12 - 8.9
COPPER, FILTERED	0.5 J	3.6 J	0.5 - 3.6
IRON, FILTERED	125 J	868 J	125 - 868
LEAD, FILTERED	0.12 J	0.28 J	0.12 - 0.28
MAGNESIUM, FILTERED	5620 J	8490 J	5620 - 8490
MANGANESE, FILTERED	1 J	235 J	1 - 235
NICKEL, FILTERED	1.7 J	20.6 J	1.7 - 20.6
POTASSIUM, FILTERED	553 J	2270 J	553 - 2270
SODIUM, FILTERED	2100 J	27800 J	2100 - 27800
THALLIUM, FILTERED	0.06 J	0.06 J	0.06 - 0.06
ZINC, FILTERED	2.2 J	41.2 J	2.2 - 41.2
AMMONIA-N	0.013 J	0.037	0.013 - 0.037
NITRITE/NITRATE-N	0.05 J	0.6	0.05 - 0.6

TABLE 2.13

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER - PENNSYLVANIAN LOWER AND MISSISSIPPIAN GLEN DEAN ZONE
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Location of Maximum Concentration	Frequency of Detection	Range of Nondetections[2]	Concentration Used for Screening[3]	Concentrations in Upgradient Samples [4]	Screening Toxicity Value[5]	Potential ARAR/TBC[6]	Potential ARAR/TBC Source[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]				Exposure Point
Energetics																		
118-96-7	**2,4,6-Trinitrotoluene**	4.2	4.2	ug/L	12GWT4401	1/5	0.24 - 0.266	4.2	NA	**1.8** N	NA NA	NA NA	**Yes**	**ASL**	1.8	ASL	ASL	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.65	0.65	ug/L	12GWT4401	1/5	0.24 - 0.266	0.65	NA	0.73 N[8]	NA NA	NA NA	No	BSL	0.73	BSL	BSL	
2691-41-0	HMX	0.28 J	0.28 J	ug/L	12GWT4401	1/5	0.24 - 0.266	0.28	NA	180 N	NA NA	NA NA	No	BSL	180	BSL	BSL	
121-82-4	**RDX**	3.9	3.9	ug/L	12GWT4401	1/5	0.24 - 0.266	3.9	NA	**0.61** C	NA NA	NA NA	**Yes**	**ASL**	0.61	ASL	ASL	
Total Metals																		
7429-90-5	Aluminum	165 J	2540 J	ug/L	12GWT4901	3/5	8.35 - 55.4	2540	18000 - 31600	3600 N	NA NA	NA NA	No	BSL	3600	BSL	BSL	
7440-36-0	**Antimony**	3.1 J	3.1 J	ug/L	12GWT4101	1/5	0.085 - 0.9	3.1	ND	**1.5** N	6 6	FED-MCL IDEM	**Yes**	**ASL**	1.5	ASL	ASL	
7440-38-2	**Arsenic**	1.7 J	9.5 J	ug/L	12GWT4102	4/5	2.1	9.5	17.6 - 19.7	**0.045** C	10 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium	24.8 J	79.3 J	ug/L	12GWT4901	4/5	20.5	79.3	1360 - 1950	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
7440-70-2	Calcium	106000 J	201000 J	ug/L	12GWT4402	5/5	---	201000	27200 - 33100	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	Chromium	6.6 J	6.6 J	ug/L	12GWT4901	1/5	0.58 - 2	6.6	28.4 - 78.9	11 N[9]	100 100	FED-MCL IDEM[9]	No	BSL	11	BSL	BSL	
7440-48-4	Cobalt	5.3 J	14.7 J	ug/L	12GWT4402	4/5	1.2	14.7	39.1 - 54.3	73 N	NA NA	NA NA	No	BSL	73	BSL	BSL	
7440-50-8	Copper	1.2 J	6.4 J	ug/L	12GWT4901	4/5	1.4	6.4	45.1 - 58.5	150 N	1300 1300	FED-MCL[10] IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron**	914 J	7150 J	ug/L	12GWT4901	5/5	---	7150	46100 - 84200	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	Lead	0.53 J	10.5 J	ug/L	12GWT4901	2/5	0.069 - 0.35	10.5	35.6 - 39.5	NA	15 15	FED-MCL[10] IDEM	No	BSL	15	BSL	BSL	
7439-95-4	Magnesium	13000 J	171000 J	ug/L	12GWT4402	5/5	---	171000	7580 - 17300	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese**	531	2190 J	ug/L	12GWT4402	5/5	---	2190	1340 - 1790	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7440-02-0	Nickel	6.3 J	44.2 J	ug/L	12GWT4401	5/5	---	44.2	92.1 - 132	73 N	NA 730	NA IDEM	No	BSL	73	BSL	BSL	
7440-09-7	Potassium	2550 J	9660 J	ug/L	12GWT4402	5/5	---	9660	6290 - 10800	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium	1.2 J	2 J	ug/L	12GWT4401	4/5	0.77	2	1.5 - 2.2	18 N	50 50	FED-MCL IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium	6380 J	158000 J	ug/L	12GWT4401	5/5	---	158000	152000 - 208000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-31-5	Tin	4.2 J	4.2 J	ug/L	12GWT4901	1/5	0.1 - 0.73	4.2	1.9 - 2.4	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-62-2	**Vanadium**	4.9	4.9	ug/L	12GWT4901	1/5	1.14	4.9	39.9 - 58.5	**3.6** N	NA NA	NA NA	**Yes**	**ASL**	3.6	ASL	ASL	
Total Metals (Continued)																		
7440-66-6	Zinc	9.1 J	40 J	ug/L	12GWT4901	4/5	7.5	40	158 - 244	1100 N	NA 11000	NA IDEM	No	BSL	1100	BSL	BSL	
Dissolved Metals																		
7440-38-2	**Arsenic, Filtered**	1.8 J	1.8 J	ug/L	12GWT4401	1/2	0.6	1.8	3.4 - 5.3	**0.045** C	10 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium, Filtered	56.4 J	65 J	ug/L	12GWT4901	2/2	---	65	552 - 735	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
7440-70-2	Calcium, Filtered	150000 J	168000 J	ug/L	12GWT4901	2/2	---	168000	8860 - 12600	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-48-4	Cobalt, Filtered	5.5 J	15.5	ug/L	12GWT4401	2/2	---	15.5	0.64 - 1.8	73 N	NA NA	NA NA	No	BSL	73	BSL	BSL	
7440-50-8	Copper, Filtered	3.6 J	3.6 J	ug/L	12GWT4401	1/2	0.3	3.6	2.4 - 5	150 N	1300 1300	FED-MCL[10] IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron, Filtered**	1130 J	1130 J	ug/L	12GWT4401	1/2	10.6	1130	1870	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-95-4	Magnesium, Filtered	14600 J	112000 J	ug/L	12GWT4401	2/2	---	112000	3240 - 3960	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese, Filtered**	580 J	1240 J	ug/L	12GWT4901	2/2	---	1240	65.6 - 134	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7440-02-0	**Nickel, Filtered**	21.8 J	73.9 J	ug/L	12GWT4401	2/2	---	73.9	3.4 - 6	**73** N	NA 730	NA IDEM	**Yes**	**ASL**	73	ASL	ASL	
7440-09-7	Potassium, Filtered	2260 J	7940 J	ug/L	12GWT4401	2/2	---	7940	2910 - 3970	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium, Filtered	1.9 J	1.9 J	ug/L	12GWT4401	1/2	0.45	1.9	0.68 - 0.94	18 N	NA 50	NA IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium, Filtered	8390 J	172000 J	ug/L	12GWT4401	2/2	---	172000	171000 - 207000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-31-5	Tin, Filtered	1 J	1 J	ug/L	12GWT4401	1/2	1.6	1	1.1	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-66-6	Zinc, Filtered	8 J	8 J	ug/L	12GWT4401	1/2	7.1	8	3.8 - 29	1100 N	NA 11000	NA IDEM	No	BSL	1100	BSL	BSL	
Miscellaneous Parameters (mg/L)																		
NA	Ammonia-N	0.16 J	0.5 J	mg/L	12GWT4402	5/5	---	0.5	0.83 - 0.9	NA	NA NA	NA NA	No	NTX		BSL	NTX	

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in groundwater relative to upgradient well concentrations is presented in Section 5.0.
5 - The U.S. EPA Region 9 tap water screening level is presented. Value represents the risk-based tap water screening level divided by 10 to correspond to a target Hazard Quotient of 0.1 for non-carcinogens (denoted with a "N" flag), or an incremental lifetime cancer risk of $1x10^{-6}$ for carcinogens (denoted with a "C" flag) (U.S. EPA Region 9, October 2004).
6 - U.S. EPA Primary Drinking Water Standard (U.S. EPA, 2004).
Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for groundwater (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for aminodinitrotoluene.
9 - Values are for hexavalent chromium.
10 - The MCL for this parameter is actually a treatment technique. The Safe Drinking Water Act (SDWA) action level (at the tap) has been presented.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/\To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Non-carcinogen
NA = Not applicable/not available
ND = Not detected
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NUT = Essential nutrient
NTX = No toxicity data

Associated Samples

12GWT4101	12GWT4402
12GWT4102	12GWT4901
12GWT4401	12GWT4901
12GWT4401-F	12GWT4901-F

ALUMINUM	18000 J	31600 J	18000 - 31600	
ARSENIC	17.6 J	19.7	17.6 - 19.7	
BARIUM	1360 J	1950 J	1360 - 1950	
BERYLLIUM	1.6 J	2.2 J	1.6 - 2.2	
CADMIUM	0.71 J	0.71 J		0.71
CALCIUM	27200	33100	27200 - 33100	
CHROMIUM	28.4 J	78.9 J	28.4 - 78.9	
COBALT	39.1 J	54.3	39.1 - 54.3	
COPPER	45.1 J	58.5	45.1 - 58.5	
IRON	46100 J	84200 J	46100 - 84200	
LEAD	35.6 J	39.5	35.6 - 39.5	
MAGNESIUM	7580 J	17300	7580 - 17300	
MANGANESE	1340	1790	1340 - 1790	
MERCURY	0.056 J	0.056 J	0.056 - 0.056	
NICKEL	92.1 J	132	92.1 - 132	
POTASSIUM	6290 J	10800 J	6290 - 10800	
SELENIUM	1.5 J	2.2 J	1.5 - 2.2	
SODIUM	152000 J	208000 J	152000 - 208000	
THALLIUM	0.21 J	0.42 J	0.21 - 0.42	
TIN	1.9 J	2.4 J	1.9 - 2.4	
VANADIUM	39.9 J	58.5	39.9 - 58.5	
ZINC	158 J	244	158 - 244	
Dissolved Metals (ug/L)				
ALUMINUM, FILTERED	861 J	861 J		861
ANTIMONY, FILTERED	3.5 J	3.5 J		3.5
ARSENIC, FILTERED	3.4	5.3 J	3.4 - 5.3	
BARIUM, FILTERED	552 J	735 J	552 - 735	
CALCIUM, FILTERED	8860	12600 J	8860 - 12600	
CHROMIUM, FILTERED	2.7 J	2.7 J		2.7
COBALT, FILTERED	0.64 J	1.8	0.64 - 1.8	
COPPER, FILTERED	2.4	5 J	2.4 - 5	
IRON, FILTERED	1870 J	1870 J		1870
LEAD, FILTERED	0.274 J	1.5 J	0.274 - 1.5	
MAGNESIUM, FILTERED	3240 J	3960 J	3240 - 3960	
MANGANESE, FILTERED	65.6 J	134	65.6 - 134	
NICKEL, FILTERED	3.4	6 J	3.4 - 6	
POTASSIUM, FILTERED	2910 J	3970 J	2910 - 3970	
SELENIUM, FILTERED	0.68 J	0.94 J	0.68 - 0.94	
SODIUM, FILTERED	171000 J	207000 J	171000 - 207000	
TIN, FILTERED	1.1 J	1.1 J		1.1
VANADIUM, FILTERED	2.3 J	2.3 J		2.3
ZINC, FILTERED	3.8 J	29 J	3.8 - 29	
AMMONIA-N	0.83 J	0.9	0.83 - 0.9	

TABLE 2.12

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER - PENNSYLVANIAN MIDDLE ZONE
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Nondetections(2)	Concentration Used for Screening(3)	Concentrations in Upgradient Samples (4)	Screening Toxicity Value(5)	Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)				Exposure Point
Energetics																		
2691-41-0	HMX	0.52	0.52	ug/L	12GWT4802	1/16	0.24 - 0.446	0.52	NA	180 N	NA NA	NA NA	No	BSL	180	BSL	BSL	
121-82-4	**RDX**	1.3 J	4.2 J	ug/L	12GWT4802	2/16	0.24 - 0.446	4.2	NA	**0.61** C	NA NA	NA NA	**Yes**	**ASL**	0.61	ASL	ASL	
Total Metals																		
7429-90-5	**Aluminum**	95.6 J	31000 J	ug/L	12GWT4801	12/14	50.2 - 72.9	31000	200	**3600** N	NA NA	NA NA	**Yes**	**ASL**	3600	ASL	ASL	
7440-36-0	**Antimony**	2 J	2.9 J	ug/L	12GWT3101	3/14	0.085 - 0.41	2.9	ND	**1.5** N	6 6	FED-MCL IDEM	**Yes**	**ASL**	1.5	ASL	ASL	
7440-38-2	**Arsenic**	0.17 J	11.4 J	ug/L	12GWT4801	14/14	---	11.4	2.7	**0.045** C	**10** 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium	10.6 J	214 J	ug/L	12GWT4802	14/14	---	214	13.2	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
7440-41-7	Beryllium	0.2 J	1.2 J	ug/L	12GWT4801	4/14	0.02 - 1.5	1.2	1.3 - 2.2	7.3 N	4 4	FED-MCL IDEM	No	BSL	4	BSL	BSL	
7440-43-9	**Cadmium**	0.07 J	2.3 J	ug/L	12GWT4801	5/14	0.039 - 1.3	2.3	ND	**1.8** N	5 5	FED-MCL IDEM	**Yes**	**ASL**	1.8	ASL	ASL	
7440-70-2	Calcium	12300 J	194000 J	ug/L	12GWT3202	14/14	---	194000	56400 - 61100	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	**Chromium**	3.9 J	47.9 J	ug/L	12GWT4802	8/14	0.27 - 0.91	47.9	ND	**11** N(8)	100 100	FED-MCL IDEM(8)	**Yes**	**ASL**	11	ASL	ASL	
7440-48-4	**Cobalt**	0.14 J	79.7 J	ug/L	12GWT4801	12/14	1.8	79.7	40 - 44.4	**73** N	NA NA	NA NA	**Yes**	**ASL**	73	ASL	ASL	
7440-50-8	Copper	0.68 J	24.3 J	ug/L	12GWT4801	14/14	---	24.3	0.7 - 2.5	150 N	1300 1300	FED-MCL(9) IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron**	424 J	48900 J	ug/L	12GWT4801	14/14	---	48900	41700 - 41800	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	**Lead**	0.089 J	24.7 J	ug/L	12GWT4802	11/14	0.11 - 1.8	24.7	ND	NA	**15** **15**	FED-MCL(9) IDEM	**Yes**	**ASL**	15	ASL	ASL	
7439-95-4	Magnesium	4080 J	121000 J	ug/L	12GWT3202	14/14	---	121000	27200 - 33500	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese**	1.5 J	7570	ug/L	12GWT4601	14/14	---	7570	1680 - 3010	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7439-97-6	Mercury	0.057 J	0.057 J	ug/L	12GWT4802	1/14	0.03 - 0.034	0.057	ND	1.1 N	2 2	FED-MCL IDEM	No	BSL	1.1	BSL	BSL	
7440-02-0	**Nickel**	3.2 J	178	ug/L	12GWT4502	13/14	5.5	178	110 - 131	**73** N	NA 730	NA IDEM	**Yes**	**ASL**	73	ASL	ASL	
7440-09-7	Potassium	1380 J	11200 J	ug/L	12GWT3202	14/14	---	11200	4520 - 4770	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium	0.98 J	7.7 J	ug/L	12GWT3201	9/14	0.54 - 2.1	7.7	ND	18 N	50 50	FED-MCL IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium	10000 J	161000 J	ug/L	12GWT2901	14/14	---	161000	32200 - 40300	NA	NA NA	NA NA	No	NUT		BSL	NUT	
Total Metals (Continued)																		
7440-28-0	**Thallium**	0.06 J	0.32 J	ug/L	12GWT4801	3/14	0.043 - 0.5	0.32	ND	**0.24** N	2 2	FED-MCL IDEM	**Yes**	**ASL**	0.24	ASL	ASL	
7440-31-5	Tin	0.08 J	1.1 J	ug/L	12GWT4801	4/14	0.048 - 1.6	1.1	ND	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-62-2	**Vanadium**	3.4	49.4 J	ug/L	12GWT4801	8/14	1.14	49.4	ND	**3.6** N	NA NA	NA NA	**Yes**	**ASL**	3.6	ASL	ASL	
7440-66-6	Zinc	2.5 J	262	ug/L	12GWT4502	12/14	3.4 - 4.8	262	96 - 128	1100 N	NA 11000	NA IDEM	No	BSL	1100	BSL	BSL	
Dissolved Metals																		
7429-90-5	Aluminum, Filtered	9.1 J	210 J	ug/L	12GWT4502	2/10	9.1 - 140	210	NA	3600 N	NA NA	NA NA	No	BSL	3600	BSL	BSL	
7440-36-0	**Antimony, Filtered**	2.3 J	3.2 J	ug/L	12GWT3101	2/10	0.085 - 1.6	3.2	NA	**1.5** N	6 6	FED-MCL IDEM	**Yes**	**ASL**	1.5	ASL	ASL	
7440-38-2	**Arsenic, Filtered**	0.15 J	3.7 J	ug/L	12GWT3101	8/10	0.28 - 1.6	3.7	NA	**0.045** C	10 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium, Filtered	11.2 J	68 J	ug/L	12GWT3201	10/10	---	68	NA	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
7440-43-9	Cadmium, Filtered	0.06 J	1.7 J	ug/L	12GWT4801	5/10	0.039 - 0.17	1.7	NA	1.8 N	5 5	FED-MCL IDEM	No	BSL	1.8	BSL	BSL	
7440-70-2	Calcium, Filtered	12600 J	237000	ug/L	12GWT3201	10/10	---	237000	NA	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	Chromium, Filtered	0.81 J	0.81 J	ug/L	12GWT3101	1/10	0.14 - 0.78	0.81	NA	11 N(8)	100 100	FED-MCL IDEM(8)	No	BSL	11	BSL	BSL	
7440-48-4	Cobalt, Filtered	1.9	29.2	ug/L	12GWT3201	6/10	0.13 - 0.98	29.2	NA	73 N	NA NA	NA NA	No	BSL	73	BSL	BSL	
7440-50-8	Copper, Filtered	0.99 J	3.5	ug/L	12GWT2901	6/10	0.16 - 0.33	3.5	NA	150 N	1300 1300	FED-MCL(9) IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron, Filtered**	295 J	1250	ug/L	12GWT3201	5/10	6.2 - 120	1250	NA	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	Lead, Filtered	0.12 J	0.315 J	ug/L	12GWT4502	3/10	0.069 - 0.45	0.315	NA	NA	15 15	FED-MCL(9) IDEM	No	BSL	15	BSL	BSL	
7439-95-4	Magnesium, Filtered	3650 J	139000 J	ug/L	12GWT3201	10/10	---	139000	NA	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese, Filtered**	27.2 J	3300	ug/L	12GWT4602	9/10	25.4	3300	NA	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7440-02-0	**Nickel, Filtered**	6.8 J	178	ug/L	12GWT4502	7/10	0.68 - 2.1	178	NA	**73** N	NA 730	NA IDEM	**Yes**	**ASL**	73	ASL	ASL	
7440-09-7	Potassium, Filtered	908 J	11900 J	ug/L	12GWT3201	10/10	---	11900	NA	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium, Filtered	0.99 J	7.6 J	ug/L	12GWT3201	3/10	0.17 - 2.4	7.6	NA	18 N	NA 50	NA IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium, Filtered	12600 J	171000 J	ug/L	12GWT2901	10/10	---	171000	NA	NA	NA NA	NA NA	No	NUT		BSL	NUT	
Dissolved Metals (Continued)																		
7440-28-0	Thallium, Filtered	0.06 J	0.06 J	ug/L	12GWT4502	1/10	0.043 - 0.13	0.06	NA	0.24 N	2 2	FED-MCL IDEM	No	BSL	0.24	BSL	BSL	
7440-66-6	Zinc, Filtered	4.2 J	234	ug/L	12GWT4502	6/10	1.7 - 6.4	234	NA	1100 N	NA 11000	NA IDEM	No	BSL	1100	BSL	BSL	
Miscellaneous Parameters (mg/L)																		
NA	Ammonia-N	0.047 J	1.8 J	mg/L	12GWT4601	12/14	0.01	1.8	0.35 - 0.54	NA	NA NA	NA NA	No	NTX		BSL	NTX	
NA	**Nitrite/Nitrate-N**	0.15	2	mg/L	12GWT4802	6/14	0.025 - 0.05	2	ND	**1** N	**1** NA	FED-MCL(9) NA	**Yes**	**ASL**	1	ASL	ASL	

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in groundwater relative to upgradient well concentrations is presented in Section 5.0.
5 - The U.S. EPA Region 9 tap water screening level is presented. Value represents the risk-based tap water screening level divided by 10 to correspond to a target Hazard Quotient of 0.1 for non-carcinogens (denoted with a "N" flag), or an incremental lifetime cancer risk of $1x10^{-6}$ for carcinogens (denoted with a "C" flag) (U.S. EPA Region 9, October 2004).
6 - U.S. EPA Primary Drinking Water Standard (U.S. EPA, 2004b).
Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for groundwater (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for hexavalent chromium.
9 - The MCL for this parameter is actually a treatment technique. The Safe Drinking Water Act (SDWA) action level (at the tap) has been presented.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Non-carcinogen
NA = Not applicable/not available
ND = Not detected.
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below screening level
NUT = Essential nutrient
NTX = No toxicity data

Associated Samples

12GWT2901	12GWT3101-F	12GWT3401	12GWT4602-F
12GWT2901-F	12GWT3102	12GWT3402	12GWT4701
12GWT2902	12GWT3102-F	12GWT4501	12GWT4702
12GWT2902-F	12GWT3201	12GWT4502	12GWT4801
12GWT3001	12GWT3201-F	12GWT4502-F	12GWT4801-F
12GWT3002	12GWT3202	12GWT4601	12GWT4802
12GWT3101	12GWT3202-F	12GWT4602	12GWT4802-F

ALUMINUM	200 J	200 J		200
ARSENIC	2.7 J	2.7 J		2.7
BARIUM	13.2 J	13.2 J		13.2
BERYLLIUM	1.3 J	2.2 J	1.3 - 2.2	
CALCIUM	56400 J	61100 J	56400 - 61100	
COBALT	40 J	44.4 J	40 - 44.4	
COPPER	0.7 J	2.5 J	0.7 - 2.5	
IRON	41700 J	41800 J	41700 - 41800	
MAGNESIUM	27200 J	33500 J	27200 - 33500	
MANGANESE	1680 J	3010 J	1680 - 3010	
NICKEL	110 J	131 J	110 - 131	
POTASSIUM	4520 J	4770 J	4520 - 4770	
SODIUM	32200 J	40300 J	32200 - 40300	
ZINC	96 J	128 J	96 - 128	
AMMONIA-N	0.35 J	0.54 J	0.35 - 0.54	

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

TABLE 2.11

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER - PENNSYLVANIA UPPER ZONE
SWMU 12 (MINE FIELD A)

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentrations in Upgradient Samples (4)	Screening Toxicity Value(5)	Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)				Exposure Point
Energetics																		
99-35-4	1,3,5-Trinitrobenzene	0.66 J	110	ug/L	12GWT1101, 12GWT1102	9/63	0.238 - 0.305	110	NA	110 N	NA NA	NA NA	No	BSL	110	BSL	BSL	Upper Aquifer
99-65-0	**1,3-Dinitrobenzene**	0.28 J	8.9	ug/L	12GWT0602	8/63	0.238 - 0.305	8.9	NA	**0.36** N	NA NA	NA NA	**Yes**	**ASL**	0.36	ASL	ASL	
118-96-7	**2,4,6-Trinitrotoluene**	0.26 J	170	ug/L	12GWT0602	10/63	0.238 - 0.305	170	NA	**1.8** N	NA NA	NA NA	**Yes**	**ASL**	1.8	ASL	ASL	
6629-29-4	2,4-Diamino-6-Nitrotoluene	0.42 J	75 J	ug/L	12GWT1102	12/63	0.238 - 0.305	75	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
121-14-2	2,4-Dinitrotoluene	0.3 J	2.8 J	ug/L	12GWT1101	4/63	0.238 - 0.305	2.8	NA	7.3 N	NA NA	NA NA	No	BSL	7.3	BSL	BSL	
606-20-2	**2,6-Dinitrotoluene**	0.27 J	9.8 J	ug/L	12GWT0601	11/63	0.238 - 0.305	9.8	NA	**3.6** N	NA NA	NA NA	**Yes**	**ASL**	3.6	ASL	ASL	
35572-78-2	**2-Amino-4,6-Dinitrotoluene**	0.47 J	100 J	ug/L	12GWT1602	17/63	0.238 - 0.305	100	NA	**0.73** N(8)	NA NA	NA NA	**Yes**	**ASL**	0.73	ASL	ASL	
88-72-2	**2-Nitrotoluene**	0.3 J	0.45 J	ug/L	12GWT1101	2/63	0.238 - 0.305	0.45	NA	**0.049** C	NA NA	NA NA	**Yes**	**ASL**	0.049	ASL	ASL	
618-87-1	3,5-Dinitroaniline	0.63 J	12 J	ug/L	12GWT1102	10/63	0.238 - 0.305	12	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
99-08-1	3-Nitrotoluene	0.68 J	1.7 J	ug/L	12GWT1301	4/63	0.238 - 0.305	1.7	NA	12 N	NA NA	NA NA	No	BSL	12	BSL	BSL	
19406-51-0	**4-Amino-2,6-Dinitrotoluene**	0.26 J	190	ug/L	12GWT1602	18/63	0.238 - 0.305	190	NA	**0.73** N(8)	NA NA	NA NA	**Yes**	**ASL**	0.73	ASL	ASL	
99-99-0	**4-Nitrotoluene**	5.8 J	5.8 J	ug/L	12GWT0602	1/63	0.238 - 0.305	5.8	NA	**0.66** C	NA NA	NA NA	**Yes**	**ASL**	0.66	ASL	ASL	
NA	DNX	0.36 J	22	ug/L	12GWT1601	10/63	0.238 - 0.305	22	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
2691-41-0	**HMX**	0.32 J	530	ug/L	12GWT0602, 12GWT1102	37/63	0.238 - 0.305	530	NA	**180** N	NA NA	NA NA	**Yes**	**ASL**	180	ASL	ASL	
NA	MNX	0.33 J	250	ug/L	12GWT1601	23/63	0.238 - 0.305	250	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
121-82-4	**RDX**	0.75	7400	ug/L	12GWT1602	46/63	0.238 - 0.305	7400	NA	**0.61** C	NA NA	NA NA	**Yes**	**ASL**	0.61	ASL	ASL	
NA	TNX	0.54 J	11 J	ug/L	12GWT1102	7/63	0.238 - 0.305	11	NA	NA	NA NA	NA NA	No	NTX		BSL	NTX	
Total Metals																		
7429-90-5	**Aluminum**	27.6 J	190000 J	ug/L	12GWT24A02	54/63	8.35 - 172	190000	126 - 565	**3600** N	NA NA	NA NA	**Yes**	**ASL**	3600	ASL	ASL	
7440-36-0	Antimony	1.7 J	1.7 J	ug/L	12GWT24A01	1/63	0.085 - 2.7	1.7	ND	**1.5** N	6 6	FED-MCL IDEM	No	FREQ	1.5	ASL	FREQ	
7440-38-2	**Arsenic**	0.07 J	91.2 J	ug/L	12GWT0501	37/63	0.14 - 2	91.2	1.1 - 2.3	**0.045** C	**10** **50**	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium	7.9 J	212 J	ug/L	12GWT3901	56/63	9 - 18.8	212	17.5 - 38.4	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
Total Metals (Continued)																		
7440-41-7	**Beryllium**	0.11 J	97.4 J	ug/L	12GWT2301	34/63	0.02 - 3.2	97.4	0.1	**7.3** N	**4** **4**	FED-MCL IDEM	**Yes**	**ASL**	4	ASL	ASL	
7440-43-9	**Cadmium**	0.04 J	83.4 J	ug/L	12GWT2302	30/63	0.039 - 3.4	83.4	ND	**1.8** N	**5** **5**	FED-MCL IDEM	**Yes**	**ASL**	1.8	ASL	ASL	
7440-70-2	Calcium	2100 J	589000 J	ug/L	12GWT0702	62/63	25300	589000	77900 - 216000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	**Chromium**	0.75 J	35.2 J	ug/L	12GWT3901	27/63	0.14 - 1.8	35.2	1.7	**11** N(9)	100 100	FED-MCL IDEM(9)	**Yes**	**ASL**	11	ASL	ASL	
7440-48-4	**Cobalt**	1	6060 J	ug/L	12GWT2302	61/63	1.2 - 44	6060	5.6 - 53.2	**73** N	NA NA	NA NA	**Yes**	**ASL**	73	ASL	ASL	
7440-50-8	Copper	0.67 J	93.3 J	ug/L	12GWT2302	57/63	0.17 - 1.1	93.3	0.84 - 4	150 N	1300 1300	FED-MCL(10) IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron**	134 J	209000 J	ug/L	12GWT24A02	56/63	14.5 - 144	209000	307 - 2990	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	**Lead**	0.07 J	104 J	ug/L	12GWT2302	39/63	0.069 - 4.4	104	0.08	NA	**15** **15**	FED-MCL(10) IDEM	**Yes**	**ASL**	15	ASL	ASL	
7439-95-4	Magnesium	2530 J	1160000 J	ug/L	12GWT0702	63/63	---	1160000	50000 - 233000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese**	31.6 J	138000 J	ug/L	12GWT24A02	62/63	41.8	138000	287 - 6000	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7439-97-6	**Mercury**	0.03 J	7.3	ug/L	12GWT0602	21/63	0.03 - 0.094	7.3	ND	**1.1** N	**2** **2**	FED-MCL IDEM	**Yes**	**ASL**	1.1	ASL	ASL	
7440-02-0	**Nickel**	3.3	14600 J	ug/L	12GWT2302	62/63	57.8	14600	12.4 - 103	**73** N	NA **730**	NA IDEM	**Yes**	**ASL**	73	ASL	ASL	
7440-09-7	Potassium	352 J	17800 J	ug/L	12GWT3901	63/63	---	17800	1630 -5320	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	**Selenium**	0.62 J	24.7 J	ug/L	12GWT2302	32/63	0.094 - 3	24.7	0.99 - 3.4	**18** N	50 50	FED-MCL IDEM	**Yes**	**ASL**	18	ASL	ASL	
7440-23-5	Sodium	11300 J	789000 J	ug/L	12GWT0702	61/63	6.79 - 307	789000	116000 - 167000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-28-0	**Thallium**	0.05 J	6 J	ug/L	12GWT2302	18/63	0.043 - 1.5	6	0.08	**0.24** N	**2** **2**	FED-MCL IDEM	**Yes**	**ASL**	0.24	ASL	ASL	
7440-31-5	Tin	0.08 J	1.4 J	ug/L	12GWT3901	6/63	0.048 - 1.1	1.4	NA	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-62-2	**Vanadium**	1.3 J	22.9	ug/L	12GWT3901	15/63	1.14	22.9	ND	**3.6** N	NA NA	NA NA	**Yes**	**ASL**	3.6	ASL	ASL	
7440-66-6	**Zinc**	2.8 J	18000	ug/L	12GWT2302	57/63	3.1 - 357	18000	8 - 26.1	**1100** N	NA **11000**	NA IDEM	**Yes**	**ASL**	1100	ASL	ASL	
Dissolved Metals																		
7429-90-5	**Aluminum, Filtered**	42.8 J	8580 J	ug/L	12GWT1802	10/14	10.6 - 105	8580	ND	**3600** N	NA NA	NA NA	**Yes**	**ASL**	3600	ASL	ASL	
7440-36-0	**Antimony, Filtered**	1.9 J	1.9 J	ug/L	12GWT3901	1/14	0.085 - 1.1	1.9	ND	**1.5** N	6 6	FED-MCL IDEM	**Yes**	**ASL**	1.5	ASL	ASL	
Dissolved Metals (Continued)																		
7440-38-2	**Arsenic, Filtered**	0.87 J	1.5 J	ug/L	12GWT1401	5/14	0.28 - 1.1	1.5	2.5	**0.045** C	10 50	FED-MCL IDEM	**Yes**	**ASL**	0.045	ASL	ASL	
7440-39-3	Barium, Filtered	8.2 J	79.5 J	ug/L	12GWT3901	14/14	---	79.5	38.8	260 N	2000 2000	FED-MCL IDEM	No	BSL	260	BSL	BSL	
7440-41-7	**Beryllium, Filtered**	0.09 J	5.1 J	ug/L	12GWT1802	4/14	0.04 - 1.1	5.1	ND	7.3 N	**4** **4**	FED-MCL IDEM	**Yes**	**ASL**	4	ASL	ASL	
7440-43-9	**Cadmium, Filtered**	0.43 J	6.6	ug/L	12GWT1802	5/14	0.06 - 0.96	6.6	ND	**1.8** N	**5** **5**	FED-MCL IDEM	**Yes**	**ASL**	1.8	ASL	ASL	
7440-70-2	Calcium, Filtered	8590 J	303000 J	ug/L	12GWT1401	14/14	---	303000	107000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-47-3	Chromium, Filtered	0.88 J	2.6 J	ug/L	12GWT3902	7/14	0.2 - 1.7	2.6	ND	11 N(9)	100 100	FED-MCL IDEM(9)	No	BSL	11	BSL	BSL	
7440-48-4	**Cobalt, Filtered**	7 J	563 J	ug/L	12GWT1401	14/14	---	563	41.4	**73** N	NA NA	NA NA	**Yes**	**ASL**	73	ASL	ASL	
7440-50-8	Copper, Filtered	1.3 J	8.6	ug/L	12GWT3701	11/14	0.59 - 1	8.6	1.3	150 N	1300 1300	FED-MCL(10) IDEM	No	BSL	150	BSL	BSL	
7439-89-6	**Iron, Filtered**	282 J	99700 J	ug/L	12GWT1401	7/14	6.15 - 99.3	99700	2830	**1100** N	NA NA	NA NA	**Yes**	**ASL**	1100	ASL	ASL	
7439-92-1	Lead, Filtered	1	8.5	ug/L	12GWT1802	8/14	0.2 - 0.75	8.5	ND	NA	15 15	FED-MCL(10) IDEM	No	BSL	15	BSL	BSL	
7439-95-4	Magnesium, Filtered	5290 J	281000 J	ug/L	12GWT1902	14/14	---	281000	80600	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7439-96-5	**Manganese, Filtered**	84.9 J	29700	ug/L	12GWT1402	14/14	---	29700	3350	**88** N	NA NA	NA NA	**Yes**	**ASL**	88	ASL	ASL	
7439-97-6	**Mercury, Filtered**	0.04 J	2.9 J	ug/L	12GWT3901	3/14	0.03 - 0.13	2.9	ND	**1.1** N	**2** **2**	FED-MCL IDEM	**Yes**	**ASL**	1.1	ASL	ASL	
7440-02-0	**Nickel, Filtered**	14.1 J	1320 J	ug/L	12GWT1401	14/14	---	1320	76.1	**73** N	NA **730**	NA IDEM	**Yes**	**ASL**	73	ASL	ASL	
7440-09-7	Potassium, Filtered	1080 J	18300 J	ug/L	12GWT3901	14/14	---	18300	4130	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7782-49-2	Selenium, Filtered	1.2 J	6.2 J	ug/L	12GWT1802	4/14	0.24 - 2.6	6.2	ND	18 N	NA 50	NA IDEM	No	BSL	18	BSL	BSL	
7440-23-5	Sodium, Filtered	34000 J	220000 J	ug/L	12GWT1902	14/14	---	220000	170000	NA	NA NA	NA NA	No	NUT		BSL	NUT	
7440-28-0	**Thallium, Filtered**	0.1 J	0.63 J	ug/L	12GWT1802	3/14	0.043 - 0.46	0.63	ND	**0.24** N	2 2	FED-MCL IDEM	**Yes**	**ASL**	0.24	ASL	ASL	
7440-31-5	Tin, Filtered	0.1 J	0.21 J	ug/L	12GWT3701	2/14	0.048 - 0.37	0.21	NA	2200 N	NA NA	NA NA	No	BSL	2200	BSL	BSL	
7440-62-2	Vanadium, Filtered	1.2 J	1.2 J	ug/L	12GWT1402	1/14	1.14	1.2	ND	3.6 N	NA NA	NA NA	No	BSL	3.6	BSL	BSL	
7440-66-6	**Zinc, Filtered**	11.4 J	1180	ug/L	12GWT1802	14/14	---	1180	12.9	**1100** N	NA 11000	NA IDEM	**Yes**	**ASL**	1100	ASL	ASL	
Miscellaneous Parameters (mg/L)																		
NA	Ammonia-N	0.03	10	mg/L	12GWT24A02	40/63	0.005 - 0.08	10	0.12 - 0.17	NA	NA NA	NA NA	No	NTX		BSL	NTX	
NA	**Nitrite/Nitrate-N**	0.05	10 J	mg/L	12GWT1101	42/63	0.025 - 0.05	10	0.18 - 0.81	**1** N	**1** NA	FED-MCL(9) NA	**Yes**	**ASL**	1	ASL	ASL	
NA	Total Organic Carbon	1	1	mg/L	12GWT0201	1/2	1	1	1.7 - 1.8	NA	NA NA	NA NA	No	NTX		BSL	NTX	

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in groundwater relative to upgradient well concentrations is presented in Section 5.0.
5 - The U.S. EPA Region 9 tap water screening level is presented. Value represents the risk-based tap water screening level divided by 10 to correspond to a target Hazard Quotient of 0.1 for non-carcinogens (denoted with a "N" flag), or an incremental lifetime cancer risk of $1x10^{-6}$ for carcinogens (denoted with a "C" flag) (U.S. EPA Region 9, October 2004).
6 - U.S. EPA Primary Drinking Water Standard (U.S. EPA, 2004b).
Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for groundwater (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for aminodinitrotoluene.
9 - Value is for hexavalent chromium.
10 - The MCL for this parameter is actually a treatment technique. The Safe Water Drainking Act (SDWA) action level (at the tap) has been presented.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
N = Non-carcinogen
NA = Not applicable/not available
ND = Not detected
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level.

For elimination as a COPC:
BSL = Below screening level
FREQ = Frequency of occurrence less than 5 percent (1 of 20 samples)
NUT = Essential nutrient
NTX = No toxicity data

Associated Samples

12GWT0101	12GWT0901	12GWT1601	12GWT2101	12GWT3602
12GWT0102	12GWT0902	12GWT1601-F	12GWT2102	12GWT3701
12GWT0201	12GWT1001	12GWT1602	12GWT2201	12GWT3701-F
12GWT0202	12GWT1002	12GWT1602-F	12GWT2202	12GWT3702
12GWT0301	12GWT1101	12GWT1701	12GWT2301	12GWT3801
12GWT0302	12GWT1102	12GWT1701-F	12GWT2302	12GWT3802
12GWT0401	12GWT1201	12GWT1702	12GWT2401	12GWT3901
12GWT0402	12GWT1202	12GWT1702-F	12GWT2402	12GWT3901-F
12GWT0501	12GWT1301	12GWT1801	12GWT24A01	12GWT3902
12GWT0502	12GWT1302	12GWT1802	12GWT24A02	12GWT3902-F
12GWT0601	12GWT1401	12GWT1802-F	12GWT2701	12GWT4001
12GWT0602	12GWT1401-F	12GWT1901	12GWT2702	12GWT4001-F
12GWT0701	12GWT1402	12GWT1902	12GWT3501	12GWT4002
12GWT0702	12GWT1402-F	12GWT1902-F	12GWT3501-F	12GWT4002-F
12GWT0801	12GWT1501	12GWT2001	12GWT3502	12GWT4201
12GWT0802	12GWT1502	12GWT2002	12GWT3601	12GWT4202

TABLE 2.10

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - MIGRATION PATHWAYS
SWMU 12 (MINE FIELD A) - BATTERY AREA
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Generic SSL for Soil to Air(5)		U.S. EPA Generic SSL for Migration to Groundwater(5)	IDEM Closure Level for Migration to Groundwater(6)					
Volatile Organics (ug/kg)																		
75-71-8	DICHLORODIFLUOROMETHANE	3 J	6 J	ug/kg	12SB150204, 12SB130607	9/12	0.865 - 1.13	6	NA	25000	N	28000	NA	250	BSL	BSL	250	#N/A
Semivolatile Organics (ug/kg)																		#N/A
56-55-3	BENZO(A)ANTHRACENE	8	8	ug/kg	12SB140607	1/12	3.56 - 3.88	8	NA	NA	C	160	19000	160	BSL	BSL	NA	19
205-99-2	BENZO(B)FLUORANTHENE	16	16	ug/kg	12SB140607	1/12	3.56 - 3.88	16	NA	NA	C	490	57000	490	BSL	BSL	NA	57
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	440 J	440 J	ug/kg	12SB140607	1/12	72.4 - 78.8	440	NA	NA	C	180000	3600000	180000	BSL	BSL	NA	3600
218-01-9	CHRYSENE	14	14	ug/kg	12SB140607	1/12	3.56 - 3.88	14	NA	7500000	C	160	25000	160	BSL	BSL	7500	25
206-44-0	FLUORANTHENE	11	11	ug/kg	12SB140607	1/12	3.56 - 3.88	11	NA	NA	N	310000	880000	310000	BSL	BSL	NA	880
120-58-1	ISOSAFROLE	260 J	690	ug/kg	12SB180204	2/12	73.4 - 78.8	690	NA	NA		NA	NA		BSL	BSL	NA	#N/A
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	12700 J	24700 J	mg/kg	12SB140607	12/12	---	24700	NA	686000	N	**8.3**	NA	8.3	ASL	ASL	6860000	#N/A
7440-36-0	**ANTIMONY**	0.3 J	0.31 J	mg/kg	12SB130607	2/12	0.1 - 1.2	0.31	NA	NA	N	**0.27**	5.4	0.27	ASL	ASL	NA	5.4
7440-38-2	**ARSENIC**	0.95 J	6.4 J	mg/kg	12SB190204	12/12	---	6.4	NA	745	C	**0.29**	29	0.29	ASL	ASL	745	29
7440-39-3	**BARIUM**	32 J	792 J	mg/kg	12SB200204	12/12	---	792	NA	68600	N	**82**	1600	82	ASL	ASL	686000	1600
7440-41-7	BERYLLIUM	0.51 J	1.7 J	mg/kg	12SB140204	12/12	---	1.7	NA	1330	C	3.2	63	3.2	BSL	BSL	1330	63
7440-70-2	CALCIUM	287 J	1160 J	mg/kg	12SB180608	12/12	---	1160	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7440-47-3	**CHROMIUM**	18.6 J	38.8 J	mg/kg	12SB150607	12/12	---	38.8	NA	267	C	**2.1**	**38**	2.1	ASL	ASL	267	#N/A
7440-48-4	**COBALT**	3.3 J	24.2 J	mg/kg	12SB130204	12/12	---	24.2	NA	1140	C	**0.17**	NA	0.17	ASL	ASL	1140	#N/A
7440-50-8	COPPER	5.4 J	23.9 J	mg/kg	12SB130607	12/12	---	23.9	NA	NA	N	560	920	560	BSL	BSL	NA	920
7439-89-6	IRON	6580 J	93300 J	mg/kg	12SB130204	12/12	---	93300	NA	NA	N	NA	NA		BSL	BSL	NA	#N/A
7439-92-1	LEAD	10.8 J	25.4 J	mg/kg	12SB130204	12/12	---	25.4	NA	NA	N	NA	81		BSL	BSL	NA	81
7439-95-4	MAGNESIUM	824 J	1910 J	mg/kg	12SB190204	12/12	---	1910	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7439-96-5	**MANGANESE**	22.6 J	796 J	mg/kg	12SB130204	12/12	---	796	NA	6860	N	**110**	NA	110	ASL	ASL	68600	#N/A
7439-97-6	MERCURY	0.008 J	1 J	mg/kg	12SB190204	7/11	0.007	1	NA	NA	N	NA	2.1		BSL	BSL	NA	2.1
7440-02-0	**NICKEL**	10.7 J	72.6 J	mg/kg	12SB130204	12/12	---	72.6	NA	13300	C	**14**	950	14	ASL	ASL	NA	#N/A
7440-09-7	POTASSIUM	1010 J	5130 J	mg/kg	12SB140607	12/12	---	5130	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7782-49-2	**SELENIUM**	0.67 J	2.3 J	mg/kg	12SB130607	2/12	0.13 - 0.88	2.3	NA	NA	N	**0.26**	5.2	0.26	ASL	ASL	NA	5.2
7440-23-5	SODIUM	56.8 J	505 J	mg/kg	12SB200608	4/12	37.4 - 246	505	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7440-62-2	VANADIUM	20.6 J	34 J	mg/kg	12SB190204	12/12	---	34	NA	NA	N	260	NA	260	BSL	BSL	NA	#N/A
7440-66-6	ZINC	17.8 J	128 J	mg/kg	12SB130204	12/12	---	128	NA	NA	N	680	14000	680	BSL	BSL	NA	14000

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Soil Screening Levels (SSLs) calculated on the U.S. EPA Internet Site at http://risk.lsd.ornl.gov/calc_start.htm. The soil-to-air SSLs for non-carcinogens are divided by 10. The migration-to-groundwater value represents a dilution attenuation factor (DAF) of 1.
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Associated Samples

13SS010002	12SB160608
12SB120204	12SB170204
12SB120608	12SB170608
12SB130204	12SB180204
12SB130607	12SB180608
12SB140204	12SB190204
12SB140607	12SB190608
12SB150204	12SB200204
12SB150607	12SB200608
12SB160204	

TABLE 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - DIRECT CONTACT
SWMU 12 (MINE FIELD A) - BATTERY AREA
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)			
Volatile Organics (ug/kg)																		
75-71-8	DICHLORODIFLUOROMETHANE	3 J	6 J	ug/kg	12SB150204, 12SB130607	9/12	0.865 - 1.13	6	NA	9400	N	NA	IDEM	No	BSL	9400	BSL	BSL
Semivolatile Organics (ug/kg)																		
56-55-3	BENZO(A)ANTHRACENE	8	8	ug/kg	12SB140607	1/12	3.56 - 3.88	8	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
205-99-2	BENZO(B)FLUORANTHENE	16	16	ug/kg	12SB140607	1/12	3.56 - 3.88	16	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	440 J	440 J	ug/kg	12SB140607	1/12	72.4 - 78.8	440	NA	35000	C	300000	IDEM	No	BSL	35000	BSL	BSL
218-01-9	CHRYSENE	14	14	ug/kg	12SB140607	1/12	3.56 - 3.88	14	NA	62000	C	500000	IDEM	No	BSL	62000	BSL	BSL
206-44-0	FLUORANTHENE	11	11	ug/kg	12SB140607	1/12	3.56 - 3.88	11	NA	230000	N	6300000	IDEM	No	BSL	230000	BSL	BSL
120-58-1	ISOSAFROLE	260 J	690	ug/kg	12SB180204	2/12	73.4 - 78.8	690	NA	NA		NA	IDEM	No	NTX		BSL	NTX
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	12700 J	24700 J	mg/kg	12SB140607	12/12	---	24700	NA	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-36-0	ANTIMONY	0.3 J	0.31 J	mg/kg	12SB130607	2/12	0.1 - 1.2	0.31	NA	3.1	N	140	IDEM	No	BSL	3.1	BSL	BSL
7440-38-2	**ARSENIC**	0.95 J	6.4 J	mg/kg	12SB190204	12/12	---	6.4	NA	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	**BARIUM**	32 J	792 J	mg/kg	12SB200204	12/12	---	792	NA	**540**	N	23000	IDEM	**Yes**	**ASL**	540	ASL	ASL
7440-41-7	BERYLLIUM	0.51 J	1.7 J	mg/kg	12SB140204	12/12	---	1.7	NA	15	N	680	IDEM	No	BSL	15	BSL	BSL
7440-70-2	CALCIUM	287 J	1160 J	mg/kg	12SB180608	12/12	---	1160	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	18.6 J	38.8 J	mg/kg	12SB150607	12/12	---	38.8	NA	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	3.3 J	24.2 J	mg/kg	12SB130204	12/12	---	24.2	NA	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	COPPER	5.4 J	23.9 J	mg/kg	12SB130607	12/12	---	23.9	NA	310	N	13000	IDEM	No	BSL	310	BSL	BSL
7439-89-6	**IRON**	6580 J	93300 J	mg/kg	12SB130204	12/12	---	93300	NA	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	LEAD	10.8 J	25.4 J	mg/kg	12SB130204	12/12	---	25.4	NA	400	N	400	IDEM	No	BSL	400	BSL	BSL
7439-95-4	MAGNESIUM	824 J	1910 J	mg/kg	12SB190204	12/12	---	1910	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	22.6 J	796 J	mg/kg	12SB130204	12/12	---	796	NA	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.008 J	1 J	mg/kg	12SB190204	7/11	0.007	1	NA	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	10.7 J	72.6 J	mg/kg	12SB130204	12/12	---	72.6	NA	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	1010 J	5130 J	mg/kg	12SB140607	12/12	---	5130	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7782-49-2	SELENIUM	0.67 J	2.3 J	mg/kg	12SB130607	2/12	0.13 - 0.88	2.3	NA	39	N	1700	IDEM	No	BSL	39	BSL	BSL
7440-23-5	SODIUM	56.8 J	505 J	mg/kg	12SB200608	4/12	37.4 - 246	505	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7440-62-2	**VANADIUM**	20.6 J	34 J	mg/kg	12SB190204	12/12	---	34	NA	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	ZINC	17.8 J	128 J	mg/kg	12SB130204	12/12	---	128	NA	2300	N	100000	IDEM	No	BSL	2300	BSL	BSL

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (USEPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Associated Samples

13SS010002	12SB160608
12SB120204	12SB170204
12SB120608	12SB170608
12SB130204	12SB180204
12SB130607	12SB180608
12SB140204	12SB190204
12SB140607	12SB190608
12SB150204	12SB200204
12SB150607	12SB200608
12SB160204	

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For Elimination as a COPC:
BSL = Below COPC screening level/ARAR/TBC
NTX = No toxicity information
NUT = Essential nutrient

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil

TABLE 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL - MIGRATION PATHWAYS
SWMU 12 (MINE FIELD A) - BATTERY AREA

CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections[2]	Concentration Used for Screening[3]	Concentration Greater Than Background ?[4]	U.S. EPA Generic SSL for Soil to Air[5]		U.S. EPA Generic SSL for Migration to Groundwater[5]	IDEM Closure Level for Migration to Groundwater[6]					
Volatile Organics (ug/kg)																		
75-71-8	DICHLORODIFLUOROMETHANE	2 J	15	ug/kg	12SS210002	9/11	1.14 - 1.25	15	NA	25000	N	28000	NA	250	BSL	BSL	250	#N/A
75-09-2	**METHYLENE CHLORIDE**	1 J	2 J	ug/kg	12SS220002, 12SS230002	3/11	0.921 - 1.6	2	NA	13000	C	**1.2**	23	1.2	ASL	ASL	13	**0.023**
Semivolatile Organics (ug/kg)																		#N/A
83-32-9	ACENAPHTHENE	4 J	4 J	ug/kg	12SS150002	1/11	3.47 - 3.82	4	NA	NA	N	31000	130000	31000	BSL	BSL	NA	130
208-96-8	ACENAPHTHYLENE	19	19	ug/kg	12SS150002	1/11	3.47 - 3.82	19	NA	NA	N	NA	18000		BSL	BSL	NA	**18**
120-12-7	ANTHRACENE	21	21	ug/kg	12SS150002	1/11	3.47 - 3.82	21	NA	NA	N	650000	51000	650000	BSL	BSL	NA	51
56-55-3	BENZO(A)ANTHRACENE	5 J	98	ug/kg	12SS150002	5/11	3.63 - 3.82	98	NA	NA	C	160	19000	160	BSL	BSL	NA	**19**
50-32-8	BENZO(A)PYRENE	12	110	ug/kg	12SS150002	4/11	3.47 - 3.82	110	NA	NA	C	410	8200	410	BSL	BSL	NA	**8.2**
205-99-2	BENZO(B)FLUORANTHENE	13	150	ug/kg	12SS150002	5/11	3.63 - 3.82	150	NA	NA	C	490	57000	490	BSL	BSL	NA	**57**
191-24-2	BENZO(G,H,I)PERYLENE	13	93	ug/kg	12SS150002	5/11	3.63 - 3.82	93	NA	NA	N	NA	16000		BSL	BSL	NA	**16**
207-08-9	BENZO(K)FLUORANTHENE	4 J	90	ug/kg	12SS150002	5/11	3.63 - 3.82	90	NA	NA	C	490	39000	490	BSL	BSL	NA	**39**
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	1300	1300	ug/kg	12SS150002	1/11	70.4 - 77.5	1300	NA	NA	C	180000	3600000	180000	BSL	BSL	NA	3600
218-01-9	CHRYSENE	12	110	ug/kg	12SS210002	5/11	3.63 - 3.82	110	NA	7500000	C	160	25000	160	BSL	BSL	7500	**25**
84-74-2	DI-N-BUTYL PHTHALATE	170 J	170 J	ug/kg	12SS210002	1/11	73.6 - 77.5	170	NA	NA	N	250000	5000000	250000	BSL	BSL	NA	5000
53-70-3	DIBENZO(A,H)ANTHRACENE	21	21	ug/kg	12SS150002	1/11	3.47 - 3.82	21	NA	NA	C	1500	18000	1500	BSL	BSL	NA	**18**
206-44-0	FLUORANTHENE	11	140	ug/kg	12SS150002	5/11	3.63 - 3.82	140	NA	NA	N	310000	880000	310000	BSL	BSL	NA	880
86-73-7	FLUORENE	4 J	4 J	ug/kg	12SS150002	1/11	3.47 - 3.82	4	NA	NA	N	41000	170000	41000	BSL	BSL	NA	170
193-39-5	INDENO(1,2,3-CD)PYRENE	11	80	ug/kg	12SS150002	5/11	3.63 - 3.82	80	NA	NA	C	1400	3100	1400	BSL	BSL	NA	**3.1**
120-58-1	ISOSAFROLE	2300	8400	ug/kg	12SS180002	2/11	70.4 - 77.5	8400	NA	NA		NA	NA		BSL	BSL	NA	#N/A
91-20-3	NAPHTHALENE	4 J	38	ug/kg	12SS210002	3/11	3.63 - 3.82	38	NA	17000	N	3100	700	170	BSL	BSL	170	**0.7**
85-01-8	PHENANTHRENE	9 J	140 J	ug/kg	12SS210002	5/11	3.63 - 3.82	140	NA	NA	N	NA	13000		BSL	BSL	NA	**13**
129-00-0	PYRENE	19	180	ug/kg	12SS150002	5/11	3.63 - 3.82	180	NA	NA	N	230000	570000	230000	BSL	BSL	NA	570
Energetics (mg/kg)																		
99-35-4	**1,3,5-TRINITROBENZENE**	0.84	0.84	mg/kg	12SS210002	1/11	0.25	0.84	NA	NA	N	**0.25**	NA	0.25	ASL	ASL	NA	#N/A
2691-41-0	HMX	1.7	1.7	mg/kg	12SS210002	1/11	0.25	1.7	NA	NA	N	NA	NA		BSL	BSL	NA	#N/A
121-82-4	RDX	6.1	6.1	mg/kg	12SS210002	1/11	0.25	6.1	NA	NA	C	NA	NA		BSL	BSL	NA	#N/A
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	8780 J	23700	mg/kg	12SS190002	11/11	---	23700	NA	686000	N	**8.3**	NA	8.3	ASL	ASL	6860000	#N/A
7440-36-0	**ANTIMONY**	0.38 J	3610 J	mg/kg	12SS210002	5/11	0.12 - 0.95	3610	NA	NA	N	**0.27**	**5.4**	0.27	ASL	ASL	NA	**5.4**
7440-38-2	**ARSENIC**	2.6 J	158 J	mg/kg	12SS240002	11/11	---	158	NA	745	C	**0.29**	**29**	0.29	ASL	ASL	745	**29**
7440-39-3	**BARIUM**	54.1 J	505 J	mg/kg	12SS210002	11/11	---	505	NA	68600	N	**82**	1600	82	ASL	ASL	686000	1600
7440-41-7	BERYLLIUM	0.72 J	1.5 J	mg/kg	12SS130002, 12SS140002	7/11	0.35 - 1	1.5	NA	1330	C	3.2	63	3.2	BSL	BSL	1330	63
7440-43-9	**CADMIUM**	5.8 J	6.3 J	mg/kg	12SS220002	2/11	0.2 - 0.81	6.3	NA	1780	C	**0.38**	7.5	0.38	ASL	ASL	1780	7.5
7440-70-2	CALCIUM	299 J	17800 J	mg/kg	12SS150002	11/11	---	17800	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7440-47-3	**CHROMIUM**	18.3 J	51.7 J	mg/kg	12SS240002	11/11	---	51.7	NA	267	C	**2.1**	**38**	2.1	ASL	ASL	267	#N/A
7440-48-4	**COBALT**	5 J	13.6 J	mg/kg	12SS220002	11/11	---	13.6	NA	1140	C	**0.17**	NA	0.17	ASL	ASL	1140	#N/A
7440-50-8	COPPER	8.7 J	345 J	mg/kg	12SS210002	11/11	---	345	NA	NA	N	560	920	560	BSL	BSL	NA	920
7439-89-6	IRON	7160 J	65900 J	mg/kg	12SS130002	11/11	---	65900	NA	NA	N	NA	NA		BSL	BSL	NA	#N/A
7439-92-1	LEAD	8.2 J	429000 J	mg/kg	12SS210002	11/11	---	429000	NA	NA		NA	**81**		BSL	BSL	NA	**81**
7439-95-4	MAGNESIUM	940 J	2750 J	mg/kg	12SS220002	11/11	---	2750	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7439-96-5	**MANGANESE**	68.7 J	1400	mg/kg	12SS230002	11/11	---	1400	NA	68600	N	**110**	NA	110	ASL	ASL	68600	#N/A
7439-97-6	MERCURY	0.009 J	0.31	mg/kg	12SS210002	9/11	0.007	0.31	NA	NA	N	NA	2.1		BSL	BSL	NA	2.1
7440-02-0	**NICKEL**	14 J	44.6 J	mg/kg	12SS130002	11/11	---	44.6	NA	13300	C	**14**	950	14	ASL	ASL	NA	#N/A
7440-09-7	POTASSIUM	558 J	4370 J	mg/kg	12SS140002	11/11	---	4370	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7782-49-2	**SELENIUM**	0.49 J	0.61 J	mg/kg	12SS240002	2/11	0.13 - 0.56	0.61	NA	NA	N	**0.26**	5.2	0.26	ASL	ASL	NA	5.2
7440-22-4	**SILVER**	18.5 J	18.5 J	mg/kg	12SS210002	1/11	0.042 - 0.72	18.5	NA	NA	N	**1.6**	31	1.6	ASL	ASL	NA	31
7440-23-5	SODIUM	78.2 J	370 J	mg/kg	12SS220002	3/11	20.5 - 153	370	NA	NA		NA	NA		BSL	NUT	NA	#N/A
7440-28-0	**THALLIUM**	6.4 J	6.4 J	mg/kg	12SS210002	1/11	0.15 - 0.34	6.4	NA	NA	N	**0.056**	**2.8**	0.056	ASL	ASL	NA	**2.8**
7440-31-5	TIN	12.4 J	838 J	mg/kg	12SS210002	4/11	0.46 - 2.3	838	NA	NA	N	NA	NA		BSL	BSL	NA	#N/A
7440-62-2	VANADIUM	16.8 J	42.8 J	mg/kg	12SS190002	11/11	---	42.8	NA	NA	N	260	NA	260	BSL	BSL	NA	#N/A
7440-66-6	**ZINC**	31 J	2490 J	mg/kg	12SS220002	11/11	---	2490	NA	NA	N	**680**	14000	680	ASL	ASL	NA	14000

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Soil Screening Levels (SSLs) calculated on the U.S. EPA Internet Site at http://risk.lsd.ornl.gov/calc_start.htm. The soil-to-air SSLs for non-carcinogens are divided by 10. The migration-to-groundwater value represents a dilution attenuation factor (DAF) of 1.
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirements/To Be Considered
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Associated Samples

12SS120002	12SS190002
12SS130002	12SS200002
12SS140002	12SS210002
12SS160002	12SS220002
12SS170002	12SS230002
12SS180002	12SS240002

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN -SURFACE SOIL - DIRECT CONTACT
SWMU12 (MINE FIELD A) - BATTERY AREA
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)			
Volatile Organics (ug/kg)																		
75-71-8	DICHLORODIFLUOROMETHANE	2 J	15	ug/kg	12SS210002	9/11	1.14 - 1.25	15	NA	9400	N	NA	IDEM	No	BSL	9400	BSL	BSL
75-09-2	METHYLENE CHLORIDE	1 J	2 J	ug/kg	12SS220002, 12SS230002	3/11	0.921 - 1.6	2	NA	9100	C	120000	IDEM	No	BSL	9100	BSL	BSL
Semivolatile Organics (ug/kg)																		
83-32-9	ACENAPHTHENE	4 J	4 J	ug/kg	12SS150002	1/11	3.47 - 3.82	4	NA	370000	N	9500000	IDEM	No	BSL	370000	BSL	BSL
208-96-8	ACENAPHTHYLENE	19	19	ug/kg	12SS150002	1/11	3.47 - 3.82	19	NA	370000	N	1100000	IDEM	No	BSL	370000	BSL	BSL
120-12-7	ANTHRACENE	21	21	ug/kg	12SS150002	1/11	3.47 - 3.82	21	NA	2200000	N	47000000	IDEM	No	BSL	2200000	BSL	BSL
56-55-3	BENZO(A)ANTHRACENE	5 J	98	ug/kg	12SS150002	5/11	3.63 - 3.82	98	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
50-32-8	**BENZO(A)PYRENE**	12	110	ug/kg	12SS150002	4/11	3.47 - 3.82	110	NA	**62**	C	500	IDEM	**Yes**	**ASL**	62	ASL	ASL
205-99-2	BENZO(B)FLUORANTHENE	13	150	ug/kg	12SS150002	5/11	3.63 - 3.82	150	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
191-24-2	BENZO(G,H,I)PERYLENE	13	93	ug/kg	12SS150002	5/11	3.63 - 3.82	93	NA	230000	N	50000	IDEM	No	BSL	50000	BSL	BSL
207-08-9	BENZO(K)FLUORANTHENE	4 J	90	ug/kg	12SS150002	5/11	3.63 - 3.82	90	NA	6200	C	50000	IDEM	No	BSL	6200	BSL	BSL
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	1300	1300	ug/kg	12SS150002	1/11	70.4 - 77.5	1300	NA	35000	C	300000	IDEM	No	BSL	35000	BSL	BSL
218-01-9	CHRYSENE	12	110	ug/kg	12SS210002	5/11	3.63 - 3.82	110	NA	62000	C	500000	IDEM	No	BSL	62000	BSL	BSL
84-74-2	DI-N-BUTYL PHTHALATE	170 J	170 J	ug/kg	12SS210002	1/11	73.6 - 77.5	170	NA	610000	N	18000000	IDEM	No	BSL	610000	BSL	BSL
53-70-3	DIBENZO(A,H)ANTHRACENE	21	21	ug/kg	12SS150002	1/11	3.47 - 3.82	21	NA	62	C	500	IDEM	No	BSL	62	BSL	BSL
206-44-0	FLUORANTHENE	11	140	ug/kg	12SS150002	5/11	3.63 - 3.82	140	NA	230000	N	6300000	IDEM	No	BSL	230000	BSL	BSL
86-73-7	FLUORENE	4 J	4 J	ug/kg	12SS150002	1/11	3.47 - 3.82	4	NA	270000	N	6300000	IDEM	No	BSL	270000	BSL	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	11	80	ug/kg	12SS150002	5/11	3.63 - 3.82	80	NA	620	C	5000	IDEM	No	BSL	620	BSL	BSL
120-58-1	ISOSAFROLE	2300	8400	ug/kg	12SS180002	2/11	70.4 - 77.5	8400	NA	NA		NA	IDEM	No	NTX		BSL	NTX
91-20-3	NAPHTHALENE	4 J	38	ug/kg	12SS210002	3/11	3.63 - 3.82	38	NA	5600	N	3200000	IDEM	No	BSL	5600	BSL	BSL
85-01-8	PHENANTHRENE	9 J	140 J	ug/kg	12SS210002	5/11	3.63 - 3.82	140	NA	230000	N	470000	IDEM	No	BSL	230000	BSL	BSL
129-00-0	PYRENE	19	180	ug/kg	12SS150002	5/11	3.63 - 3.82	180	NA	230000	N	4700000	IDEM	No	BSL	230000	BSL	BSL
Energetics (mg/kg)																		
99-35-4	1,3,5-TRINITROBENZENE	0.84	0.84	mg/kg	12SS210002	1/11	0.25	0.84	NA	180	N	NA	IDEM	No	BSL	180	BSL	BSL
2691-41-0	HMX	1.7	1.7	mg/kg	12SS210002	1/11	0.25	1.7	NA	310	N	NA	IDEM	No	BSL	310	BSL	BSL
121-82-4	**RDX**	6.1	6.1	mg/kg	12SS210002	1/11	0.25	6.1	NA	**4.4**	C	NA	IDEM	**Yes**	**ASL**	4.4	ASL	ASL
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	8780 J	23700	mg/kg	12SS190002	11/11	---	23700	NA	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-36-0	**ANTIMONY**	0.38 J	3610 J	mg/kg	12SS210002	5/11	0.12 - 0.95	3610	NA	**3.1**	N	**140**	IDEM	**Yes**	**ASL**	3.1	ASL	ASL
7440-38-2	**ARSENIC**	2.6 J	158 J	mg/kg	12SS240002	11/11	---	158	NA	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	BARIUM	54.1 J	505 J	mg/kg	12SS210002	11/11	---	505	NA	540	N	23000	IDEM	No	BSL	540	BSL	BSL
7440-41-7	BERYLLIUM	0.72 J	1.5 J	mg/kg	12SS130002, 12SS140002	7/11	0.35 - 1	1.5	NA	15	N	680	IDEM	No	BSL	15	BSL	BSL
7440-43-9	**CADMIUM**	5.8 J	6.3 J	mg/kg	12SS220002	2/11	0.2 - 0.81	6.3	NA	**3.7**	N	12	IDEM	**Yes**	**ASL**	3.7	ASL	ASL
7440-70-2	CALCIUM	299 J	17800 J	mg/kg	12SS150002	11/11	---	17800	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	18.3 J	51.7 J	mg/kg	12SS240002	11/11	---	51.7	NA	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	5 J	13.6 J	mg/kg	12SS220002	11/11	---	13.6	NA	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	**COPPER**	8.7 J	345 J	mg/kg	12SS210002	11/11	---	345	NA	**310**	N	13000	IDEM	**Yes**	**ASL**	310	ASL	ASL
7439-89-6	**IRON**	7160 J	65900 J	mg/kg	12SS130002	11/11	---	65900	NA	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	**LEAD**	8.2 J	429000 J	mg/kg	12SS210002	11/11	---	429000	NA	**400**		**400**	IDEM	**Yes**	**ASL**	400	ASL	ASL
7439-95-4	MAGNESIUM	940 J	2750 J	mg/kg	12SS220002	11/11	---	2750	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	68.7 J	1400	mg/kg	12SS230002	11/11	---	1400	NA	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.009 J	0.31	mg/kg	12SS210002	9/11	0.007	0.31	NA	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	14 J	44.6 J	mg/kg	12SS130002	11/11	---	44.6	NA	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	558 J	4370 J	mg/kg	12SS140002	11/11	---	4370	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7782-49-2	SELENIUM	0.49 J	0.61 J	mg/kg	12SS240002	2/11	0.13 - 0.56	0.61	NA	39	N	1700	IDEM	No	BSL	39	BSL	BSL
7440-22-4	SILVER	18.5 J	18.5 J	mg/kg	12SS210002	1/11	0.042 - 0.72	18.5	NA	39	N	1700	IDEM	No	BSL	39	BSL	BSL
7440-23-5	SODIUM	78.2 J	370 J	mg/kg	12SS220002	3/11	20.5 - 153	370	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7440-28-0	**THALLIUM**	6.4 J	6.4 J	mg/kg	12SS210002	1/11	0.15 - 0.34	6.4	NA	**0.52**	N	24	IDEM	**Yes**	**ASL**	0.52	ASL	ASL
7440-31-5	TIN	12.4 J	838 J	mg/kg	12SS210002	4/11	0.46 - 2.3	838	NA	4700	N	NA	IDEM	No	BSL	4700	BSL	BSL
7440-62-2	**VANADIUM**	16.8 J	42.8 J	mg/kg	12SS190002	11/11	---	42.8	NA	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	**ZINC**	31 J	2490 J	mg/kg	12SS220002	11/11	---	2490	NA	**2300**	N	100000	IDEM	**Yes**	**ASL**	2300	ASL	ASL

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 -The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Associated Samples

12SS120002	12SS190002
12SS130002	12SS200002
12SS140002	12SS210002
12SS160002	12SS220002
12SS170002	12SS230002
12SS180002	12SS240002

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For Elimination as a COPC:
BSL = Below COPC screening level/ARAR/TBC
NTX = No toxicity information
NUT = Essential nutrient

TABLE 2.6

COMPARISON OF SOIL CONCENTRATIONS TO CRITERIA FOR MIGRATION FROM SOIL TO AIR AND SOIL TO GROUNDWATER - HISTORICAL SURFACE / SUBSURFACE SOIL DATA
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface / Subsurface Soil

CAS Number	Chemical	Minimum Concentration(1)		Maximum Concentration(1)		Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Generic SSL for Soil to Air(5)		U.S. EPA Generic SSL for Migration to Groundwater(5)	IDEM Closure Level for Migration to Groundwater(6)	EPA SSLS DAF 1	IDEM SSL	Inhalation
Explosives (mg/kg)																		
99-35-4	**1,3,5-TRINITROBENZENE**	0.135	J	5.26		mg/kg	Bldg 157, Grid 112	14/442	0.192 - 31.2	5.26	NA	NA	N	**0.25**	NA	0.25		na
118-96-7	**2,4,6-TRINITROTOLUENE**	0.06	J	793		mg/kg	Bldg 153, Grid 27	246/442	0.2 - 12.5	793	NA	NA	N	**0.00057**	NA	0.00057		na
121-14-2	**2,4-DINITROTOLUENE**	0.242	J	0.242	J	mg/kg	Bldg 158, Grid 58	1/442	0.192 - 312	0.242	NA	NA	N	**0.000049**	**0.0091**	0.000049		na
606-20-2	**2,6-DINITROTOLUENE**	0.178	J	1.41		mg/kg	Bldg 158, Grid 58	3/442	0.2 - 32.5	1.41	NA	NA	N	**0.000042**	**0.0091**	0.000049		na
1321-12-6	2-AMINO-4,6-DINITROTOLUENE	0.0524	J	2.33		mg/kg	Bldg 153, Grid 4	65/442	0.192 - 312	2.33	NA	NA	N	NA	NA			na
88-72-2	**2-NITROTOLUENE**	0.074	J	0.939		mg/kg	Bldg 158, Grid 58	3/442	0.192 - 31.2	0.939	NA	NA	C	**0.00015**	NA	0.00015		na
1321-12-6	4-AMINO-2,6-DINITROTOLUENE	0.0664	J	5.8		mg/kg	Bldg 153, Grid 4	88/442	0.192 - 312	5.8	NA	NA	N	NA	NA			na
2691-41-0	HMX	0.191	J	752		mg/kg	Bldg 153, Grid 28	348/442	1 - 2.2	752	NA	NA	N	NA	NA			na
121-82-4	RDX	0.0849	J	5940		mg/kg	Bldg 153, Grid 28	332/442	0.5 - 1	5940	NA	NA	C	NA	NA			na
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	3310		35200		mg/kg	Bldg 153, Grid 173	210/210	---	35200	NA	686000	N	**8.3**	NA	8.3		6.86E+06
7440-38-2	**ARSENIC**	2.9		57.3		mg/kg	Bldg 158, Grid 196	107/110	11.5 - 12.2	57.3	NA	745	C	**0.29**	**3.9**	0.29	3.9	745
7440-39-3	**BARIUM**	14.4		351		mg/kg	Bldg 153, Grid 205	337/337	---	351	NA	68600	N	**82**	1600	82	1600	6.86E+05
7440-43-9	**CADMIUM**	0.03		2.4		mg/kg	Bldg 153, Grid 170	143/337	0.03 - 0.95	2.4	NA	1780	C	**0.38**	7.5	0.38	7.5	1780
18540-29-9	**CHROMIUM**	4.4		60.4		mg/kg	Bldg 153, Grid 37	337/337	---	60.4	NA	267	C	**2.1**	**38**	2.1	38	267
7439-92-1	LEAD	3.7	B	71		mg/kg	Bldg 158, Grid 44	337/337	---	71	NA	NA	N	NA	81		81	na
7487-94-7	MERCURY	0.0073	J	1.6		mg/kg	Bldg 158, Grid 12	120/210	0.02 - 0.14	1.6	NA	NA	N	NA	2.1			na
7782-49-2	**SELENIUM**	0.5	B	1.4		mg/kg	Bldg 153, Grid 179	21/110	0.36 - 46.9	1.4	NA	NA	N	**0.26**	5.2	0.26	5.2	na
7440-22-4	SILVER	0.14	B	0.14	B	mg/kg	Bldg 160, Grid 186	1/110	0.13 - 1.4	0.14	NA	NA	N	1.6	31	1.6	31	na
Volatile Organics (ug/kg)																		
67-64-1	ACETONE	2	J	200	B	ug/kg	Bldg 158, Grid 148	129/247	4 - 29	200	NA	NA	N	6600	3800	6600	3800	na
67-66-3	CHLOROFORM	2	JB	2	JB	ug/kg	Bldg 157, Grid 110	1/76	5- 6	2	NA	280	C	29	470	1.2	23	13000
78-93-3	2-BUTANONE	3	J	12	J	ug/kg	Bldg 153, Grid 173	7/247	4 - 15	12	NA	24000000	sat	4400	35000	4400	35000	24000000
75-09-2	**METHYLENE CHLORIDE**	1	J	75		ug/kg	Bldg 158, Grid 56	112/247	4 - 10	75	NA	13000	C	**1.2**	**23**	1.2	23	13000
108-88-3	TOLUENE	1	J	7		ug/kg	Bldg 158, Grid 183	13/247	4 - 10	7	NA	650000	sat	590	12000	590	12000	650000
1330-20-7	XYLENES	2	J	13	B	ug/kg	Bldg 153, Grid 135	15/247	4 - 10	13	NA	71000	N	7100	170000	7100	170000	710000

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in historical samples relative to Crane background levels is presented in Section 5.0.
5 - U.S. EPA Soil Screening Levels (SSLs) calculated on the U.S. EPA Internet Site at http://risk.lsd.ornl.gov/calc_start.htm. The soil-to-air SSLs for non-carcinogens are divided by 10.
The migration-to-groundwater value represents a dilution attenuation factor (DAF) of 1.
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).

Definitions:
B = Compound was found in the associated blank
C = Carcinogen
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
sat = Soil saturation concentration
CAS = Chemical Abstracts Service

TABLE 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE / SUBSURFACE SOIL - DIRECT CONTACT - HISTORICAL DATA
SWMU 12 (MINE FIELD A)
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface / Subsurface Soil

CAS Number	Chemical	Minimum Concentration(1)		Maximum Concentration(1)		Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)	EPA SSLS DAF 1	IDEM SSL	Inhalation
Energetics (mg/kg)																				
99-35-4	1,3,5-TRINITROBENZENE	0.135	J	5.26		mg/kg	Bldg 157, Grid 112	14/442	0.192 - 31.2	5.26	NA	180	N	NA	IDEM	No	BSL	0.25		na
118-96-7	**2,4,6-TRINITROTOLUENE**	0.06	J	793		mg/kg	Bldg 153, Grid 27	246/442	0.2 - 12.5	793	NA	**3.1**	**N**	NA	IDEM	**Yes**	ASL	0.00057		na
121-14-2	2,4-DINITROTOLUENE	0.242	J	0.242	J	mg/kg	Bldg 158, Grid 58	1/442	0.192 - 312	0.242	NA	12	N	6.3	IDEM	No	BSL	0.000049		na
606-20-2	2,6-DINITROTOLUENE	0.178	J	1.41		mg/kg	Bldg 158, Grid 58	3/442	0.2 - 32.5	1.41	NA	6.1	N	6.3	IDEM	No	BSL	0.000049		na
1321-12-6	**2-AMINO-4,6-DINITROTOLUENE**	0.0524	J	2.33		mg/kg	Bldg 153, Grid 4	65/442	0.192 - 312	2.33	NA	**1.2**	**N**	NA	IDEM	**Yes**	ASL			na
88-72-2	**2-NITROTOLUENE**	0.074	J	0.939		mg/kg	Bldg 158, Grid 58	3/442	0.192 - 31.2	0.939	NA	**0.88**	**C**	NA	IDEM	**Yes**	ASL	0.00015		na
1321-12-6	**4-AMINO-2,6-DINITROTOLUENE**	0.0664	J	5.8		mg/kg	Bldg 153, Grid 4	88/442	0.192 - 312	5.8	NA	**1.2**	**N**	NA	IDEM	**Yes**	ASL			na
2691-41-0	**HMX**	0.191	J	752		mg/kg	Bldg 153, Grid 28	348/442	1 - 2.2	752	NA	**310**	**N**	NA	IDEM	**Yes**	ASL			na
121-82-4	**RDX**	0.0849	J	5940		mg/kg	Bldg 153, Grid 28	332/442	0.5 - 1	5940	NA	**4.4**	**C**	NA	IDEM	**Yes**	ASL			na
Inorganics (mg/kg)																				
7429-90-5	**ALUMINUM**	3310		35200		mg/kg	Bldg 153, Grid 173	210/210	---	35200	NA	**7600**	**N**	NA	NA	**Yes**	ASL	8.3		6.86E+06
7440-38-2	**ARSENIC**	2.9		57.3		mg/kg	Bldg 158, Grid 196	107/110	11.5 - 12.2	57.3	NA	**0.39**	**C**	**3.9**	IDEM	**Yes**	ASL	0.29	3.9	745
7440-39-3	BARIUM	14.4		351		mg/kg	Bldg 153, Grid 205	337/337	---	351	NA	540	N	23000	IDEM	No	BSL	82	1600	6.86E+05
7440-43-9	CADMIUM	0.03		2.4		mg/kg	Bldg 153, Grid 170	143/337	0.03 - 0.95	2.4	NA	3.7	N	12	IDEM	No	BSL	0.38	7.5	1780
18540-29-9	CHROMIUM	4.4		60.4		mg/kg	Bldg 153, Grid 37	337/337	---	60.4	NA	210	C	430	IDEM	No	BSL	2.1	38	267
7439-92-1	LEAD	3.7	B	71		mg/kg	Bldg 158, Grid 44	337/337	---	71	NA	400	N	400	IDEM	No	BSL		81	na
7487-94-7	MERCURY	0.0073	J	1.6		mg/kg	Bldg 158, Grid 12	120/210	0.02 - 0.14	1.6	NA	2.3	N	100	IDEM	No	BSL			na
7782-49-2	SELENIUM	0.5	B	1.4		mg/kg	Bldg 153, Grid 179	21/110	0.36 - 46.9	1.4	NA	39	N	1700	IDEM	No	BSL	0.26	5.2	na
7440-22-4	SILVER	0.14	B	0.14	B	mg/kg	Bldg 160, Grid 186	1/110	0.13 - 1.4	0.14	NA	39	N	1700	IDEM	No	BSL	1.6	31	na
Volatile Organics (ug/kg)																				
67-64-1	ACETONE	2	J	200	B	ug/kg	Bldg 158, Grid 148	129/247	4 - 29	200	NA	1400000	N	4800000	IDEM	No	BSL	6600	3800	na
67-66-3	CHLOROFORM	2	JB	2	JB	ug/kg	Bldg 157, Grid 110	1/76	5 - 6	2	NA	220	C	910	IDEM	No	BSL	1.2	23	13000
78-93-3	2-BUTANONE	3	J	12	J	ug/kg	Bldg 153, Grid 173	7/247	4 - 15	12	NA	2200000	N	44000000	IDEM	No	BSL	4400	35000	24000000
75-09-2	METHYLENE CHLORIDE	1	J	75		ug/kg	Bldg 158, Grid 56	112/247	4 - 10	75	NA	9100	C	120000	IDEM	No	BSL	1.2	23	13000
108-88-3	TOLUENE	1	J	7		ug/kg	Bldg 158, Grid 183	13/247	4 - 10	7	NA	520000	sat	1700000	IDEM	No	BSL	590	12000	650000
1330-20-7	XYLENES	2	J	13	B	ug/kg	Bldg 153, Grid 135	15/247	4 - 10	13	NA	27000	N	690000	IDEM	No	BSL	7100	170000	710000

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 -The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in historical samples relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
B = Compound was found in the associated blank
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Noncarcinogen
NA = Not applicable/not available
sat = Soil saturation concentration
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For Elimination as a COPC:
BSL = Below COPC screening level/ARAR/TBC

TABLE 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - MIGRATION PATHWAYS
SWMU 12 (MINE FIELD A) - PROPER
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Ddetections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Generic SSL for Soil to Air(5)		U.S. EPA Generic SSL for Migration to Groundwater(5)	IDEM Closure Level for Migration to Groundwater(6)	EPA SSLS DAF 1			IDEM SSL	Inhalation
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	11900 J	37000 J	mg/kg	12SB110205	17/17	---	37000	NA	686000	N	**8.3**	NA	8.3	ASL	ASL		6860000
7440-36-0	**ANTIMONY**	0.38 J	0.71 J	mg/kg	12SB070206	6/17	0.13 - 0.87	0.71	NA	NA	N	**0.27**	5.4	0.27	ASL	ASL		NA
7440-38-2	**ARSENIC**	2.5 J	12.3 J	mg/kg	12SB080507	17/17	---	12.3	NA	745	C	**0.29**	29	0.29	ASL	ASL		745
7440-39-3	**BARIUM**	45.2 J	568 J	mg/kg	12SB070610	17/17	---	568	NA	68600	N	**82**	1600	82	ASL	ASL		686000
7440-41-7	BERYLLIUM	0.47 J	2 J	mg/kg	12SB090508	17/17	---	2	NA	1330	C	3.2	63	3.2	BSL	BSL		1330
7440-70-2	CALCIUM	357 J	8100 J	mg/kg	12SB050204	17/17	---	8100	NA	NA		NA	NA		BSL	NUT		NA
7440-47-3	**CHROMIUM**	21.2 J	38.7 J	mg/kg	12SB110205	17/17	---	38.7	NA	267	C	**2.1**	**38**	2.1	ASL	ASL		267
7440-48-4	**COBALT**	2.2 J	27 J	mg/kg	12SB070610	17/17	---	27	NA	1140	C	**0.17**	NA	0.17	ASL	ASL		1140
7440-50-8	COPPER	4 J	22.9 J	mg/kg	12SB090508	17/17	---	22.9	NA	NA	N	560	920	560	BSL	BSL		NA
7439-89-6	IRON	8380 J	49600 J	mg/kg	12SB060509	17/17	---	49600	NA	NA	N	NA	NA		BSL	BSL		NA
7439-92-1	LEAD	8.8 J	39.4 J	mg/kg	12SB080507	17/17	---	39.4	NA	NA		NA	81		BSL	BSL		NA
7439-95-4	MAGNESIUM	911 J	4560 J	mg/kg	12SB040712	17/17	---	4560	NA	NA		NA	NA		BSL	NUT		NA
7439-96-5	**MANGANESE**	12.5 J	1600 J	mg/kg	12SB050204	17/17	---	1600	NA	6860	N	**110**	NA	110	ASL	ASL		68600
7439-97-6	MERCURY	0.007 J	0.13	mg/kg	12SB040207	12/15	0.007	0.13	NA	NA	N	NA	2.1		BSL	BSL		NA
7440-02-0	**NICKEL**	8.4 J	47.3 J	mg/kg	12SB090508	17/17	---	47.3	NA	13300	N	**14**	950	14	ASL	ASL		13300
7440-09-7	POTASSIUM	894 J	2490 J	mg/kg	12SB100508	17/17	---	2490	NA	NA		NA	NA		BSL	NUT		NA
7782-49-2	**SELENIUM**	0.21 J	0.38 J	mg/kg	12SB080507	3/17	0.04 - 0.6	0.38	NA	NA	N	**0.26**	5.2	0.26	ASL	ASL		NA
7440-23-5	SODIUM	62.1 J	179 J	mg/kg	12SB040712	5/17	53.3 - 101	179	NA	NA		NA	NA		BSL	NUT		NA
7440-31-5	TIN	0.49 J	0.66 J	mg/kg	12SB110205	3/17	0.27 - 0.7	0.66	NA	NA	N	NA	NA		BSL	BSL		NA
7440-62-2	VANADIUM	17.4 J	50.5 J	mg/kg	12SB080507	17/17	---	50.5	NA	NA	N	260	NA	260	BSL	BSL		NA
7440-66-6	ZINC	9.8 J	99.2 J	mg/kg	12SB090508	17/17	---	99.2	NA	NA	N	680	14000	680	BSL	BSL		NA
Miscellaneous Parameters (mg/kg)																		
NA	AMMONIA-N	0.16 J	0.9 J	mg/kg	12SB020608	2/2	---	0.9	NA	NA		1.37×10^9	NA		BSL	NTX		
NA	CATION EXCHANGE CAPACITY (MEQ/1)	9.2	16	mg/kg	12SB020608	2/2	---	16	NA	NA		NA	NA		BSL	NTX		
NA	PH (S.U.)	6.05	6.1	mg/kg	12SB030608	2/2	---	6.1	NA	NA		NA	NA		BSL	NTX		

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 -The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Soil Screening Levels (SSLs) calculated on the U.S. EPA Internet Site at http://risk.lsd.ornl.gov/calc_start.htm. The soil-to-air SSLs for non-carcinogens are divided by 10. The migration-to-groundwater value represents a dilution attenuation factor (DAF) of 1.
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).

Associated Samples

12SB120204	12SB150204	12SB180204
12SB120608	12SB150607	12SB180608
12SB130204	12SB160204	12SB190204
12SB130607	12SB160608	12SB190608
12SB140204	12SB170204	12SB200204
12SB140607	12SB170608	12SB200608

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - DIRECT CONTACT
SWMU 12 (MINE FIELD A) - PROPER
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)	EPA SSLS	IDEM SSL	Inhalation DAF 1
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	11900 J	37000 J	mg/kg	12SB110205	17/17	---	37000	NA	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-36-0	ANTIMONY	0.38 J	0.71 J	mg/kg	12SB070206	6/17	0.13 - 0.87	0.71	NA	3.1	N	140	IDEM	No	BSL	3.1	BSL	BSL
7440-38-2	**ARSENIC**	2.5 J	12.3 J	mg/kg	12SB080507	17/17	---	12.3	NA	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	**BARIUM**	45.2 J	568 J	mg/kg	12SB070610	17/17	---	568	NA	**540**	N	23000	IDEM	**Yes**	**ASL**	540	ASL	ASL
7440-41-7	BERYLLIUM	0.47 J	2 J	mg/kg	12SB090508	17/17	---	2	NA	15	N	680	IDEM	No	BSL	15	BSL	BSL
7440-70-2	CALCIUM	357 J	8100 J	mg/kg	12SB050204	17/17	---	8100	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	21.2 J	38.7 J	mg/kg	12SB110205	17/17	---	38.7	NA	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	2.2 J	27 J	mg/kg	12SB070610	17/17	---	27	NA	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	COPPER	4 J	22.9 J	mg/kg	12SB090508	17/17	---	22.9	NA	310	N	13000	IDEM	No	BSL	310	BSL	BSL
7439-89-6	**IRON**	8380 J	49600 J	mg/kg	12SB060509	17/17	---	49600	NA	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	LEAD	8.8 J	39.4 J	mg/kg	12SB080507	17/17	---	39.4	NA	400		400	IDEM	No	BSL	400	BSL	BSL
7439-95-4	MAGNESIUM	911 J	4560 J	mg/kg	12SB040712	17/17	---	4560	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	12.5 J	1600 J	mg/kg	12SB050204	17/17	---	1600	NA	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.007 J	0.13	mg/kg	12SB040207	12/15	0.007	0.13	NA	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	8.4 J	47.3 J	mg/kg	12SB090508	17/17	---	47.3	NA	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	894 J	2490 J	mg/kg	12SB100508	17/17	---	2490	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7782-49-2	SELENIUM	0.21 J	0.38 J	mg/kg	12SB080507	3/17	0.04 - 0.6	0.38	NA	39	N	1700	IDEM	No	BSL	39	BSL	BSL
7440-23-5	SODIUM	62.1 J	179 J	mg/kg	12SB040712	5/17	53.3 - 101	179	NA	NA		NA	IDEM	No	NUT		BSL	NUT
7440-31-5	TIN	0.49 J	0.66 J	mg/kg	12SB110205	3/17	0.27 - 0.7	0.66	NA	4700	N	NA	IDEM	No	BSL	4700	BSL	BSL
7440-62-2	**VANADIUM**	17.4 J	50.5 J	mg/kg	12SB080507	17/17	---	50.5	NA	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	ZINC	9.8 J	99.2 J	mg/kg	12SB090508	17/17	---	99.2	NA	2300	N	100000	IDEM	No	BSL	2300	BSL	BSL
Miscellaneous Parameters (mg/kg)																		
NA	AMMONIA-N	0.16 J	0.9 J	mg/kg	12SB020608	2/2	---	0.9	NA	NA		NA	NA	No	NTX		BSL	NTX
NA	CATION EXCHANGE CAPACITY (MEQ/1)	9.2	16	mg/kg	12SB020608	2/2	---	16	NA	NA		NA	NA	No	NTX		BSL	NTX
NA	PH (S.U.)	6.05	6.1	mg/kg	12SB030608	2/2	---	6.1	NA	NA		NA	NA	No	NTX		BSL	NTX

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The non-carcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1x10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level .

Associated Samples

12SB120204	12SB150204	12SB180204
12SB120608	12SB150607	12SB180608
12SB130204	12SB160204	12SB190204
12SB130607	12SB160608	12SB190608
12SB140204	12SB170204	12SB200204
12SB140607	12SB170608	12SB200608

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For Elimination as a COPC:
BSL = Below COPC screening level/ARAR/TBC
NTX = No Toxicity Information
NUT = Essential nutrient

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL - MIGRATION PATHWAYS
SWMU 12 (MINE FIELD A) - PROPER
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-Detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Generic SSL for Soil to Air(5)		U.S. EPA Generic SSL for Migration to Groundwater(5)	IDEM Closure Level for Migration to Groundwater(6)				
Inorganics (mg/kg)																	
7429-90-5	**ALUMINUM**	17500 J	29800 J	mg/kg	12SS070002	9/9	---	29800	NA	686000	N	**8.3**	NA	8.3	ASL	ASL	6860000
7440-36-0	**ANTIMONY**	0.35 J	1.4 J	mg/kg	12SS070002	5/9	0.29 - 0.49	1.4	NA	NA	N	**0.27**	5.4	0.27	ASL	ASL	NA
7440-38-2	**ARSENIC**	4 J	9 J	mg/kg	12SS010002	9/9	---	9	NA	745	C	**0.29**	29	0.29	ASL	ASL	745
7440-39-3	**BARIUM**	50.2 J	128 J	mg/kg	12SS010002	9/9	---	128	NA	68600	N	**82**	1600	82	ASL	ASL	686000
7440-41-7	BERYLLIUM	0.53 J	0.98 J	mg/kg	12SS080002	8/9	0.5	0.98	NA	1330	C	3.2	63	3.2	BSL	BSL	1330
7440-70-2	CALCIUM	285 J	26000 J	mg/kg	12SS060002	9/9	---	26000	NA	NA		NA	NA		BSL	NUT	NA
7440-47-3	**CHROMIUM**	18.1 J	26.9 J	mg/kg	12SS050002	9/9	---	26.9	NA	267	C	**2.1**	38	2.1	ASL	ASL	267
7440-48-4	**COBALT**	4.6 J	15.7 J	mg/kg	12SS010002	9/9	---	15.7	NA	1140	C	**0.17**	NA	0.17	ASL	ASL	1140
7440-50-8	COPPER	8.1 J	19 J	mg/kg	12SS070002	9/9	---	19	NA	NA	N	560	920	560	BSL	BSL	NA
7439-89-6	IRON	18800 J	30600 J	mg/kg	12SS050002	9/9	---	30600	NA	NA	N	NA	NA		BSL	BSL	NA
7439-92-1	LEAD	10.7 J	31.2 J	mg/kg	12SS070002	9/9	---	31.2	NA	NA	N	NA	81	81	BSL	BSL	NA
7439-95-4	MAGNESIUM	1360 J	3050 J	mg/kg	12SS060002	9/9	---	3050	NA	NA		NA	NA		BSL	NUT	NA
7439-96-5	**MANGANESE**	140 J	1080 J	mg/kg	12SS010002	9/9	---	1080	NA	6860	N	**110**	NA	110	ASL	ASL	68600
7439-97-6	MERCURY	0.009 J	0.041 J	mg/kg	12SS040002	9/9	---	0.041	NA	NA	N	NA	2.1	2.1	BSL	BSL	NA
7440-02-0	**NICKEL**	12.1 J	21.4 J	mg/kg	12SS050002	9/9	---	21.4	NA	13300	C	**14**	950	14	ASL	ASL	13300
7440-09-7	POTASSIUM	1130 J	2120 J	mg/kg	12SS070002	9/9	---	2120	NA	NA		NA	NA		BSL	NUT	NA
7440-22-4	SILVER	0.21 J	0.21 J	mg/kg	12SS080002	1/9	0.042 - 0.14	0.21	NA	NA	N	1.6	31	1.6	BSL	BSL	NA
7440-23-5	SODIUM	59.8 J	59.8 J	mg/kg	12SS060002	1/9	26.9 - 62.6	59.8	NA	NA		NA	NA		BSL	NUT	NA
7440-31-5	TIN	0.58 J	0.61 J	mg/kg	12SS080002	2/9	0.38 - 0.6	0.61	NA	NA	N	NA	NA		BSL	BSL	NA
7440-62-2	VANADIUM	28.4 J	48.6 J	mg/kg	12SS070002	9/9	---	48.6	NA	NA	N	260	NA	260	BSL	BSL	NA
7440-66-6	ZINC	23.3 J	165 J	mg/kg	12SS070002	9/9	---	165	NA	NA	N	680	14000	680	BSL	BSL	NA

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 -The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Soil Screening Levels (SSLs) calculated on the U.S. EPA Internet Site at http://risk.lsd.ornl.gov/calc_start.htm. The soil-to-air SSLs for non-carcinogens are divided by 10. The migration-to-groundwater value represents a dilution attenuation factor (DAF) of 1.
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).

Associated Samples

13SS010002	12SS060002
12SS010002	12SS070002
12SS020002	12SS080002
12SS030002	12SS090002
12SS040002	12SS100002
12SS050002	12SS110002

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

TABLE 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL - DIRECT CONTACT
SWMU 12 (MINE FIELD A) - PROPER
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil

CAS Number	Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Units	Location of Maximum Concentration	Frequency of Detection	Range of Non-detections(2)	Concentration Used for Screening(3)	Concentration Greater Than Background ?(4)	U.S. EPA Region 9 PRG (Residential)(5)		Potential ARAR/TBC(6)	Potential ARAR/TBC Source(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)			
Inorganics (mg/kg)																		
7429-90-5	**ALUMINUM**	17500 J	29800 J	mg/kg	12SS070002	9/9	---	29800	NA	**7600**	N	NA	IDEM	**Yes**	**ASL**	7600	ASL	ASL
7440-36-0	ANTIMONY	0.35 J	1.4 J	mg/kg	12SS070002	5/9	0.29 - 0.49	1.4	NA	3.1	N	140	IDEM	No	BSL	3.1	BSL	BSL
7440-38-2	**ARSENIC**	4 J	9 J	mg/kg	12SS010002	9/9	---	9	NA	**0.39**	C	**3.9**	IDEM	**Yes**	**ASL**	0.39	ASL	ASL
7440-39-3	BARIUM	50.2 J	128 J	mg/kg	12SS010002	9/9	---	128	NA	540	N	23000	IDEM	No	BSL	540	BSL	BSL
7440-41-7	BERYLLIUM	0.53 J	0.98 J	mg/kg	12SS080002	8/9	0.5	0.98	NA	15	N	680	IDEM	No	BSL	15	BSL	BSL
7440-70-2	CALCIUM	285 J	26000 J	mg/kg	12SS060002	9/9	---	26000	NA	NA	N	NA	IDEM	No	NUT		BSL	NUT
7440-47-3	CHROMIUM	18.1 J	26.9 J	mg/kg	12SS050002	9/9	---	26.9	NA	210	C	430	IDEM	No	BSL	210	BSL	BSL
7440-48-4	COBALT	4.6 J	15.7 J	mg/kg	12SS010002	9/9	---	15.7	NA	140	N	NA	IDEM	No	BSL	140	BSL	BSL
7440-50-8	COPPER	8.1 J	19 J	mg/kg	12SS070002	9/9	---	19	NA	310	N	13000	IDEM	No	BSL	310	BSL	BSL
7439-89-6	**IRON**	18800 J	30600 J	mg/kg	12SS050002	9/9	---	30600	NA	**2300**	N	NA	IDEM	**Yes**	**ASL**	2300	ASL	ASL
7439-92-1	LEAD	10.7 J	31.2 J	mg/kg	12SS070002	9/9	---	31.2	NA	400		400	IDEM	No	BSL	400	BSL	BSL
7439-95-4	MAGNESIUM	1360 J	3050 J	mg/kg	12SS060002	9/9	---	3050	NA	NA	N	NA	IDEM	No	NUT		BSL	NUT
7439-96-5	**MANGANESE**	140 J	1080 J	mg/kg	12SS010002	9/9	---	1080	NA	**180**	N	NA	IDEM	**Yes**	**ASL**	180	ASL	ASL
7439-97-6	MERCURY	0.009 J	0.041 J	mg/kg	12SS040002	9/9	---	0.041	NA	2.3	N	100	IDEM	No	BSL	2.3	BSL	BSL
7440-02-0	NICKEL	12.1 J	21.4 J	mg/kg	12SS050002	9/9	---	21.4	NA	160	N	6900	IDEM	No	BSL	160	BSL	BSL
7440-09-7	POTASSIUM	1130 J	2120 J	mg/kg	12SS070002	9/9	---	2120	NA	NA	N	NA	IDEM	No	NUT		BSL	NUT
7440-22-4	SILVER	0.21 J	0.21 J	mg/kg	12SS080002	1/9	0.042 - 0.14	0.21	NA	39	N	1700	IDEM	No	BSL	39	BSL	BSL
7440-23-5	SODIUM	59.8 J	59.8 J	mg/kg	12SS060002	1/9	26.9 - 62.6	59.8	NA	NA	N	NA	IDEM	No	NUT		BSL	NUT
7440-31-5	TIN	0.58 J	0.61 J	mg/kg	12SS080002	2/9	0.38 - 0.6	0.61	NA	4700	N	NA	IDEM	No	BSL	4700	BSL	BSL
7440-62-2	**VANADIUM**	28.4 J	48.6 J	mg/kg	12SS070002	9/9	---	48.6	NA	**7.8**	N	NA	IDEM	**Yes**	**ASL**	7.8	ASL	ASL
7440-66-6	ZINC	23.3 J	165 J	mg/kg	12SS070002	9/9	---	165	NA	2300	N	100000	IDEM	No	BSL	2300	BSL	BSL

Shaded cell indicates that the maximum concentration exceeds the specified criterion and that the chemical is selected as a COPC.

Footnotes
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 -The maximum detected concentration is used for screening purposes.
4 - Background is not considered for COPC screening. A discussion of metals concentrations in soil relative to NSWC Crane background levels is presented in Section 5.0.
5 - U.S. EPA Region 9 Preliminary Remediation Goal (PRG). The noncarcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target Hazard Quotient of 0.1. Carcinogenic values represent an incremental lifetime cancer risk of $1X10^{-6}$ (carcinogens denoted with a "C" flag) (U.S. EPA Region 9, October 2004, Updated December 28, 2004).
6 - Indiana Department of Environmental Management, Risk Integrated System of Closure (RISC) residential closure levels for soil (IDEM, 2004).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level .

Associated Samples

13SS010002	12SS060002
12SS010002	12SS070002
12SS020002	12SS080002
12SS030002	12SS090002
12SS040002	12SS100002
12SS050002	12SS110002

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered Criterion
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
N = Non-carcinogen
NA = Not applicable/not available
CAS = Chemical Abstracts Service

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For Elimination as a COPC:
BSL = Below COPC screening level/ARAR/TBC
NUT = Essential nutrient

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	SWMU 12	Maintenance Worker	Adult	Ingestion Dermal	Quant Quant	Maintenance workers may contact surface soil during normal work activities.
				Occupational Worker	Adult	Ingestion Dermal	Quant Quant	Occupational workers may contact surface soil during normal work activities.
				Trespassers	Adolescents	Ingestion Dermal	Quant Quant	Although access to the base is controlled, once inside the base, access to the SWMU 12 is not limited by any physical restraint. Adolescent trespassers may be exposed to surface soil while at the site.
		Air	SWMU 12	Maintenance Worker	Adult	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
				Occupational Worker	Adult	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
				Trespassers	Adolescents	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
	Subsurface Soil	Subsurface Soil	SWMU 12	Maintenance Worker	Adult	Ingestion Dermal	None None	Maintenance workers are not expected to be exposed to subsurface soil.
				Occupational Worker	Adult	Ingestion Dermal	None None	Occupational workers are not expected to be exposed to subsurface soil.
				Trespassers	Adolescents	Ingestion Dermal	None None	Trespassers are not exposed to subsurface soil.
		Air	SWMU 12	Maintenance Worker	Adult	Inhalation	None	Maintenance workers are not expected to be exposed to subsurface soil.
				Occupational Worker	Adult	Inhalation	None	Occupational workers are not expected to be exposed to subsurface soil.
				Trespassers	Adolescents	Inhalation	None	Trespassers are not exposed to subsurface soil.
	Groundwater	Groundwater	All Aquifers	Maintenance Workers	Adult	Ingestion Dermal	None None	Maintenance workers are not expected to have contact with groundwater.
				Occupational Worker	Adult	Ingestion Dermal	Quant Quant	Occupational workers may be exposed to groundwater if groundwater was used as a potable water source.
				Trespassers	Adolescents	Ingestion Dermal	None None	Adolescent trespassers are not expected to be exposed to groundwater.
		Air	All Aquifers	Maintenance Workers	Adult	Inhalation	None	Maintenance workers are not expected to be exposed to COPCs that have volatilized from groundwater.
				Occupational Worker	Adult	Inhalation	None	Occupational workers are not expected to be exposed to COPCs that have volatilized from groundwater.
				Trespassers	Adolescents	Inhalation	None	Adolescent trespassers are not expected to be exposed to groundwater.
			Vapor Intrusion	Occupational Worker	Adult	Inhalation	None	No VOCs were identified as COPCs for groundwater at SWMU 12
Current/Future	Surface Water	Surface Water	Gully and Mainstream	Maintenance Workers	Adult	Ingestion Dermal	None Quant	Maintenance workers are not expected to ingest surface water. Maintenance workers may have dermal contact with surface water.
				Occupational Worker	Adult	Ingestion Dermal	None None	Occupational workers are not expected to be exposed to surface water.
				Trespassers	Adolescents	Ingestion Dermal	Quant Quant	Although access to the base is controlled, once inside the base, access to the SWMU 12 is not limited by any physical restraint. Adolescent trespassers may be exposed to surface water while at the site.
	Sediment	Sediment	Gully and Mainstream	Maintenance Workers	Adult	Ingestion Dermal	Quant Quant	Maintenance workers may contact sediment.
				Occupational Worker	Adult	Ingestion Dermal	None None	Occupational workers are not expected to be exposed to sediment.
				Trespassers	Adolescents	Ingestion Dermal	Quant Quant	Although access to the base is controlled, once inside the base, access to the SWMU 12 is not limited by any physical restraint. Adolescent trespassers may be exposed to sediment while at the site.
Future	Surface Soil	Surface Soil	SWMU 12	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	This scenario is evaluated on the assumption that the Facility would close and be turned into a state park in the future.
					Adult	Ingestion Dermal	Quant Quant	This scenario is evaluated on the assumption that the Facility would close and be turned into a state park in the future.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
		Air	SWMU 12	Construction Workers	Adult	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
				Recreational Users	Child	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
					Adult	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
				Residents	Child	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
					Adult	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
	Subsurface Soil	Subsurface Soil	SWMU 12	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Recreational Users	Child	Ingestion Dermal	None None	Recreational users are not expected to be exposed to subsurface soil.
					Adult	Ingestion Dermal	None None	Recreational users are not expected to be exposed to subsurface soil.
				Residents	Child	Ingestion Dermal	None None	Future residents are not expected to be exposed to subsurface soil.
					Adult	Ingestion Dermal	None None	Future residents are not expected to be exposed to subsurface soil.
Future	Subsurface Soil	Air	SWMU 12	Construction Workers	Adult	Inhalation	Qual	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs for transfers from soil to air. Concentrations of all detected constituents were less than the SSLs.
				Recreational Users	Child	Inhalation	None	Recreational workers are not expected to be exposed to subsurface soil.
					Adult	Inhalation	None	Recreational workers are not expected to be exposed to subsurface soil.
		Air	SWMU 12	Residents	Child	Inhalation	None	Future residents are not expected to be exposed to subsurface soil.
					Adult	Inhalation	None	Future residents are not expected to be exposed to subsurface soil.
	Ground Water	Groundwater	All Aquifers	Construction Workers	Adult	Ingestion Dermal	None Quant	Construction workers are not expected to ingest groundwater. Construction workers may have dermal contact with ground water during excavation activities.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to groundwater if groundwater was used as a potable water source.
					Adult	Ingestion Dermal	Quant Quant	Recreational users may be exposed to groundwater if groundwater was used as a potable water source.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
		Air	All Aquifers	Construction Workers	Adult	Inhalation	None	No VOCs were identified as COPCs for groundwater at SWMU 12
				Recreational Users	Child	Inhalation	None	No VOCs were identified as COPCs for groundwater at SWMU 12
					Adult	Inhalation	None	No VOCs were identified as COPCs for groundwater at SWMU 12
				Residents	Child	Inhalation	None	No VOCs were identified as COPCs for groundwater at SWMU 12
					Adult	Inhalation	None	No VOCs were identified as COPCs for groundwater at SWMU 12
			Vapor Intrusion	Residents	Child	Inhalation	Quant	No VOCs were identified as COPCs for groundwater at SWMU 12
					Adult	Inhalation	Quant	No VOCs were identified as COPCs for groundwater at SWMU 12
	Surface Water	Surface Water	Gully and Mainstream	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not expected to be exposed to surface water.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	This scenario is evaluated on the assumption that the Facility would close and be turned into a state park in the future.
					Adult	Ingestion Dermal	Quant Quant	This scenario is evaluated on the assumption that the Facility would close and be turned into a state park in the future.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
Future	Sediment	Sediment	Gully and Mainstream	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not expected to be exposed to sediment.
				Recreational Users	Child	Ingestion Dermal	Quant Quant	This scenario is evaluated on the assumption that the Facility would close and be turned into a state park in the future.
					Adult	Ingestion Dermal	Quant Quant	This scenario is evaluated on the assumption that the Facility would close and be turned into a state park in the future.
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario is included to aid in future risk management decisions.

Notes:
Quant - Quantitative.
Qual - Qualitative.

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADOLESCENT TRESPASSER		
BASED ON: USEPA, DEC. 1989		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface water by an adolescent trespasser.

EQUATION:

$$IEX = \frac{Csw \times CF \times CRsw \times ET \times EF \times ED}{BW \times AT}$$

Where:

IEX = estimated exposure intake (mg/kg/day)
Csw = exposure point concentration in surface water (ug/L)
CF = conversion factor (1.0E-6 kg/mg)
CRsw = contact rate (L/hour)
ET = exposure time (hours/day)
EF = exposure frequency (days/year)
ED = exposure duration (years)
BW = body weight (kg)
AT = averaging time (days)
CSFo = oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo $(mg/kg/day)^{-1}$
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Csw	=	25	ug/L	RDX (gully surface water)
CRsw	=	0.05	L/day	
CF	=	1.0E-03	mg/ug	
ET	=	4	hours	
EF	=	26	days/year	
ED	=	11	years	
BW	=	43	kg	
ATc	=	25,550	days	
ATnc	=	4,015	days	
CSFo	=	1.10E-01	$(mg/kg/day)^{-1}$	
RfDo	=	3.00E-03	(mg/kg/day)	

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADOLESCENT TRESPASSER		
BASED ON: USEPA, DEC. 1989		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{25\ ug/L \times 0.001\ mg/ug \times 0.05\ L/day \times 4\ hours \times 26\ days/year \times 11\ years}{43\ kg \times 25550\ days}$$

IEXc = 1.30E-06 mg/kg/day

ICLR = 1.30E-06 mg/kg/day x 0.11 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR = 1.4E-07

EXAMPLE CARCINOGENIC CALCULATION

$$IEXnc = \frac{25\ ug/L \times 0.001\ mg/ug \times 0.05\ L/day \times 4\ hours \times 26\ days/year \times 11\ years}{43\ kg \times 4015\ days}$$

IEXnc = 8.28E-06 mg/kg/day

HQ = 8.28E-06 mg/kg/day / 0.003 (mg/kg/day) = Hazard Quotient

HQ = 0.0028

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL/SEDIMENT FUTURE CHILD RESIDENT		
BASED ON: USEPA, DECEMBER 1989		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface soil by the future child resident for the Reasonable Maximum Exposure (RME).

EQUATION:

$$IEX = \frac{Cs \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil/sediment (mg/kg)
IR	=	incidental soil ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)$^{-1}$
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	25	mg/kg	RDX (Building 153/154)
IR	=	200	mg/day	
EF	=	350	days/year	
ED	=	6	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	15	kg	
ATc	=	25550	days	
ATnc	=	2190	days	
CSFo	=	0.11	(mg/kg/day)$^{-1}$	
RfDo	=	3.00E-03	(mg/kg/day)	

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL/SEDIMENT FUTURE CHILD RESIDENT		
BASED ON: USEPA, DECEMBER 1989		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{25 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/year} \times 6 \text{ years} \times 0.000001 \text{ kg/mg}}{15 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 2.74E-05 mg/kg/day

ICLR = 2.74E-05 mg/kg/day x 0.11 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR = 3.0E-06

EXAMPLE CARCINOGENIC CALCULATION

$$IEXnc = \frac{25 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/year} \times 6 \text{ years} \times 0.000001 \text{ kg/mg}}{15 \text{ kg} \times 2190 \text{ days}}$$

IEXnc = 3.20E-04 mg/kg/day

HQ = 3.20E-04 mg/kg/day / 0.003 (mg/kg/day) = Hazard Quotient

HQ = 0.11

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL/SEDIMENT FUTURE CHILD RESIDENT		
BASED ON: U.S. EPA, DECEMBER 1989 AND JULY 2004		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface/subsurface soil by the future child resident for the Reasonable Maximum Exposure (RME).

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil/sediment (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFd $(mg/kg/day)^{-1}$

HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	25	mg/kg	RDX (Building 153/154)
CF	=	1.0E-06	kg/mg	
SA	=	2,800	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.015		
EF	=	350	days/year	
ED	=	6	years	
BW	=	15	kg	
ATc	=	25550	days	
ATnc	=	2190	days	
CSFd	=	0.11	$(mg/kg/day)^{-1}$	
RfDd	=	3.00E-03	(mg/kg/day)	

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL/SEDIMENT FUTURE CHILD RESIDENT		
BASED ON: U.S. EPA, DECEMBER 1989 AND JULY 2004		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{25\ mg/kg \times 0.000001\ kg/mg \times 2800cm2/day \times 0.2mg/cm2 \times 0.015 \times 350\ days/year \times 6\ years}{15\ kg \times 25550\ days}$$

DEXc = 1.15E-06 mg/kg/day

ICLR = 1.15E-06 mg/kg/day x 0.11 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR = 1.3E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{25\ mg/kg \times 0.000001\ kg/mg \times 2800cm2/day \times 0.2mg/cm2 \times 0.015 \times 350\ days/year \times 6\ years}{15\ kg \times 2190\ days}$$

DEXnc = 1.34E-05 mg/kg/day

HQ = 1.34E-05 mg/kg/day / 0.003 (mg/kg/day) = Hazard Quotient

HQ = 0.0045

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FUTURE ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from ingestion of groundwater by the future adult resident (RME).

EQUATION:

$$IEX = \frac{Cgw \times CF \times IRgw \times EF \times ED}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (µg/L)
CF	=	conversion factor (1.0E-3 mg/µg)
IRgw	=	ingestion rate (L/hour)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)$^{-1}$
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cgw	=	1100	µg/L	RDX (PUZ Groundwater)
IRgw	=	2	L/day	
CF	=	1.0E-03	mg/µg	
EF	=	350	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	8,760	days	
CSFo	=	1.10E-01	(mg/kg/day)$^{-1}$	
RfDo	=	3.00E-03	(mg/kg/day)	

CLIENT: NSWC, CRANE, INDIANA - SWMU 12		JOB NUMBER: 6878
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FUTURE ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989		
BY: T. JACKMAN	CHECKED BY:	DATE: 10/17/08

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1100 \text{ mg/L} \times 0.001 \text{ mg/mg} \times 2 \text{ L/day} \times 350 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 1.03E-02 mg/kg/day

ICLR = 1.03E-02 mg/kg/day x 0.11 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR = 1.1E-03

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{1100 \text{ mg/L} \times 0.001 \text{ mg/mg} \times 2 \text{ L/day} \times 350 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 8760 \text{ days}}$$

IEXnc = 3.01E-02 mg/kg/day

HQ = 3.01E-02 mg/kg/day / 0.003 (mg/kg/day) = Hazard Quotient

HQ = 1.0E+01

TABLE 6.1

CANCER TOXICITY DATA - ORAL/DERMAL
SWMU 12 MINE FILL A
NSWC CRANE, CRANE, INDIANA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date
Semivolatile Organic Compounds								
Benzo(a)anthracene	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2	EPA[1]	7/1993
Benzo(a)pyrene	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	9/01/2005
Benzo(b)fluoranthene	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2	EPA[1]	7/1993
Dibenzo(a,h)anthracene	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2	EPA[1]	7/1993
Indeno(1,2,3-cd)pyrene	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2	EPA[1]	7/1993
Dioxins/Furans								
2,3,7,8-TCDD	1.5E+05	$(mg/kg/day)^{-1}$	1	1.5E+05	$(mg/kg/day)^{-1}$	B2	HEAST	7/1997
PCBs								
PCBs	2.0E+00	$(mg/kg/day)^{-1}$	1	2.0E+00	$(mg/kg/day)^{-1}$	B2	IRIS	9/01/2005
Energetics								
2,4,6-Trinitrotoluene	3.0E-02	$(mg/kg/day)^{-1}$	1	3.0E-02	$(mg/kg/day)^{-1}$	C	IRIS	9/01/2005
RDX	1.1E-01	$(mg/kg/day)^{-1}$	1	1.1E-01	$(mg/kg/day)^{-1}$	C	IRIS	9/01/2005
2-Nitrotoluene	2.3E-01	$(mg/kg/day)^{-1}$	1	2.3E-01	$(mg/kg/day)^{-1}$	NA	EPA 9	10/2004
4-Nitrotoluene	7.0E-02	$(mg/kg/day)^{-1}$	1	7.0E-02	$(mg/kg/day)^{-1}$	NA	EPA 9	10/2004
Metals								
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A	IRIS	9/01/2005

Notes:
1 - U.S. EPA, 2004a.
2 - Adjusted cancer slope factor for dermal =
Oral cancer slope factor / Oral absorption efficiency for dermal.

IRIS = Integrated Risk Information System.
HEAST= Health Effects Assessment Summary Tables.
EPA[1] = U.S. EPA, 1993b.

EPA 9 = U.S. EPA Region 9 PRG Table, October, 2004, updated December 28, 2004.

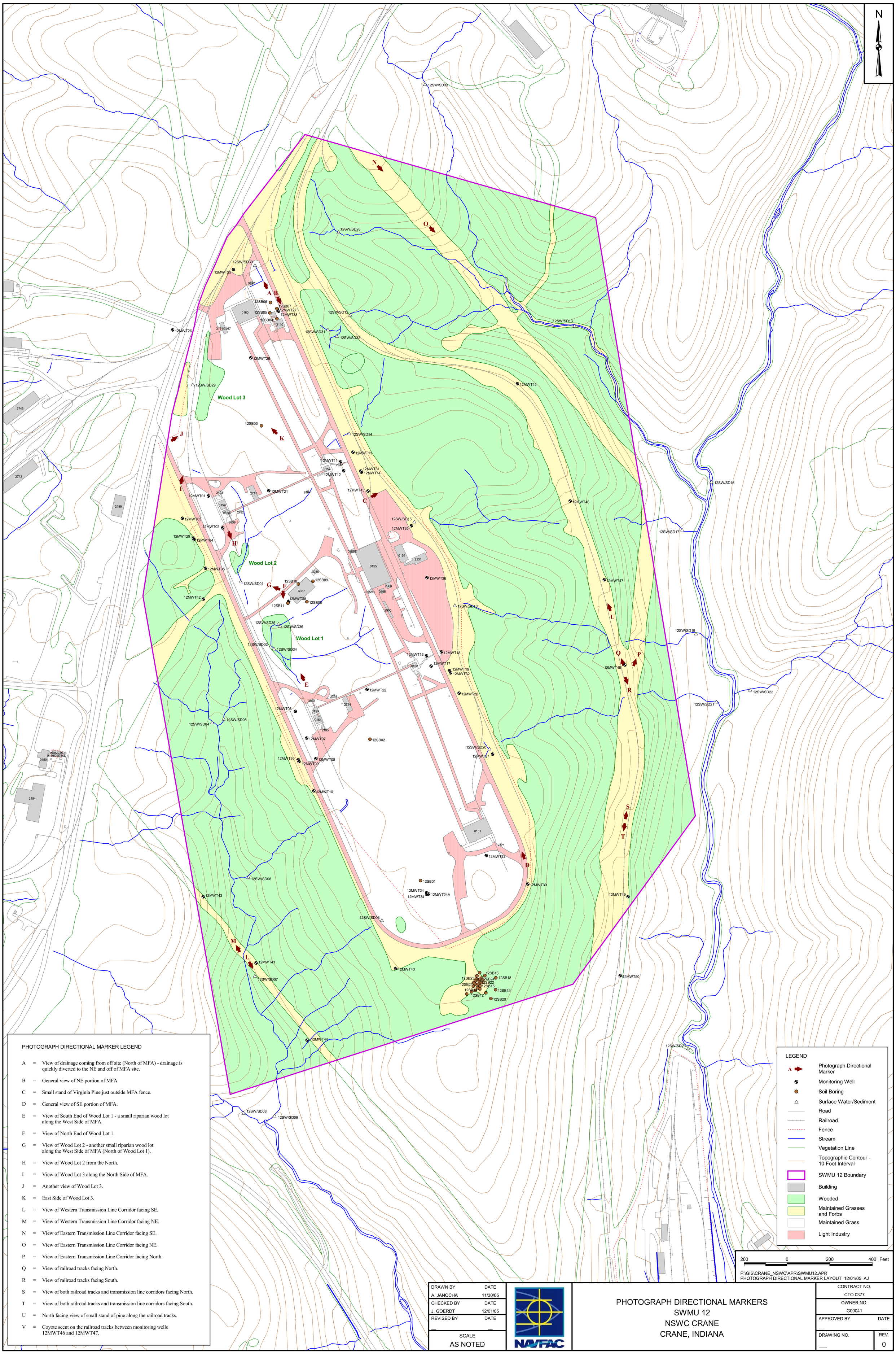
NA = Not available.

EPA 3 = U.S. EPA Region 3 RBC Table, October 19, 2004.

U.S. EPA Group:
A - Human carcinogen.
B1 - Probable human carcinogen - indicates that limited human data are available.
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans .
C - Possible human carcinogen.
D - Not classifiable as a human carcinogen.
E - Evidence of noncarcinogenicity.

APPENDIX J

SUPPORTING DOCUMENTATION FOR THE ECOLOGICAL RISK ASSESSMENT
SWMU 12



PHOTOGRAPH DIRECTIONAL MARKER LEGEND

A = View of drainage coming from off site (North of MFA) - drainage is quickly diverted to the NE and off of MFA site.

B = General view of NE portion of MFA.

C = Small stand of Virginia Pine just outside MFA fence.

D = General view of SE portion of MFA.

E = View of South End of Wood Lot 1 - a small riparian wood lot along the West Side of MFA.

F = View of North End of Wood Lot 1.

G = View of Wood Lot 2 - another small riparian wood lot along the West Side of MFA (North of Wood Lot 1).

H = View of Wood Lot 2 from the North.

I = View of Wood Lot 3 along the North Side of MFA.

J = Another view of Wood Lot 3.

K = East Side of Wood Lot 3.

L = View of Western Transmission Line Corridor facing SE.

M = View of Western Transmission Line Corridor facing NE.

N = View of Eastern Transmission Line Corridor facing SE.

O = View of Eastern Transmission Line Corridor facing NE.

P = View of Eastern Transmission Line Corridor facing North.

Q = View of railroad tracks facing North.

R = View of railroad tracks facing South.

S = View of both railroad tracks and transmission line corridors facing North.

T = View of both railroad tracks and transmission line corridors facing South.

U = North facing view of small stand of pine along the railroad tracks.

V = Coyote scent on the railroad tracks between monitoring wells 12MWT46 and 12MWT47.

DRAWN BY	DATE
A. JANOCHA	11/30/05
CHECKED BY	DATE
J. GOERDT	12/01/05
REVISED BY	DATE

SCALE
AS NOTED

NAVFAC

PHOTOGRAPH DIRECTIONAL MARKERS
SWMU 12
NSWC CRANE
CRANE, INDIANA

CONTRACT NO.	
CTO 0377	
OWNER NO.	
G00041	
APPROVED BY	DATE
DRAWING NO.	REV.
	0

Photo A - Drainage coming from off-site (North of MFA). Drainage quickly diverted NE and off-site.

Photo B - General view of NE portion of MFA.

Photo C - Small stand of Virginia Pine just outside MFA fence line.

Photo D - General view of SE portion of MFA.

Photo E - South end of woodlot 1 - a small riparian woodlot along the west side of MFA.

Photo F - North end of woodlot 1.

Photo G - Woodlot 2 - another small riparian woodlot along the west side of MFA (north of woodlot 1).

Photo H - Woodlot 2 from the north.

Photo I - Woodlot 3 - north side of MFA.

Photo J - Woodlot 3.

Photo K - East side of Woodlot 3.

Photo L - Western transmission line corridor facing southeast.

Photo M - Western transmission line corridor facing northeast.

Photo N - Eastern transmission line corridor facing southeast.

Photo O - Eastern transmission line corridor facing southeast.

Photo P - Eastern transmission line corridor facing north.

Photo Q - Railroad tracks facing north.

Photo R - Railroad tracks facing south.

Photo S - Railroad tracks and transmission line corridor facing north.

Photo T - Railroad tracks and transmission line corridor facing south.

Photo U - Facing north to small stand of Pine the railroad tracks.

Photo V - Coyote scat on railroad tracks between monitoring well 12MWT46 and 47.

Checklist for Ecological Assessment/Sampling

I. SITE DESCRIPTION

1. Site Name: NSWC CRANE

   Location: SWMU 12 - MINE FILL A (MFA)

   County: MARTIN City: CRANE State: INDIANA

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? MFA SITE INSIDE FENCE ~64.3 ACRES
   MFA BUFFER ZONE ~135.5 ACRES
   Total = 199.8 ACRES

4. Is this the first site visit? ☑ yes ☐ no If no, attach trip report of previous site visit(s), if available.

   Date(s) of previous site visit(s): 1st VISIT FOR Ecological ASSESSMENT. Other visits were made for groundwater, surface water, sediment & soil sampling (SEE FIR, August 2005).

5. Please attach to the checklist USGS topographic map(s) of the site, if available.
   SEE FIGURE 1-3 OF FIR, August 2005 (See below)

6. Are aerial or other site photographs available? ☑ yes ☐ no If yes, please attach any available photo(s) to the site map at the conclusion of this section.

   SEE FIGURE 8-5 (SWMU 12 Aerial Photograph - SWMU 12 Boundary) in the "Resource Conservation and Recovery Act Facility Investigation Report for Mine Fill A (SWMU 12), Naval Surface Warfare Center Crane, Crane, Indiana, Contract Task Order 0357, August 2005" (FIR, August 2005) to which this Checklist for Ecological Assessment/Sampling is attached.
   SEE FIGURE A-1 Photographs in FIR, August 2005 Vol. II of III.
   SEE photographs attached to this Ecological Assessment.

7. The land use on the site is:
(Within the MFA Fence)

– % Urban	– % Urban
– % Rural	– % Rural
– % Residential	– % Residential
24.6 % Industrial (☑ light ☐ heavy)	1.1 % Industrial (☐ light ☐ heavy)
– % Agricultural	– % Agricultural
(Crops: _____)	(Crops: _____)
– % Recreational	– % Recreational
(Describe; note if it is a park, etc.)	(Describe; note if it is a park, etc.)
– % Undisturbed	– % Undisturbed
75.4 % Other { 2.2 % Wooded; 73.2 % Maintained Grass }	98.9 % Other { 82.4 % = Wooded; 16.5 % = Maintained Grasses + Forbes }

The area surrounding the site is: MFA Buffer Zone
~ 0.1 Ave. mile radius

8. Has any movement of soil taken place at the site? ☐ yes ☑ no. If yes, please identify the most likely cause of this disturbance: Not recently inside MFA Fence.

_____ Agricultural Use _____ Heavy Equipment _____ Mining

_____ Natural Events _____ Erosion _____ Other

Please describe:

However, a portion of the former "Battery Site" just outside the south gate had some heavy equipment Activity (related to clean up).

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

MFA is outside of FEMAs Floodplain (Zone A). Martin County soil survey considers this site as poor to very poor for wetland plants and wildlife.

10. What type of facility is located at the site?

☐ Chemical ☑ Manufacturing ☐ Mixing ☐ Waste disposal

☐ Other (specify)_____

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Energetic compounds, PAHs, metals, and inorganic nitrogen compounds. SEE Sections 3, 5, etc. OF FIR, August 2005 to which this Checklist is attached.

12. Check any potential routes of off-site migration of contaminants observed at the site:

☑ Swales ☑ Depressions ☑ Drainage ditches

☑ Runoff ☐ Windblown particulates ☐ Vehicular traffic

☐ Other (specify) intermittent streams

13. If known, what is the approximate depth to the water table? ~5' in low elevations to ~35' in the higher elevations.

14. Is the direction of surface runoff apparent from site observations? ☑ yes ☐ no If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☑ Surface water ☐ Groundwater ☐ Sewer ☐ Collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ yes ☑ no

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist -- Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist -- Flowing Systems.

☐ yes (approx. distance_____) ☑ no

17. Is there evidence of flooding? ☐ yes ☑ no *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use a blank sheet if additional space is needed for text.]

NA

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ yes ☑ no *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service.* If species' identities are known, please list them next.

For Additional information SEE Section 8.2.1.1 of the the FIR, August 2005 to which this Checklist is Attached.

20. Record weather conditions at the time this checklist was prepared:

DATE: 10-11-05

60°s Temperature (°C/°F) — Normal daily high temperature

NA Wind (direction/speed) NA Precipitation (rain, snow)

80+ Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

Within the fenced off area of SWMU 12 – Mine Fill A (MFA) light industry comprises 24.6% (15.8 acres) and consists of numerous buildings, an elaborate railroad system, covered walkways, asphalt and gravel roads, and gravel storage lay down areas. Other comprises 75.4% of MFA and consists of 73.2% (47.1 acres) of maintained grass and 2.2% (1.4 acres) wooded.

There are three isolated woodlots within the fenced off area of MFA (See figure attached to this Ecological Checklist). Woodlot 1 (See photographs E and F attached to this Ecological Checklist) is a small riparian woodlot with white oak and yellow poplar as the dominant species in the tree canopy, and red maple, sugar maple and sassafras as associated species. Sassafras, red maple, ash and flowering dogwood are common species in the understory. Woodlot 2 (See photographs G and H attached to this Ecological Checklist) is also a small riparian woodlot with sycamore and red maple as the dominant species in the tree canopy, and yellow poplar, persimmon, sassafras, and sweet cherry as associated species. Sassafras and red maple are common species in the understory. Woodlot 3(See photographs I, J and K attached to this Ecological Checklist) is an upland woodlot with mixed coniferous and deciduous trees. Shortleaf pine, sassafras, yellow poplar and black locust make up the dominant species in the overstory. Red maple, sassafras and flowering dogwood are common species in the understory.

MFA drains southwest and northeast toward tributaries of Boggs Creek. There is a network of several culverts along both the southwest side (See photographs Figure A-1m, 1n and 1o in FIR, August 2005, Volume II of III) and northeast side (See photographs Figure A-1s, 1t, 1u and 1v in FIR, August 2005, Volume II of III) of MFA. These culverts facilitate the drainage of MFA and divert surface water under the perimeter road and railroads that traverse the site. Drainage ditches/gullies and intermittent streams (associated with the two riparian woodlots) carry surface water to these culverts and surface water is diverted off site via said culverts to larger drainage ditches/gullies and intermittent streams. As noted above all of MFA drainage flows into tributaries that feeds Boggs Creek. Boggs Creek in turn flows into Lake Gallimore near the southern boundary of NSWC Crane then continues to flow out of Lake Gallimore until it ultimately discharges into the East Fork of the White River.

At the time of this assessment no flow was observed at the drainage ditches/gullies and at the intermittent streams associated with the two riparian woodlots. Therefore the occurrence of aquatic receptors (i.e. fish and sediment invertebrates) maybe considered somewhat unlikely. Furthermore, this site is an upland site well outside of FEMAs flood hazard area (Zone A). Additionally, Martin County soil survey considers this a poor to very poor site for wetland plants and wetland wildlife.

Wildlife observed on site and in the buffer zone included wild turkeys, whitetail deer, coyote and eastern fox squirrel.

See attached MFA photographs to enhance site familiarity.

Completed by Terry Rozahn Affiliation T+ NUS

Additional Preparers

Site Manager Mr. Ralph Basinski

Date 11-22-05

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☑ yes ☐ no If no, go to Section IIB: Shrub/Scrub.

2. What percentage or area of the site is wooded? (2.2 % 1.4 acres). Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site. Ground truthing

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen/Deciduous/Mixed) Provide a photograph, if available.
   Dominant plant, if known: Oaks (White & Black), Maple (Red & Sugar) Tulip Poplar / Yellow Poplar & Sycamore

4. What is the predominant size of the trees at the site? Use diameter at breast height.

   ☐ 0-6 in. ☑ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.
   Sassafras, Red maple, Sugar maple, Flowering Dogwood & Hawthorn

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ yes ☑ no If no, go to Section IIC: Open Field.
   Only under wooded areas

2. What percentage of the site is covered by scrub/shrub vegetation? (_____% _____ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph, if available.

4. What is the approximate average height of the scrub/shrub vegetation?

   ☐ 0-2 ft. ☐ 2-5 ft. ☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ Dense ☐ Patchy ☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ yes ☑ no If yes, please indicate the type below:

☐ Prairie/plains ☐ Savannah ☐ Old field ☐ Other (specify)_____

2. What percentage of the site is open field? (_____% _____ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant?_____

5. Describe the vegetation cover: ☐ Dense ☐ Sparse ☐ Patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☑ yes ☐ no If yes, identify and describe them below.

Maintained grassy areas made up 73.2 % (47.1 Acres)

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

Grassy areas stand out on the Aerial Photograph - SEE Figure 8-5 of the FIR, August 2005 to which this Checklist for Ecological Assessment/Sampling is attached.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

Fish & macroinvertebrated due to lack of any sustained surface water are very unlikely.
Wild turkey, coyote, whitetail deer, eastern fox squirrel were observed on site or within the EMA ~~Buffer~~ zone.

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

IV. AQUATIC HABITAT CHECKLIST – FLOWING SYSTEMS

Note: *Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.*

1. What type(s) of flowing water system(s) is (are) present at the site?

☐ River	☐ Stream	☐ Creek
☐ Dry wash	☐ Arroyo	☐ Brook
☑ Artificially created (ditch, etc.)	☑ Intermittent Stream	☑ Channeling
	☐ Other (specify)_____	

2. If known, what is the name of the waterbody? All on site drainage not named

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
☑ yes ☐ no If yes, please describe indicators that were observed.
Culverts, swales, drainage ditches throughout MFA.

4. What is the general composition of the substrate? Check all that apply.

☐ Bedrock	☑ Sand (coarse)	☐ Muck (fine/black)
☐ Boulder (>10 in.)	☑ Silt (fine)	☐ Debris
☑ Cobble (2.5-10 in.)	☐ Marl (shells)	☐ Detritus
☑ Gravel (0.1-2.5 in.)	☑ Clay (slick)	☑ Concrete
☐ Other (specify)_____		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?
Swales - Gentle & grassy
Intermittent Streams
Ht = 1-2'
Width = 2-4'
Slope = Gentle Veg = Trace only - None

6. Is the system influenced by tides? ☐ yes ☑ no What information was used to make this determination?

7. Is the flow intermittent? ☑ yes ☐ no If yes, please note the information that was used in making this determination.

On site flow for the most part is due to periods of prolonged rain events.

8. Is there a discharge from the site to the waterbody? ☐ yes ☐ no If yes, please describe the discharge and its path.

SEE Section 1A of this CHECKLIST

9. Is there a discharge from the waterbody? ☑ yes ☐ no If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

SEE Section 1A of this checklist

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:

_____ Width (ft.)

_____ Depth (ft.)

_____ Velocity (specify units):_____

_____ Temperature (depth of the water at which the reading was taken_____)

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque)
(Secchi disk depth _____)

_____ Other (specify)_____

SEE Section C of VOLUME II of III of the FIR, August 2005 to WHICH this Checklist is attached.

11. Describe observed color and area of coloration.

SEE comment for #10 in SEC. IV of this Checklist.

12. Is any aquatic vegetation present? ☐ yes ☑ no If yes, please identify the type of vegetation present, if known.

☐ Emergent ☐ Submergent ☐ Floating

13. Mark the flowing water system on the attached site map.

SEE Figure A-1 of Volume II of III of the FRI; August 2005 to which this Checklist is Attached.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

SEE 1A in SEC. I of this Checklist.

No FISH OR INVERTEBRATES were observed during this ASSESSMENT - NO flow in SWALES, drainage ditches or intermittent streams.

APPENDIX J.2
PHYSICAL AND CHEMICAL CHARACTERISTICS OF ECOLOGICAL COPC CLASSES

This appendix presents a discussion of the different chemical classes that were detected in environmental media at SWMU 12, including toxicity information, potential food chain and trophic transfer, and bioaccumulation potential. Appendix Table J.2-1 presents the bioaccumulation factors (BAFs) that were used in the surrogate species' food-chain models for the individual constituents that are detected at SWMU 12. The sources for most of the BAFs are presented in section 8.4.2.1 of the Ecological Risk Assessment (ERA), while the text below discusses some additional sources of the BAFs, where necessary. Note that dry weight BAFs were used for this ERA.

Volatile Organic Compounds

VOCs are usually very mobile in the environment because they are poorly adsorbed to soil and sediment particles. Also, because they are very volatile, they typically are only detected in surface water, surface soil, and sediment at low concentrations.

Most VOCs have very little potential to bioaccumulate in ecological receptors; therefore, biomagnification through the food chain does not appear to be significant. VOCs are not expected to biomagnify in plants and are typically only toxic to ecological receptors at relatively high concentrations.

Semivolatile Organic Compounds

The most common semivolatile organic compounds that are found at naval facilities include polynuclear aromatic hydocarbons (PAHs) and phthalates. PAHs are a diverse group of compounds consisting of two or more substituted and unsubstituted polynuclear aromatic rings formed by the incomplete combustion of carbonaceous materials. PAHs are ubiquitous in the modern environment and are common constituents of coal tar, soot, vehicle exhaust, cigarette smoke, certain petroleum products, road tar, mineral oils, creosote, and many cooked foods. PAHs also are released to the environment through natural sources such as volcanoes and forest fires.

PAHs are transferred from surface water by volatilization and sorption to settling particles. The compounds are transformed in surface water by photooxidation, chemical oxidation, and microbial metabolism (ATSDR, 1989). In soil and sediments, microbial metabolism is the major process for degradation of PAHs (ATSDR, 1989). Although PAHs accumulate in terrestrial and aquatic plants, many organisms are able to metabolize and eliminate these compounds. Vertebrates can readily metabolize PAHs, but lower forms (insects and worms) cannot

metabolize PAHs as quickly. However, food chain uptake does not appear to be a major exposure source to PAHs for aquatic animals (ATSDR, 1989).

PAHs vary substantially in their toxicity to aquatic organisms. In general, toxicity increases as molecular weight increases, with the exception of some high molecular weight PAHs that have low acute toxicity. Most species of aquatic organisms rapidly accumulate PAHs that occur at low concentrations in the ambient medium. However, uptake of PAHs is highly species-specific, it is higher in algae, mollusks, and other species that are incapable of metabolizing PAHs (Eisler, 1987). The ability of fish to metabolize PAHs may explain why benzo(a)pyrene is frequently not detected or is found at only very low levels in fish from environments heavily contaminated with PAHs (ATSDR, 1989).

Phthalates are semivolatile organic compounds that are used in production of plastics (ATSDR, 1993). Most phthalates are expected to sorb to soil or sediment particles after their release because of their high Log K_{OC} values (Howard, 1989). Some phthalates may bioconcentrate in aquatic organisms [Spectrum Laboratories, 1999; Howard, 1989; ATSDR, 1989].

Explosives

Some of the more common explosives include nitroaromatic compounds such as 2,4,6-trinitrotoluene, hexahydro-1,3,5-trinitro-1,3,5-triazine, octahydro-1,3,5,7-tetranitro-1,3,5-tetrazocine, N-methyl-N,2,4,6-tetranitroaniline, and associated by-products and degradation products that may have been released to the environment during manufacturing and load, assembly, and pack processes at military facilities (Talmage et al., 1999). These explosives are moderately to highly toxic to freshwater organisms, with chronic screening values less than 1 mg/L, although some of the screening values are low because of the conservative methods used to develop them based on an absence of data (Talmage et al., 1999). Available data indicate that none of the compounds are expected to bioconcentrate (Talmage et al., 1999). Most of the explosives do not appear to be highly toxic to mammals. Terrestrial reference values (TRVs) are greater than 1 mg/kg-day.

Explosives have little to moderate potential to adsorb to soil and sediment (Talmage et al., 1999). Therefore, explosives will have moderate to high mobility in soils and sediment, and most of the explosives will be found in the water column (Talmage et al., 1999).

Metals

Many metals occur naturally at various concentrations in the surface water and sediment primarily to chemical weathering of rocks and fallout from volcanoes. Most metals are toxic to aquatic (i.e., fish, invertebrates) and terrestrial (i.e., plants, invertebrates, vertebrates) ecological receptors above certain concentrations, with some metals being more toxic at lower concentrations than others. Also, different chemical forms of the metals may be more toxic than others. For example, hexavalent chromium is typically more toxic than trivalent chromium, and methylmercury is more toxic than inorganic mercury. In addition, the toxicity of several metals (cadmium, chromium, copper, lead, nickel, silver, and zinc) to aquatic receptors in freshwater systems decreases with increasing water hardness.

Many factors (e.g., pH, Eh, clay content, organic matter content) influence the bioavailability of metals to invertebrates in sediment. One way to estimate the bioavailable portion of certain divalent metals (cadmium, copper, lead, nickel, and zinc) in sediment is to measure the amount of acid volatile sulfides (AVS) and simultaneously extracted metals (SEM) in a sediment sample. If the molar concentration of AVS is higher than the molar concentration of SEM, then the SEM metals are expected to be unavailable and non-toxic to aquatic invertebrates. AVS plays little or no role in determining interstitial water concentrations of metals in aerobic systems or those with low productivity (i.e., where the absence of organic carbon limits sulfate reduction) (Ankley et al., 1995), or when ingestion of sediments is the primary exposure route (Lee et al., 2000).

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TABLE J.2-1

DRY WEIGHT BAFS AND BSAFS FOR PLANTS, EARTHWORMS, AND SEDIMENT INVERTEBRATES

	Plant BAFs[1,2]		Earthworm BAFs[3]		Sediment Invertebrate BSAFs[4]	
Chemicals	**Conservative**	**Average**	**Conservative**	**Average**	**Conservative**	**Average**
Energetics						
2,4,6-Trinitrotoluene	1.80E+00	1.80E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
1,3,5-Trinitrobenzene	7.70E+00	7.70E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
RDX	4.60E-01	4.60E-01	1.00E+00	1.00E+00	1.00E+00	1.00E+00
HMX	1.70E+01	1.70E+01	1.00E+00	1.00E+00	1.00E+00	1.00E+00
3-Nitrotoluene	1.50E+00	1.50E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Inorganics						
Arsenic	1.10E+00	3.75E-02	5.23E-01	2.24E-01	6.90E-01	1.43E-01
Cadmium	3.25E+00	5.86E-01	4.07E+01	7.71E+00	7.99E+00	6.00E-01
Chromium	8.39E-02	4.10E-02	3.16E+00	3.06E-01	4.68E-01	1.00E-01
Copper	6.25E-01	1.24E-01	1.53E+00	5.15E-01	5.25E+00	1.56E+00
Lead	4.68E-01	3.89E-02	1.52E+00	2.66E-01	6.07E-01	7.10E-02
Mercury	5.00E+00	6.52E-01	2.06E+01	1.69E+00	2.87E+00	1.14E+00
Nickel	1.41E+00	1.80E-02	4.73E+00	1.06E+00	2.32E+00	4.86E-01
Selenium	3.01E+00	6.72E-01	1.34E+00	9.85E-01	1.00E+00	1.00E+00
Silver	3.67E-02	1.40E-02	1.53E+01	2.05E+00	1.00E+00	1.00E+00
Zinc	1.82E+00	3.66E-01	1.29E+01	3.20E+00	7.53E+00	1.94E+00

Notes:

BAF - Bioaccumulation Factor

BSAF - Biota Sediment Accumulation Factor

1 - ORNL (2005) for organics; only one value is available for conservative and average exposures

2 - ORNL (1998a) for inorganics; conservative value is 90th percentile; average value is median value

3 - Sample et al (1998) for all chemicals; conservative value is 90th percentile; average value is median value

4 - ORNL (1998b) for all chemicals; conservative value is 90th percentile; average value is median value

Conservative and average refers to the exposure scenarios for which the uptake factors are used

Default value of 1 is assigned to parameters without uptake factors

Only the chemicals for which BAFs and/or BSAFs are available are shown. Chemicals not having BAFs and/or BSAFs are not included in this table.

APPENDIX J.3
SURROGATE TERRESTRIAL RECEPTOR PROFILES

The following sections present the receptor profiles for the representative herbivorous, insectivorous, and piscivorous receptors chosen for foodchain modeling at SWMU 12. The majority of the information for the profiles was obtained from the Wildlife Exposure Factors Handbook (U.S. EPA, 1993). The data for the incidental soil ingestion rates were obtained from the Estimates of Soil Ingestion by Wildlife (Beyer, 1994) or the U.S. EPA Ecological Soil Screening Guidance (U.S. EPA, 2005).

The food and water ingestion rates are listed in g/g (of body weight)-day on a wet weight basis but were converted to dry weight for the ERA. The home ranges are presented in hectares in U.S. EPA (1993) but were converted to acres by multiplying the number of hectares by 2.471. Also note that the estimated percent of soil in the diets are listed in dry weight.

Short-Tailed Shrew (*Blarina brevicauda*)

Shrews inhabit a wide variety of habitats and are common in areas with abundant vegetative cover. They need cool, moist habitats because of their high metabolic and water-loss rates. The short-tailed shrew is primarily carnivorous, eating insects such as earthworms, slugs, and snails.

The adult body weight for the short-tailed shrew in various habitats ranged from 0.015 to 0.01921 kg with an average of 0.0169 kg. The listed food ingestion rates for shrews are between 0.43 and 0.96 g/g-day (wet-weight). The water ingestion rate was listed as 0.223 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown on Table J.3-1. The food ingestion rates were then multiplied by 0.16 in the food chain model, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (3% for conservative food chain model and 0.9% for the average food chain model) from U.S. EPA (February 2005). 3% is the 90th percentile value and 0.9% is the 50th percentile value from U.S. EPA (February 2005). The home range for the shrew (0. 9699 acres) was calculated using data from a tamarek bog in Manitoba (only value available).

American Woodcock (*Scolopax minor*)

Woodcocks inhabit both woodlands and abandoned fields, particularly those with risk and moderately to poorly drained loamy soils, which tend to support abundant earthworm populations. They feed primarily on invertebrates found in moist upland soils by probing the soil with their long prehensile-tipped bill. Earthworms are their preferred diet, but seeds and other plant matter may also be consumed.

The adult body weight for the woodcock ranges from 0.166 to 0.213 kg with an average of 0.190 kg. The listed food ingestion rates for the woodcock are between 0.73 and 1.0 g/g-day (wet-weight). The water ingestion rate is listed as 0.1 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated

were calculated as shown in Table 8-9. The food ingestion rates were then multiplied by 0.16 in the food chain model, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 16.4% for conservative food chain model and 6.4% for the average food chain model) from U.S. EPA (February 2005). 16.4% is the 90th percentile value and 6.4% is the 50th percentile value from U.S. EPA (February 2005).

The range of home range sizes for the woodcock is 7.66 to 182 acres with an average home range of 61 acres.

Meadow Vole (*Microtus pennsylvanicus*)

Meadow voles inhabit grassy fields, marshes, and bogs; however, they prefer fields with more grass, more cover, and fewer woody plants. They typically consume green succulent vegetation, sedges, seeds, roots, bark, fungi, insects, and animal matter. However, green succulent vegetation makes up the majority of their diet.

The adult body weight for the vole ranges from 0.0329 to 0.0391 kg with an average of 0.0366 kg. The only listed food ingestion rates for voles range from 0.30 to 0.35 g/g-day (wet-weight), with an average of 0.325 g/g-day. The water ingestion rates are 0.14 (estimated) and 0.21 g/g-day, with an average of 0.175 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in Table 8-9. The food ingestion rates were then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (U.S. EPA, February 2005), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 3.2% for conservative food chain model and 1.2% for the average food chain model) from U.S. EPA (February 2005). 3.2% is the 90th percentile value and 1.2% is the 50th percentile value from U.S. EPA (February 2005).

Northern Bobwhite Quail (*Colinus virginianus*)

Quails inhabit grasslands, idle fields, pastures, and large clumps of grasses. Bobwhite quails forage in areas with open vegetation, some bare ground, and light litter. Seeds from weeds, woody plants, and grasses comprise the majority of an adult's diet, although green vegetation has been found to dominate the diet of this species in winter in the southern areas of the United States.

The adult body weight for the bobwhite quail ranges from 0.162 to 0.186 kg with an average of 0.177 kg. The listed food ingestion rates for quails range from 0.067 to 0.093 g/g-day (wet-weight), with an average of 0.082 g/g-day. The water ingestion rate ranges from 0.086 to 0.131 g/g-day, with an average water ingestion rate of 0.104 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown

on Table 8-9. The food ingestion rates were then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (U.S. EPA, February 2005), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 13.9% for conservative food chain model and 6.1% for the average food chain model) from U.S. EPA (February 2005). 13.9% is the 90th percentile value and 6.1% is the 50th percentile value for the mourning dove from U.S. EPA (February 2005).

The home range for the quail ranges from 16 to 41 acres with an average home range of 29 acres.

Belted Kingfisher *Ceryle alcyon)*

Belted kingfishers are typically found along rivers, streams, and the edges of lakes and ponds. They are also common along seacoasts and estuaries. They prefer water that is free of thick vegetation and overhanging trees that obscure the view of the water. Because kingfishers eat primarily fish that swim near the surface or in shallow water, they require relatively clear water to see and catch their prey. Although kingfishers feed predominantly on fish, they have been know to consume crayfish, crabs, mussels, lizards, frogs, toads, small snakes, turtles, insects, salamanders, newts, young birds, mice, and berries.

Based on data from Michigan, Pennsylvania, Ohio, and Minnesota, the adult body weights range from 0.136 to 0.170 kg, with an average of 0.152 kg. The listed food ingestion rates, based on data from Michigan, range from 0.41 to 0.5 g/g-day. The water ingestion rate is estimated as 0.11 g/g-day. The food ingestion rates were then multiplied by 0.25 in the food chain model, which is the percent solids of fish (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental sediment ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (3.3 percent), based on the mallard in Beyer (1994).

The home range for the kingfisher ranges from 0.39 to 2.185 km of shoreline, based on data from streams in Pennsylvania and Ohio.

Mink (Mustela vison)

Minks are the most abundant and widespread carnivorous mammals in North America. They are found associated with every type of aquatic habitat including waterways such as rivers, streams, lakes, ditches, swamps, marshes, and backwater areas. Minks prefer irregular shorelines and tend to use brushy or wooded cover adjacent to the water, where prey is abundant and downfall and debris provide den sites. Mammals are minks' most important prey year round in many parts of their range, but they also hunt aquatic species such as fish, amphibians, and crustaceans.

The adult body weight for the mink in various habitats ranged from 0.55 to 1.734 kg with an average of 1.02 kg. The listed food ingestion rates for minks range from 0.12 to 0.22 g/g-day (wet-weight). The water ingestion rates range from 0.028 to 0.11 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in Table J.3-1. The food ingestion rates were then multiplied by 0.25 in the food chain model, which is the percent solids of fish (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental sediment ingestion rate was calculated by multiplying the ingestion rate by the percentage of sediment that is incidentally ingested (4.3% for conservative food chain model and 1.3% for the average food chain model) from U.S. EPA (February 2005). 4.3% is the 90th percentile value and 1.3% is the 50th percentile value for the weasel from U.S. EPA (February 2005), because an incidental sediment ingestion rate is not available for the mink.

The home range for the mink in riverine areas ranged from 19.3 to 50.4 acres, with an average of 34.85 acres. (U.S. EPA, 1993).

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TABLE J.3-1

CALCULATION OF EXPOSURE PARAMETERS FOR SURROGATE WILDLIFE RECEPTORS

Exposure Parameters	Meadow Vole		Short-Tailed Shrew		American Woodcock	Bobwhite Quail		Belted Kingfisher	Mink
Body Weights (g)	32.9		17.61	16.87	168	180	181	150	1734
	39.1		17.33	15.58	209	168	183	136	974
	35.5		19.21	15.7	166	162	179	158	1040
	39		17.4	15.25	212	175	175	147	1233
					169	178	183.2	148	550
					213	179	185.5	170	586
						180	173		
						162.8	180.4		
Minimum	***32.9***		***15.25***		***166***	***162***		***136***	***550***
Maximum	***39.1***		***19.21***		***213***	***186***		***170.0***	***1734***
Average	***36.6***		***16.87***		***190***	***177***		***152***	***1019.5***
Food Ingestion Rate (g/g-day) (1)	0.3		0.49	0.77	1.0	0.067	0.079	0.5	0.13
	0.35		0.62	0.55	0.77	0.072	0.093	0.41	0.12
			0.43	0.96	0.73	0.09	0.089		0.16
			0.52	0.54					0.22
Minimum	***0.3***		***0.43***		***0.73***	***0.067***		***0.41***	***0.12***
Maximum	***0.35***		***0.96***		***1.0***	***0.093***		***0.5***	***0.22***
Average	***0.325***		***0.61***		***0.8***	***0.082***		***0.455***	***0.1575***
Food Ingestion Rate (kg/day)									
Conservative	***1.28E-02***		***1.62E-02***		***1.90E-01***	***1.64E-02***		***0.0758***	***0.2243***
Average	***1.19E-02***		***1.03E-02***		***1.58E-01***	***1.44E-02***		***0.0689***	***0.1606***
Water Ingestion Rate (g/g-day) (1)	0.14	0.21	0.223		0.1	0.115	0.1	0.11	0.11
					0.1	0.106	0.131		0.099
						0.093	0.101		0.028
						0.086	0.102		
						0.11	0.1		
Minimum	***0.14***		***0.223***		***0.1***	***0.086***		***0.11***	***0.028***
Maximum	***0.21***		***0.223***		***0.1***	***0.131***		***0.11***	***0.11***
Average	***0.175***		***0.223***		***0.1***	***0.104***		***0.110***	***0.079***
Water Ingestion Rate (L/day)									
Conservative	***7.69E-03***		***4.28E-03***		***2.13E-02***	***2.31E-02***		***0.0187***	***0.1907***
Average	***6.41E-03***		***3.76E-03***		***1.90E-02***	***1.84E-02***		***0.0167***	***0.0805***
Home Range (Ha)	0.43	0.097	0.3925		4.5	7.6		2.185	7.8
	0.019	0.041			32.4	16.7		1.028	20.4
	0.013	0.033			3.1	6.4		1.03	
	0.012	0.013			73.6	15.6		0.39	
	0.043	0.057			10.5				
	0.023	0.032							
	0.051	0.078							
	0.058	0.061							
Minimum (acres)	***0.0297***		***0.97***		***7.7***	***16***		***0.39***	***19***
Maximum (acres)	***1.06***		***0.97***		***182***	***41***		***2.19***	***50***
Average (acres)	***0.16***		***0.97***		***61***	***29***		***1.16***	***35***

Notes:
Source of data is U.S. EPA (1993).

Footnotes:
(1) - Ingestion Rates (kg/day or L/day) (if more than 1 ingestion rate is available)
- Conservative value = Max Ingestion Rate (g/g-day) * Avg. Body Weight
- Average value = Avg. Ingestion Rate (g/g-day) * Avg. Body Weight

Ingestion Rates (L/day) (if only 1 ingestion rate is available)
- Conservative value = Ingestion Rate (g/g-day) * Max. Body Weight
- Average value = Ingestion Rate (g/g-day) * Avg. Body Weight

APPENDIX J.4
TOXICITY REFERENCE VALUES

SOURCES AND ENPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE

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TABLE J.4-4

TRVS USED FOR AVIAN RECEPTORS FOOD-CHAIN MODELS

Parameter	NOAEL (mg/kg-day)	LOAEL (mg/kg-day)
EXPLOSIVES		
2,4,6-Trinitrotoluene	7	178
RDX	2.23	2.63
INORGANICS		
Arsenic	2.46	7.38
Cadmium	1.45	20
Chromium	1	5
Copper	46.97	61.72
Lead	1.13	11.3
Mercury	0.0064	0.064
Nickel	77.4	107
Selenium	0.4	0.8
Zinc	14.49	130.9

-Only the chemicals for which NOAELs and LOAELs are available are shown. Chemicals not having NOAELs and LOAELs are not included in this table.
-The sources of these NOAELS and LOAELS are presented in the table J.4-5. The NOAELS and LOAELS in the source table were divided by 10 if a subchronic study was the basis for the value.
-Also, if only a NOAEL was available, the value was multiplied by 10 to estimate the LOAEL and if only a LOAEL was available, the value was divided by 10 to estimate the NOAEL.

Acronyms:
NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level

TABLE J.4-5

SOURCES AND ENDPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference	Source of Reference
Energetics							
m, o, and p-Nitrotoluene	200	LOAEL	systemic	chronic	rat	Ciss et al., 1980	HEAST, 1997
HMX	30	NOAEL	mortality	subchronic	mouse	Everett and Maddock, 1985	Talmage et al., 1999
HMX	75	LOAEL	mortality	subchronic	mouse	Everett and Maddock, 1985	Talmage et al., 1999
RDX	7	NOAEL	reproduction	chronic	mouse	Lish et al., 1984	Talmage et al., 1999
RDX	35	LOAEL	reproduction	chronic	mouse	Lish et al., 1984	Talmage et al., 1999
1,3,5-Trinitrobenzene	2.68	NOAEL	systemic	chronic	rat	Reddy et al, 1996	IRIS, 2002
1,3,5-Trinitrobenzene	13.31	LOAEL	systemic	chronic	rat	Reddy et al, 1996	IRIS, 2002
2,4,6-Trinitrotoluene	160	LOAEL	reproductive	subchronic	rat	Dilley et al., 1982	Talmage et al., 1999
Inorganics							
Arsenic	1.261	LOAEL	reproductive	chronic	mouse	Schroeder and Mitchner, 1971	Sample et.al., 1996
Arsenic	2.46	NOAEL	mortality	chronic	brown-headed cowbird	USFWS, 1969	Sample et.al., 1996
Arsenic	7.38	LOAEL	mortality	chronic	brown-headed cowbird	USFWS, 1969	Sample et.al., 1996
Cadmium	1	NOAEL	reproductive	chronic	rat	Sutou et al., 1980	Sample et.al., 1996
Cadmium	10	LOAEL	reproductive	chronic	rat	Sutou et al., 1980	Sample et.al., 1996
Cadmium	1.45	NOAEL	reproductive	chronic	mallard duck	White and Finely, 1978	Sample et.al., 1996
Cadmium	20	LOAEL	reproductive	chronic	mallard duck	White and Finely, 1978	Sample et.al., 1996
Chromium(III)	1	NOAEL	reproductive	chronic	black duck	Haseltine et al., 1985	Sample et.al., 1996
Chromium(III)	5	LOAEL	reproductive	chronic	black duck	Haseltine et al., 1985	Sample et.al., 1996
Chromium(VI)	3.28	NOAEL	BW/food cons.	chronic	rat	Mackenzie et al., 1958	Sample et.al., 1996
Chromium(VI)	131.4	LOAEL	mortality	subchronic	rat	Steven et al., 1976	Sample et.al., 1996
Copper	11.71	NOAEL	reproductive	chronic	mink	Aulerich et al., 1982	ATSDR, 1989
Copper	15.14	LOAEL	reproductive	chronic	mink	Aulerich et al., 1982	ATSDR, 1989
Copper	46.97	NOAEL	mortality	chronic	chicks	Mehring et al., 1960	Sample et.al., 1996
Copper	61.72	LOAEL	mortality	chronic	chicks	Mehring et al., 1960	Sample et.al., 1996
Lead	8	NOAEL	reproductive	chronic	rat	Azar et al., 1973	Sample et.al., 1996
Lead	80	LOAEL	reproductive	chronic	rat	Azar et al., 1973	Sample et.al., 1996
Lead	1.13	NOAEL	reproductive	chronic	Japanese quail	Edens et al., 1976	Sample et.al., 1996
Lead	11.3	LOAEL	reproductive	chronic	Japanese quail	Edens et al., 1976	Sample et.al., 1996
Mercury	0.064	LOAEL	reproductive	chronic	mallard duck	Heinz, 1979	Sample et.al., 1996
Mercury	0.032	NOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Mercury	0.16	LOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Nickel	40	NOAEL	reproductive	chronic	rat	Ambrose et al., 1976	Sample et.al., 1996
Nickel	80	LOAEL	reproductive	chronic	rat	Ambrose et al., 1976	Sample et.al., 1996
Nickel	77.4	NOAEL	mortality	chronic	mallard duck	Cain and Pafford, 1981	Sample et.al., 1996
Nickel	107	LOAEL	mortality	chronic	mallard duck	Cain and Pafford, 1981	Sample et.al., 1996
Selenium	0.4	NOAEL	reproductive	chronic	mallard duck	Heinz et al., 1989	Sample et.al., 1996
Selenium	0.8	LOAEL	reproductive	chronic	mallard duck	Heinz et al., 1989	Sample et.al., 1996
Selenium	0.2	NOAEL	reproductive	chronic	rat	Rosenfeld and Beath, 1954	Sample et.al., 1996
Selenium	0.33	LOAEL	reproductive	chronic	rat	Rosenfeld and Beath, 1954	Sample et.al., 1996
Silver	54.4	LOAEL	survival	chronic	chicks	Petersen and Jensen, 1975	
Silver	23.81	LOAEL	weight loss	chronic	mouse	Rungby and Danscher, 1984	
Zinc	160	NOAEL	reproductive	chronic	rat	Schlicker and Cox, 1968	Sample et.al., 1996
Zinc	320	LOAEL	reproductive	chronic	rat	Schlicker and Cox, 1968	Sample et.al., 1996
Zinc	14.49	NOAEL	reproductive	chronic	white leghorn hen	Stahl et al., 1990	Sample et.al., 1996
Zinc	130.9	LOAEL	reproductive	chronic	white leghorn hen	Stahl et al., 1990	Sample et.al., 1996

NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level

TABLE J.4-2

MAMMALIAN TRVS USED IN THE CONSERVATIVE SCENARIO FOOD-CHAIN MODELS

Parameter	Mammals				Short-tailed Shrew		Meadow Vole		Mink	
	NOAEL	LOAEL	Test Species	Body Weight (kg)	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
EXPLOSIVES (mg/kg)										
1,3,5-Trinitrobenzene	2.64	13.31	rat	0.35	48.1	242.5	23.6	119.1	0.5	2.7
2,4,6-Trinitrotoluene	1.6	16	rat	0.35	29.15	291.5	14.3	143.2	0.3	3.2
3-Nitrotoluene	20	200	rat	0.35	364.4	3644	179.0	1790.3	4.0	40.4
HMX	3	7.5	mouse	0.03	4.7	11.7	2.3	5.8	0.1	0.1
RDX	7	35	mouse	0.03	10.9	54.7	5.4	26.9	0.1	0.6
INORGANICS (mg/kg)										
Arsenic	0.126	1.26	mouse	0.03	0.20	2.0	0.10	1.0	0.002	0.02
Cadmium	1	10	rat	0.303	15.77	157.7	7.7	77.5	0.2	1.7
Chromium	3.28	13.14	rat	0.35	59.8	239.4	29.4	117.6	0.7	2.7
Copper	11.71	15.14	mink	1	609.6	788.1	299.5	387.2	6.8	8.7
Lead	8	80	rat	0.35	145.8	1458	71.6	716.1	1.6	16.1
Mercury	0.015	0.025	mink	1	0.8	1.3	0.4	0.6	0.01	0.01
Nickel	40	80	rat	0.35	728.8	1458	358.1	716.1	8.1	16.1
Selenium	0.2	0.33	rat	0.35	3.6	6.0	1.8	3.0	0.04	0.1
Silver	1.81	18.1	mouse	0.03	2.8	28.3	1.4	13.9	0.03	0.3
Zinc	160	320	rat	0.35	2915.1	5830	1432	2864.5	32.3	64.6

Acronyms:
NA = Not Applicable or Not Available
NV = No value available
NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level

Maximum Body Weights (kg)

Shrew:	0.01921
Vole:	0.0391
Mink:	1.734

Derivation NOAEL/LOAEL Equation:
Derived NOAEL = NOAEL*(test species body weight/surrogate species maximum body weight
Derived LOAEL = LOAEL*(test species body weight/surrogate species maximum body weight)

Only the chemicals for which NOAELs and LOAELs are available are shown. Chemicals not having NOAELs and LOAELs are not included in this table.

TABLE J.4-3

MAMMALIAN TRVS USED IN THE AVERAGE EXPOSURE SCENARIO FOOD-CHAIN MODELS

Parameter	Mammals				Short-tailed Shrew		Meadow Vole		Mink	
	NOAEL	LOAEL	Test Species	Body Weight (kg)	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
EXPLOSIVES (mg/kg)										
1,3,5-Trinitrobenzene	2.64	13.44	rat	0.35	54.8	278.8	25.2	128.4	0.9	4.6
2,4,6-Trinitrotoluene	1.6	16	rat	0.35	33.2	332.0	15.3	152.9	0.5	5.5
3-Nitrotoluene	20	200	rat	0.35	414.9	4149	191.1	1911	6.9	68.6
HMX	3	7.5	mouse	0.03	5.3	13.3	2.5	6.1	0.1	0.2
RDX	7	35	mouse	0.03	12.4	62.2	5.7	28.7	0.2	1.0
INORGANICS (mg/kg)										
Arsenic	0.126	1.26	mouse	0.03	0.22	2.2	0.10	1.0	0.004	0.04
Cadmium	1	10	rat	0.303	18.0	179.6	8.3	82.7	0.3	3.0
Chromium	3.28	13.14	rat	0.35	68.0	272.6	31.3	125.6	1.1	4.5
Copper	11.71	15.14	mink	1	694.1	897.5	319.7	413.3	11.5	14.8
Lead	8	80	rat	0.35	166.0	1660	76.4	764	2.7	27.5
Mercury	0.015	0.025	mink	1	0.89	1.48	0.41	0.68	0.0	0.0
Nickel	40	80	rat	0.35	829.9	1660	382.2	764	13.7	27.5
Selenium	0.2	0.33	rat	0.35	4.15	6.85	1.91	3.15	0.1	0.1
Silver	1.81	18.1	mouse	0.03	3.2	32.2	1.5	14.8	0.1	0.5
Zinc	160	320	rat	0.35	3320	6639	1529	3058	54.9	109.8

Acronyms:
NA = Not Applicable or Not Available
NV = No value available
NOAEL = No Observed Adverse Effect Level
LOAEL = Lowest Observed Adverse Effect Level

Average Body Weights (kg)

Shrew:	0.01687
Vole:	0.03663
Mink:	1.02

Derivation NOAEL/LOAEL Equation:
Derived NOAEL = NOAEL*(test species body weight/surrogate species average body weight)
Derived LOAEL = LOAEL*(test species body weight/surrogate species average body weight)

Only the chemicals for which NOAELs and LOAELs are available are shown. Chemicals not having NOAELs and LOAELs are not included in this table.

MINK - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Sediment Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (sed to inv.)[1]	Fish Concentration (mg/kg)	Dose (mg/kg/day) from: Sediment	Surface Water	Fish	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
ARSENIC	2.78E+01	0.00E+00	6.90E-01	1.92E+01	7.18E-02	0.00E+00	1.15E+00	1.22E+00	2.07E-03	2.07E-02	5.90E+02	5.90E+01
CHROMIUM	7.04E+01	0.00E+00	4.68E-01	3.29E+01	1.82E-01	0.00E+00	1.98E+00	2.16E+00	6.30E-01	2.52E+00	3.43E+00	8.56E-01
LEAD	3.96E+01	0.00E+00	6.07E-01	2.40E+01	1.02E-01	0.00E+00	1.44E+00	1.55E+00	1.54E+00	1.54E+01	1.01E+00	1.01E-01
NICKEL	5.21E+01	1.70E-03	2.32E+00	1.21E+02	1.35E-01	9.93E-05	7.26E+00	7.40E+00	7.68E+00	1.54E+01	9.63E-01	4.81E-01
SELENIUM	1.60E-01	0.00E+00	1.00E+00	1.60E-01	4.13E-04	0.00E+00	9.61E-03	1.00E-02	3.84E-02	6.34E-02	2.61E-01	1.58E-01

Cells are shaded if the EEQ is greater than 1.0.
1- The sediment to invertebrate BAF was used for metals because no sediment to fish BAFs were available for metals.

Body Weight = (BW)	8.730E-01	kg
Food Ingestion Rate = (If)	5.245E-02	kg/day
Water Ingestion Rate = (Iw)	5.100E-02	L/day
Sediment Ingestion Rate = (Is)	2.255E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Cf = Contaminant conc. in fish (=sediment concentration * Biotransfer Factor)

Dose (sediment) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Total Dose = Dose (sediment) + Dose (surface water) + Dose (fish)

MINK - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Sediment Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (sed to inv.)[1]	Fish Concentration (mg/kg)	Dose (mg/kg/day) from: Sediment	Surface Water	Fish	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
ARSENIC	1.24E+01	0.00E+00	1.43E-01	1.78E+00	5.55E-03	0.00E+00	6.10E-02	6.66E-02	2.80E-03	2.80E-02	2.38E+01	2.38E+00
CHROMIUM	3.14E+01	0.00E+00	1.00E-01	3.14E+00	1.40E-02	0.00E+00	1.08E-01	1.22E-01	8.50E-01	3.41E+00	1.43E-01	3.58E-02
LEAD	1.99E+01	0.00E+00	7.10E-02	1.41E+00	8.86E-03	0.00E+00	4.84E-02	5.73E-02	2.07E+00	2.07E+01	2.76E-02	2.76E-03
NICKEL	2.55E+01	8.75E-04	4.86E-01	1.24E+01	1.14E-02	2.45E-05	4.25E-01	4.37E-01	1.04E+01	2.07E+01	4.21E-02	2.11E-02
SELENIUM	1.60E-01	0.00E+00	1.00E+00	1.60E-01	7.14E-05	0.00E+00	5.49E-03	5.56E-03	5.19E-02	8.56E-02	1.07E-01	6.50E-02

Cells are shaded if the EEQ is greater than 1.0.
1- The sediment to invertebrate BAF was used for metals because no sediment to fish BAFs were available for metals.

Body Weight = (BW)	1.351E+00	kg
Food Ingestion Rate = (If)	4.638E-02	kg/day
Water Ingestion Rate = (Iw)	3.780E-02	L/day
Sediment Ingestion Rate = (Is)	6.029E-04	kg/day
Home Range = (HR)	3.484E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Cf = Contaminant conc. in fish (=sediment concentration * Biotransfer Factor)

Dose (sediment) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Total Dose = Dose (sediment) + Dose (surface water) + Dose (fish)

AMERICAN WOODCOCK - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.26E+00	9.60E-04	1.00E+00	5.26E+00	1.58E-01	1.10E-04	9.61E-01	1.12E+00	NV	NV	#VALUE!	#VALUE!
2,4,6-TRINITROTOLUENE	7.93E+02	7.90E-02	1.00E+00	7.93E+02	2.38E+01	9.04E-03	1.45E+02	1.69E+02	7.00E+00	1.78E+02	2.41E+01	9.47E-01
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	1.60E-03	#N/A	#N/A	0.00E+00	1.83E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	2.70E-04	#N/A	#N/A	0.00E+00	3.09E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-AMINO-4,6-DINITROTOLUENE	1.28E+00	1.90E-02	1.00E+00	1.28E+00	3.83E-02	2.17E-03	2.34E-01	2.74E-01	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	0.00E+00	7.10E-04	1.00E+00	0.00E+00	0.00E+00	8.13E-05	0.00E+00	8.13E-05	NV	NV	#VALUE!	#VALUE!
4-AMINO-2,6-DINITROTOLUENE	5.80E+00	7.40E-02	1.00E+00	5.80E+00	1.74E-01	8.47E-03	1.06E+00	1.24E+00	NV	NV	#VALUE!	#VALUE!
HMX	7.52E+02	9.80E-02	1.00E+00	7.52E+02	2.25E+01	1.12E-02	1.37E+02	1.60E+02	NV	NV	#VALUE!	#VALUE!
MNX	0.00E+00	1.90E-03	#N/A	#N/A	0.00E+00	2.17E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
RDX	5.94E+03	1.40E-01	1.00E+00	5.94E+03	1.78E+02	1.60E-02	1.08E+03	1.26E+03	2.23E+00	2.63E+00	5.66E+02	4.80E+02
Inorganics												
ARSENIC	5.73E+01	2.03E-02	5.23E-01	3.00E+01	1.72E+00	2.32E-03	5.47E+00	7.19E+00	2.46E+00	7.38E+00	2.92E+00	9.75E-01
CADMIUM	2.40E+00	4.37E-02	4.07E+01	9.77E+01	7.19E-02	5.00E-03	1.78E+01	1.79E+01	1.45E+00	2.00E+01	1.24E+01	8.96E-01
CHROMIUM	6.00E+01	1.05E-01	3.16E+00	1.90E+02	1.80E+00	1.20E-02	3.47E+01	3.65E+01	1.00E+00	5.00E+00	3.65E+01	7.29E+00
COPPER	0.00E+00	1.65E+00	1.53E+00	0.00E+00	0.00E+00	1.89E-01	0.00E+00	1.89E-01	4.70E+01	6.17E+01	4.02E-03	3.06E-03
LEAD	7.10E+01	4.58E-01	1.52E+00	1.08E+02	2.13E+00	5.24E-02	1.97E+01	2.19E+01	1.13E+00	1.13E+01	1.94E+01	1.94E+00
MERCURY	1.60E-01	1.70E-03	2.06E+01	3.30E+00	4.79E-03	1.95E-04	6.03E-01	6.08E-01	6.40E-03	6.40E-02	9.50E+01	9.50E+00
NICKEL	0.00E+00	1.40E-01	4.73E+00	0.00E+00	0.00E+00	1.60E-02	0.00E+00	1.60E-02	7.74E+01	1.07E+02	2.07E-04	1.50E-04
SELENIUM	1.40E+00	9.60E-03	1.34E+00	1.88E+00	4.19E-02	1.10E-03	3.43E-01	3.86E-01	4.00E-01	8.00E-01	9.64E-01	4.82E-01
SILVER	1.40E-01	2.60E-03	1.53E+01	2.15E+00	4.19E-03	2.98E-04	3.92E-01	3.97E-01	NV	NV	#VALUE!	#VALUE!
ZINC	0.00E+00	5.22E+00	1.29E+01	0.00E+00	0.00E+00	5.97E-01	0.00E+00	5.97E-01	1.45E+01	1.31E+02	4.12E-02	4.56E-03

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	1.660E-01	kg
Food Ingestion Rate = (If)	3.032E-02	kg/day
Water Ingestion Rate = (Iw)	1.900E-02	L/day
Soil Ingestion Rate = (Is)	4.972E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

AMERICAN WOODCOCK - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.96E-01	1.48E-04	1.00E+00	5.96E-01	5.09E-03	1.49E-05	7.95E-02	8.46E-02	NV	NV	#VALUE!	#VALUE!
2,4,6-TRINITROTOLUENE	5.88E+00	3.08E-03	1.00E+00	5.88E+00	5.01E-02	3.08E-04	7.83E-01	8.34E-01	7.00E+00	1.78E+02	1.19E-01	4.68E-03
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	2.17E-04	#N/A	#N/A	0.00E+00	2.18E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	1.31E-04	#N/A	#N/A	0.00E+00	1.31E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-AMINO-4,6-DINITROTOLUENE	1.23E+00	1.34E-03	1.00E+00	1.23E+00	1.05E-02	1.34E-04	1.63E-01	1.74E-01	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	5.46E-01	1.42E-04	1.00E+00	5.46E-01	4.66E-03	1.43E-05	7.28E-02	7.75E-02	NV	NV	#VALUE!	#VALUE!
4-AMINO-2,6-DINITROTOLUENE	1.27E+00	3.65E-03	1.00E+00	1.27E+00	1.08E-02	3.66E-04	1.69E-01	1.80E-01	NV	NV	#VALUE!	#VALUE!
HMX	1.11E+01	8.08E-03	1.00E+00	1.11E+01	9.50E-02	8.10E-04	1.48E+00	1.58E+00	NV	NV	#VALUE!	#VALUE!
MNX	0.00E+00	3.10E-04	#N/A	#N/A	0.00E+00	3.11E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
RDX	6.28E+01	1.53E-02	1.00E+00	6.28E+01	5.35E-01	1.53E-03	8.37E+00	8.90E+00	2.23E+00	2.63E+00	3.99E+00	3.39E+00
Inorganics												
ARSENIC	9.81E+00	2.58E-03	2.24E-01	2.20E+00	8.37E-02	2.59E-04	2.93E-01	3.77E-01	2.46E+00	7.38E+00	1.53E-01	5.11E-02
CADMIUM	2.03E-01	1.67E-03	7.71E+00	1.56E+00	1.73E-03	1.67E-04	2.09E-01	2.11E-01	1.45E+00	2.00E+01	1.45E-01	1.05E-02
CHROMIUM	1.84E+01	4.90E-03	3.06E-01	5.62E+00	1.57E-01	4.91E-04	7.49E-01	9.06E-01	1.00E+00	5.00E+00	9.06E-01	1.81E-01
COPPER	0.00E+00	4.85E-02	5.15E-01	0.00E+00	0.00E+00	4.86E-03	0.00E+00	4.86E-03	4.70E+01	6.17E+01	1.04E-04	7.88E-05
LEAD	1.90E+01	4.20E-02	2.66E-01	5.05E+00	1.62E-01	4.21E-03	6.73E-01	8.39E-01	1.13E+00	1.13E+01	7.42E-01	7.42E-02
MERCURY	3.80E-02	6.65E-05	1.69E+00	6.43E-02	3.24E-04	6.67E-06	8.58E-03	8.91E-03	6.40E-03	6.40E-02	1.39E+00	1.39E-01
NICKEL	0.00E+00	9.05E-03	1.06E+00	0.00E+00	0.00E+00	9.07E-04	0.00E+00	9.07E-04	7.74E+01	1.07E+02	1.17E-05	8.48E-06
SELENIUM	1.78E+00	5.07E-04	9.85E-01	1.75E+00	1.52E-02	5.08E-05	2.34E-01	2.49E-01	4.00E-01	8.00E-01	6.22E-01	3.11E-01
SILVER	1.64E-01	8.34E-05	2.05E+00	3.35E-01	1.40E-03	8.36E-06	4.47E-02	4.61E-02	NV	NV	#VALUE!	#VALUE!
ZINC	0.00E+00	1.58E-01	3.20E+00	0.00E+00	0.00E+00	1.58E-02	0.00E+00	1.58E-02	1.45E+01	1.31E+02	1.09E-03	1.21E-04

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	1.895E-01	kg
Food Ingestion Rate = (If)	2.526E-02	kg/day
Water Ingestion Rate = (Iw)	1.900E-02	L/day
Soil Ingestion Rate = (Is)	1.617E-03	kg/day
Home Range = (HR)	6.133E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

BOBWHITE QUAIL - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.26E+00	9.60E-04	7.70E+00	4.05E+01	1.11E-02	1.37E-04	6.15E-01	6.26E-01	NV	NV	#VALUE!	#VALUE!
2,4,6-TRINITROTOLUENE	7.93E+02	7.90E-02	1.80E+00	1.43E+03	1.67E+00	1.13E-02	2.17E+01	2.34E+01	7.00E+00	1.78E+02	3.34E+00	1.31E-01
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	1.60E-03	1.00E+00	0.00E+00	0.00E+00	2.28E-04	0.00E+00	2.28E-04	NV	NV	#VALUE!	#VALUE!
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	2.70E-04	1.00E+00	0.00E+00	0.00E+00	3.85E-05	0.00E+00	3.85E-05	NV	NV	#VALUE!	#VALUE!
2-AMINO-4,6-DINITROTOLUENE	1.28E+00	1.90E-02	1.00E+00	1.28E+00	2.70E-03	2.71E-03	1.94E-02	2.48E-02	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	0.00E+00	7.10E-04	1.50E+00	0.00E+00	0.00E+00	1.01E-04	0.00E+00	1.01E-04	NV	NV	#VALUE!	#VALUE!
4-AMINO-2,6-DINITROTOLUENE	5.80E+00	7.40E-02	1.00E+00	5.80E+00	1.22E-02	1.06E-02	8.81E-02	1.11E-01	NV	NV	#VALUE!	#VALUE!
HMX	7.52E+02	9.80E-02	1.70E+01	1.28E+04	1.59E+00	1.40E-02	1.94E+02	1.96E+02	NV	NV	#VALUE!	#VALUE!
MNX	0.00E+00	1.90E-03	1.00E+00	0.00E+00	0.00E+00	2.71E-04	0.00E+00	2.71E-04	NV	NV	#VALUE!	#VALUE!
RDX	5.94E+03	1.40E-01	4.60E-01	2.73E+03	1.25E+01	2.00E-02	4.15E+01	5.40E+01	2.23E+00	2.63E+00	2.42E+01	2.06E+01
Inorganics												
ARSENIC	5.73E+01	2.03E-02	1.10E+00	6.32E+01	1.21E-01	2.89E-03	9.60E-01	1.08E+00	2.46E+00	7.38E+00	4.40E-01	1.47E-01
CADMIUM	2.40E+00	4.37E-02	3.25E+00	7.80E+00	5.07E-03	6.23E-03	1.18E-01	1.30E-01	1.45E+00	2.00E+01	8.95E-02	6.49E-03
CHROMIUM	6.00E+01	1.05E-01	8.39E-02	5.03E+00	1.27E-01	1.50E-02	7.64E-02	2.18E-01	1.00E+00	5.00E+00	2.18E-01	4.36E-02
COPPER	0.00E+00	1.65E+00	6.25E-01	0.00E+00	0.00E+00	2.35E-01	0.00E+00	2.35E-01	4.70E+01	6.17E+01	5.01E-03	3.81E-03
LEAD	7.10E+01	4.58E-01	4.68E-01	3.32E+01	1.50E-01	6.53E-02	5.05E-01	7.20E-01	1.13E+00	1.13E+01	6.37E-01	6.37E-02
MERCURY	1.60E-01	1.70E-03	5.00E+00	8.00E-01	3.38E-04	2.42E-04	1.21E-02	1.27E-02	6.40E-03	6.40E-02	1.99E+00	1.99E-01
NICKEL	0.00E+00	1.40E-01	1.41E+00	0.00E+00	0.00E+00	2.00E-02	0.00E+00	2.00E-02	7.74E+01	1.07E+02	2.58E-04	1.87E-04
SELENIUM	1.40E+00	9.60E-03	3.01E+00	4.22E+00	2.96E-03	1.37E-03	6.40E-02	6.84E-02	4.00E-01	8.00E-01	1.71E-01	8.54E-02
SILVER	1.40E-01	2.60E-03	3.67E-02	5.14E-03	2.96E-04	3.71E-04	7.80E-05	7.44E-04	NV	NV	#VALUE!	#VALUE!
ZINC	0.00E+00	5.22E+00	1.82E+00	0.00E+00	0.00E+00	7.44E-01	0.00E+00	7.44E-01	1.45E+01	1.31E+02	5.14E-02	5.69E-03

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	1.620E-01	kg
Food Ingestion Rate = (If)	2.460E-03	kg/day
Water Ingestion Rate = (Iw)	2.310E-02	L/day
Soil Ingestion Rate = (Is)	3.419E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

BOBWHITE QUAIL - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.96E-01	1.48E-04	7.70E+00	4.59E+00	4.44E-04	1.54E-05	5.60E-02	5.65E-02	NV	NV	#VALUE!	#VALUE!
2,4,6-TRINITROTOLUENE	5.88E+00	3.08E-03	1.80E+00	1.06E+01	4.37E-03	3.20E-04	1.29E-01	1.34E-01	7.00E+00	1.78E+02	1.91E-02	7.51E-04
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	2.17E-04	#N/A	#N/A	0.00E+00	2.26E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	1.31E-04	#N/A	#N/A	0.00E+00	1.36E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-AMINO-4,6-DINITROTOLUENE	1.23E+00	1.34E-03	0.00E+00	0.00E+00	9.12E-04	1.39E-04	0.00E+00	1.05E-03	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	5.46E-01	1.42E-04	1.50E+00	8.19E-01	4.06E-04	1.48E-05	9.99E-03	1.04E-02	NV	NV	#VALUE!	#VALUE!
4-AMINO-2,6-DINITROTOLUENE	1.27E+00	3.65E-03	0.00E+00	0.00E+00	9.45E-04	3.80E-04	0.00E+00	1.32E-03	NV	NV	#VALUE!	#VALUE!
HMX	1.11E+01	8.08E-03	1.70E+01	1.89E+02	8.29E-03	8.40E-04	2.31E+00	2.32E+00	NV	NV	#VALUE!	#VALUE!
MNX	0.00E+00	3.10E-04	#N/A	#N/A	0.00E+00	3.23E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
RDX	6.28E+01	1.53E-02	4.60E-01	2.89E+01	4.67E-02	1.59E-03	3.52E-01	4.01E-01	2.23E+00	2.63E+00	1.80E-01	1.52E-01
Inorganics												
ARSENIC	9.81E+00	2.58E-03	3.75E-02	3.68E-01	7.31E-03	2.68E-04	4.49E-03	1.21E-02	2.46E+00	7.38E+00	4.90E-03	1.63E-03
CADMIUM	2.03E-01	1.67E-03	5.86E-01	1.19E-01	1.51E-04	1.74E-04	1.45E-03	1.78E-03	1.45E+00	2.00E+01	1.23E-03	8.88E-05
CHROMIUM	1.84E+01	4.90E-03	4.10E-02	7.53E-01	1.37E-02	5.09E-04	9.19E-03	2.34E-02	1.00E+00	5.00E+00	2.34E-02	4.67E-03
COPPER	0.00E+00	4.85E-02	1.24E-01	0.00E+00	0.00E+00	5.04E-03	0.00E+00	5.04E-03	4.70E+01	6.17E+01	1.07E-04	8.17E-05
LEAD	1.90E+01	4.20E-02	3.89E-02	7.38E-01	1.41E-02	4.37E-03	9.01E-03	2.75E-02	1.13E+00	1.13E+01	2.43E-02	2.43E-03
MERCURY	3.80E-02	6.65E-05	6.52E-01	2.48E-02	2.83E-05	6.91E-06	3.02E-04	3.38E-04	6.40E-03	6.40E-02	5.27E-02	5.27E-03
NICKEL	0.00E+00	9.05E-03	1.80E-02	0.00E+00	0.00E+00	9.41E-04	0.00E+00	9.41E-04	7.74E+01	1.07E+02	1.22E-05	8.79E-06
SELENIUM	1.78E+00	5.07E-04	6.72E-01	1.20E+00	1.33E-03	5.27E-05	1.46E-02	1.60E-02	4.00E-01	8.00E-01	3.99E-02	2.00E-02
SILVER	1.64E-01	8.34E-05	1.40E-02	2.30E-03	1.22E-04	8.67E-06	2.80E-05	1.59E-04	NV	NV	#VALUE!	#VALUE!
ZINC	0.00E+00	1.58E-01	3.66E-01	0.00E+00	0.00E+00	1.64E-02	0.00E+00	1.64E-02	1.45E+01	1.31E+02	1.13E-03	1.25E-04

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	1.770E-01	kg
Food Ingestion Rate = (If)	2.160E-03	kg/day
Water Ingestion Rate = (Iw)	1.840E-02	L/day
Soil Ingestion Rate = (Is)	1.318E-04	kg/day
Home Range = (HR)	2.860E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

SHORT-TAILED SHREW - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.26E+00	9.60E-04	1.00E+00	5.26E+00	2.68E-02	2.71E-04	8.94E-01	9.21E-01	4.81E+01	2.43E+02	1.92E-02	3.80E-03
2,4,6-TRINITROTOLUENE	7.93E+02	7.90E-02	1.00E+00	7.93E+02	4.04E+00	2.23E-02	1.35E+02	1.39E+02	2.92E+01	2.92E+02	4.76E+00	4.76E-01
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	1.60E-03	1.00E+00	0.00E+00	0.00E+00	4.51E-04	0.00E+00	4.51E-04	NV	NV	#VALUE!	#VALUE!
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	2.70E-04	1.00E+00	0.00E+00	0.00E+00	7.61E-05	0.00E+00	7.61E-05	NV	NV	#VALUE!	#VALUE!
2-AMINO-4,6-DINITROTOLUENE	1.28E+00	1.90E-02	1.00E+00	1.28E+00	6.53E-03	5.36E-03	2.18E-01	2.29E-01	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	0.00E+00	7.10E-04	1.00E+00	0.00E+00	0.00E+00	2.00E-04	0.00E+00	2.00E-04	3.64E+02	3.64E+03	5.49E-07	5.49E-08
4-AMINO-2,6-DINITROTOLUENE	5.80E+00	7.40E-02	1.00E+00	5.80E+00	2.96E-02	2.09E-02	9.86E-01	1.04E+00	NV	NV	#VALUE!	#VALUE!
HMX	7.52E+02	9.80E-02	1.00E+00	7.52E+02	3.83E+00	2.76E-02	1.28E+02	1.32E+02	4.69E+00	1.17E+01	2.81E+01	1.12E+01
MNX	0.00E+00	1.90E-03	1.00E+00	0.00E+00	0.00E+00	5.36E-04	0.00E+00	5.36E-04	NV	NV	#VALUE!	#VALUE!
RDX	5.94E+03	1.40E-01	1.00E+00	5.94E+03	3.03E+01	3.95E-02	1.01E+03	1.04E+03	1.09E+01	5.47E+01	9.51E+01	1.90E+01
Inorganics												
ARSENIC	5.73E+01	2.03E-02	5.23E-01	3.00E+01	2.92E-01	5.72E-03	5.09E+00	5.39E+00	1.97E-01	1.97E+00	2.74E+01	2.74E+00
CADMIUM	2.40E+00	4.37E-02	4.07E+01	9.77E+01	1.22E-02	1.23E-02	1.66E+01	1.66E+01	1.58E+01	1.58E+02	1.05E+00	1.05E-01
CHROMIUM	6.00E+01	1.05E-01	3.16E+00	1.90E+02	3.06E-01	2.96E-02	3.22E+01	3.26E+01	5.98E+01	2.39E+02	5.45E-01	1.36E-01
COPPER	0.00E+00	1.65E+00	1.53E+00	0.00E+00	0.00E+00	4.65E-01	0.00E+00	4.65E-01	6.10E+02	7.88E+02	7.63E-04	5.90E-04
LEAD	7.10E+01	4.58E-01	1.52E+00	1.08E+02	3.62E-01	1.29E-01	1.84E+01	1.89E+01	1.46E+02	1.46E+03	1.29E-01	1.29E-02
MERCURY	1.60E-01	1.70E-03	2.06E+01	3.30E+00	8.16E-04	4.79E-04	5.61E-01	5.62E-01	7.81E-01	1.30E+00	7.20E-01	4.32E-01
NICKEL	0.00E+00	1.40E-01	4.73E+00	0.00E+00	0.00E+00	3.95E-02	0.00E+00	3.95E-02	7.29E+02	1.46E+03	5.42E-05	2.71E-05
SELENIUM	1.40E+00	9.60E-03	1.34E+00	1.88E+00	7.14E-03	2.71E-03	3.19E-01	3.29E-01	3.64E+00	6.01E+00	9.02E-02	5.47E-02
SILVER	1.40E-01	2.60E-03	1.53E+01	2.15E+00	7.14E-04	7.33E-04	3.65E-01	3.66E-01	2.83E+00	2.83E+01	1.30E-01	1.30E-02
ZINC	0.00E+00	5.22E+00	1.29E+01	0.00E+00	0.00E+00	1.47E+00	0.00E+00	1.47E+00	2.92E+03	5.83E+03	5.05E-04	2.52E-04

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	1.525E-02	kg
Food Ingestion Rate = (If)	2.592E-03	kg/day
Water Ingestion Rate = (Iw)	4.300E-03	L/day
Soil Ingestion Rate = (Is)	7.776E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

SHORT-TAILED SHREW - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.96E-01	1.48E-04	1.00E+00	5.96E-01	5.24E-04	3.34E-05	5.82E-02	5.88E-02	5.48E+01	2.79E+02	1.07E-03	2.11E-04
2,4,6-TRINITROTOLUENE	5.88E+00	3.08E-03	1.00E+00	5.88E+00	5.17E-03	6.93E-04	5.74E-01	5.80E-01	3.32E+01	3.32E+02	1.75E-02	1.75E-03
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	2.17E-04	#N/A	#N/A	0.00E+00	4.89E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	1.31E-04	#N/A	#N/A	0.00E+00	2.94E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-AMINO-4,6-DINITROTOLUENE	1.23E+00	1.34E-03	1.00E+00	1.23E+00	1.08E-03	3.02E-04	1.20E-01	1.21E-01	#VALUE!	#VALUE!	#VALUE!	#VALUE!
3-NITROTOLUENE	5.46E-01	1.42E-04	1.00E+00	5.46E-01	4.80E-04	3.20E-05	5.33E-02	5.38E-02	4.15E+02	4.15E+03	1.30E-04	1.30E-05
4-AMINO-2,6-DINITROTOLUENE	1.27E+00	3.65E-03	1.00E+00	1.27E+00	1.12E-03	8.23E-04	1.24E-01	1.26E-01	#VALUE!	#VALUE!	#VALUE!	#VALUE!
HMX	1.11E+01	8.08E-03	1.00E+00	1.11E+01	9.79E-03	1.82E-03	1.09E+00	1.10E+00	5.33E+00	1.33E+01	2.06E-01	8.24E-02
MNX	0.00E+00	3.10E-04	#N/A	#N/A	0.00E+00	6.99E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
RDX	6.28E+01	1.53E-02	1.00E+00	6.28E+01	5.52E-02	3.44E-03	6.13E+00	6.19E+00	1.24E+01	6.22E+01	4.97E-01	9.94E-02
Inorganics												
ARSENIC	9.81E+00	2.58E-03	2.24E-01	2.20E+00	8.63E-03	5.81E-04	2.15E-01	2.24E-01	2.24E-01	2.24E+00	1.00E+00	1.00E-01
CADMIUM	2.03E-01	1.67E-03	7.71E+00	1.56E+00	1.78E-04	3.76E-04	1.53E-01	1.53E-01	1.80E+01	1.80E+02	8.54E-03	8.54E-04
CHROMIUM	1.84E+01	4.90E-03	3.06E-01	5.62E+00	1.61E-02	1.10E-03	5.49E-01	5.66E-01	6.80E+01	2.73E+02	8.32E-03	2.08E-03
COPPER	0.00E+00	4.85E-02	5.15E-01	0.00E+00	0.00E+00	1.09E-02	0.00E+00	1.09E-02	6.94E+02	8.97E+02	1.57E-05	1.22E-05
LEAD	1.90E+01	4.20E-02	2.66E-01	5.05E+00	1.67E-02	9.46E-03	4.93E-01	5.19E-01	1.66E+02	1.66E+03	3.13E-03	3.13E-04
MERCURY	3.80E-02	6.65E-05	1.69E+00	6.43E-02	3.34E-05	1.50E-05	6.28E-03	6.33E-03	8.89E-01	1.48E+00	7.12E-03	4.27E-03
NICKEL	0.00E+00	9.05E-03	1.06E+00	0.00E+00	0.00E+00	2.04E-03	0.00E+00	2.04E-03	8.30E+02	1.66E+03	2.46E-06	1.23E-06
SELENIUM	1.78E+00	5.07E-04	9.85E-01	1.75E+00	1.56E-03	1.14E-04	1.71E-01	1.73E-01	4.15E+00	6.85E+00	4.17E-02	2.53E-02
SILVER	1.64E-01	8.34E-05	2.05E+00	3.35E-01	1.44E-04	1.88E-05	3.28E-02	3.29E-02	3.22E+00	3.22E+01	1.02E-02	1.02E-03
ZINC	0.00E+00	1.58E-01	3.20E+00	0.00E+00	0.00E+00	3.56E-02	0.00E+00	3.56E-02	3.32E+03	6.64E+03	1.07E-05	5.36E-06

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	1.687E-02	kg
Food Ingestion Rate = (If)	1.648E-03	kg/day
Water Ingestion Rate = (Iw)	3.800E-03	L/day
Soil Ingestion Rate = (Is)	1.483E-05	kg/day
Home Range = (HR)	9.700E-01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

MEADOW VOLE - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.26E+00	9.60E-04	7.70E+00	4.05E+01	9.82E-03	2.25E-04	2.36E+00	2.37E+00	2.36E+01	1.19E+02	1.00E-01	1.99E-02
2,4,6-TRINITROTOLUENE	7.93E+02	7.90E-02	1.80E+00	1.43E+03	1.48E+00	1.85E-02	8.33E+01	8.48E+01	1.43E+01	1.43E+02	5.92E+00	5.92E-01
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	1.60E-03	1.00E+00	0.00E+00	0.00E+00	3.74E-04	0.00E+00	3.74E-04	NV	NV	#VALUE!	#VALUE!
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	2.70E-04	1.00E+00	0.00E+00	0.00E+00	6.32E-05	0.00E+00	6.32E-05	NV	NV	#VALUE!	#VALUE!
2-AMINO-4,6-DINITROTOLUENE	1.28E+00	1.90E-02	1.00E+00	1.28E+00	2.39E-03	4.45E-03	7.47E-02	8.15E-02	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	0.00E+00	7.10E-04	1.50E+00	0.00E+00	0.00E+00	1.66E-04	0.00E+00	1.66E-04	1.79E+02	1.79E+03	9.28E-07	9.28E-08
4-AMINO-2,6-DINITROTOLUENE	5.80E+00	7.40E-02	1.00E+00	5.80E+00	1.08E-02	1.73E-02	3.38E-01	3.67E-01	NV	NV	#VALUE!	#VALUE!
HMX	7.52E+02	9.80E-02	1.70E+01	1.28E+04	1.40E+00	2.29E-02	7.46E+02	7.47E+02	2.30E+00	5.75E+00	3.25E+02	1.30E+02
MNX	0.00E+00	1.90E-03	1.00E+00	0.00E+00	0.00E+00	4.45E-04	0.00E+00	4.45E-04	NV	NV	#VALUE!	#VALUE!
RDX	5.94E+03	1.40E-01	4.60E-01	2.73E+03	1.11E+01	3.28E-02	1.59E+02	1.71E+02	5.37E+00	2.69E+01	3.18E+01	6.35E+00
Inorganics												
ARSENIC	5.73E+01	2.03E-02	1.10E+00	6.32E+01	1.07E-01	4.75E-03	3.69E+00	3.80E+00	9.67E-02	9.67E-01	3.93E+01	3.93E+00
CADMIUM	2.40E+00	4.37E-02	3.25E+00	7.80E+00	4.48E-03	1.02E-02	4.55E-01	4.70E-01	7.75E+00	7.75E+01	6.06E-02	6.06E-03
CHROMIUM	6.00E+01	1.05E-01	8.39E-02	5.03E+00	1.12E-01	2.46E-02	2.94E-01	4.30E-01	2.94E+01	1.18E+02	1.47E-02	3.66E-03
COPPER	0.00E+00	1.65E+00	6.25E-01	0.00E+00	0.00E+00	3.86E-01	0.00E+00	3.86E-01	2.99E+02	3.87E+02	1.29E-03	9.97E-04
LEAD	7.10E+01	4.58E-01	4.68E-01	3.32E+01	1.33E-01	1.07E-01	1.94E+00	2.18E+00	7.16E+01	7.16E+02	3.04E-02	3.04E-03
MERCURY	1.60E-01	1.70E-03	5.00E+00	8.00E-01	2.99E-04	3.98E-04	4.67E-02	4.74E-02	3.84E-01	6.39E-01	1.24E-01	7.41E-02
NICKEL	0.00E+00	1.40E-01	1.41E+00	0.00E+00	0.00E+00	3.28E-02	0.00E+00	3.28E-02	3.58E+02	7.16E+02	9.15E-05	4.58E-05
SELENIUM	1.40E+00	9.60E-03	3.01E+00	4.22E+00	2.61E-03	2.25E-03	2.46E-01	2.51E-01	1.79E+00	2.95E+00	1.40E-01	8.50E-02
SILVER	1.40E-01	2.60E-03	3.67E-02	5.14E-03	2.61E-04	6.09E-04	3.00E-04	1.17E-03	1.39E+00	1.39E+01	8.42E-04	8.42E-05
ZINC	0.00E+00	5.22E+00	1.82E+00	0.00E+00	0.00E+00	1.22E+00	0.00E+00	1.22E+00	1.43E+03	2.86E+03	8.53E-04	4.27E-04

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	3.290E-02	kg
Food Ingestion Rate = (If)	1.920E-03	kg/day
Water Ingestion Rate = (Iw)	7.700E-03	L/day
Soil Ingestion Rate = (Is)	6.144E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

MEADOW VOLE - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	5.96E-01	1.48E-04	7.70E+00	4.59E+00	3.49E-04	2.59E-05	2.24E-01	2.24E-01	2.52E+01	1.28E+02	8.88E-03	1.74E-03
2,4,6-TRINITROTOLUENE	5.88E+00	3.08E-03	1.80E+00	1.06E+01	3.44E-03	5.38E-04	5.15E-01	5.19E-01	1.53E+01	1.53E+02	3.40E-02	3.40E-03
2,4-DIAMINO-6-NITROTOLUENE	0.00E+00	2.17E-04	1.00E+00	0.00E+00	0.00E+00	3.79E-05	0.00E+00	3.79E-05	NV	NV	#VALUE!	#VALUE!
2,6-DIAMINO-4-NITROTOLUENE	0.00E+00	1.31E-04	1.00E+00	0.00E+00	0.00E+00	2.28E-05	0.00E+00	2.28E-05	NV	NV	#VALUE!	#VALUE!
2-AMINO-4,6-DINITROTOLUENE	1.23E+00	1.34E-03	1.00E+00	1.23E+00	7.16E-04	2.34E-04	5.97E-02	6.06E-02	NV	NV	#VALUE!	#VALUE!
3-NITROTOLUENE	5.46E-01	1.42E-04	1.50E+00	8.19E-01	3.19E-04	2.48E-05	3.99E-02	4.03E-02	1.91E+02	1.91E+03	2.11E-04	2.11E-05
4-AMINO-2,6-DINITROTOLUENE	1.27E+00	3.65E-03	1.00E+00	1.27E+00	7.42E-04	6.39E-04	6.18E-02	6.32E-02	NV	NV	#VALUE!	#VALUE!
HMX	1.11E+01	8.08E-03	1.70E+01	1.89E+02	6.51E-03	1.41E-03	9.22E+00	9.23E+00	2.46E+00	6.14E+00	3.76E+00	1.50E+00
MNX	0.00E+00	3.10E-04	1.00E+00	0.00E+00	0.00E+00	5.42E-05	0.00E+00	5.42E-05	NV	NV	#VALUE!	#VALUE!
RDX	6.28E+01	1.53E-02	4.60E-01	2.89E+01	3.67E-02	2.67E-03	1.41E+00	1.45E+00	5.73E+00	2.87E+01	2.52E-01	5.05E-02
Inorganics												
ARSENIC	9.81E+00	2.58E-03	3.75E-02	3.68E-01	5.74E-03	4.51E-04	1.79E-02	2.41E-02	1.03E-01	1.03E+00	2.34E-01	2.34E-02
CADMIUM	2.03E-01	1.67E-03	5.86E-01	1.19E-01	1.19E-04	2.92E-04	5.80E-03	6.21E-03	8.27E+00	8.27E+01	7.50E-04	7.50E-05
CHROMIUM	1.84E+01	4.90E-03	4.10E-02	7.53E-01	1.07E-02	8.56E-04	3.67E-02	4.83E-02	3.13E+01	1.26E+02	1.54E-03	3.84E-04
COPPER	0.00E+00	4.85E-02	1.24E-01	0.00E+00	0.00E+00	8.47E-03	0.00E+00	8.47E-03	3.20E+02	4.13E+02	2.65E-05	2.05E-05
LEAD	1.90E+01	4.20E-02	3.89E-02	7.38E-01	1.11E-02	7.34E-03	3.60E-02	5.44E-02	7.64E+01	7.64E+02	7.12E-04	7.12E-05
MERCURY	3.80E-02	6.65E-05	6.52E-01	2.48E-02	2.22E-05	1.16E-05	1.21E-03	1.24E-03	4.10E-01	6.83E-01	3.03E-03	1.82E-03
NICKEL	0.00E+00	9.05E-03	1.80E-02	0.00E+00	0.00E+00	1.58E-03	0.00E+00	1.58E-03	3.82E+02	7.64E+02	4.14E-06	2.07E-06
SELENIUM	1.78E+00	5.07E-04	6.72E-01	1.20E+00	1.04E-03	8.86E-05	5.83E-02	5.94E-02	1.91E+00	3.15E+00	3.11E-02	1.88E-02
SILVER	1.64E-01	8.34E-05	1.40E-02	2.30E-03	9.59E-05	1.46E-05	1.12E-04	2.22E-04	1.48E+00	1.48E+01	1.50E-04	1.50E-05
ZINC	0.00E+00	1.58E-01	3.66E-01	0.00E+00	0.00E+00	2.76E-02	0.00E+00	2.76E-02	1.53E+03	3.06E+03	1.81E-05	9.03E-06

Cells are shaded if the EEQ is greater than 1.0.
Historical data from samples collected during the Remedial Activities were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, MNX, copper, nickel, silver, and zinc were COPCs in surface water only.

Body Weight = (BW)	3.663E-02	kg
Food Ingestion Rate = (If)	1.785E-03	kg/day
Water Ingestion Rate = (Iw)	6.400E-03	L/day
Soil Ingestion Rate = (Is)	2.142E-05	kg/day
Home Range = (HR)	1.640E-01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

AMERICAN WOODCOCK - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	8.40E-01	9.60E-04	1.00E+00	8.40E-01	2.52E-02	1.10E-04	1.53E-01	1.79E-01	NV	NV	#VALUE!	#VALUE!
HMX	1.70E+00	9.80E-02	1.00E+00	1.70E+00	5.09E-02	1.12E-02	3.11E-01	3.73E-01	NV	NV	#VALUE!	#VALUE!
RDX	6.10E+00	1.40E-01	1.00E+00	6.10E+00	1.83E-01	1.60E-02	1.11E+00	1.31E+00	2.23E+00	2.63E+00	5.89E-01	4.99E-01
Inorganics												
ARSENIC	1.58E+02	2.03E-02	5.23E-01	8.26E+01	4.73E+00	2.32E-03	1.51E+01	1.98E+01	2.46E+00	7.38E+00	8.06E+00	2.69E+00
CADMIUM	6.30E+00	4.37E-02	4.07E+01	2.56E+02	1.89E-01	5.00E-03	4.68E+01	4.70E+01	1.45E+00	2.00E+01	3.24E+01	2.35E+00
CHROMIUM	5.17E+01	1.05E-01	3.16E+00	1.63E+02	1.55E+00	1.20E-02	2.99E+01	3.14E+01	1.00E+00	5.00E+00	3.14E+01	6.28E+00
COPPER	3.45E+02	1.65E+00	1.53E+00	5.28E+02	1.03E+01	1.89E-01	9.65E+01	1.07E+02	4.70E+01	6.17E+01	2.28E+00	1.73E+00
LEAD	4.29E+05	4.58E-01	1.52E+00	6.53E+05	1.29E+04	5.24E-02	1.19E+05	1.32E+05	1.13E+00	1.13E+01	1.17E+05	1.17E+04
MERCURY	3.10E-01	1.70E-03	2.06E+01	6.39E+00	9.29E-03	1.95E-04	1.17E+00	1.18E+00	6.40E-03	6.40E-02	1.84E+02	1.84E+01
NICKEL	4.46E+01	1.40E-01	4.73E+00	2.11E+02	1.34E+00	1.60E-02	3.85E+01	3.99E+01	7.74E+01	1.07E+02	5.15E-01	3.73E-01
SELENIUM	6.10E-01	9.60E-03	1.34E+00	8.17E-01	1.83E-02	1.10E-03	1.49E-01	1.69E-01	4.00E-01	8.00E-01	4.22E-01	2.11E-01
SILVER	1.85E+01	2.60E-03	1.53E+01	2.84E+02	5.54E-01	2.98E-04	5.18E+01	5.24E+01	NV	NV	#VALUE!	#VALUE!
ZINC	2.49E+03	5.22E+00	1.29E+01	3.21E+04	7.46E+01	5.97E-01	5.86E+03	5.94E+03	1.45E+01	1.31E+02	4.10E+02	4.53E+01

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	1.660E-01	kg
Food Ingestion Rate = (If)	3.032E-02	kg/day
Water Ingestion Rate = (Iw)	1.900E-02	L/day
Soil Ingestion Rate = (Is)	4.972E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

AMERICAN WOODCOCK - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	1.90E-01	1.48E-04	1.00E+00	1.90E-01	1.62E-03	1.49E-05	2.53E-02	2.70E-02	NV	NV	#VALUE!	#VALUE!
HMX	2.68E-01	8.08E-03	1.00E+00	2.68E-01	2.29E-03	8.10E-04	3.58E-02	3.89E-02	NV	NV	#VALUE!	#VALUE!
RDX	6.68E-01	1.53E-02	1.00E+00	6.68E-01	5.70E-03	1.53E-03	8.91E-02	9.63E-02	2.23E+00	2.63E+00	4.32E-02	3.66E-02
Inorganics												
ARSENIC	2.74E+01	2.58E-03	2.24E-01	6.13E+00	2.34E-01	2.59E-04	8.17E-01	1.05E+00	2.46E+00	7.38E+00	4.27E-01	1.42E-01
CADMIUM	1.26E+00	1.67E-03	7.71E+00	9.73E+00	1.08E-02	1.67E-04	1.30E+00	1.31E+00	1.45E+00	2.00E+01	9.02E-01	6.54E-02
CHROMIUM	3.27E+01	4.90E-03	3.06E-01	1.00E+01	2.79E-01	4.91E-04	1.33E+00	1.61E+00	1.00E+00	5.00E+00	1.61E+00	3.23E-01
COPPER	7.07E+01	4.85E-02	5.15E-01	3.64E+01	6.03E-01	4.86E-03	4.86E+00	5.46E+00	4.70E+01	6.17E+01	1.16E-01	8.85E-02
LEAD	3.94E+04	4.20E-02	2.66E-01	1.05E+04	3.36E+02	4.21E-03	1.40E+03	1.73E+03	1.13E+00	1.13E+01	1.53E+03	1.53E+02
MERCURY	5.19E-02	6.65E-05	1.69E+00	8.79E-02	4.43E-04	6.67E-06	1.17E-02	1.22E-02	6.40E-03	6.40E-02	1.90E+00	1.90E-01
NICKEL	2.34E+01	9.05E-03	1.06E+00	2.48E+01	2.00E-01	9.07E-04	3.31E+00	3.51E+00	7.74E+01	1.07E+02	4.53E-02	3.28E-02
SELENIUM	2.44E-01	5.07E-04	9.85E-01	2.40E-01	2.08E-03	5.08E-05	3.21E-02	3.42E-02	4.00E-01	8.00E-01	8.55E-02	4.27E-02
SILVER	1.75E+00	8.34E-05	2.05E+00	3.57E+00	1.49E-02	8.36E-06	4.76E-01	4.91E-01	NV	NV	#VALUE!	#VALUE!
ZINC	4.94E+02	1.58E-01	3.20E+00	1.58E+03	4.21E+00	1.58E-02	2.11E+02	2.15E+02	1.45E+01	1.31E+02	1.48E+01	1.64E+00

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	1.895E-01	kg
Food Ingestion Rate = (If)	2.526E-02	kg/day
Water Ingestion Rate = (Iw)	1.900E-02	L/day
Soil Ingestion Rate = (Is)	1.617E-03	kg/day
Home Range = (HR)	6.133E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

BOBWHITE QUAIL - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	8.40E-01	9.60E-04	7.70E+00	6.47E+00	1.77E-03	1.37E-04	9.82E-02	1.00E-01	NV	NV	#VALUE!	#VALUE!
HMX	1.70E+00	9.80E-02	1.70E+01	2.89E+01	3.59E-03	1.40E-02	4.39E-01	4.56E-01	NV	NV	#VALUE!	#VALUE!
RDX	6.10E+00	1.40E-01	4.60E-01	2.81E+00	1.29E-02	2.00E-02	4.26E-02	7.54E-02	2.23E+00	2.63E+00	3.38E-02	2.87E-02
Inorganics												
ARSENIC	1.58E+02	2.03E-02	1.10E+00	1.74E+02	3.33E-01	2.89E-03	2.65E+00	2.98E+00	2.46E+00	7.38E+00	1.21E+00	4.04E-01
CADMIUM	6.30E+00	4.37E-02	3.25E+00	2.05E+01	1.33E-02	6.23E-03	3.11E-01	3.30E-01	1.45E+00	2.00E+01	2.28E-01	1.65E-02
CHROMIUM	5.17E+01	1.05E-01	8.39E-02	4.34E+00	1.09E-01	1.50E-02	6.59E-02	1.90E-01	1.00E+00	5.00E+00	1.90E-01	3.80E-02
COPPER	3.45E+02	1.65E+00	6.25E-01	2.16E+02	7.28E-01	2.35E-01	3.27E+00	4.24E+00	4.70E+01	6.17E+01	9.02E-02	6.87E-02
LEAD	4.29E+05	4.58E-01	4.68E-01	2.01E+05	9.06E+02	6.53E-02	3.05E+03	3.95E+03	1.13E+00	1.13E+01	3.50E+03	3.50E+02
MERCURY	3.10E-01	1.70E-03	5.00E+00	1.55E+00	6.54E-04	2.42E-04	2.35E-02	2.44E-02	6.40E-03	6.40E-02	3.82E+00	3.82E-01
NICKEL	4.46E+01	1.40E-01	1.41E+00	6.29E+01	9.41E-02	2.00E-02	9.56E-01	1.07E+00	7.74E+01	1.07E+02	1.38E-02	1.00E-02
SELENIUM	6.10E-01	9.60E-03	3.01E+00	1.84E+00	1.29E-03	1.37E-03	2.79E-02	3.06E-02	4.00E-01	8.00E-01	7.64E-02	3.82E-02
SILVER	1.85E+01	2.60E-03	3.67E-02	6.79E-01	3.90E-02	3.71E-04	1.03E-02	4.97E-02	NV	NV	#VALUE!	#VALUE!
ZINC	2.49E+03	5.22E+00	1.82E+00	4.53E+03	5.26E+00	7.44E-01	6.88E+01	7.48E+01	1.45E+01	1.31E+02	5.16E+00	5.72E-01

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	1.620E-01	kg
Food Ingestion Rate = (If)	2.460E-03	kg/day
Water Ingestion Rate = (Iw)	2.310E-02	L/day
Soil Ingestion Rate = (Is)	3.419E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

BOBWHITE QUAIL - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	1.90E-01	1.48E-04	7.70E+00	1.46E+00	1.41E-04	1.54E-05	1.79E-02	1.80E-02	NV	NV	#VALUE!	#VALUE!
HMX	2.68E-01	8.08E-03	1.70E+01	4.56E+00	2.00E-04	8.40E-04	5.56E-02	5.67E-02	NV	NV	#VALUE!	#VALUE!
RDX	6.68E-01	1.53E-02	4.60E-01	3.07E-01	4.97E-04	1.59E-03	3.75E-03	5.84E-03	2.23E+00	2.63E+00	2.62E-03	2.22E-03
Inorganics												
ARSENIC	2.74E+01	2.58E-03	3.75E-02	1.03E+00	2.04E-02	2.68E-04	1.25E-02	3.32E-02	2.46E+00	7.38E+00	1.35E-02	4.49E-03
CADMIUM	1.26E+00	1.67E-03	5.86E-01	7.40E-01	9.40E-04	1.74E-04	9.03E-03	1.01E-02	1.45E+00	2.00E+01	6.99E-03	5.07E-04
CHROMIUM	3.27E+01	4.90E-03	4.10E-02	1.34E+00	2.44E-02	5.09E-04	1.64E-02	4.12E-02	1.00E+00	5.00E+00	4.12E-02	8.25E-03
COPPER	7.07E+01	4.85E-02	1.24E-01	8.77E+00	5.26E-02	5.04E-03	1.07E-01	1.65E-01	4.70E+01	6.17E+01	3.51E-03	2.67E-03
LEAD	3.94E+04	4.20E-02	3.89E-02	1.53E+03	2.93E+01	4.37E-03	1.87E+01	4.80E+01	1.13E+00	1.13E+01	4.25E+01	4.25E+00
MERCURY	5.19E-02	6.65E-05	6.52E-01	3.38E-02	3.86E-05	6.91E-06	4.13E-04	4.59E-04	6.40E-03	6.40E-02	7.17E-02	7.17E-03
NICKEL	2.34E+01	9.05E-03	1.80E-02	4.22E-01	1.74E-02	9.41E-04	5.14E-03	2.35E-02	7.74E+01	1.07E+02	3.04E-04	2.20E-04
SELENIUM	2.44E-01	5.07E-04	6.72E-01	1.64E-01	1.82E-04	5.27E-05	2.00E-03	2.24E-03	4.00E-01	8.00E-01	5.59E-03	2.80E-03
SILVER	1.75E+00	8.34E-05	1.40E-02	2.44E-02	1.30E-03	8.67E-06	2.98E-04	1.61E-03	NV	NV	#VALUE!	#VALUE!
ZINC	4.94E+02	1.58E-01	3.66E-01	1.81E+02	3.68E-01	1.64E-02	2.21E+00	2.59E+00	1.45E+01	1.31E+02	1.79E-01	1.98E-02

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	1.770E-01	kg
Food Ingestion Rate = (If)	2.160E-03	kg/day
Water Ingestion Rate = (Iw)	1.840E-02	L/day
Soil Ingestion Rate = (Is)	1.318E-04	kg/day
Home Range = (HR)	2.860E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

SHORT-TAILED SHREW - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	8.40E-01	9.60E-04	1.00E+00	8.40E-01	4.28E-03	2.71E-04	1.43E-01	1.47E-01	4.81E+01	2.43E+02	3.06E-03	6.08E-04
HMX	1.70E+00	9.80E-02	1.00E+00	1.70E+00	8.67E-03	2.76E-02	2.89E-01	3.25E-01	4.69E+00	1.17E+01	6.94E-02	2.78E-02
RDX	6.10E+00	1.40E-01	1.00E+00	6.10E+00	3.11E-02	3.95E-02	1.04E+00	1.11E+00	1.09E+01	5.47E+01	1.01E-01	2.03E-02
Inorganics												
ARSENIC	1.58E+02	2.03E-02	5.23E-01	8.26E+01	8.06E-01	5.72E-03	1.40E+01	1.49E+01	1.97E-01	1.97E+00	7.55E+01	7.55E+00
CADMIUM	6.30E+00	4.37E-02	4.07E+01	2.56E+02	3.21E-02	1.23E-02	4.36E+01	4.36E+01	1.58E+01	1.58E+02	2.77E+00	2.77E-01
CHROMIUM	5.17E+01	1.05E-01	3.16E+00	1.63E+02	2.64E-01	2.96E-02	2.78E+01	2.81E+01	5.98E+01	2.39E+02	4.70E-01	1.17E-01
COPPER	3.45E+02	1.65E+00	1.53E+00	5.28E+02	1.76E+00	4.65E-01	8.98E+01	9.20E+01	6.10E+02	7.88E+02	1.51E-01	1.17E-01
LEAD	4.29E+05	4.58E-01	1.52E+00	6.53E+05	2.19E+03	1.29E-01	1.11E+05	1.13E+05	1.46E+02	1.46E+03	7.76E+02	7.76E+01
MERCURY	3.10E-01	1.70E-03	2.06E+01	6.39E+00	1.58E-03	4.79E-04	1.09E+00	1.09E+00	7.81E-01	1.30E+00	1.39E+00	8.37E-01
NICKEL	4.46E+01	1.40E-01	4.73E+00	2.11E+02	2.27E-01	3.95E-02	3.59E+01	3.61E+01	7.29E+02	1.46E+03	4.96E-02	2.48E-02
SELENIUM	6.10E-01	9.60E-03	1.34E+00	8.17E-01	3.11E-03	2.71E-03	1.39E-01	1.45E-01	3.64E+00	6.01E+00	3.97E-02	2.41E-02
SILVER	1.85E+01	2.60E-03	1.53E+01	2.84E+02	9.43E-02	7.33E-04	4.82E+01	4.83E+01	2.83E+00	2.83E+01	1.71E+01	1.71E+00
ZINC	2.49E+03	5.22E+00	1.29E+01	3.21E+04	1.27E+01	1.47E+00	5.45E+03	5.47E+03	2.92E+03	5.83E+03	1.88E+00	9.38E-01

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	1.525E-02	kg
Food Ingestion Rate = (If)	2.592E-03	kg/day
Water Ingestion Rate = (Iw)	4.300E-03	L/day
Soil Ingestion Rate = (Is)	7.776E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

SHORT-TAILED SHREW - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	1.90E-01	1.48E-04	1.00E+00	1.90E-01	1.67E-04	3.34E-05	1.86E-02	1.88E-02	5.48E+01	2.79E+02	3.43E-04	6.73E-05
HMX	2.68E-01	8.08E-03	1.00E+00	2.68E-01	2.36E-04	1.82E-03	2.62E-02	2.83E-02	5.33E+00	1.33E+01	5.30E-03	2.12E-03
RDX	6.68E-01	1.53E-02	1.00E+00	6.68E-01	5.87E-04	3.44E-03	6.53E-02	6.93E-02	1.24E+01	6.22E+01	5.57E-03	1.11E-03
Inorganics												
ARSENIC	2.74E+01	2.58E-03	2.24E-01	6.13E+00	2.41E-02	5.81E-04	5.99E-01	6.24E-01	2.24E-01	2.24E+00	2.78E+00	2.78E-01
CADMIUM	1.26E+00	1.67E-03	7.71E+00	9.73E+00	1.11E-03	3.76E-04	9.50E-01	9.52E-01	1.80E+01	1.80E+02	5.30E-02	5.30E-03
CHROMIUM	3.27E+01	4.90E-03	3.06E-01	1.00E+01	2.88E-02	1.10E-03	9.78E-01	1.01E+00	6.80E+01	2.73E+02	1.48E-02	3.70E-03
COPPER	7.07E+01	4.85E-02	5.15E-01	3.64E+01	6.22E-02	1.09E-02	3.56E+00	3.63E+00	6.94E+02	8.97E+02	5.23E-03	4.05E-03
LEAD	3.94E+04	4.20E-02	2.66E-01	1.05E+04	3.46E+01	9.46E-03	1.02E+03	1.06E+03	1.66E+02	1.66E+03	6.37E+00	6.37E-01
MERCURY	5.19E-02	6.65E-05	1.69E+00	8.79E-02	4.56E-05	1.50E-05	8.59E-03	8.65E-03	8.89E-01	1.48E+00	9.72E-03	5.83E-03
NICKEL	2.34E+01	9.05E-03	1.06E+00	2.48E+01	2.06E-02	2.04E-03	2.42E+00	2.45E+00	8.30E+02	1.66E+03	2.95E-03	1.47E-03
SELENIUM	2.44E-01	5.07E-04	9.85E-01	2.40E-01	2.15E-04	1.14E-04	2.35E-02	2.38E-02	4.15E+00	6.85E+00	5.74E-03	3.48E-03
SILVER	1.75E+00	8.34E-05	2.05E+00	3.57E+00	1.54E-03	1.88E-05	3.49E-01	3.50E-01	3.22E+00	3.22E+01	1.09E-01	1.09E-02
ZINC	4.94E+02	1.58E-01	3.20E+00	1.58E+03	4.34E-01	3.56E-02	1.54E+02	1.55E+02	3.32E+03	6.64E+03	4.67E-02	2.33E-02

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	1.687E-02	kg
Food Ingestion Rate = (If)	1.648E-03	kg/day
Water Ingestion Rate = (Iw)	3.800E-03	L/day
Soil Ingestion Rate = (Is)	1.483E-05	kg/day
Home Range = (HR)	9.700E-01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

MEADOW VOLE - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	8.40E-01	9.60E-04	7.70E+00	6.47E+00	1.57E-03	2.25E-04	3.77E-01	3.79E-01	2.36E+01	1.19E+02	1.60E-02	3.18E-03
HMX	1.70E+00	9.80E-02	1.70E+01	2.89E+01	3.17E-03	2.29E-02	1.69E+00	1.71E+00	2.30E+00	5.75E+00	7.44E-01	2.98E-01
RDX	6.10E+00	1.40E-01	4.60E-01	2.81E+00	1.14E-02	3.28E-02	1.64E-01	2.08E-01	5.37E+00	2.69E+01	3.87E-02	7.74E-03
Inorganics												
ARSENIC	1.58E+02	2.03E-02	1.10E+00	1.74E+02	2.95E-01	4.75E-03	1.02E+01	1.05E+01	9.67E-02	9.67E-01	1.08E+02	1.08E+01
CADMIUM	6.30E+00	4.37E-02	3.25E+00	2.05E+01	1.18E-02	1.02E-02	1.19E+00	1.22E+00	7.75E+00	7.75E+01	1.57E-01	1.57E-02
CHROMIUM	5.17E+01	1.05E-01	8.39E-02	4.34E+00	9.65E-02	2.46E-02	2.53E-01	3.74E-01	2.94E+01	1.18E+02	1.27E-02	3.18E-03
COPPER	3.45E+02	1.65E+00	6.25E-01	2.16E+02	6.44E-01	3.86E-01	1.26E+01	1.36E+01	2.99E+02	3.87E+02	4.55E-02	3.52E-02
LEAD	4.29E+05	4.58E-01	4.68E-01	2.01E+05	8.01E+02	1.07E-01	1.17E+04	1.25E+04	7.16E+01	7.16E+02	1.75E+02	1.75E+01
MERCURY	3.10E-01	1.70E-03	5.00E+00	1.55E+00	5.79E-04	3.98E-04	9.05E-02	9.14E-02	3.84E-01	6.39E-01	2.38E-01	1.43E-01
NICKEL	4.46E+01	1.40E-01	1.41E+00	6.29E+01	8.33E-02	3.28E-02	3.67E+00	3.79E+00	3.58E+02	7.16E+02	1.06E-02	5.29E-03
SELENIUM	6.10E-01	9.60E-03	3.01E+00	1.84E+00	1.14E-03	2.25E-03	1.07E-01	1.11E-01	1.79E+00	2.95E+00	6.18E-02	3.74E-02
SILVER	1.85E+01	2.60E-03	3.67E-02	6.79E-01	3.45E-02	6.09E-04	3.96E-02	7.48E-02	1.39E+00	1.39E+01	5.38E-02	5.38E-03
ZINC	2.49E+03	5.22E+00	1.82E+00	4.53E+03	4.65E+00	1.22E+00	2.64E+02	2.70E+02	1.43E+03	2.86E+03	1.89E-01	9.44E-02

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	3.290E-02	kg
Food Ingestion Rate = (If)	1.920E-03	kg/day
Water Ingestion Rate = (Iw)	7.700E-03	L/day
Soil Ingestion Rate = (Is)	6.144E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

MEADOW VOLE - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Energetics												
1,3,5-TRINITROBENZENE	1.90E-01	1.48E-04	7.70E+00	1.46E+00	1.11E-04	2.59E-05	7.13E-02	7.14E-02	2.52E+01	1.28E+02	2.83E-03	5.56E-04
HMX	2.68E-01	8.08E-03	1.70E+01	4.56E+00	1.57E-04	1.41E-03	2.22E-01	2.24E-01	2.46E+00	6.14E+00	9.11E-02	3.64E-02
RDX	6.68E-01	1.53E-02	4.60E-01	3.07E-01	3.91E-04	2.67E-03	1.50E-02	1.80E-02	5.73E+00	2.87E+01	3.15E-03	6.29E-04
Inorganics												
ARSENIC	2.74E+01	2.58E-03	3.75E-02	1.03E+00	1.60E-02	4.51E-04	5.00E-02	6.65E-02	1.03E-01	1.03E+00	6.44E-01	6.44E-02
CADMIUM	1.26E+00	1.67E-03	5.86E-01	7.40E-01	7.38E-04	2.92E-04	3.60E-02	3.71E-02	8.27E+00	8.27E+01	4.48E-03	4.48E-04
CHROMIUM	3.27E+01	4.90E-03	4.10E-02	1.34E+00	1.91E-02	8.56E-04	6.54E-02	8.54E-02	3.13E+01	1.26E+02	2.72E-03	6.80E-04
COPPER	7.07E+01	4.85E-02	1.24E-01	8.77E+00	4.14E-02	8.47E-03	4.27E-01	4.77E-01	3.20E+02	4.13E+02	1.49E-03	1.15E-03
LEAD	3.94E+04	4.20E-02	3.89E-02	1.53E+03	2.30E+01	7.34E-03	7.47E+01	9.77E+01	7.64E+01	7.64E+02	1.28E+00	1.28E-01
MERCURY	5.19E-02	6.65E-05	6.52E-01	3.38E-02	3.04E-05	1.16E-05	1.65E-03	1.69E-03	4.10E-01	6.83E-01	4.13E-03	2.48E-03
NICKEL	2.34E+01	9.05E-03	1.80E-02	4.22E-01	1.37E-02	1.58E-03	2.05E-02	3.58E-02	3.82E+02	7.64E+02	9.37E-05	4.69E-05
SELENIUM	2.44E-01	5.07E-04	6.72E-01	1.64E-01	1.43E-04	8.86E-05	7.99E-03	8.22E-03	1.91E+00	3.15E+00	4.30E-03	2.61E-03
SILVER	1.75E+00	8.34E-05	1.40E-02	2.44E-02	1.02E-03	1.46E-05	1.19E-03	2.23E-03	1.48E+00	1.48E+01	1.50E-03	1.50E-04
ZINC	4.94E+02	1.58E-01	3.66E-01	1.81E+02	2.89E-01	2.76E-02	8.81E+00	9.13E+00	1.53E+03	3.06E+03	5.97E-03	2.98E-03

Cells are shaded if the EEQ is greater than 1.0.
Data from Battery Disposal Area samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
2,4-Diamino-6-nitrotoluene, 2,6-diamino-4-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and MNX were COPCs in surface water only.

Body Weight = (BW)	3.663E-02	kg
Food Ingestion Rate = (If)	1.785E-03	kg/day
Water Ingestion Rate = (Iw)	6.400E-03	L/day
Soil Ingestion Rate = (Is)	2.142E-05	kg/day
Home Range = (HR)	1.640E-01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

AMERICAN WOODCOCK - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	4.37E-02	4.07E+01	0.00E+00	0.00E+00	5.00E-03	0.00E+00	5.00E-03	1.45E+00	2.00E+01	3.45E-03	2.50E-04
CHROMIUM	2.69E+01	1.05E-01	3.16E+00	8.51E+01	8.06E-01	1.20E-02	1.55E+01	1.64E+01	1.00E+00	5.00E+00	1.64E+01	3.27E+00
COPPER	1.90E+01	1.65E+00	1.53E+00	2.91E+01	5.69E-01	1.89E-01	5.31E+00	6.07E+00	4.70E+01	6.17E+01	1.29E-01	9.84E-02
LEAD	3.12E+01	4.58E-01	1.52E+00	4.75E+01	9.35E-01	5.24E-02	8.67E+00	9.66E+00	1.13E+00	1.13E+01	8.55E+00	8.55E-01
MERCURY	4.10E-02	1.70E-03	2.06E+01	8.46E-01	1.23E-03	1.95E-04	1.54E-01	1.56E-01	6.40E-03	6.40E-02	2.44E+01	2.44E+00
NICKEL	2.14E+01	1.40E-01	4.73E+00	1.01E+02	6.41E-01	1.60E-02	1.85E+01	1.91E+01	7.74E+01	1.07E+02	2.47E-01	1.79E-01
SELENIUM	0.00E+00	9.60E-03	1.34E+00	0.00E+00	0.00E+00	1.10E-03	0.00E+00	1.10E-03	4.00E-01	8.00E-01	2.75E-03	1.37E-03
SILVER	2.10E-01	2.60E-03	1.53E+01	3.22E+00	6.29E-03	2.98E-04	5.88E-01	5.95E-01	NV	NV	#VALUE!	#VALUE!
ZINC	1.65E+02	5.22E+00	1.29E+01	2.13E+03	4.94E+00	5.97E-01	3.88E+02	3.94E+02	1.45E+01	1.31E+02	2.72E+01	3.01E+00

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	1.660E-01	kg
Food Ingestion Rate = (If)	3.032E-02	kg/day
Water Ingestion Rate = (Iw)	1.900E-02	L/day
Soil Ingestion Rate = (Is)	4.972E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)
NV = No Value is available

AMERICAN WOODCOCK - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	1.67E-03	7.71E+00	0.00E+00	0.00E+00	1.67E-04	0.00E+00	1.67E-04	1.45E+00	2.00E+01	1.15E-04	8.37E-06
CHROMIUM	2.40E+01	4.90E-03	3.06E-01	7.34E+00	2.05E-01	4.91E-04	9.79E-01	1.18E+00	1.00E+00	5.00E+00	1.18E+00	2.37E-01
COPPER	1.31E+01	4.85E-02	5.15E-01	6.76E+00	1.12E-01	4.86E-03	9.02E-01	1.02E+00	4.70E+01	6.17E+01	2.17E-02	1.65E-02
LEAD	1.61E+01	1.50E-02	2.66E-01	4.27E+00	1.37E-01	1.50E-03	5.70E-01	7.08E-01	1.13E+00	1.13E+01	6.27E-01	6.27E-02
MERCURY	2.50E-02	6.65E-05	1.69E+00	4.23E-02	2.13E-04	6.67E-06	5.64E-03	5.86E-03	6.40E-03	6.40E-02	9.16E-01	9.16E-02
NICKEL	1.69E+01	9.05E-03	1.06E+00	1.79E+01	1.44E-01	9.07E-04	2.39E+00	2.54E+00	7.74E+01	1.07E+02	3.28E-02	2.37E-02
SELENIUM	0.00E+00	5.07E-04	9.85E-01	0.00E+00	0.00E+00	5.08E-05	0.00E+00	5.08E-05	4.00E-01	8.00E-01	1.27E-04	6.35E-05
SILVER	5.02E-02	8.34E-05	2.05E+00	1.03E-01	4.28E-04	8.36E-06	1.37E-02	1.41E-02	NV	NV	#VALUE!	#VALUE!
ZINC	5.35E+01	1.58E-01	3.20E+00	1.71E+02	4.56E-01	1.58E-02	2.28E+01	2.33E+01	1.45E+01	1.31E+02	1.61E+00	1.78E-01

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	1.895E-01	kg
Food Ingestion Rate = (If)	2.526E-02	kg/day
Water Ingestion Rate = (Iw)	1.900E-02	L/day
Soil Ingestion Rate = (Is)	1.617E-03	kg/day
Home Range = (HR)	6.133E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)
NV = No Value is available

BOBWHITE QUAIL - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	4.37E-02	3.25E+00	0.00E+00	0.00E+00	6.23E-03	0.00E+00	6.23E-03	1.45E+00	2.00E+01	4.30E-03	3.12E-04
CHROMIUM	2.69E+01	1.05E-01	8.39E-02	2.26E+00	5.68E-02	1.50E-02	3.43E-02	1.06E-01	1.00E+00	5.00E+00	1.06E-01	2.12E-02
COPPER	1.90E+01	1.65E+00	6.25E-01	1.19E+01	4.01E-02	2.35E-01	1.80E-01	4.56E-01	4.70E+01	6.17E+01	9.70E-03	7.38E-03
LEAD	3.12E+01	4.58E-01	4.68E-01	1.46E+01	6.59E-02	6.53E-02	2.22E-01	3.53E-01	1.13E+00	1.13E+01	3.12E-01	3.12E-02
MERCURY	4.10E-02	1.70E-03	5.00E+00	2.05E-01	8.65E-05	2.42E-04	3.11E-03	3.44E-03	6.40E-03	6.40E-02	5.38E-01	5.38E-02
NICKEL	2.14E+01	1.40E-01	1.41E+00	3.02E+01	4.52E-02	2.00E-02	4.59E-01	5.24E-01	7.74E+01	1.07E+02	6.77E-03	4.89E-03
SELENIUM	0.00E+00	9.60E-03	3.01E+00	0.00E+00	0.00E+00	1.37E-03	0.00E+00	1.37E-03	4.00E-01	8.00E-01	3.42E-03	1.71E-03
SILVER	2.10E-01	2.60E-03	3.67E-02	7.71E-03	4.43E-04	3.71E-04	1.17E-04	9.31E-04	NV	NV	#VALUE!	#VALUE!
ZINC	1.65E+02	5.22E+00	1.82E+00	3.00E+02	3.48E-01	7.44E-01	4.56E+00	5.65E+00	1.45E+01	1.31E+02	3.90E-01	4.32E-02

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	1.620E-01	kg
Food Ingestion Rate = (If)	2.460E-03	kg/day
Water Ingestion Rate = (Iw)	2.310E-02	L/day
Soil Ingestion Rate = (Is)	3.419E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)
NV = No Value is available

BOBWHITE QUAIL - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	1.67E-03	5.86E-01	0.00E+00	0.00E+00	1.74E-04	0.00E+00	1.74E-04	1.45E+00	2.00E+01	1.20E-04	8.68E-06
CHROMIUM	2.40E+01	4.90E-03	4.10E-02	9.84E-01	1.79E-02	5.09E-04	1.20E-02	3.04E-02	1.00E+00	5.00E+00	3.04E-02	6.07E-03
COPPER	1.31E+01	4.85E-02	1.24E-01	1.63E+00	9.78E-03	5.04E-03	1.99E-02	3.47E-02	4.70E+01	6.17E+01	7.39E-04	5.62E-04
LEAD	1.61E+01	1.50E-02	3.89E-02	6.25E-01	1.20E-02	1.56E-03	7.63E-03	2.11E-02	1.13E+00	1.13E+01	1.87E-02	1.87E-03
MERCURY	2.50E-02	6.65E-05	6.52E-01	1.63E-02	1.86E-05	6.91E-06	1.99E-04	2.24E-04	6.40E-03	6.40E-02	3.51E-02	3.51E-03
NICKEL	1.69E+01	9.05E-03	1.80E-02	3.05E-01	1.26E-02	9.41E-04	3.72E-03	1.73E-02	7.74E+01	1.07E+02	2.23E-04	1.61E-04
SELENIUM	0.00E+00	5.07E-04	6.72E-01	0.00E+00	0.00E+00	5.27E-05	0.00E+00	5.27E-05	4.00E-01	8.00E-01	1.32E-04	6.59E-05
SILVER	5.02E-02	8.34E-05	1.40E-02	7.03E-04	3.74E-05	8.67E-06	8.58E-06	5.46E-05	NV	NV	#VALUE!	#VALUE!
ZINC	5.35E+01	1.58E-01	3.66E-01	1.96E+01	3.98E-02	1.64E-02	2.39E-01	2.95E-01	1.45E+01	1.31E+02	2.04E-02	2.25E-03

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	1.770E-01	kg
Food Ingestion Rate = (If)	2.160E-03	kg/day
Water Ingestion Rate = (Iw)	1.840E-02	L/day
Soil Ingestion Rate = (Is)	1.318E-04	kg/day
Home Range = (HR)	2.860E+01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)
NV = No Value is available

SHORT-TAILED SHREW - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	4.37E-02	4.07E+01	0.00E+00	0.00E+00	1.23E-02	0.00E+00	1.23E-02	1.58E+01	1.58E+02	7.81E-04	7.81E-05
CHROMIUM	2.69E+01	1.05E-01	3.16E+00	8.51E+01	1.37E-01	2.96E-02	1.45E+01	1.46E+01	5.98E+01	2.39E+02	2.45E-01	6.11E-02
COPPER	1.90E+01	1.65E+00	1.53E+00	2.91E+01	9.69E-02	4.65E-01	4.94E+00	5.51E+00	6.10E+02	7.88E+02	9.03E-03	6.99E-03
LEAD	3.12E+01	4.58E-01	1.52E+00	4.75E+01	1.59E-01	1.29E-01	8.07E+00	8.36E+00	1.46E+02	1.46E+03	5.74E-02	5.74E-03
MERCURY	4.10E-02	1.70E-03	2.06E+01	8.46E-01	2.09E-04	4.79E-04	1.44E-01	1.44E-01	7.81E-01	1.30E+00	1.85E-01	1.11E-01
NICKEL	2.14E+01	1.40E-01	4.73E+00	1.01E+02	1.09E-01	3.95E-02	1.72E+01	1.74E+01	7.29E+02	1.46E+03	2.38E-02	1.19E-02
SELENIUM	0.00E+00	9.60E-03	1.34E+00	0.00E+00	0.00E+00	2.71E-03	0.00E+00	2.71E-03	3.64E+00	6.01E+00	7.43E-04	4.50E-04
SILVER	2.10E-01	2.60E-03	1.53E+01	3.22E+00	1.07E-03	7.33E-04	5.47E-01	5.49E-01	2.83E+00	2.83E+01	1.94E-01	1.94E-02
ZINC	1.65E+02	5.22E+00	1.29E+01	2.13E+03	8.41E-01	1.47E+00	3.61E+02	3.64E+02	2.92E+03	5.83E+03	1.25E-01	6.24E-02

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	1.525E-02	kg
Food Ingestion Rate = (If)	2.592E-03	kg/day
Water Ingestion Rate = (Iw)	4.300E-03	L/day
Soil Ingestion Rate = (Is)	7.776E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)
NV = No Value is available

SHORT-TAILED SHREW - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to inv.)	Invertebrate Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Inverts.	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	1.67E-03	7.71E+00	0.00E+00	0.00E+00	3.76E-04	0.00E+00	3.76E-04	1.80E+01	1.80E+02	2.09E-05	2.09E-06
CHROMIUM	2.40E+01	4.90E-03	3.06E-01	7.34E+00	2.11E-02	1.10E-03	7.17E-01	7.39E-01	6.80E+01	2.73E+02	1.09E-02	2.71E-03
COPPER	1.31E+01	4.85E-02	5.15E-01	6.76E+00	1.15E-02	1.09E-02	6.61E-01	6.83E-01	6.94E+02	8.97E+02	9.84E-04	7.61E-04
LEAD	1.61E+01	1.50E-02	2.66E-01	4.27E+00	1.41E-02	3.38E-03	4.17E-01	4.35E-01	1.66E+02	1.66E+03	2.62E-03	2.62E-04
MERCURY	2.50E-02	6.65E-05	1.69E+00	4.23E-02	2.20E-05	1.50E-05	4.13E-03	4.17E-03	8.89E-01	1.48E+00	4.69E-03	2.82E-03
NICKEL	1.69E+01	9.05E-03	1.06E+00	1.79E+01	1.49E-02	2.04E-03	1.75E+00	1.77E+00	8.30E+02	1.66E+03	2.13E-03	1.07E-03
SELENIUM	0.00E+00	5.07E-04	9.85E-01	0.00E+00	0.00E+00	1.14E-04	0.00E+00	1.14E-04	4.15E+00	6.85E+00	2.75E-05	1.67E-05
SILVER	5.02E-02	8.34E-05	2.05E+00	1.03E-01	4.41E-05	1.88E-05	1.00E-02	1.01E-02	3.22E+00	3.22E+01	3.14E-03	3.14E-04
ZINC	5.35E+01	1.58E-01	3.20E+00	1.71E+02	4.70E-02	3.56E-02	1.67E+01	1.68E+01	3.32E+03	6.64E+03	5.06E-03	2.53E-03

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	1.687E-02	kg
Food Ingestion Rate = (If)	1.648E-03	kg/day
Water Ingestion Rate = (Iw)	3.800E-03	L/day
Soil Ingestion Rate = (Is)	1.483E-05	kg/day
Home Range = (HR)	9.700E-01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (invertebrates) = (Ci * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (invertebrates)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Ci = Contaminant conc. in soil invertebrates (=soil conc. * Biotransfer Factor)
NV = No Value is available

MEADOW VOLE - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Soil Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	4.37E-02	3.25E+00	0.00E+00	0.00E+00	1.02E-02	0.00E+00	1.02E-02	7.75E+00	7.75E+01	1.32E-03	1.32E-04
CHROMIUM	2.69E+01	1.05E-01	8.39E-02	2.26E+00	5.02E-02	2.46E-02	1.32E-01	2.07E-01	2.94E+01	1.18E+02	7.03E-03	1.76E-03
COPPER	1.90E+01	1.65E+00	6.25E-01	1.19E+01	3.55E-02	3.86E-01	6.93E-01	1.11E+00	2.99E+02	3.87E+02	3.72E-03	2.88E-03
LEAD	3.12E+01	4.58E-01	4.68E-01	1.46E+01	5.83E-02	1.07E-01	8.52E-01	1.02E+00	7.16E+01	7.16E+02	1.42E-02	1.42E-03
MERCURY	4.10E-02	1.70E-03	5.00E+00	2.05E-01	7.66E-05	3.98E-04	1.20E-02	1.24E-02	3.84E-01	6.39E-01	3.24E-02	1.95E-02
NICKEL	2.14E+01	1.40E-01	1.41E+00	3.02E+01	4.00E-02	3.28E-02	1.76E+00	1.83E+00	3.58E+02	7.16E+02	5.12E-03	2.56E-03
SELENIUM	0.00E+00	9.60E-03	3.01E+00	0.00E+00	0.00E+00	2.25E-03	0.00E+00	2.25E-03	1.79E+00	2.95E+00	1.26E-03	7.61E-04
SILVER	2.10E-01	2.60E-03	3.67E-02	7.71E-03	3.92E-04	6.09E-04	4.50E-04	1.45E-03	1.39E+00	1.39E+01	1.04E-03	1.04E-04
ZINC	1.65E+02	5.22E+00	1.82E+00	3.00E+02	3.08E-01	1.22E+00	1.75E+01	1.91E+01	1.43E+03	2.86E+03	1.33E-02	6.65E-03

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	3.290E-02	kg
Food Ingestion Rate = (If)	1.920E-03	kg/day
Water Ingestion Rate = (Iw)	7.700E-03	L/day
Soil Ingestion Rate = (Is)	6.144E-05	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)
NV = No Value is available

MEADOW VOLE - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Soil Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (soil to veg.)	Vegetation Concentration (mg/kg)	Dose (mg/kg/day) from: Surface Soil	Surface Water	Vegetation	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
CADMIUM	0.00E+00	1.67E-03	5.86E-01	0.00E+00	0.00E+00	2.92E-04	0.00E+00	2.92E-04	8.27E+00	8.27E+01	3.53E-05	3.53E-06
CHROMIUM	2.40E+01	4.90E-03	4.10E-02	9.84E-01	1.40E-02	8.56E-04	4.79E-02	6.28E-02	3.13E+01	1.26E+02	2.00E-03	5.00E-04
COPPER	1.31E+01	4.85E-02	1.24E-01	1.63E+00	7.68E-03	8.47E-03	7.94E-02	9.55E-02	3.20E+02	4.13E+02	2.99E-04	2.31E-04
LEAD	1.61E+01	1.50E-02	3.89E-02	6.25E-01	9.40E-03	2.62E-03	3.05E-02	4.25E-02	7.64E+01	7.64E+02	5.56E-04	5.56E-05
MERCURY	2.50E-02	6.65E-05	6.52E-01	1.63E-02	1.46E-05	1.16E-05	7.94E-04	8.21E-04	4.10E-01	6.83E-01	2.00E-03	1.20E-03
NICKEL	1.69E+01	9.05E-03	1.80E-02	3.05E-01	9.90E-03	1.58E-03	1.49E-02	2.63E-02	3.82E+02	7.64E+02	6.89E-05	3.45E-05
SELENIUM	0.00E+00	5.07E-04	6.72E-01	0.00E+00	0.00E+00	8.86E-05	0.00E+00	8.86E-05	1.91E+00	3.15E+00	4.64E-05	2.81E-05
SILVER	5.02E-02	8.34E-05	1.40E-02	7.03E-04	2.94E-05	1.46E-05	3.42E-05	7.82E-05	1.48E+00	1.48E+01	5.27E-05	5.27E-06
ZINC	5.35E+01	1.58E-01	3.66E-01	1.96E+01	3.13E-02	2.76E-02	9.54E-01	1.01E+00	1.53E+03	3.06E+03	6.63E-04	3.31E-04

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.
Data from Gully samples were used for surface water concentrations.
Energetics, cadmium, mercury, selenium, and silver were COPCs in surface water only.
A biotransfer factor of 1.0 was used for the energetics where a biotransfer factor was not available.

Body Weight = (BW)	3.663E-02	kg
Food Ingestion Rate = (If)	1.785E-03	kg/day
Water Ingestion Rate = (Iw)	6.400E-03	L/day
Soil Ingestion Rate = (Is)	2.142E-05	kg/day
Home Range = (HR)	1.640E-01	acres
Contaminated Area = (CA)	Assume equal to home range	
H=HR/CA (Assume = to 1 for maximum exposure)		

Dose (surface soil) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW
Total Dose = Dose (surface soil) + Dose (surface water) + Dose (vegetation)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in soil
Cw = Contaminant concentration in water
Cv = Contaminant conc. in vegetation (=soil conc. * Biotransfer Factor)
NV = No Value is available

BELTED KINGFISHER - CONSERVATIVE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Max Sediment Concentration (mg/kg)	Max SW Concentration (mg/L)	Biotransfer Factor (sed to inv.)[1]	Fish Concentration (mg/kg)	Dose (mg/kg/day) from: Sediment	Surface Water	Fish	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
ARSENIC	2.78E+01	0.00E+00	6.90E-01	1.92E+01	1.28E-01	0.00E+00	2.67E+00	2.80E+00	2.46E+00	7.38E+00	1.14E+00	3.79E-01
CHROMIUM	7.04E+01	0.00E+00	4.68E-01	3.29E+01	3.24E-01	0.00E+00	4.59E+00	4.91E+00	1.00E+00	5.00E+00	4.91E+00	9.83E-01
LEAD	3.96E+01	0.00E+00	6.07E-01	2.40E+01	1.82E-01	0.00E+00	3.35E+00	3.53E+00	1.13E+00	1.13E+01	3.13E+00	3.13E-01
NICKEL	5.21E+01	1.70E-03	2.32E+00	1.21E+02	2.40E-01	2.34E-04	1.68E+01	1.71E+01	7.74E+01	1.07E+02	2.21E-01	1.60E-01
SELENIUM	1.60E-01	0.00E+00	1.00E+00	1.60E-01	7.36E-04	0.00E+00	2.23E-02	2.30E-02	4.00E-01	8.00E-01	5.76E-02	2.88E-02

Cells are shaded if the EEQ is greater than 1.0.
1- The sediment to invertebrate BAF was used for metals because no sediment to fish BAFs were available for metals.

Body Weight = (BW) 1.360E-01 kg
Food Ingestion Rate = (If) 1.895E-02 kg/day
Water Ingestion Rate = (Iw) 1.870E-02 L/day
Sediment Ingestion Rate = (Is) 6.254E-04 kg/day
Home Range = (HR) Assume 100% on site
Contaminated Area = (CA) Assume equal to home range
H=HR/CA (Assume = to 1 for maximum exposure)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Cf = Contaminant conc. in fish (=sediment concentration * Biotransfer Factor)

Dose (sediment) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Total Dose = Dose (sediment) + Dose (surface water) + Dose (fish)

BELTED KINGFISHER - AVERAGE INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION
SWMU 12 (MINE FILL A)
NSWC CRANE, INDIANA

Parameter	Avg Sediment Concentration (mg/kg)	Avg SW Concentration (mg/L)	Biotransfer Factor (sed to inv.)[1]	Fish Concentration (mg/kg)	Dose (mg/kg/day) from: Sediment	Surface Water	Fish	Total Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL EEQ	LOAEL EEQ
Inorganics												
ARSENIC	1.24E+01	0.00E+00	1.43E-01	1.78E+00	4.65E-02	0.00E+00	2.01E-01	2.48E-01	2.46E+00	7.38E+00	1.01E-01	3.36E-02
CHROMIUM	3.14E+01	0.00E+00	1.00E-01	3.14E+00	1.18E-01	0.00E+00	3.56E-01	4.74E-01	1.00E+00	5.00E+00	4.74E-01	9.47E-02
LEAD	1.99E+01	0.00E+00	7.10E-02	1.41E+00	7.43E-02	0.00E+00	1.60E-01	2.34E-01	1.13E+00	1.13E+01	2.07E-01	2.07E-02
NICKEL	2.55E+01	8.75E-04	4.86E-01	1.24E+01	9.54E-02	9.61E-05	1.40E+00	1.50E+00	7.74E+01	1.07E+02	1.94E-02	1.40E-02
SELENIUM	1.60E-01	0.00E+00	1.00E+00	1.60E-01	5.98E-04	0.00E+00	1.81E-02	1.87E-02	4.00E-01	8.00E-01	4.68E-02	2.34E-02

Cells are shaded if the EEQ is greater than 1.0.
Data from Mine Fill A Proper samples were used for surface soil concentrations.

Body Weight = (BW) 1.520E-01 kg
Food Ingestion Rate = (If) 1.723E-02 kg/day
Water Ingestion Rate = (Iw) 1.670E-02 L/day
Sediment Ingestion Rate = (Is) 5.684E-04 kg/day
Home Range = (HR) 1.160E+00 km
Contaminated Area = (CA) Assume equal to home range
H=HR/CA (Assume = to 1 for maximum exposure)

Definitions:
EEQ - Ecological Effects Quotient
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Cf = Contaminant conc. in fish (=sediment concentration * Biotransfer Factor)

Dose (sediment) = (Cs * Is)(H)/BW
Dose (surface water) = (Cw * Iw)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Total Dose = Dose (sediment) + Dose (surface water) + Dose (fish)