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FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FOR LOAD AND FILL AREA SOLID WASTE MANAGEMENT UNIT 18 SUBAREAS B, C AND F AND BOGGS CREEK NSA CRANE IN

10/1/2013

TETRA TECH

FINAL
Resource Conservation and Recovery Act Facility Investigation Report
for
Load and Fill Area (SWMU 18)
Subareas B, C, and F
and
Boggs Creek

Naval Support Activity Crane
Crane, Indiana

Naval Facilities Engineering Command Midwest

Contract Number N62472-03-D-0057

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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FOR LOAD AND FILL AREA (SWMU 18) SUBAREAS B, C, AND F AND BOGGS CREEK

NAVAL SUPPORT ACTIVITY CRANE CRANE, INDIANA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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ABBREVIATIONS AND ACRONYMS

µg/L	Micrograms per liter
°F	degrees Fahrenheit
2ADNT	2-amino-4,6-dinitrotoluene
4ADNT	4-amino-2,6-dinitrotoluene
ABG	Ammunition Burning Grounds
ASD	Applied Science Department
AST	Aboveground storage tank
atm-m^3/mole	Atmosphere-cubic meter per mole
BAF	Bioaccumulation factor
BCF	Bioconcentration factor
bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
CAAA	Crane Army Ammunition Activity
CLEAN	Comprehensive Long-Term Environmental Action Navy
CNIC	Commander Naval Installation Command
COC	Chemical of concern
COPC	Chemical of potential concern
CSM	Conceptual site model
CTE	Central tendency exposure
CTO	Contract Task Order
DCE	Dichloroethene
DI	Deionized
DNX	Hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
DNT	2,4-dinitrotoluene
DO	Dissolved oxygen
DoD	Department of Defense
DPT	Direct push technology
DQR	Data quality review
DRO	Diesel range organics
DON	Department of the Navy
EC_{50}	Effects concentration 50 percent
Eco SSL	Ecological soil screening level
EEQ	Ecological effects quotient
EI	Environmental indicator

EPC	Exposure point concentrations
ERA	Ecological risk assessment
ERO	Extended range organics
f_{oc}	Fraction of organic carbon
FOL	Field operations leader
FSP	Field sampling plan
HASP	Heatlh and safety plan
HHRA	Human health risk assessment
HI	Hazard index
HMX	High melting explosive
HQ	Hazard quotient
IAS	Initial Assessment Study
IDEM	Indiana Department of Environmental Management
IDW	Investigation-derived waste
ILCR	Incremental Lifetime Cancer Risk
IUPPS	Indiana Underground Plant Protection Services
K_d	Soil-water distribution coefficient
K_{oc}	Organic carbon partition coefficient
K_{ow}	Octanol/water partition coefficient
LEL	Lowest effects level
LOAEL	Lowest observed adverse effect level
MCL	Maximum contaminant level
mg/kg	Milligrams Per Kilogram
mg/L	Milligrams per liter
MI	Mobility index
MNX	Hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
msl	Mean sea level
NAD	Naval Ammunition Depot
NAD83	North American Datum of 1983
NAPEC	Naval Ammunition Production Engineering Center
NAVD88	North American Vertical Datum of 1988
NAVFAC	Naval Facilities Engineering Command
NEESA	Naval Energy and Environmental Support Activity
NFA	No further action
NG	Nitroglycerin
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No observable adverse effect level

NOEC	No observed effect concentration
NSA	Naval Support Activity
NSWC	Naval Surface Warfare Center
NTU	Nephelometric Turbidity Unit
ORP	Oxidation-reduction potential
PAH	Polycyclic aromatic hydrocarbons
PEC	Probable effects concentration
PEL	Probable effects level
PID	Photoionization detector
PM	Project Manager
PPE	Personal protective equipment
ppm	Parts per million
PR	Preliminary review
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RAGS	Risk Assessment Guidance for Superfund
RBTL	Risk-based target level
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RD	Reductive dechlorination
RDX	Royal Demolition Explosive
RFI	RCRA Facility Investigation
RISC	Risk Integrated System of Closure
RME	Reasonable maximum exposure
RSL	Regional screening level
SAP	Sampling and analysis plan
SCS	Soil Conservation Service
SEL	Severe effects level
SLERA	Screening-level ecological risk assessment
SOP	Standard operating procedure
SP	Special Program
SPCS	State Plane Coordinate System
SQG	Soil quality guideline
SSL	Soil screening level
SWMU	Solid Waste Management Unit

TAL	Target analyte list
TCE	Trichloroethene
TEC	Threshold effects concentration
TEL	Threshold effects level
Tetra Tech	Tetra Tech NUS, Inc.
TNT	2,4,6-trinitrotoluene
TNX	Hexahydro-1,3,5-trinitroso-1,3,5-triazine
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TRV	Toxicity reference value
UCL	Upper confidence limit
UFP	Unified Federal Policy
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
UTL	Upper tolerance limit
VOC	Volatile organic compound
VSI	Visual Site Inspection
WRS	Wilcoxon Rank Sum
WES	Waterways Experiment Station
WWII	World War II

EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for Solid Waste Management Unit (SWMU) 18 - Load and Fill Area - was prepared for Naval Support Activity (NSA) Crane, located in Crane, Indiana, through Naval Facilities Engineering Command (NAVFAC) Midwest under Contract Task Order (CTO) F201 of the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-03-D-0057.

SWMU 18 is located in the west-central portion of NSA Crane encompasses approximately 1 square mile, and includes over 100 buildings. SWMU 18 is bounded on the north and south by drainages to Boggs Creek, on the east by Boggs Creek, and on the west by Highway 101. Buildings within SWMU 18 are generally situated along two east-west trending ridges. The tops of the ridges are generally cleared and level, whereas the slopes are wooded and steep, with relief of 150 to 200 feet.

Projectile load and fill operations, powder operations, and propellant testing have been conducted since the early 1940s at SWMU 18 and continued throughout its operational history. Load and fill operations were conducted in the northern portion and part of the southern portion of SWMU 18. The remaining area of the southern portion of SWMU 18 was used for research, development, and testing and was referred to as the Applied Sciences Complex. Current operations within SWMU 18 include renovation, rework, and loading of munitions items; research and development; and testing.

Due to its large size, SWMU 18 was subdivided into ten subareas based on similar operations or use and geographic proximity to facilitate more efficient and effective investigation. The SWMU 18 subareas are:

- Subarea A: Building 105 Area
- Subarea B: Buildings 101, 102, and 103 Area
- Subarea C: Inert Operation Area
- Subarea D: Special Program (SP) Area
- Subarea E: Building 104 Area
- Subarea F: Buildings 2084, 2085, and 2540 Area
- Subarea G: Applied Science Department (ASD) I Area
- Subarea H: Building 198 Area
- Subarea I: Building 200 Area
- Subarea J: ASD II Area

Several environmental investigations have previously been conducted at SWMU 18 and include the following:

- Installation Assessment (Army, 1978)
- Initial Assessment Study (IAS) [Naval Energy and Environmental Support Activity (NEESA), 1983]
- Preliminary Review (PR)/Visual Site Inspection (VSI) (A.T. Kearney, 1987)
- Underground Storage Tank Closure for Building 199 (Sverdrup, 1997)
- Environmental Indicator (EI) Investigation [Tetra Tech NUS, Inc. (Tetra Tech), 2005]
- Preliminary Review/Visual Site Inspection (PR/VSI) (Tetra Tech, 2011a)

The 2010 PR/VSI provided information for the Department of the Navy (Navy) and regulatory agency decision makers to determine whether SWMU 18 posed an imminent threat to public health or the environment and whether an accelerated response action was warranted. The scope of the 2010 PR/VSI included review of historical records, site reconnaissance, and interviews with facility personnel to assess environmental conditions related to current and historical activities conducted at SWMU 18. The 2010 PR/VSI recommended additional investigation to be conducted in phases at each subarea. The initial phase of the RFI would determine whether contaminants are present within a subarea at concentrations of potential concern. Subsequent phases of investigation would characterize the nature and extent of contamination for risk assessments and potential remedial evaluations.

RFI field activities were conducted from October 2011 through January 2012 in accordance with the Sampling and Analysis Plan (SAP) for SWMU 18 (Tetra Tech, 2011a). The field activities included:

- Mobilization/demobilization activities, including utility clearance
- Surface and subsurface soil sampling using direct push technology (DPT) methods
- Surface soil composite sampling
- Soil boring drilling and monitoring well installation using hollow-stem auger and air rotary drilling methods
- Water level measurement
- Groundwater sampling
- Surface water and sediment sampling
- Surveying

Prior to evaluating the nature and extent of contaminants in soils, sediment, surface water, and groundwater, and conducting human health and ecological risk assessments for the subareas, the

laboratory analytical data went through a Data Quality Review (DQR), including data verification and validation and a data usability assessment. In addition, metals concentrations in surface and subsurface soils at Subareas C and F were compared to the representative background soil data sets developed for NSA Crane.

This report addresses the investigations of Subarea B, Subarea C, Subarea F, and Boggs Creek, which are recommended for no further action (NFA). Background, histories, and results of the RFI field investigation for these subareas are summarized in the text that follows. The remaining subareas will be addressed in separate reports following additional characterization activities.

Subarea B – Buildings 101, 102, and 103 Area

Subarea B is located in the northern portion of SWMU 18 along Highway 10. The subarea includes the three principal buildings (Buildings 101, 102, and 103), multiple small outbuildings and support structures (e.g., storage bunkers), and the adjacent land area. The buildings, outbuildings, and support structures were constructed in 1942 for the purpose of supporting Navy gun ammunition, principally black powder and smokeless powder operations, during World War II (WWII). Specifically, the types of ammunition items ranged from 5-inch/38 caliber to 16 inch/55 caliber. Black powder and smokeless powder operations, including cartridge tanking and assembly, were conducted in Building 101. Building 101 was also used for loading propellant charges for medium-caliber cartridges. Building 102 was designed to support bag charge loading and assembly operations for major-caliber ammunition, such as 16-inch/50 used by Iowa-class battleships. Site operations at Buildings 103, identified as an igniter loading building, included ignition filling and packing activities from approximately 1942 to the late 1980s/early 1990s. Black powder was loaded into a number of ignition devices used with propellant charges during this time. The facility was last used to produce black powder patches that were sewn to each 16-inch/50 bag charge. Although no previous investigations had been conducted at Subarea B, it was suspected that releases had occurred at the subarea.

The baseline human health risk assessment (HHRA), performed to characterize the potential risks to likely human receptors under current and potential future land use scenarios for Subarea B at SWMU 18, identified no chemicals of concern (COC) in surface or subsurface soil through direct contact or migration to groundwater. Therefore, cancer risks and hazard indices were not calculated for exposures to surface soil and subsurface soil at Subarea B; no unacceptable risk from exposure to contaminants in soils is considered to exist for Subarea B. Similarly, the ecological risk assessment (ERA), performed to characterize the potential risks to likely ecological receptors at Subarea B at SWMU 18 identified no chemicals of potential concern (COPC) in surface soil.

Based on the results of the human health and ecological risk assessments, NFA is recommended for Subarea B. Table ES-1 includes a summary of the HHRA and ERA for Subarea B.

Subarea C – Inert Operation Area

Subarea C is located in the western portion of SWMU 18, off of Highway 101 and within the area operated by Crane Army Ammunition Activity (CAAA). Three main buildings and several smaller buildings were located at Subarea C. The three main buildings include Buildings 119, 226, and 227 which were part of operations associated with Buildings 106 and 107 for overhaul of projectile tanks and cases. The five buildings were connected by a series of covered walkways. Building 227 was used for storage of dirty projectile cases and tanks. Cases and tanks were transferred to Building 106 for cleaning with caustics, degreasers, and acids prior to being finished in Building 107 with grit blasters, degreasers, and paint. Building 119 was used to store clean cases, and Building 226 was used to store clean tanks. Finishing and painting were also conducted in Buildings 119 and 227. No explosive materials were handled or stored in Buildings 119, 226, or 227. Underground storage tanks (UST) were located east of Buildings 119, 226, and 227.

A release of No. 2 fuel oil from the secondary containment for the aboveground storage tank (AST) at Building 115 (Boiler House) occurred in February 1994. The release was concluded to have been the result of ice damage to a valve on one of the fuel oil ASTs associated with Building 115. Fuel oil was released from the valve and collected in the secondary containment of the AST; however, the oil leaked from the sump in the secondary containment to a sanitary sewer line and a storm sewer line (via an overflow from the sanitary sewer line). The fuel oil was discharged from the storm sewer to a surface water drainage east of Building 115, which flowed to Boggs Creek. The Navy initiated a spill response the day of the release, recovering approximately 11,000 gallons of the 13,800 gallons of fuel oil released by May 1994. The release reportedly extended from the storm sewer discharge to the confluence to Boggs Creek.

The baseline HHRA for Subarea C identified barium, chromium, methylene chloride, and naphthalene as COPCs in surface soil and TPH-DRO and TCE as COPCs in subsurface soil. Benzene, arsenic, cadmium, and chromium were identified as COPCs in groundwater, and benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene were identified as COPCs in sediment. Cumulative hazard indexes (HI) for all receptors under the reasonable maximum exposure (RME) and central tendency exposure (CTE) scenarios were less than 1, indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. Incremental lifetime

cancer risks (ILCR) for all receptors under the RME scenario were less than or within the United States Environmental Protection Agency's (USEPA) and the Indiana Department of Environmental Management's (IDEM) target risk range of 10^{-4} to 10^{-6}. Concentrations of TPH-DRO exceed the IDEM UST standards; however, risk estimates cannot be calculated for TPH-DRO. Individual petroleum-related constituents were evaluated for risk estimates, and no unacceptable risk to potential receptors was identified. The ERA for Subarea C evaluated surface soil and sediment from Subarea C. No chemicals were retained in the ERA as COPCs for potential ecological receptors.

Based on the results of the human health and ecological risk assessments, NFA is recommended for Subarea C. Table ES-1 includes a summary of the HHRA and ERA for Subarea C.

Subarea F – Buildings 2084, 2085, and 2540 Area

Subarea F is located in the southeastern portion of SWMU 18 along Highway 101. Subarea F consists of three large building (Buildings 2084, 2085, and 2540), several small buildings and support structures (e.g., ASTs), and the adjacent land area. Floor drains located throughout Building 2084 were connected to a settling basin located southeast of Building 2084; the settling basin discharges to the sanitary sewer system. Machinery and operations at Building 2084 consisted of a paint booth, drying oven, vacuum system, sand room, and plaster loading room. Four trenches in the plaster loading room drained to the south side of the building. The trenches were lined with metal in 1961. A ditch was located on the southern side of the building. Other structures in the area include Building 3323 (research and development offices), Building 199 (boiler house) with two 30,000 gallon ASTs with secondary containment, and Building 3317 (weather structure). Building 199 is a concrete structure housing three boilers, with drains at the building connected to a nearby sump. Multiple small ancillary buildings (Buildings 2160, 2932, 2933, 2934, 2935, and 2938) supported operations in this subarea; these buildings did not handle explosives and have been demolished. Buildings 2084 and 2085 were built in 1946 and were originally used for ammunition engineering and inert storage, respectively. Building 2084 has been used for a number of functions through the years, including housing inert materials loading (dummy loads), plastic molding, ordnance engineering and now a general storage function. Building 2540 was built in 1945 and was originally used for ordnance engineering and development. Building 2540 is the largest at SWMU 18 and has an area of 29,483 square feet.

In 1997, four 5,000 gallon and one 10,000 gallon fuel oil USTs () were removed from behind Building 199. Approximately 345 cubic yards of petroleum-impacted soil were also removed for disposal at the Crane landfill. Sverdrup (1997) concluded that TPH concentrations were generally "below levels that are usually indicative of environmental soil contamination [i.e., TPH concentrations less than 100 ppm]". The

maximum TPH concentration was 218 mg/kg from the bottom of the UST # 3 excavation. This concentration is less than the current IDEM Risk Integrated System of Closure (RISC) value of 230 mg/kg for residential use.

The baseline HHRA for Subarea F identified benzo(a)pyrene and thallium as COPCs in surface soil and cobalt as a COPC in subsurface soil. ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

The ERA for Subarea C also evaluated surface soil from Subarea F. No chemicals were retained in the ERA as COPCs for potential ecological receptors.

Based on the results of the human health and ecological risk assessments, NFA is recommended for Subarea F. Table ES-1 includes a summary of the HHRA and ERA for Subarea F.

Boggs Creek

Boggs Creek is one of six major streams at NSA Crane. Boggs Creek is a third-order stream and lies within Drainage Basin IV at NSA Crane. Drainage Basin IV consists of Boggs and Turkey Creeks, which are the primary streams at NSA Crane and drain the majority of the installation. SWMU 18 lies within Drainage Basin IV.

Drainage swales and ditches convey surface water from developed areas of SWMU 18 to drainageways and then to three tributaries of Boggs Creek. The three tributaries are located east of Subareas A and B and north of Subarea E; along the boundary of Subareas C, D, E, F, G, and H; and, southeast of Subarea J. Two smaller drainages flow directly from Subarea E to Boggs Creek. Boggs Creek also drains areas north and east of SWMU 18. The headwaters of Boggs Creek lie just south of Highway 5, approximately 1.5 miles north of Subarea A.

The baseline HHRA, performed to characterize the potential risks to likely human receptors for exposures to surface water and sediment at Boggs Creek, identified RDX and chromium as COPCs in surface water and arsenic, chromium, cobalt, iron, manganese, and thallium as COPCs in sediment. Cumulative ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}. Furthermore, SWMU 18 is not contributing RDX to surface water in Boggs Creek. The maximum concentration of RDX detected was from the sample from the tributary that flows from the area east of Boggs Creek. This tributary flows past SWMU 13 (Mine Fill B). Characterization activities associated with SWMU 13 have determined that RDX-contaminated groundwater from

SWMU13 discharges to this unnamed tributary via seeps. The RDX in Boggs Creek is being addressed as part of remedial actions for SWMU 13. Therefore, no COCs were identified for the surface waters and sediments of Boggs Creek.

The ERA for Boggs Creek evaluated potential ecological risks from surface water and sediment. No chemicals were retained in the ERA as COPCs for potential ecological receptors.

Based on the results of the human health and ecological risk assessments, NFA is recommended for Boggs Creek. Table ES-1 includes a summary of the HHRA and ERA for Boggs Creek.

TABLE ES-1

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AND ECOLOGICAL RISKS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
SUBAREA B - BUILDINGS 101, 102, AND 103 AREA					
Current/Future Trespassers (Adolescent)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Construction Worker (Adult)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Industrial Worker (Adult)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Recreational User (Adult)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Recreational User (Child)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Recreational User (Lifelong)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Resident (Adult)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Resident (Child)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Future Resident (Lifelong)	Surface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	No carcinogenic COPCs	No noncarcinogenic COPCs	NA	NA
Terrestrial Plants and Invertebrates	Surface Soil	NA	NA	Acceptable	NA
Mammals and Birds	Surface Soil	NA	NA	Acceptable	NA
SUBAREA C - INERT STORAGE AREA					
Current/Future Trespassers (Adolescent)	Surface Soil	2E-06	0.005	NA	NA
	Sediment	1E-07	No noncarcinogenic COPCs	NA	NA
Future Construction Worker (Adult)	Surface Soil	9E-06	0.2	NA	NA
	Groundwater	1E-08	0.001	NA	NA
Future Industrial Worker (Adult)	Surface Soil	1E-05	0.03	NA	NA

TABLE ES-1

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AND ECOLOGICAL RISKS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
SUBAREA C - INERT STORAGE AREA (cont.)					
Future Recreational User (Adult)	Surface Soil	2E-06	0.003	NA	NA
	Sediment	2E-07	No noncarcinogenic COPCs	NA	NA
Future Recreational User (Child)	Surface Soil	1E-05	0.03	NA	NA
	Sediment	1E-06	No noncarcinogenic COPCs	NA	NA
Future Recreational User (Lifelong)	Surface Soil	2E-05	NA	NA	NA
	Sediment	1E-06	No noncarcinogenic COPCs	NA	NA
Future Resident (Adult)	Surface Soil	3E-05	0.04	NA	NA
	Sediment	2E-07	No noncarcinogenic COPCs	NA	NA
	Groundwater	5E-05	0.2	NA	NA
Future Resident (Child)	Surface Soil	2E-04 (No carcinogenic COPCs)[(2)]	0.4	NA	Ingestion of soil (chromium)
	Sediment	1E-06	No noncarcinogenic COPCs	NA	NA
	Groundwater	5E-05	0.6	NA	NA
Future Resident (Lifelong)	Surface Soil	2E-04 (No carcinogenic COPCs)[(2)]	NA	NA	Ingestion of soil (chromium)
	Sediment	1E-06	No noncarcinogenic COPCs	NA	NA
	Groundwater	1E-04	NA	NA	NA
Mammals and Birds	Surface Soil	NA	NA	Acceptable	NA
Sediment Invertebrates	Sediment	NA	NA	Acceptable	NA
	Sediment	NA	NA	Acceptable	NA
Terrestrial Plants and Invertebrates	Surface Soil	NA	NA	Acceptable	NA
SUBAREA F - BUILDINGS 20832, 2083, AND 2540 AREA					
Current/Future Trespassers (Adolescent)	Surface Soil	2E-08	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	3E-10	0.02	NA	NA
Future Construction Worker (Adult)	Surface Soil	6E-09	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	4E-07	0.2	NA	NA
Future Industrial Worker (Adult)	Surface Soil	1E-07	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	2E-08	0.09	NA	NA
Future Recreational User (Adult)	Surface Soil	3E-08	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	8E-10	0.009	NA	NA
SUBAREA F - BUILDINGS 20832, 2083, AND 2540 AREA (cont.)					

TABLE ES-1

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AND ECOLOGICAL RISKS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
Future Recreational User (Child)	Surface Soil	1E-07	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	4E-10	0.09	NA	NA
Future Recreational User (Lifelong)	Surface Soil	1E-07	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	1E-09	NA	NA	NA
Future Resident (Adult)	Surface Soil	2E-07	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	6E-08	0.1	NA	NA
Future Resident (Child)	Surface Soil	1E-06	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	2E-08	1	NA	NA
Future Resident (Lifelong)	Surface Soil	1E-06	No noncarcinogenic COPCs	NA	NA
	Subsurface Soil	8E-08	NA	NA	NA
Terrestrial Plants and Invertebrates	Surface Soil	NA	NA	Acceptable	NA
Mammals and Birds	Surface Soil	NA	NA	Acceptable	NA
BOGGS CREEK					
Current/Future Trespassers (Adolescent)	Surface Water	4E-07	0.0009	NA	NA
	Sediment	6E-07	0.02	NA	NA
Future Recreational User (Adult)	Surface Water	1E-06	0.001	NA	NA
	Sediment	2E-06	0.03	NA	NA
Future Recreational User (Child)	Surface Water	2E-06	0.004	NA	NA
	Sediment	1E-05	0.3	NA	NA
Future Recreational User (Lifelong)	Surface Water	3E-06	NA	NA	NA
	Sediment	1E-05	NA	NA	NA
Aquatic Organisms	Surface Water	NA	NA	Acceptable	NA
Mammals and Birds	Sediment and Surface Water	NA	NA	Acceptable	NA
Sediment	Sediment	NA	NA	Acceptable	NA

Footnotes
1 - Target organs hazard index is less than 1.
2 - Chromium was evaluated in the human health risk assessment as hexavalent chromium. Value in parenthesis is cancer risk or hazard index if chromium is evaluated as trivalent chromium.

1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for Solid Waste Management Unit (SWMU) 18 - Load and Fill Area was prepared for the Naval Support Activity (NSA) Crane, located in Crane, Indiana, through Naval Facilities Engineering Command (NAVFAC) Midwest under Contract Task Order (CTO) F201 of the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-03-D-0057. The RFI was conducted in accordance with the Unified Federal Policy (UFP) Sampling and Analysis Plan (SAP) [Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP)] for SWMU 18 (Tetra Tech, September 2011).

Projectile load and fill operations, powder operations, and propellant testing have been conducted at SWMU 18 since the early 1940s and continued throughout its operational history. Load and fill operations were conducted in the northern portion and part of the southern portion of SWMU 18. The remaining area of the southern portion of SWMU 18 was used for research, development, and testing and was referred to as the Applied Sciences Complex. Current operations within SWMU 18 include renovation, rework, and loading of munitions items; research and development; and testing.

1.1 PURPOSE

The purpose of this RFI Report is to describe the site investigation activities conducted at SWMU 18 and to present the results and interpretation thereof for SWMU 18 Subareas B, C, and F and Boggs Creek. In addition, human health and ecological risks were evaluated through a baseline human health risk assessment (HHRA) and a screening-level ecological risk assessment (SLERA).

1.2 SITE BACKGROUND

Locations and descriptions of NSA Crane and SWMU 18 are presented in the subsections that follow.

1.2.1 Facility Location and Description

NSA Crane is located in a rural, sparsely populated region of south-central Indiana, approximately 75 miles southwest of Indianapolis, 60 miles northwest of Louisville, Kentucky, and immediately east of Burns City and Crane Village, Indiana. A location map of the NSA Crane facility is provided as Figure 1-1. NSA Crane is the third largest United States naval installation in the world. The base includes over 3,000 buildings and covers more than 63,000 acres in the northern portion of Martin County and smaller portions of Greene, Daviess, and Lawrence Counties. More than 5,000 military and Department of Defense (DoD) civilians and contractors work at NSA Crane [Commander Naval

Installation Command (CNIC), 2010]. Currently, NSA Crane hosts several commands and divisions, including Naval Surface Warfare Center (NSWC) Crane Division which provides material, technical, and logistical support to the Department of the Navy (Navy) for equipment, shipboard weapons systems, and nonexpendable ordnance items. In addition, NSA Crane supports the Crane Army Ammunition Activity (CAAA) with production, renovation, storage, shipment, demilitarization, and disposal of conventional ammunition.

The facility was commissioned in 1941 as the Naval Ammunition Depot (NAD) Burns City to serve as an inland munitions production and storage center for the Navy. Operations at the facility originally included production, testing, and storage of ordnance. The facility was constructed on land publicly acquired under the White River Land Utilization Project (35,000 acres) and land purchased from private ownership (26,830 acres) beginning in 1934. Prior to its acquisition by the Navy, the land was largely used for timber and agriculture (Tetra Tech, 2001). The name of the facility was changed in 1943 to NAD Crane, in 1975 to the Naval Weapons Support Center, and in 1992 to NSWC Crane. In 2003, NSWC Crane operations fell under the command structure of NSA Crane during regional reorganization by the Navy. DoD ammunition procurement responsibility was transferred to the Army in 1977. The Army assumed ordnance production, storage, and related responsibilities at the facility, which continues to the present.

1.2.2 SWMU 18 Location and Description

SWMU 18 is located in the west-central portion of NSA Crane, encompasses approximately 1 square mile (Figure 1-1), and includes over 100 buildings (Figure 1-2). SWMU 18 is bounded on the north and south by drainages to Boggs Creek, on the east by Boggs Creek, and on the west by Highway 101. Buildings used by CAAA (and not included in SWMU 18) are located west of Highway 101. Highway 45, which parallels a surface water tributary to Boggs Creek, generally bisects the site into northern and southern areas along two east-west ridges. Access to the southern portion of the site is from Highway 45, and access to the northern portion is from Highway 101. Surface elevations within SWMU 18 range from approximately 700 feet above mean sea level (msl) along western areas of the ridges to approximately 515 feet above msl along Boggs Creek on the southeastern side of the site. The tops of the ridges are generally cleared and level, whereas the slopes are wooded and steep, with relief of 150 to 200 feet. Buildings within SWMU 18 are generally situated along the two east-west trending ridges.

Several SWMUs and munition response sites are located either within or near SWMU 18. SWMU 08 – Building 106 Pond is located within the eastern portion of SWMU 18. SWMU 11 – Old Storage Building 225 is located west of SWMU 18 across Highway 101. Area of Concern 1 – Building 143 Drop Test Area is located south of Building 143, and UXO 6 – Test Pads on Hill Behind Building 198 is located northeast

of Building 198. These areas are or have been addressed under other environmental projects by NSA Crane.

Projectile load and fill operations, powder operations, and propellant testing have been conducted at SWMU 18 since the early 1940s and continued throughout its operational history. Load and fill operations were conducted in the northern portion of SWMU 18, principally in Buildings 101, 102, 103, 104, 105, and 189 and also in Buildings 200 and 198 in the southern portion of SWMU 18. The remaining area of the southern portion of SWMU 18 was used for research, development, and testing and was referred to as the Applied Science Department (ASD) Complex.

Due to its large size, SWMU 18 was subdivided into ten subareas based on similar operations or use and geographic proximity to facilitate more efficient and effective investigation. These subareas are delineated on Figure 1-2 and are as follows:

- Subarea A: Building 105 Area
- Subarea B: Buildings 101, 102, and 103 Area
- Subarea C: Inert Operation Area
- Subarea D: Special Program (SP) Area
- Subarea E: Building 104 Area
- Subarea F: Buildings 2084, 2085, and 2540 Area
- Subarea G: ASD I Area
- Subarea H: Building 198 Area
- Subarea I: Building 200 Area
- Subarea J: ASD II Area

This report addresses the investigations of Subarea B, Subarea C, Subarea F, and Boggs Creek. The remaining subareas will be addressed in separate reports following additional characterization activities.

Table 1-1 includes a list of buildings associated with the subareas presented in this report. Further discussion of site location and history for the subareas is provided in the individual subarea sections (Sections 6 through 9).

1.3 PREVIOUS INVESTIGATIONS

Several environmental investigations have previously been conducted at SWMU 18. These previous studies and investigations are summarized in the subsections that follow.

1.3.1 Installation Assessment (1978)

The Installation Assessment report (Army, 1978) identified the main areas of potential contamination within the area of SWMU 18 as being associated with Building 104. The report identified explosives, such as Composition A and Explosive D, and acids and caustics as constituents potentially adversely impacting the environmental media of the site. The report also stated that chemicals were discharged directly to Boggs Creek from the ASD complex, located in the southern portion of SWMU 18. The principal constituents discharged were likely explosives, magnesium oxide, and dyes.

1.3.2 Installation Assessment Study (1983)

The Initial Assessment Study (IAS), conducted in 1983 by Naval Energy and Environmental Support Activity (NEESA), identified four buildings within the Load and Fill Area as suspected contamination sites - Buildings 104, 105, 198, and 200 (NEESA, 1983). Potential surface contamination was identified at these buildings. Mercury, chromium, cadmium, ammonium picrate, royal demolition explosive (RDX), high melting explosive (HMX), 2,4,6-trinitrotoluene (TNT), and trichloroethene (TCE) were identified as chemicals of potential concern (COPC). Additional sampling was recommended for the four buildings.

1.3.3 Preliminary Review/Visual Site Inspection (1987)

A 1987 Preliminary Review (PR)/Visual Site Inspection (VSI) Report (A.T. Kearney, Inc., 1987) identified several “units” and other areas of concern. The report indicated that wastes managed at SWMU 18 contained heavy metals and explosives, including lead, chromium, ammonium picrate, RDX, and HMX. The report stated that load and fill operations produced particulate emissions, which would be assumed to migrate to surface waters (Boggs Creek) and percolate to groundwater, and recommended obtaining information on design and operation of the various units identified. The report also recommended sampling the intermittent stream that runs from Building 104 to Boggs Creek.

1.3.4 Closure Report, Building # 199 (1997)

The Closure Report for Building # 199 (Sverdrup, 1997), located in Subarea F documented closure of five heating oil underground storage tanks (UST) located at Building 199. The report concluded that total petroleum hydrocarbons (TPH) concentrations in soil were “below levels that are usually indicative of environmental soil contamination (i.e., TPH – 100 parts per million [ppm]).”

1.3.5 Environmental Indicator Investigation (2005)

An Environmental Indicator (EI) Investigation (Tetra Tech, 2005) was conducted in 2005 and included surface soil sampling at SWMU 18 near Buildings 104 (Subarea E), 105 (Subarea A), 198 (Subarea H), and 200 (Subarea I). No samples were collected in Subareas B, C or F or Boggs Creek as part of EI Investigation.

1.3.6 Preliminary Review/Visual Site Inspection (2010)

A 2010 PR/VSI (Tetra Tech, 2011a) assessed whether potential releases of contaminants may have occurred from historical operations at SWMU 18 and whether additional investigation activities were warranted. The PR/VSI also provided information for Navy and regulatory agency decision makers to determine whether the site posed an imminent threat to public health or the environment and to determine whether it warranted an accelerated response action. The scope of the 2010 PR/VSI included review of historical records, site reconnaissance, and interviews with facility personnel to assess environmental conditions related to current and historical activities conducted at SWMU 18.

The 2010 PR/VSI recommended additional investigation at each subarea to be conducted in phases. The initial phase of the RFI would determine whether contaminants are present at a particular subarea at concentrations of potential concern, and the subsequent phase(s) of investigation would characterize the nature and extent of contamination for risk assessment and potential remedial evaluation.

1.4 REPORT ORGANIZATION

This RFI report is organized as follows:

- Section 1.0 of this report is the introduction, including the purpose of the report, background information for the facility and subareas, previous investigations, and report organization.

- Section 2.0 describes the study area field sampling activities and procedures associated with data collection.

- Section 3.0 describes the general physical characteristics for SWMU 18.

- Section 4.0 presents the comparison evaluation of the RFI soil analytical data for metals to the NSA Crane background data set.

- Section 5 presents a fate and transport analysis.

- Sections 6 through 9 present investigation results and data evaluation for Subareas B, C, and F and Boggs Creek, respectively. The subarea-specific sections present the subarea hydrogeology, nature and extent of contamination, identification of chemicals of concern (COC), the HHRA, and the SLERA.

Supporting documentation for this report is presented in Appendices A through J. The information included in each appendix is as follows:

- Appendix A – Miscellaneous field documentation (chain-of-custody forms, equipment calibration forms, groundwater level measurement forms, work permits, field task modification forms, and survey data)

- Appendices B through E – Field investigation documentation for individual subareas (boring logs, well construction diagrams, and sample log sheets)

- Appendix F – Data Quality Review

- Appendix G – Analytical Data

- Appendix H – Background Comparison

- Appendix I – Supporting Documentation for the Human Health Risk Assessment

- Appendix J – Supporting Documentation for the Ecological Risk Assessment

The Data Quality Review (DQR) (Appendix F) encompassed the laboratory analytical data collected during the RFI investigation activities conducted between October 2011 and January 2012. Therefore, the DQR includes an assessment for Subareas B, C, and F and Boggs Creek, as well as the other subareas (A, D, E, F, G, H, I, and J) not included in this report. Complete analytical data sets are provided in Appendix G.

TABLE 1-1

LIST OF BUILDINGS FOR EACH NFA SUBAREA
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

SWMU Subarea[1]	Building No.	Current Building Name[2]	Current User	Current Status Active/Inactive	Building Area (sq ft)	Year of Construction	Roof Vents, Floor Drains, or Sumps/Settling Basins Present?	Historical Use	Historical Building Name/Use[4]	Major Materials Handled/Stored/Used
B **(Buildings 101, 102, & 103)**	101	Underwater Sound Signal Assembly	CAAA	Active	12,502	1942	Y (FD)	Cartridge tanking and assembly	Case Filling House; Cartridge tanking and assembly; Demilitarization of propellants	- Propellants (black powder and smokeless powder) - Explosives (TNT) - Fuel Oil
	102	Production Assembly Building	CAAA	Active	7,990	1942	Y (FD)	Bag charge filling and assembly	Bag charge filling and assembly Medium-caliber loading; Demilitarization of of small arms [20mm])	- Propellants (black powder and smokeless powder) - Depleted uranium - Paint - Solvents
	103	Ignition Filling Building	CAAA	Inactive; Scheduled for demolition	1,030	1942	Y (RV)	Ignition filling and quilting	Ignition filling and quilting	- Propellants (black powder)
	Support Buildings:									
	110	Filled Bag Storage	NA	NA	49	NA	NA	NA	NA	- Propellants (black powder)
	111	Magazine Black Powder	NA	NA	49	NA	NA	NA	NA	- Propellants (black powder)
	113	Condensate Lift Station	NSA	NA	284	1942	NA	NA	NA	NA
	114	Condensate Lift Station	NA	NA	38	NA	NA	NA	NA	NA
	182	Oil and Paint Locker	CAAA	NA	178	1944	NA	Oil & paint storage	NA	- Paint - Lubricating oil
	192	Oil and Paint Locker	CAAA	NA	178	1944	NA	Oil & paint storage	NA	NA
	2137	Meter House	CAAA	NA	205	1944	NA	NA	NA	NA
	3214	Lunch and Locker	CAAA	Active	2,097	1991	NA	Lunch and locker rooms	NA	NA
	3231	Condensate Pump House	NAVFAC	NA	64	1991	NA	Steam production	NA	NA
	3349	Collector Building	CAAA	NA	546	2003	NA	NA	NA	- Single-based and double-based propellants
C **Inert Operation Area**	119	Ammo Rework	CAAA	NA	10,167	1942	Y (SB)	Inert storage (clean cases)	Inert processing (clean cases)	- Degreasers(?) - Paints - Fuel oil
	226	Storage Building Inert-RI	CAAA	NA	10,167	1941	Y (RV)	Inert storage (repaired tanks)	Inert processing (repaired tanks)	- Fuel oil
	227	Storage Building	CAAA	NA	10,167	1941	Y (RV, SB)	Projectile filling/inert storage (dirty casings and tanks)	Inert processing (dirty casings and tanks)	- Degreasers(?) - Paints - Fuel oil
	3331	Ammo Container Maint	CAAA	NA	5,200	1999	NA	NA	- ASMP Container repair (welding and painting)	- Paints
	Support Buildings:									
	115	Boiler House	CAAA	NA	5,955	1943	NA	Lunch, locker, and boiler	Lunch, locker, and boiler housing	- Fuel oil
	2651	Acid Storage Building	CAAA	NA	320	1950	NA	Acid & paint storage	Acid & paint storage	- Acid - Paints
	2676	Pump Oil - Fuel Oil	NA	NA	67	NA	NA	NA	NA	- Fuel oil
	2676A	Storage Tank Fuel Oil	NA	NA	30,000 gal.	NA	NA	NA	NA	- Fuel oil
	2676B	Storage Tank Fuel Oil	NA	NA	30,000 gal.	NA	NA	NA	NA	- Fuel oil
	2676C	Dyke	NA	NA	NA	NA	NA	NA	NA	NA
	2773	Paint Locker	NA	NA	100	NA	NA	NA	NA	NA
	2796	Paint Locker	NA	NA	100	NA	NA	NA	NA	NA
	3308	Lunch and Locker Building	CAAA	NA	3,800	1997	NA	NA	NA	NA
	3019	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1-1

LIST OF BUILDINGS FOR EACH NFA SUBAREA
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

SWMU Subarea[1]	Building No.	Current Building Name[2]	Current User	Current Status Active/Inactive	Building Area (sq ft)	Year of Construction	Roof Vents, Floor Drains, or Sumps/Settling Basins Present?	Historical Use	Historical Building Name/Use[4]	Major Materials Handled/Stored/Used
F (Buildings 2084, 2085, & 2540)	2084	Ammunition Engineering	NSWC	Vacant	10,168	1946	Y (FD, SB)	Plastic loading, sand storage	Plaster Loading Building; Inert Materials (Dummy) Loading; High-pressure testing; Office Space	- Paint
	2085	Storage Building Inert	CAAA	NA	10,167	1946	None	Storage	Storage	NA
	2540	Ordnance Eng. And Development	NSWC	NA	29,483	1945	None	Office space	Applied Research Lab; office space	- Chemical(?) room in building - Machine Shop on first floor(?)
	Support Buildings:									
	199	Boiler House	NAVFAC	Active	3,754	1944	NA	NA	NA	- Fuel oil (USTs removed)
	3317	Weather Shelter	NSA	NA	325	1989	NA	NA	NA	NA
	3323	Conventional Ordnance Project	NSWC	NA	5,400	1999	NA	NA	NA	NA
	2160	NA	NA	Demolished	253	NA	NA	NA	Garage - Farmhouse # 1	NA
	2932	NA	NA	Demolished	3,776	NA	NA	NA	Simulated Mine	NA
	2933	NA	NA	Demolished	NA	NA	NA	NA	NA	NA
	2934	NA	NA	Demolished	NA	NA	NA	NA	NA	NA
	2935	NA	NA	Demolished	3,548	NA	NA	NA	Mechanical Lab Office	NA
	2938	NA	NA	Demolished	NA	NA	NA	NA	NA	NA
	2675	Pump House	NA	NA	91	NA	NA	NA	NA	NA
	2675A	Storage Tank Fuel Oil	NA	NA	30,000 gal.	NA	NA	NA	NA	- Fuel Oil
	2675B	Storage Tank Fuel Oil	NA	NA	30,000 gal.	NA	NA	NA	NA	- Fuel Oil

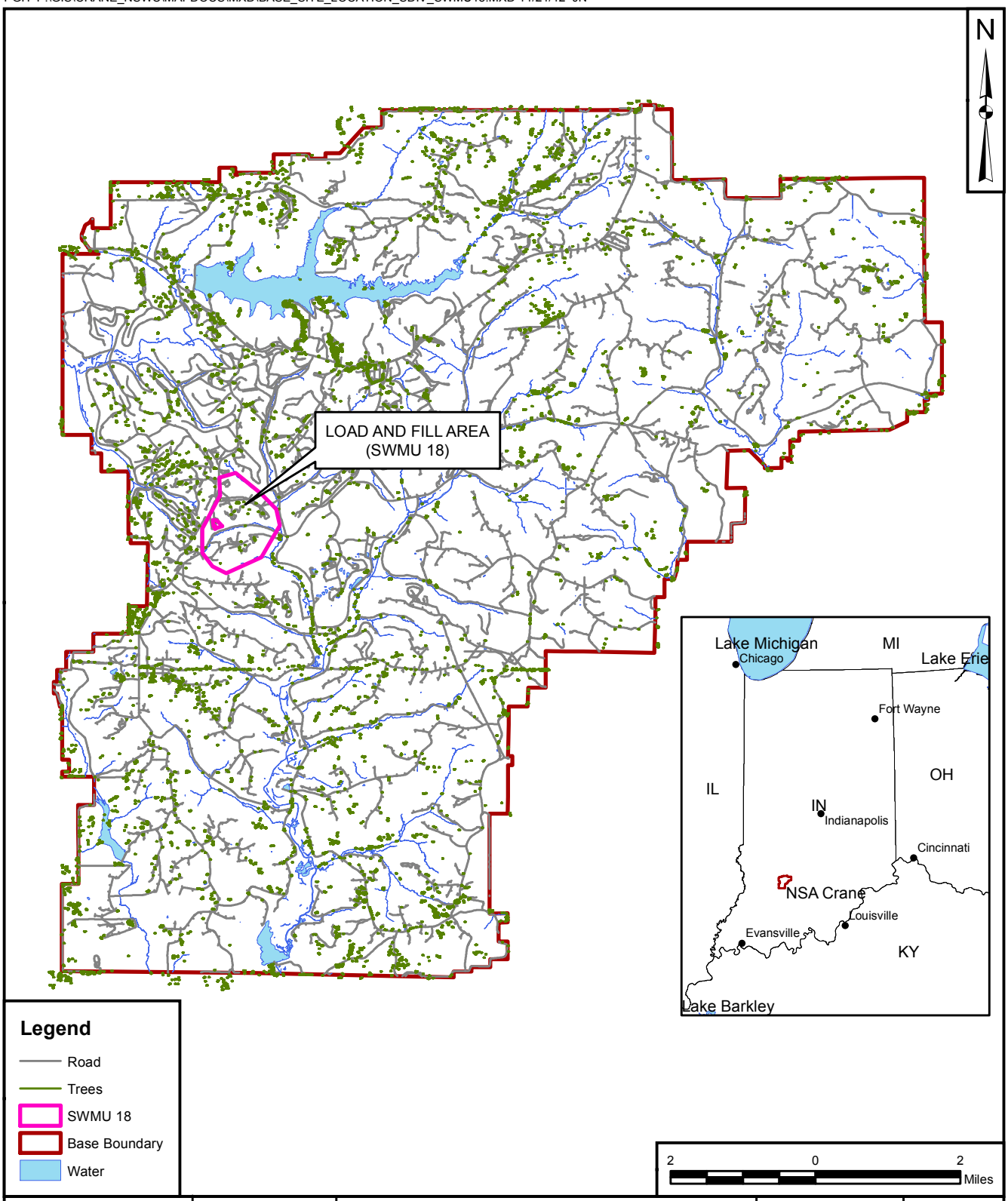
Footnotes

(1) Subareas are delineated based on common operations or mission, and topography and drainage areas.
(2) Current building names as provided by CAAA.
(3) Historical building names or uses from either:
- General Development Map (NSWC Crane, Undated)
- Initial Assessment Study (NEESA, 1983)
- Ordnance Briefings (CAAA, 2008)

Acronyms

ASD = Applied Science Department
ASMP = Army Strategic Mobility Program
CAAA = Crane Army Ammunition Activity
FD = floor drains
HMX = high melting explosive
NA = not available
NAVFAC = Naval Facilities Engineering Command
NEESA = Naval Energy and Environmental Support Activity
NFA = No Further Action
NSA = Naval Support Activity
NSWC = Naval Surface Warfare Center
PBX = polymer-bonded explosive
Qel = Quality Evaluation Laboratory
RDX = Research Department explosive
RV = roof vents
SB = settling basin
SP = special program
SWMU = Solid Waste Management Unit
TNT = trinitrotoluene
UST = underground storage tank

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\BASE_SITE_LOCATION_SDIV_SWMU18.MXD 11/21/12 JN



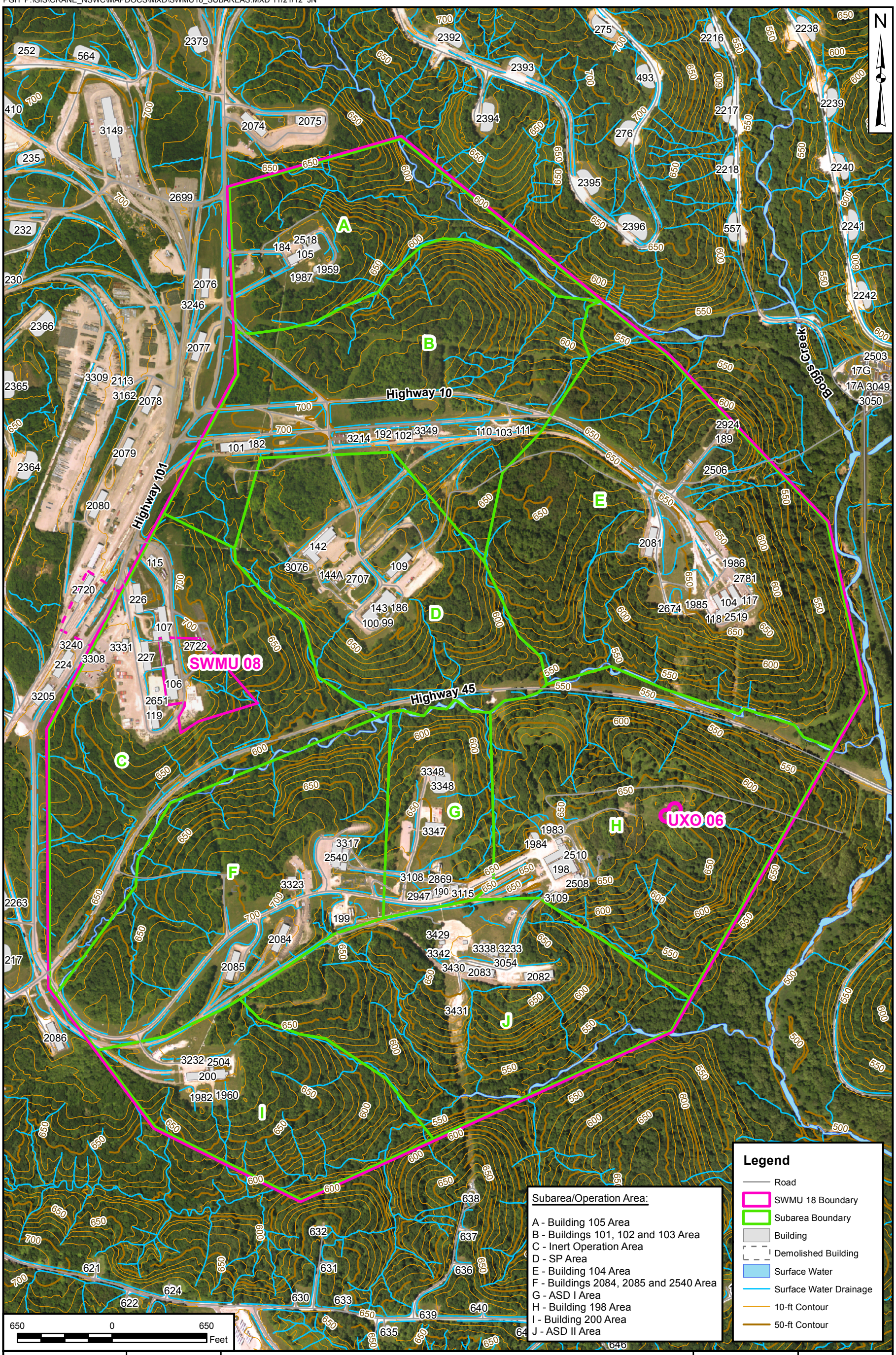
DRAWN BY / DATE	S. STROZ / 12/07/10
CHECKED BY / DATE	C. RUMER / 11/21/12
REVISED BY / DATE	J. NOVAK / 11/21/12
SCALE	AS NOTED

NAVFAC

BASE AND SITE LOCATION MAP
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER F201
APPROVED BY / DATE	
APPROVED BY / DATE	
FIGURE NO.	REV
FIGURE 1-1	0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU18_SUBAREAS.MXD 11/21/12 JN



DRAWN BY / DATE	S. STROZ / 11/10/10
CHECKED BY / DATE	C. RUMER / 11/21/12
REVISED BY / DATE	J. NOVAK / 11/21/12
SCALE	AS NOTED

NAVFAC

SWMU 18 SITE LAYOUT
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
___	F201
APPROVED BY / DATE	___ / ___
APPROVED BY / DATE	___ / ___
FIGURE NO.	REV
FIGURE 1-2	0

2.0 FIELD INVESTIGATION

This section presents a summary of the field activities, sampling procedures, and field documentation used during the RFI at NSA Crane SWMU 18 Subareas B, C and F and Boggs Creek.

2.1 OVERVIEW

The RFI field activities for SWMU 18 were conducted from October 17, 2011 through January 24, 2012. The RFI field activities were conducted in accordance with the procedures and methodologies in the Navy and Indiana Department of Environmental Management (IDEM)-approved UFP-SAP (Field Sampling Plan and Quality Assurance Plan) for SWMU 18 Load and Fill Area (Tetra Tech, 2011b), with deviations from the UFP-SAP as noted in Section 2.13. Standard Operating Procedures (SOPs) that governed the field work are included in Appendix A of the approved SAP (Tetra Tech, 2011b).

The RFI field activities were conducted at the 10 subareas (A through J) and Boggs Creek. This report focuses on proposed NFA Subareas B, C, F, and Boggs Creek. The field activities included:

- Mobilization/demobilization activities, including utility clearance
- Surface and subsurface soil sampling using direct push technology (DPT) methods
- Surface soil composite sampling
- Soil boring drilling and monitoring well installation using hollow-stem auger and air rotary drilling methods
- Water level measurement
- Groundwater sampling
- Surface water and sediment sampling
- Surveying

Field documentation is included in the following appendices:

A Miscellaneous Field Documentation (COCs, Field Calibration Logs, Work Permits, Groundwater Measurement Sheets, Survey Data, Field Task Modification Request Forms)
B Subarea B - Boring Logs and Sample Log Sheets
C Subarea C - Boring Logs, Well Construction Diagrams, and Sample Log Sheets
D Subarea F - Boring Logs, Well Construction Diagrams, and Sample Log Sheets
E Boggs Creek - Sample Log Sheets

2.2 MOBILIZATION/DEMOBILIZATION

All field team members reviewed the approved UFP-SAP and Health and Safety Plan (HASP) prior to the start of field activities. Field personnel also attended an orientation given by the Field Operations Leader (FOL) to ensure familiarity with the scope of field activities. The FOL coordinated with base personnel and Indiana Underground Plant Protection Services (IUPPS) to obtain utility clearance for the area under investigation. Permits for activities within operations areas were obtained from Navy and Army explosive safety officers. Permits were requested and issued by the NSA Crane fire department (Appendix A). A location suitable for use as a lay-down/storage and decontamination area for subcontractor drilling equipment and well constructions supplies was established. Equipment requirements, including transport to the site, decontamination, and demobilization were managed by the FOL.

2.3 SOIL INVESTIGATION

2.3.1 Surface and Subsurface Soil Sampling

A total of 39 surface and subsurface soil samples were collected in Subareas B, C, and F. A summary of soil samples is provided in Table 2-1. Locations of soil samples are illustrated on figures in the subarea-specific sections (Sections 6 through 8). Soil sample locations were selected to target areas in which releases may have occurred, based on site activities and information. Surface soil samples were collected from 0 to 2 feet bgs with the use of hand augers at targeted areas located along drainage pathways and other potentially impacted areas. If collected, surface soil samples for volatile organic compound (VOC) analyses were collected from 0.5 to 2 feet bgs. Soil borings consisted of two soil samples to be collected from each soil boring location; one surface soil (0 to 2 feet bgs; 0.5 to 2 feet bgs for VOCs) and one subsurface soil (depth was location-specific). If refusal on bedrock was encountered before the desired subsurface sample depth, the sample was collected from the 2-foot soil interval above the bedrock surface.

Surface and subsurface soil samples were collected in accordance with SOP-10 (Surface and Subsurface Soil Sampling) of the UFP-SAP (Tetra Tech, 2011). For locations where only a surface soil sample was collected or where DPT rig access was limited (i.e., steep slope or restricted access), soil samples were collected using a hand auger. For locations where both surface soil and subsurface soil samples were collected, the samples were collected using DPT probing or hollow-stem augering with split-spoon sampling methods. Soil samples were initially screened for VOCs with a photoionization detector (PID) upon collection. PID readings and any qualitative visual signs of potential contamination (such as soil

staining) were noted on the soil boring logs or sample logsheets, depending on location. Boring logs and soil sample logsheets for each subarea are provided in Appendices B through D.

2.3.2 Soil Boring Drilling

Soil borings were advanced to collect soil samples for lithologic characterization and chemical analyses. A total of 18 soil borings were advanced in Subareas B, C, and F. A summary of soil borings advanced is provided in Table 2-1. Locations of soil samples are illustrated on figures in the subarea-specific sections (Sections 6 through 8).

The soil borings were advanced using DPT methods, hollow-stem augers with split-spoon sampling, or, where access or terrain prohibited the DPT rig, a hand auger, in accordance with SOP-08 (Borehole Advancement and Soil Coring Using DPT and Hand Auger Techniques) of the UFP-SAP (Tetra Tech, 2011). Soil samples were collected during borehole advancement at 2-foot (split-spoon) or 4-foot (DPT) intervals. Upon retrieval, the soil samples from the borings were screened with a PID for VOCs, and the PID readings were recorded on the boring logs. In addition, descriptions of soil classification, lithology changes, sample moisture, depth to water, drilling methods, and total depth of each borehole were included on each boring log. Boring logs for each subarea are provided in Appendices B through D.

2.3.3 Borehole Abandonment

Soil borings advanced for soil sampling or dry monitoring well boreholes were abandoned as part of the SWMU 18 RFI. Soil borings advanced using DPT probing or hand augering were backfilled with the excess soil removed during the borehole advancement. If additional fill material was needed, bentonite chips were used to backfill the boring to within a few inches of the surface. One borehole in Subarea C advanced for monitoring well installation failed to produce water; therefore, the boring was moved and re-drilled. The dry well boreholes were abandoned by backfilling with bentonite chips and hydrating per the manufacturers recommendations.

The ground surface at each abandoned boring location was restored to its original condition (i.e., soil, asphalt, or concrete patch).

2.3.4 PCB Composite Soil Sampling

A total of 6 surface soil composite samples were collected from areas near buildings and structures in Subareas B, C, and F, where polychlorinated biphenyls (PCBs) may have been historically used in hydraulic oils or dielectric fluids (i.e., ground transformers, pump or hydraulic houses, etc.). A summary of

the composite samples is provided in Table 2-1. Locations of composite soil samples are illustrated on figures for the subarea-specific sections (Sections 6 through 8).

The surface soil composite samples were collected in accordance with SOP 11 (Composite Sampling for Surface Soil) of the UFP-SAP (Tetra Tech, 2011). At each location, four discrete surface soil samples (0 to 2 feet bgs) were collected from biased areas most likely to have been affected by hydraulic oil leaks or releases around the structures and homogenized into one sample for laboratory analyses of PCBs. If no visual evidence of a release was observed, composite samples consisted of four subsamples collected, one from each of the northern, southern, eastern, and western sides of the structure. The soil sample logs for each composite sample are included in Appendices B through and D.

2.4 GROUNDWATER INVESTIGATION

2.4.1 Monitoring Well Installation and Development

Four monitoring wells were drilled and installed at Subarea C (three wells) and Subarea F (one well) during the SWMU 18 RFI. A summary of monitoring well construction is provided in Table 2-2. Locations of the wells are illustrated on figures for the subarea-specific sections (Sections 7 and 8).

Bedrock drilling and logging were conducted in accordance with SOP-13 (Drilling and Geologic Logging of Boreholes) of the UFP-SAP (Tetra Tech, 2011). The well boreholes for the monitoring wells were drilled using hollow-stem augering techniques to drill through the overburden material, and air coring and percussion hammer techniques to drill in bedrock. In the overburden, 4.25-inch or 10-inch inside diameter hollow-stem augers were advanced to the top of bedrock. Split-spoon samples were collected continuously during auger advancement for soil characterization and screening for VOCs with a PID. Prior to advancing the boreholes into bedrock, temporary casing was installed to the top of bedrock, or the 10-inch inside diameter hollow-stem augers were used as temporary casing. One borehole per subarea was cored using NX size wireline air coring techniques for characterization of lithology and fracturing patterns. The cored boreholes and the remaining boreholes were reamed or advanced using 5.5-inch diameter air percussion hammer techniques.

Monitoring wells were installed in the boreholes in accordance with SOP-12 (Monitoring Well Installation) of the UFP-SAP (Tetra Tech, 2011). The monitoring wells were constructed of 2-inch-diameter, Schedule 40, flush-joint, polyvinyl chloride (PVC) riser pipe and slotted screen with a slot size of 0.010-inch. The well screens were 10 feet. Sand filter packs were installed in the annulus around the well screens from approximately 0.5 to 1 foot below the bottom of the well screen to 2 feet above the top

of the well screen. A 2-foot thick bentonite seal was installed above the filter pack, and the remaining annulus was sealed with cement-bentonite grout to close the ground surface.

A 6-inch steel protective surface casing with a locking cap and pad lock was set in a 4-foot by 4-foot by 6-inch thick concrete pad around each well to protect the PVC well casing. Four steel bollards were placed on the corners of the concrete pad and filled with concrete. All protective casings and bollards were painted with enamel safety yellow paint. Stainless steel tags, listing the well ID, date installed, total depth, screen length, coordinates, survey information, and contact information were installed on the protective casings. Copies of the boring logs and well construction sheets are found in Appendices C and D.

The monitoring wells were developed to remove fine sediment from within and around the well screens. The wells were developed no sooner than 48 hours after installation (i.e., grouting), in accordance with SOP-14 of the UFP-SAP (Tetra Tech, 2011). The wells were developed by surging and pumping, or for wells that were slow to recover, by repeatedly pumping or bailing dry over several days. All purge water removed from the wells during the development process was stored in a portable holding tank and discharged into a designated man-hole for treatment at the NSA Crane water treatment facility. Monitoring well development logs can be found in Appendices C and D.

2.4.2 Groundwater Purging and Sampling

The four newly installed wells and two existing wells (08MWT008 and 08MWT012) were purged and sampled as part of the SWMU 18 RFI at Subareas C and F. Purging of monitoring wells prior to sampling was performed using low-flow techniques with a bladder pump in accordance with SOP-16 (Low Flow Well Purging and Stabilization) of the UFP-SAP (Tetra Tech, 2011), and groundwater sampling was performed in accordance with SOP-17 (Groundwater Sampling).

The wells were purged using bladder pumps with Teflon® bladders and Teflon®-lined polyethylene tubing. During purging, water quality parameters of pH, specific conductance, temperature, dissolved oxygen (DO), salinity, turbidity, and oxidation-reduction potential (ORP) were measured and recorded at 5 to 10 minute intervals using a multi-parameter water quality meter and flow-through cell. Water levels and pumping rates were measured during purging and recorded at 5 to 10 minute intervals. Purging continued until a minimum of one well volume was removed from the well and the parameters stabilized within the limits of pH (+/-0.1 unit), specific conductance (+/-5%), temperature (+/-5%), turbidity [less than 10 Nephelometric Turbidity Units (NTUs)], and DO (+/-10%). If the stabilization conditions were not met after four hours of purging, purging was considered complete and sampling performed. At well locations

where metals analysis was required and the turbidity reading was >10 NTUs, a sample aliquot was collected for dissolved metals and field-filtered with a 0.45 micron in-line filter prior to preservation. Sample containers were filled directly from the low flow bladder pump by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Pertinent field data including sampling methods, purge information, pump intake depths, and locations were recorded on low-flow purge data sheets and groundwater sample log sheets (Appendices C and D).

2.4.3 Groundwater Level Measurements

One round of synoptic water-level measurements was obtained from the SMWU 18 monitoring wells as part of the RFI. Water levels were also measured from SWMU 08 wells 08MWT008 and 08MWT012 and SWMU 11 wells 11MWT001 through 11MWT004 as part of the investigation at Subarea C. The water level information from these wells provided additional information for determination of groundwater flow direction in Subarea C. In addition, water levels from Subareas F, G, H, and J were used in conjunction to determine groundwater flow in the area of those subareas. Groundwater-level measurements collected were taken within a 24-hour period using an electronic water-level meter. Water-level elevations were recorded to within 0.01-foot accuracy from a marked reference point on the well riser pipe. Water levels were recorded on a groundwater level measurement form, provided in Appendix A. Groundwater elevations and the estimated flow direction are discussed in the subarea-specific sections (Sections 7 and 8).

2.5 SURFACE WATER/SEDIMENT INVESTIGATION

Collocated surface water and sediment samples were collected at Subarea C and Boggs Creek during the SWMU 18 RFI. Five locations from Boggs Creek and two locations from Subarea C were sampled. Locations of surface water and sediment samples are illustrated on figures for the subarea-specific sections (Sections 7 and 9). The surface water and sediment samples were collected in accordance with SOPs 05 (Surface Water Sampling) and 07 (Sediment Sampling) of the UFP-SAP (Tetra Tech, 2011). Locations were sampled in order from downstream to upstream, and surface water samples were collected prior to sediment samples at each location. Surface water quality parameters were measured and recorded at each location. The sediment samples were collected at the same location as surface water samples from a depth of 0 to 6 inches below the sediment surface. Field data including water quality parameter measurements, sampling methods, and locations were recorded on sediment and surface water sample log sheets (Appendices C and E).

2.6 SETTLEMENT BASIN INVESTIGATION

Two sediment samples were collected from the base of selected settling basins at Subarea C. Sediment from the structures was collected from beneath the water surface, or if water was not present, from areas of deposition where the finest sediment was noted and sediment was moist. Measurements were made of all basins prior to sampling, and the sediment was sampled using a stainless steel pitcher attached to a section of pipe to reach to the bottom of the basin, or using a stainless steel hand auger. Field data including dimensional measurements of the structures, sampling methods, and locations were recorded on sediment sample log sheets (Appendix C).

2.7 FIELD SAMPLE DOCUMENTATION

Sample documentation from the SWMU 18 RFI field activities was prepared in accordance with SOP-03 (Sample Custody and Documentation of Field Activity) of the UFP-SAP (Tetra Tech, 2011). Documentation included boring logs, well construction sheets, well development sheets, media-specific sample log sheets, chain-of-custody records, equipment calibration log sheets, and work permits. Copies of the documentation are provided in Appendices A through E.

2.8 SAMPLE HANDLING, PACKAGING, AND SHIPPING

Sample handling activities included field-related considerations concerning the selection of sample containers, preservatives, allowable holding times, sample custody, and maintaining samples at the appropriate storage temperature. Sample handling activities were conducted in accordance with SOP-04 (Sample Preservation, Packaging, and Shipment) of the UFP-SAP (Tetra Tech, 2011). Sample containers were provided by the laboratory. Following collection of a sample, sample containers were sealed in Ziploc® plastic bags, and the glass containers were wrapped in plastic bubble wrap. Sample containers were then packed in ice in a large plastic garbage bag within a cooler. A temperature blank was placed in each cooler prior to shipment. The chain-of-custody form for the associated samples was sealed in a Ziploc® bag and taped to the inside of the cooler lid. A signed and dated custody seal was applied to each end of the cooler and then covered with strapping tape to provide a tamper-evident chain-of-custody seal. Tetra Tech maintained custody of the samples until they were relinquished to FedEx® for shipment. Samples were shipped to the laboratory via overnight delivery. FedEx® tracking numbers (airbill numbers) were recorded on the appropriate chain-of-custody form, and the sender's copy of the airbill was maintained for shipment tracking, if needed. Any deviations in cooler temperature and/or holding times were assessed and evaluated during data validation and the data usability evaluation (Appendix F).

2.9 QUALITY CONTROL SAMPLES

Quality assurance (QA) and quality control (QC) samples were generated and collected during sampling activities for the SWMU 18 RFI to monitor both field and laboratory procedures, in accordance with the UFP-SAP. QA/QC samples included field duplicates, equipment blanks, rinsate blanks, trip blanks, and temperature blanks. Also, additional sample volume was collected at the rate of 1 in 20 for the laboratory QC of matrix spike/matrix spike duplicate (MS/MSD) analyses. QA/QC samples are described below:

- Field Duplicates – Field duplicates consisted of two samples collected either independently at a sampling location at approximately the same time in the case of soil or sediment VOC samples, groundwater, and surface water samples, or as a single sample split into two portions in the case of non-VOC soil and sediment samples. Field duplicates were collected at the rate of 1 in 20 per medium and were used to assess the overall precision of the sampling and analysis program.

- Trip Blanks – Laboratory-prepared trip blanks, consisting of analyte-free water, indicated whether contamination of VOC samples had occurred during bottleware shipment or storage. One trip blank was placed in each cooler containing samples for VOC analyses.

- Equipment Rinsate Blanks – Equipment rinsates were collected at the rate of 1 in 20 for non-dedicated equipment and once per batch for disposable equipment. Equipment rinsates blanks were obtained under representative field conditions by collecting the rinse water generated by running reagent grade water through or over sample collection equipment after decontamination and before use. When pre-cleaned, dedicated, or disposable sampling equipment was used (i.e., no decontamination was required), one equipment rinsate blank was collected as a batch blank. Equipment rinsate blanks were analyzed for the same chemical constituents as the associated environmental samples.

- Temperature blanks – Temperature blanks were used to determine whether samples were adequately cooled during shipment and consisted of a sample container of water supplied by the fixed-base laboratory. A temperature blank was placed in each cooler, and its temperature was checked upon receipt at the laboratory.

2.10 FIELD INSTRUMENT MEASUREMENTS

Field measurements recorded during the SWMU 18 field sampling activities included water temperature, pH, specific conductance, ORP, DO, and turbidity; PID readings of soil samples; and groundwater level measurements. Field instruments used to obtain these measurements are listed below:

- Multi-parameter water-quality meter (Horiba U-52)
- Water level indicator (Heron Dipper-T)
- PID (MiniRAE 3000)

2.10.1 Equipment Calibration

Water quality meters and PIDs were calibrated daily prior to use according to manufacturers' requirements. Copies of the equipment calibration logs are located in Appendix A.

2.10.2 Field Investigation Preventative Maintenance Procedures/Schedules

An appropriate daily maintenance check was made on each piece of equipment. Damaged or defective instruments that may have had an impact on the accuracy of readings were removed from service until repairs or replacement had taken place. Backup instruments and equipment were available on-site depending on activities or were shipped for receipt within one day by overnight courier to avoid delays in the field schedule.

2.11 SURVEYING

The SWMU 18 RFI sampling locations, including soil, sediment and surface water locations and newly installed monitoring wells, were surveyed by an Indiana-licensed surveyor to obtain both horizontal location and vertical elevations. NSA Crane-established survey control points were used. The horizontal coordinates were surveyed to the nearest 0.1 foot and referenced to the Indiana State Plane Coordinate System (SPCS), North American Datum of 1983 (NAD 83). The vertical elevations were surveyed to the nearest 0.01 foot and referenced to Mean Sea Level, North American Vertical Datum 1988 (NAVD 88). The vertical elevations were measured for the top of the well casing (PVC), the top of the steel protection casing, and the ground surface for all of the newly installed wells. A copy of the survey data is included in Appendix A.

2.12 DECONTAMINATION

All non-dedicated (reusable) sampling equipment was decontaminated before beginning work, during drilling and sampling activities, and at the completion of the drilling and sampling in accordance with SOP-20 (Decontamination of Field Sampling Equipment). Equipment included drilling rigs, down-hole tools, and soil, sediment, and water sampling equipment.

Decontamination of sampling equipment (e.g., split-spoon samplers, DPT Macrcore® samplers, hand augers, etc.) included the following procedure:

- Potable water and phosphate-free detergent wash (scrub if necessary)
- Potable water rinse
- Deionized (DI) water rinse
- Air dry (if possible)

Field analytical equipment such as pH, conductivity, and temperature probes were rinsed first with analyte-free water then with the sample prior to making measurements. Water level measurement devices were rinsed with DI water.

Drilling equipment (e.g., hollow-stem augers, drilling rods, drilling rigs, etc.) was decontaminated using high-pressure steam at the centralized decontamination pad, which consisted of plastic sheeting bermed to collect decontamination liquids and solids.

2.13 FIELD CORRECTIVE ACTION

Corrective action includes the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or "out of QC" performance that can affect data quality, and the process of modifying procedures to address unexpected and unusual field conditions. Corrective action in the field resulted when substantive changes were made to the sampling network (i.e., more or fewer samples collected, sampling locations other than those specified, etc.) and when sampling procedures or field analytical procedures required modification. Project personnel reported suspected technical or QA nonconformance, or suspected deficiencies of any activity or issued document to the FOL or designee. The Project Manager (PM) was responsible for assessing the suspected problems in consultation with the project QA/QC Manager and for making a decision based on the potential for the situation to affect the quality of the resulting data. If it was determined that the situation warranted a reportable nonconformance requiring corrective action, a nonconformance report was initiated by the PM.

One substantive change occurred during the RFI at Subarea C. Proposed settling basin sediment sample 18CSD004 was not collected because the settling basin had been removed prior to the beginning of field activities for the SWMU 18 RFI. Soil boring 18CSB009 was advanced in the location of the former settling basin. A Field Task Modification Form was completed for the change and is provided in Appendix A.

2.14 INVESTIGATION-DERIVED WASTE HANDLING

Several types of investigation-derived wastes (IDW), including personal protective equipment (PPE), sampling equipment decontamination fluids, development and purge water, DPT plastic sleeves, and drill cuttings, were generated during the SWMU 18 RFI. Management of each type of IDW was performed as follows:

PPE, Pump Tubing, and DPT Plastic Sleeves – PPE, tubing, and DPT plastic sleeves were decontaminated, double bagged, and placed in NSA Crane dumpsters.

Purge Water and Drilling and Sampling Equipment Decontamination Fluids – Purge waters and equipment decontamination fluids were collected and discharged through 1-micron filter socks to the sanitary sewer system via the sewer manhole at Building 3245.

Cuttings from Drilling Activities – For each boring, the cuttings produced were scanned for VOCs. VOC readings were at background levels for all borings, and cuttings were used as backfill as the borings terminated above the water table. Any remaining cuttings were spread on the ground in the immediate vicinity of the boring.

2.15 SITE MANAGEMENT AND FACILITY SUPPORT

The FOL coordinated day-to-day activities and ensured that all field team members (including subcontractors) were familiar with the approved UFP-SAP and HASP during investigation activities. Coordination of sampling tasks, QA/QC, field documentation, fire and explosive safety permits, field change orders, and daily fieldwork status reports to the PM were also the responsibility of the FOL. Face-to-face meetings and electronic media were used to provide NSA Crane personnel with the most immediate and effective communication regarding site preparation, mobilization\demobilization, and sampling activities.

2.16 RECORDKEEPING

The FOL was responsible for the maintenance and security of field records. In addition to field logsheets, a site logbook was maintained and served as the overall record of field activities, weather conditions, identification of personnel, arrival and departure times of site workers, management issues, etc. Various field notebooks were also maintained by field personnel for the various field activities (e.g., soil sampling, monitoring well installation, etc.) Field records (chain-of-custody forms, sample logs sheets, field forms, logbooks, etc.) were consolidated into a central project file for CTO F201.

2.17 RESTORATION AND REVEGETATION

Areas disturbed by the drilling activities were restored to their original condition. Ruts were leveled, seeded, and covered with straw. Soil from cuttings and excavation for well pad construction and bollard installation was spread on the ground near the area as it was generated. The Tetra Tech FOL performed a site walk at the end of field activities and worked with the drilling subcontractor to ensure that restoration or revegetation due to drilling activities was completed.

TABLE 2-1

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSIS
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

Sample Location	Sample Identification	Sample Type	Date Sampled	Sample Depth Interval Sampled (feet bgs)	Energetics			Metals			VOCs	SVOCs	PCBs	Fuel Oil Parameters				Miscellaneous			Comments
					Nitroaromatics/ Nitramines	NG	Perchlorate	TAL Metals (total)	TAL Metals (dissolved)	RCRA Metals				BTEX	PAHs	TPH-DRO/ ERO	Naphthalene	pH	TOC	Ammonia	
Subarea B - Buildings 101, 102, & 103 Area																					
18BSS001	18BSS0010002	Surface Soil	20-Oct-11	0-2	X	X															
18BSS002	18BSS0020002	Surface Soil	20-Oct-11	0-2	X	X															
18BSS003	18BSS0030002	Surface Soil	20-Oct-11	0-2	X	X															Field Duplicate FD102011-01
18BSS004	18BSS0040002	Surface Soil	20-Oct-11	0-2	X	X															
18BSB001	18BSB0010002	Surface Soil	19-Oct-11	0-2	X	X															
	18BSB0010608	Subsurface Soil	19-Oct-11	6-8	X	X															
18BSB002	18BSB0020002	Surface Soil	19-Oct-11	0-2	X	X															
	18BSB0020507	Subsurface Soil	19-Oct-11	5-7	X	X															Field Duplicate FD101911-05
18BSB003	18BSB0030002	Surface Soil	20-Oct-11	0-2	X	X															
	18BSB0030203	Subsurface Soil	20-Oct-11	2-3	X	X															
18BSB004	18BSB0040002	Surface Soil	19-Oct-11	0-2	X	X															
	18BSB004XXXX	Subsurface Soil	NA	NA	--	--															Sample not collected due to boring refusal before sample depth
18BSB005	18BSB0050002	Surface Soil	19-Oct-11	0-2	X	X															
	18BSB005XXXX	Subsurface Soil	NA	NA	--	--															Sample not collected due to boring refusal before sample depth
18BSB006	18BSB0060002	Surface Soil	20-Oct-11	0-2	X	X															
	18BSB006XXXX	Subsurface Soil	NA	NA	--	--															Sample not collected due to boring refusal before sample depth
18BCP0010002	18BCP0010002	Composite Soil	20-Oct-11	0-2									X								
18BCP0020002	18BCP0020002	Composite Soil	20-Oct-11	0-2									X								Field Duplicate FD102011-02
18BCP0030002	18BCP0030002	Composite Soil	20-Oct-11	0-2									X								
Subarea C - Inert Operations Area																					
18CSS001	18CSS0010002	Surface Soil	19-Oct-11	0-2						X	X							X			Field Duplicate FD101911-01
18CSB001	18CSB0010002	Surface Soil	19-Oct-11	0-2										X	X	X	X				
	18CSB0010204	Subsurface Soil	19-Oct-11	2-4										X	X	X	X				
18CSB002	18CSB0020002	Surface Soil	20-Oct-11	0-2						X	X										
	18CSB0020507	Subsurface Soil	20-Oct-11	5-7						X	X										
18CSB003	18CSB0030002	Surface Soil	19-Oct-11	0-2						X	X										
	18CSB003XXXX	Subsurface Soil	NA	NA						X	X										Sample not collected due to boring refusal before sample depth
18CSB004	18CSB0040002	Surface Soil	20-Oct-11	0-2										X	X	X	X				
	18CSB0040507	Subsurface Soil	20-Oct-11	5-7										X	X	X	X				
18CSB005	18CSB0050002	Surface Soil	19-Oct-11	0-2						X	X										Field Duplicate FD101911-02
	18CSB005XXXX	Subsurface Soil	NA	NA						X	X										Sample not collected due to boring refusal before sample depth
18CSB006	18CSB0060002	Surface Soil	19-Oct-11	0-2						X	X							X			
	18CSB0060203	Subsurface Soil	19-Oct-11	2-3						X	X										
18CSB007	18CSB0070002	Surface Soil	20-Oct-11	0-2										X	X	X	X				
	18CSB0070406	Subsurface Soil	20-Oct-11	4-6										X	X	X	X				
18CSB008	18CSB0080002	Surface Soil	18-Oct-11	0-2						X	X										
	18CSB0080305	Subsurface Soil	18-Oct-11	3-5						X	X										
18CSB009	18CSB0090002	Surface Soil	18-Oct-11	0-2						X	X										
	18CSB0090204	Subsurface Soil	18-Oct-11	2-4						X	X										
18CMWT003	18CMWT0030204	Subsurface Soil	2-Nov-11	2-4						X	X										Sample added due to field observation
18CCP001	18CCP0010002	Composite Soil	19-Oct-11	0-2									X								
18CSD001	18CSD0010006	Sediment	19-Oct-11	0-.5										X	X	X	X				Field Duplicate FD101911-04
18CSD002	18CSD0020006	Sediment	19-Oct-11	0-.5										X	X	X	X				
18CSD003	18CSD0030006	Sediment	18-Oct-11	0-.5						X	X										Field Duplicate FD101811-01
18CSD004	18CSD0040006	Sediment	NA	NA						X	X										Settling Basin has been closed/removed & backed filled, no SD sample collected. 18CSB009 collected in foot print of former settling basin.

TABLE 2-1

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSIS
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

Sample Location	Sample Identification	Sample Type	Date Sampled	Sample Depth Interval Sampled (feet bgs)	Energetics			Metals			VOCs	SVOCs	PCBs	Fuel Oil Parameters				Miscellaneous			Comments
					Nitroaromatics/ Nitramines	NG	Perchlorate	TAL Metals (total)	TAL Metals (dissolved)	RCRA Metals				BTEX	PAHs	TPH-DRO/ ERO	Naphthalene	pH	TOC	Ammonia	
18CSW001	18CSW001	Surface Water	19-Oct-11	--										X	X	X	X				Field Duplicate FD101911-03
18CSW002	18CSW002	Surface Water	19-Oct-11	--										X	X	X	X				
18CMWT001	18CGWT001	Groundwater	17-Dec-11	24.3-34.3					X	X	X										Field Duplicate FD121711-01
18CMWT002	18CGWT002	Groundwater	16-Dec-11	23.3-33.3						X	X										
18CMWT003	18CGWT003	Groundwater	16-Dec-11	19.3-29.3					X	X	X										
08MWT008	08GWT008	Groundwater	11-Jan-12	15-30					X	X	X										
08MWT012	08GWT012	Groundwater	10-Jan-12	52-72						X	X										
Subarea F - Buildings 2084, 2085, and 2540 Area																					
18FSS001	18FSS001002	Surface Soil	22-Oct-11	0-2										X	X	X	X				Field Duplicate FD102211-01
18FSS002	18FSS002002	Surface Soil	22-Oct-11	0-2										X	X	X	X				
18FSB001	18FSB0010002	Surface Soil	22-Oct-11	0-2	X	X		X													
	18FSB0010507	Subsurface Soil	22-Oct-11	5-7	X	X		X													
18FSB002	18FSS0020002	Surface Soil	22-Oct-11	0-2	X	X		X													
	18FSB0020507	Subsurface Soil	22-Oct-11	5-7	X	X		X													
18FSB003	18FSB0030002	Surface Soil	22-Oct-11	0-2	X	X		X										X			
	18FSB0030507	Subsurface Soil	22-Oct-11	5-7	X	X		X													
18FCP001	18FCP0010002	Composite Soil	22-Oct-11	0-2									X								
18FCP002	18FCP0020002	Composite Soil	22-Oct-11	0-2									X								
18FMWT001	18FGWT001	Groundwater	11-Jan-12	13-23										X	X	X	X				Field Duplicate FD-11112-01
Boggs Creek																					
18SD001	18SD0010006	Sediment	19-Oct-11	0-.5	X	X		X											X		
18SD002	18SD0020006	Sediment	19-Oct-11	0-.5	X	X		X											X		
18SD003	18SD0030006	Sediment	21-Oct-11	0-.5	X	X		X											X		
18SD004	18SD0040006	Sediment	21-Oct-11	0-.5	X	X		X											X		
18SD005	18SD0050006	Sediment	21-Oct-11	0-.5	X	X		X											X		
18SW001	18SW001	Surface Water	19-Oct-11	--	X	X	X	X	X											X	
18SW002	18SW002	Surface Water	19-Oct-11	--	X	X	X	X	X											X	
18SW003	18SW003	Surface Water	21-Oct-11	--	X	X	X	X	X											X	
18SW004	18SW004	Surface Water	21-Oct-11	--	X	X	X	X	X											X	Field Duplacte FD102111-03
18SW005	18SW005	Surface Water	21-Oct-11	--	X	X	X	X	X											X	

Acronyms

bgs = Below ground surface
BTEX = Benzene, toluene, ethylbenzene, and xylenes
DRO = Diesel range organics
ERO = Extended range organics
FD = Field duplicate
NA = Not available
NG = Nitroglycerin
PAH = Polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyl
RCRA = Resource Conservation and Recovery Act
SVOC = Semi-volatile organic compound
TAL = Target Analyte List
TOC = Total organic compound
TPH = Total petroleum hydrocarbon
VOC = Volatile organic compound

TABLE 2-2

MONITORING WELL CONSTRUCTION AND GROUNDWATER ELEVATION SUMMARY
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Monitoring Well	Installation Date[1]	Northing (feet) (NAD83)	Easting (feet) (NAD83)	Ground Elevation (feet) (NAVD88)	Top of PVC Riser Elevation (feet) (NAVD88)	Total Depth (feet bgs)[2]	Screened Interval		Water-Bearing Zone	January 21-22, 2012	
							Top (feet bgs)	Bottom (feet bgs)		Depth to Water (feet btor)	Water Elevation (feet)
SUBAREA C - INERT OPERATIONS AREA											
18CMWT001	4-Nov-11	1306823.75	3014434.32	683.61	686.25	35.0	24.3	34.3	Puz	6.52	679.73
18CMWT002	3-Nov-11	1306547.60	3014483.20	684.68	687.34	33.8	23.3	33.3	Puz	14.10	673.24
18CMWT003	2-Nov-11	1306268.64	3014631.86	684.61	687.17	30.0	19.3	29.3	Puz	15.68	671.49
08MWT008[3]	15-May-05	1306740.09	3014737.53	695.62	697.63	30.0	15.0	30.0	Puz	9.40	688.23
08MWT012[3]	9-Oct-05	1306319.50	3014842.22	683.42	685.89	72.0	52.0	72.0	Pmz	53.35	632.54
SUBAREA F - BUILDINGS 2082, 2085, AND 2540 AREA											
18FMWT001	21-Nov-11	1305037.79	3016074.95	661.76	664.10	30.0	13.0	23.0	Puz	16.42	647.68

Notes:
1 - Represents the date when the well was completed.
2 - Total depth of boring; total depth of monitoring well may be less.
3 - Well installed as part of SWMU 8 - Building 108 Pond - environmental investigations.

NAD83 = North American Datum of 1983 (Indiana State Plane Coordinate Sytem - West Zone)
NAVD88 = 1988 North American Vertical Datum.
bgs = below ground surface.
btor = Below top of riser/reference point.

Puz = Upper Pennsylvanian water-bearing zone.
Pmz = Middle Pennsylvanian water-bearing zone.

3.0 PHYSICAL CHARACTERISTICS

This section discusses physical characteristics of NSA Crane, including physiography and topography, climate and meteorology, geology, hydrology, land use and demography, and ecology. Physical characteristics for proposed NFA subareas are discussed in Sections 6 through 9.

3.1 PHYSIOGRAPHY AND TOPOGRAPHY

NSA Crane is located in the unglaciated area of the Crawford Upland Physiographic Province of the Southern Hills and Lowlands Region of Indiana. This province is characterized as a rugged, highly vegetated, dissected plateau bounded by the Mitchell Plain Physiographic Province to the east and the Wabash Lowland Physiographic Province to the west (Murphy and Wade, 1998). The boundary between the Crawford Upland and the Mitchell Plain is marked by the highly irregular, eastward-facing Chester Escarpment. Springs, caverns, caves, and other solution-weathering features can be found along this escarpment and on the eastern edge of the NSA Crane facility. The boundary between the Crawford Upland and the Wabash Lowland near the western boundary of NSA Crane is gradual (Murphy and Wade, 1998). The terrain at NSA Crane is predominantly rolling with moderately incised stream valleys throughout and occasional flat areas in the central and northern portions of NSA Crane. Topographic relief in the Crawford Upland province generally ranges from 300 to 350 feet; surface elevations across NSA Crane range from approximately 500 to 850 feet above msl. Greater relief exists in the eastern part of NSA Crane near the Chester Escarpment (Murphy and Wade, 1998).

3.2 CLIMATE AND METEOROLOGY

NSA Crane is located in a humid continental climatic zone with warm summers. Temperatures span a wide range from an average maximum of 89 degrees Fahrenheit (°F) in July to an average minimum temperature of 26°F in January. Precipitation is fairly evenly distributed throughout the calendar year; maximum precipitation occurs during the spring and early summer. The average annual precipitation at the facility is 44 inches and consists of 42 inches of rain and 15 inches of snow. The average humidities range from 40 to 90 percent in the summer and 60 to 90 percent in the winter. Long-term climatological records for the area indicate that the monthly prevailing wind direction is from the southwest from April through December and from the northwest during January through March [National Oceanic and Atmospheric Administration (NOAA), 1988]. The annual prevailing wind direction for the region is from the southwest, and the annual average wind speed for the area is about 9.6 miles per hour. The frost line in southern Indiana is approximately 2.5 feet bgs.

3.3 GEOLOGY AND STRATIGRAPHY

The geology at NSA Crane is generally characterized by thin overburden deposits overlying bedrock. The overburden deposits at NSA Crane generally consist of two types: Quaternary-age unconsolidated deposits and unconsolidated residual soil derived from underlying bedrock. With the exception of minor outwash and lacustrine deposits in the northwestern comer of the facility, NSA Crane was unglaciated during the Pleistocene epoch. Bedrock underlying NSA Crane consists of sedimentary rocks from the Lower Pennsylvanian-age Raccoon Creek Group and Upper Mississippian-age Stephensport and West Baden Groups.

3.3.1 Unconsolidated Deposits

The Quaternary-age deposits consist of alluvial (stream-derived sediments), colluvial (sediments deposited at the foot of a slope via gravity), and glacial outwash deposits (derived from glaciers) consisting of silt, sand, and gravel; lacustrine deposits consisting of clay, silt, and sand; and loess deposits consisting of clay and silt. Unconsolidated deposits at NSA Crane can be found as deep as 65 feet bgs (Nohrstedt et al., 1998).

According to the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) soil surveys, soils at NSA Crane are classified into 23 different soil series. These soil series are defined by various soil characteristics (e.g., grain size, erosion, slope, drainage, parent material, or depositional source, etc.) specific to each series. Within these soil series, various sub-classes or soil map units have been defined. Soils at NSA Crane were derived from underlying sedimentary rocks of the Lower Pennsylvanian Raccoon Creek Group and the upper Mississippian Stephensport and West Baden Groups and consist of clay, silt, sand, and fragmented and/or partially weathered bedrock. The soils at SWMU 18 are principally identified as moderately to well-drained Apalona-Udorthents complex along the ridges and Wellston-Urdothenrts complex along the sideslopes (USDA, 2010). These soil types are well suited to trees, grasses, and shallow-rooted crops but are not well suited for septic tank absorption fields. Soil erosion could occur within all types of soils located at NSA Crane if located on higher slopes along the drainage paths. Both soil series are silt loams derived from loess deposits over bedrock residuum or from weathered bedrock of sandstone, siltstone, or shale.

Background concentrations of select inorganics in soils at NSA Crane were evaluated during a base-wide background soils investigation in 2001 (Tetra Tech, 2001). The objective of the investigation was to identify and chemically characterize native soils based on three factors: depositional environment, grain size, and depth. A total of 16 soil types were identified and evaluated in the report, based on

combinations of these three factors. Four depositional environments were identified at NSA Crane, based on the mapped geologic parent material: Pennsylvanian bedrock, Mississippian bedrock, alluvium, and loess. Three predominant grain sizes (clay, silt, and sand) and two depths (surface and subsurface) were also identified as factors possibly contributing to soil chemical characteristics. Soil samples were collected to establish representative background metals concentrations for each of the 16 soil types. Based on the classification scheme developed in the base-wide background soil study (Tetra Tech, 2001), the soils encountered at SWMU 18 fall into several different soil groups. The surface soils (0 to 2 feet bgs) belong to Soil Group 3 (Alluvial, Mississippian, and Pennsylvanian). The subsurface soils (greater than 2 feet bgs) belong to Soil Group 8 (Pennsylvanian subsurface clay and silt) or Soil Group 9 (Pennsylvanian subsurface sand). These groupings and comparison of SWMU 18 soil concentrations to background soil concentrations are discussed further in Section 4.

3.3.2 Bedrock

NSA Crane is located on the eastern edge of the Illinois Structural Basin, where Pennsylvanian and Mississippian age bedrock dips to the west-southwest and southwest at approximately 30 to 35 feet per mile (Kvale, 1992). Bedrock underlying NSA Crane consists of sedimentary rocks from the Lower Pennsylvanian-age Raccoon Creek Group and Upper Mississippian-age Stephensport and West Baden Groups and dips gently to the west-southwest. A generalized stratigraphic column of bedrock at NSA Crane is shown on Figure 3-1, and the surficial geology for NSA Crane is illustrated on Figure 3-2. The Raccoon Creek Group primarily consists of interbedded sandstone, siltstone, shale, and coal with a varying total thickness of up to 300 feet (Fisher, 1996). The underlying Stephensport Group consists of limestone, shale, and sandstone ranging in thickness from 60 to 70 feet [United States Army Corps of Engineers (USACE) Waterways Experiment Station (WES), 1995; Palmer, 1969].

The SWMU 18 area is mapped as being underlain by the Mansfield formation of the Raccoon Group. The Mansfield formation consists of alternating beds of dark shale, sandstone, mudstone, siltstone, and discontinuous coal units. Drilling at SWMU 8 (Building 106 Pond), which is located within the eastern portion of SWMU 18, did not encounter Mississippian rocks (Tetra Tech, 2008). The combined thickness of Pennsylvanian shales, sandstones, and coals at SWMU 8 was estimated to be up to 180 feet, with a basal elevation of 520 feet above msl. The relief of the unconformity between the Pennsylvanian and Mississippian bedrock has been measured to be as much as 100 feet (Kvale, 1992).

3.4 SURFACE HYDROLOGY AND DRAINAGE SYSTEM

NSA Crane is located within the Lower East Fork White watershed, approximately 10 miles northwest of the East Fork White River. The East Fork White River flows approximately 40 miles southwest before joining the Muscatatuck River, which eventually joins the Ohio River.

The surface drainage at NSA Crane has formed a dense dendritic pattern throughout the installation. Six creeks in four drainage basins (I through IV) carry surface water off the installation (Figure 3-3). Drainage from the basin in the extreme eastern part of NSA Crane consists of several small drainageways. The northern and northwestern drainage basins eventually empty into Furst Creek, which flows in a westerly direction and leaves the installation. Rainey Hollow, Sulphur Creek, and Little Sulphur Creek drain the eastern basin. Drainage Basin IV consists of Boggs and Turkey Creeks, which are the primary drainageways and drain the majority of the installation. SWMU 18 lies within this drainage basin. Drainage swales and ditches convey surface water from developed areas of SWMU 18 to drainageways.

3.5 HYDROGEOLOGY

Groundwater resources at NSA Crane had been studied to a limited extent prior to the early 1980s (NEESA, 1983). Six exploratory wells had been drilled across NSA Crane prior to the 1980s to evaluate the potential for groundwater use development, and limited water quality studies had been performed. NSA Crane uses water from Lake Greenwood for human consumption, process operations, recreation, and several soil and water conservation ponds. However, the geology, occurrences of springs and seeps, and well-developed surface drainage indicate the existence of groundwater that is hydraulically connected to the surface environment. Available groundwater data from the 1940s indicates that limited groundwater is located at 141 feet and 313 feet bgs, with the shallowest water level observed at 85 feet bgs.

The groundwater at NSA Crane appears to be divided into two distinct regimes: one associated with the overburden/unconsolidated material and one associated with bedrock. The shallow groundwater is probably transient; during periods of excessive prolonged rainfall and during the early spring months, there is probably saturated soil and free water above the soil-rock interface. The shallow groundwater dissipates by percolation into bedrock and into intermittent or perennial streams. The groundwater associated with bedrock is stable and probably fluctuates only a minor amount (less than 10 feet) per year. Possibly more than one zone of saturation exists in the bedrock due to the successive beds of sandstone, shale, and limestone. The shale beds should be the least permeable of the series and, where underlying a permeable sandstone or limestone, would support a saturated or free-water zone. These

shale zones grade laterally to zones of sandstone, so the downward percolating water would be free to move continually downward (NEESA, 1983).

3.6 LAND USE AND DEMOGRAPHY

The economic base of communities surrounding NSA Crane is in transition from agriculture, mining, and quarrying to manufacturing and service industries. The patterns of settlement, population statistics, and median income are similar throughout the region (Tetra Tech, 2001). Because most of the region is covered by vegetation, the area is classified as rural (Tetra Tech, 2001).

There is no state or local planning within the vicinity of NSA Crane. The only zoning and land use regulations are in the municipalities in the region. None of the municipalities are close enough to impact NSA Crane. None of the areas adjacent to NSA Crane are zoned, and zoning is not anticipated in the near future. No known land use or community actions are being considered or proposed at this time (Tetra Tech, 2001).

3.7 ECOLOGY

NSA Crane is a heavily forested facility situated within the Western Mesophytic Forest Region, Hill Section, and Beech-Maple Forest Region (Braun, 1950). Lindsey et al. (1970) further subdivided the area of the installation into the south-central Oak and Mixed Woods Division, including the Beech-Maple and the Beech-Oak-Maple-Hickory sub-elements. Deam (1940) classified the portion of Martin County in which the facility is located as consisting of the Chestnut Oak Upland, based on the dominant floral components at that time. More recently, Kuchler (1964) mapped this portion of Indiana and classified it as belonging to two distinct vegetation classes, the Oak-Hickory and the Beech-Maple forest components of the Broadleaf Forest Classification. This latter classification most closely resembles the current floristic components observed at the facility during the ecological studies conducted as part of this program.

The wildlife habitats and vegetation types present at NSA Crane (many stages of forest succession, streams, ponds, Greenwood Lake, and grassy open spaces) support a diverse terrestrial and aquatic fauna. The abundance of wildlife on the site is due in large measure to the mixture of land forms and vegetation types that occur over the installation. In addition, the lack of agricultural pressures has enhanced the wildlife abundance and served to provide an installation-wide "wildlife enclosure" condition. There is an adequate amount of forage materials, concealment opportunities, and shelter locations to support a highly diverse wildlife community at the site.

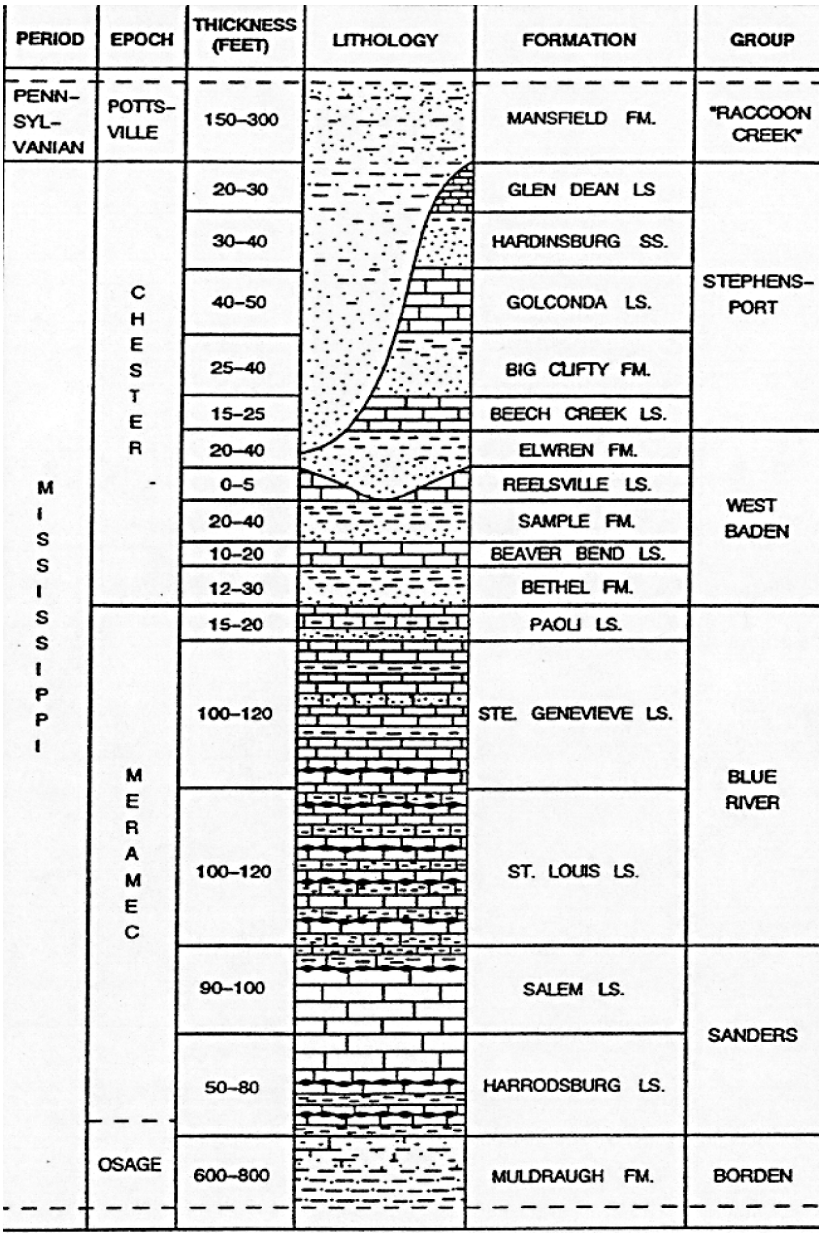
Approximately 30 species of mammals exist at NSA Crane. The white-tailed deer is the most conspicuous large wild mammal at the installation. Other mammals include opossums, raccoons, rabbits, mice, bats, chipmunks, squirrels, beavers, groundhogs, gray foxes, and coyotes. Foxes, coyotes, and hawks are carnivores whose presence indicates a healthy ecosystem because smaller mammals are present to provide a food source (NEESA, 1983). The endangered Indiana bat may be present in the vicinity of the Turkey Creek watershed.

The birds at NSA Crane are diverse, with over 100 species identified. Previous studies at the facility have identified over 100 species present at the site during breeding seasons (Hengeveld, 1987). Because the facility is largely forested, the species found at the site consist predominantly of those species that frequent wooded habitat types. There are also species of waterfowl that use the facility, especially in the vicinity of Lake Greenwood. A large number of bird species frequent the non-forested grassland, oldfield, and scrub/shrub vegetation present over portions of NSA Crane.

Previous studies conducted at NSA Crane (Nelson et al., 1987) identified 21 amphibian species and 22 reptile species (including skinks, lizards, snakes, and turtles).

A total of 46 distinct fish species were collected from the installation during a 1987 inventory of the fish fauna at NSA Crane. Other than Lake Greenwood, the 1987 study observed that the greatest number of individual fish species were recorded from the largest stream (Boggs Creek) and the smallest number of species were recorded from Turkey Creek. Boggs Creek contained 29 species, including eight species of fish characteristic of large river-type systems. This included long-nose gar, paddlefish, bowfin, gizzard shad, ribbon shiner, bigmouth buffalo, channel catfish, and flathead catfish. By contrast, the Turkey Creek survey yielded 16 species of fish, none of which were unusual. The Sulphur Creek drainage was surveyed and yielded a total of 19 species. Four species from this drainage were not found anywhere else on the installation, including southern redbelly dace, blacknose dace, black bullhead, and blackside darter.

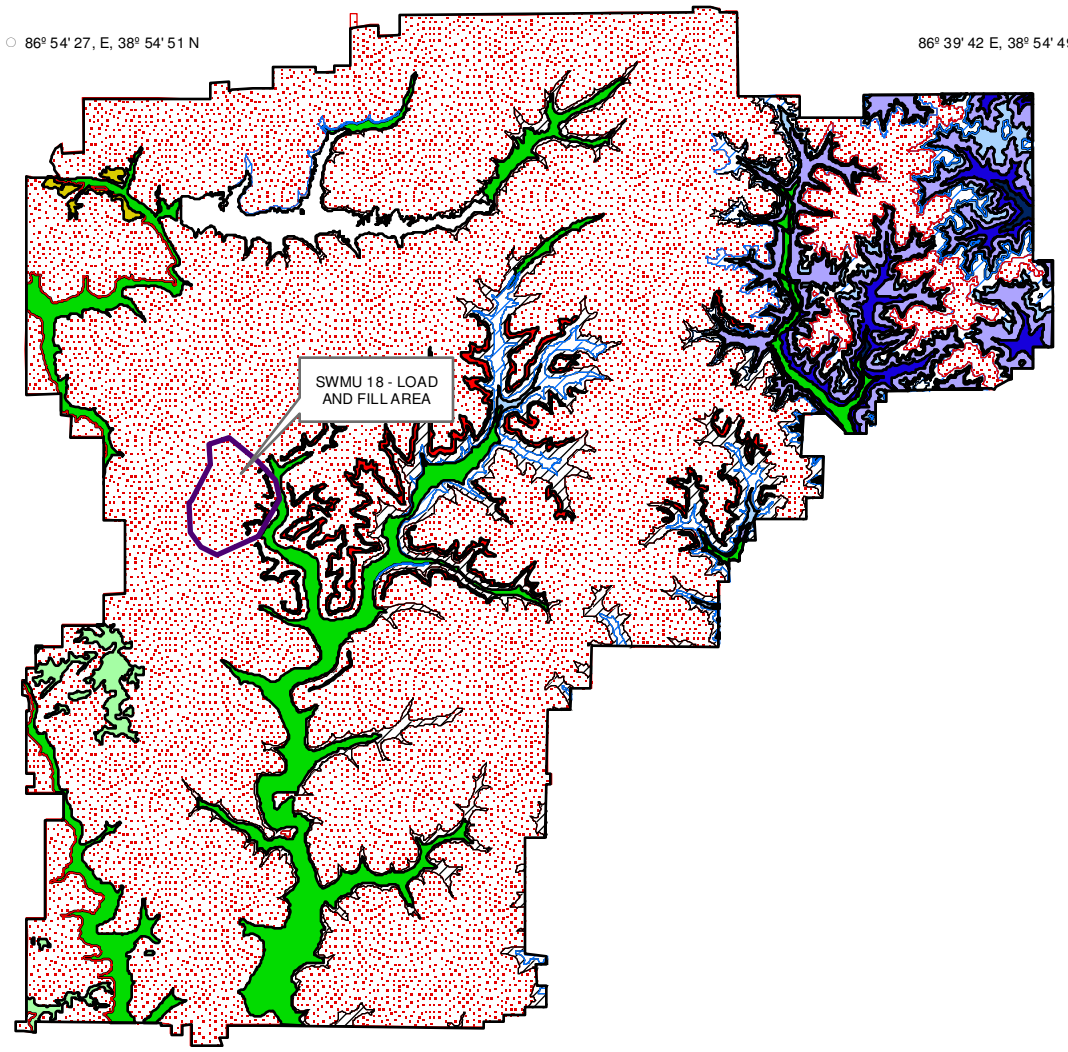
P:\GIS\CRANW_NSWC\MAPDOCS\MXD\SWMU18_STRAGRAPHIC_1.MXD 12/02/10 SS



Source: Draft Report, RCRA Facility Investigation
Phase II Groundwater Release Assessment, SWMU 06/09
Demolition Area and Phase III Release
Characterization SWMU 07/09 Old Rifle Range
November 1995 - Figure 13
by William L. Murphy and Roy Wade

DRAWN BY: S. STROZ — DATE: 12/01/10		GENERALIZED STRATIGRAPHIC COLUMN SWMU 18 - LOAD AND FILL AREA NSA CRANE CRANE, INDIANA	CONTRACT NUMBER CTO F201
CHECKED BY: J. DUCAR — DATE: 12/02/10			APPROVED BY — DATE
REVISED BY — DATE			APPROVED BY — DATE — —
SCALE: AS NOTED	NAVFAC		FIGURE NO. 3-1 — REV 0

P:\GIS\CRANW_NSWC\MAPDOCS\MXD\SWMU18_SURFICIAL_GEOLOGY.MXD 12/07/10 SS



Explanation of Geology

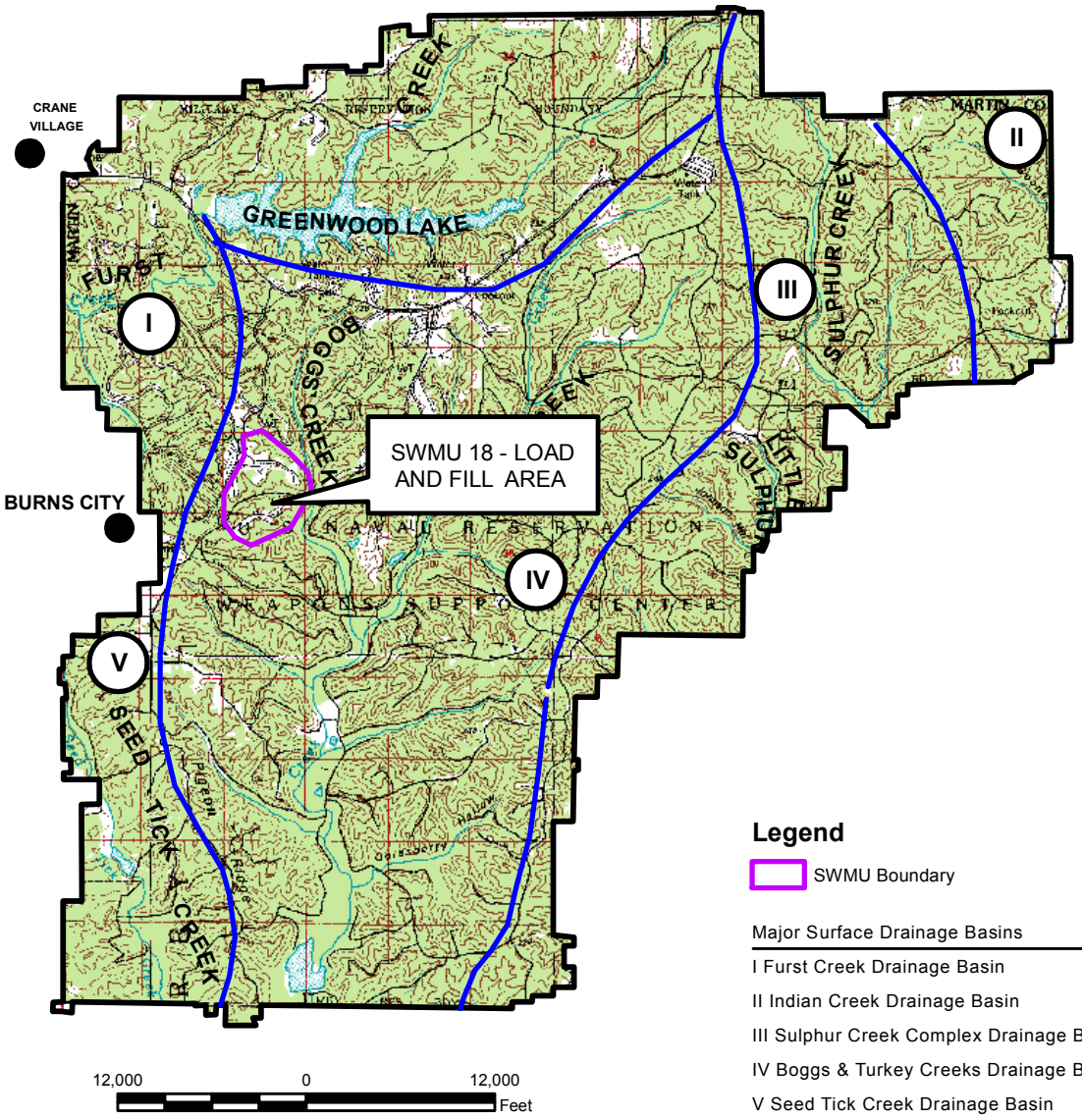
Qal	*Alluvium*
Ql	*Loess*
Qo	*Glacial Outwash*
P	*Raccoon Creek Group and undifferentiated*
Ps	*Sandstone-dominated horizon of Lower Pennsylvanian*
M6	*Glenn Dean Ls, Hardinsburg Fm, Haney Ls, Indian Springs Shale Mbr, and undifferentiated*
M5	*Sandstone member of the Big Clifty Fm*
M4	*Beech Creek Ls*
M3	*Elwren Fm, Reelsville Ls, upper Sample Fm, and undifferentiated*
M2	*Lower part of Sample Fm, Beaver Bend Ls, Bethel Fm, and undifferentiated*
M1	*Paoli Ls, Ste Genevieve Ls, and undifferentiated*
	Select Solid Waste Management Units (SWMUs)

0 6,000 12,000 24,000 Feet

(Modified from Blunck, 1995)

DRAWN BY S. STROZ	DATE 12/01/10	SURFICIAL GEOLOGY MAP SWMU 18 - LOAD AND FILL AREA NSA CRANE CRANE, INDIANA	CONTRACT NUMBER F201
CHECKED BY J. DUCAR	DATE 12/07/10		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 3-2 REV 0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU18_DRAINAGEBASIN.MXD 11/21/12 JN



Source: Initial Assessment of Study of Naval Weapons Support Center Crane, Indiana. Naval Energy and Enviornmental Support Activity, May 1983.

DRAWN BY	DATE		LOCATION AND DRAINAGE BASINS SWMU 18 - LOAD AND FILL AREA NSA CRANE CRANE, INDIANA	CONTRACT NUMBER	CTO NUMBER
S. STROZ	12/01/12			___	F201
CHECKED BY	DATE			APPROVED BY	DATE
C. RUMER	11/21/12			___	___
REVISED BY	DATE			APPROVED BY	DATE
J. NOVAK	11/21/12			___	___
SCALE AS NOTED		NAVFAC		FIGURE NO. FIGURE 3-3	REV 0

4.0 BACKGROUND COMPARISONS

This section presents the results of the comparison of metals concentrations in surface and subsurface soils at SWMU 18 to the representative background soil data sets developed for NSA Crane (Tetra Tech, 2001). In accordance with Navy policy (Navy, 2004), chemicals present at background concentrations are not to be retained as COPCs in HHRAs. In the COPC selection process, if the results of the background evaluation indicate that chemical concentrations detected in site soils do not exceed background concentrations, that chemical is not to be selected as a COPC and is not carried through the quantitative risk assessment. However, chemicals present at concentrations exceeding risk-based screening criteria but not selected as COPCs on the basis of background evaluations are to be further discussed in the risk characterization sections. Background data is only available for inorganics (i.e., metals) in soils at NSA Crane; therefore, background comparisons were not performed for groundwater, surface water, or sediment samples or other chemical classes (i.e., organics or explosives).

Subarea-specific analytical results are presented in Sections 6 through 9. The conclusions of the background comparison in relation to the nature and extent of metals at the subareas and use in the risk assessments are discussed in the subarea-specific sections.

4.1 COMPARISON METHODLOGY

The comparative method used herein is outlined in the Base-Wide Background Soil Investigation Report (Tetra Tech, 2001). Two methods for comparing site data to background data are identified in the Base-Wide Background Soil Investigation Report. One method, used historically, involves a direct comparison between the site data and descriptive statistics of the background dataset [i.e., minimum, maximum, average, or 95 percent upper tolerance limit (UTL) values] presented in the background report. The prescribed UTLs represent 95 percent coverage of the sampled population with 95 percent confidence. The UTL also represents a concentration that has a five percent chance of being exceeded when the background concentration range is sampled. This means that it is possible for a site concentration to exceed the UTL even though the site represents background concentrations, but the probability of observing a sample result greater than the UTL decreases as the observed concentration increases.

The second comparison method involves a more rigorous statistical comparison with a data set to data set comparison of background and site data. This comparison method is preferred. The background data used for a data set comparison are the same data used to compute the UTLs. The comparison takes advantage of more of the available information for site and reference data, such as the spread of

the distributions. The data set-to-data set method was used for comparison of soil concentrations for this investigation.

4.2 SOIL CLASSIFICATION

As defined in the Base-Wide Background Soil Investigation Report (Tetra Tech, 2001), soils at NSA Crane have been classified into nine categories, based on depositional environment, depth (i.e., surface or subsurface), and grain size for background comparative purposes. Determination of the soil group of site soils is necessary for identifying the appropriate data set to use for background comparisons. For the SWMU 18 RFI, surface and subsurface soil samples were collected in nine subareas. Metals analyses were not conducted on soils from Subarea B. The soil samples were analyzed for TAL metals, except Subarea C in which eight RCRA metals were analyzed. Subsurface soil samples were not collected from Subarea I.

For the subareas investigated for metals during the SWMU 18 RFI, the surface soil samples collected from nine subareas (Subareas A and C through J) were identified as belonging to Soil Group 3 (Alluvial, Mississippian, and Pennsylvanian surface soil). The subsurface soil samples from these same subareas, except Subarea I, were identified as belonging to either Soil Group 8 (Pennsylvanian subsurface Clay and Silt) or Soil Group 9 (Pennsylvanian subsurface). The matrix below indicates the soil groups represented in each subarea and the number of metals analyzed in each soil type.

Subarea	Surface Soil[1]	Subsurface Soil[1]
A	Soil Group 3	Soil Group 8
B	*Metals Not Analyzed*	*Metals Not Analyzed*
C	Soil Group 3 (8 metals)	Soil Group 8 (8 metals)
D	Soil Group 3	Soil Groups 8 and 9
E	Soil Group 3	Soil Groups 8 and 9
F	Soil Group 3	Soil Group 9
G	Soil Group 3	Soil Groups 8 and 9
H	Soil Group 3	Soil Groups 8 and 9
I	Soil Group 3	*Not Collected*
J	Soil Group 3	Soil Group 8

1 Analyses were for 23 TAL metals, unless otherwise indicated. In Subareas A, E, H, and I, samples were also analyzed for tin.

Site data from Soil Group 9 warrant special mention. When the background study was conducted, only one sample from Soil Group 9 was obtained. Therefore, either a metal was not detected or there was only one concentration available for the metal in this background soil group. A background UTL could not

be computed for this soil group because multiple data points are needed to compute a UTL. For SWMU 18, Soil Group 9 site data were compared to a combination of Soil Group 8 and Soil Group 9 background data. The number of SWMU 18 samples belonging to Soil Group 9 was approximately 10 percent of the total number of samples and approximately 25 percent of subsurface soil samples analyzed for metals. Therefore, Soil Group 8 samples were viewed to represent subsurface soil more than Soil Group 9 data. However, if Soil Group 9 data indicated that a background exceedance had occurred, the subsurface data were generally classified as exceeding the background concentration range, even if the Soil Group 8 data indicated otherwise.

4.3 STATISTICAL METHODOLOGY

Two different statistical comparison methods were used to compare SWMU 18 soil data to background data for similar soil types: a comparative statistical method and a background threshold method. A final qualitative data evaluation was also conducted to ensure that the conclusions based on statistics were sensible in the context of site chemistry and geology.

4.3.1 Graphical Displays

The comparative statistical method involved a graphical evaluation and a hypothesis test comparing the central tendency (mean/median) concentrations and a hypothesis test comparing the right tails (largest values) of the data distributions. The graphical evaluation consisted of visual inspection of box and whisker plots, normal probability plots, and histograms. One-half the detection limit was used for non-detected concentrations for the graphical displays; the full detection limit was used for non-detected concentrations for the hypothesis tests. The statistical software package, R, version 2.14, was used.

Graphical displays of the site data to the background data are presented in Appendix H. Box plots show the central tendency, degree of symmetry, range of variation, and potential outliers of a data set. In box plots, the data set is shown as a rectangular box that represents the middle 50 percent of the data. The upper value of the box represents the 75th percentile and the lower value of the box represents the 25th percentile. The median is represented by the middle line in the box. Box plots for the same analyte were plotted on the same graph for site and background data sets. The plots were visually inspected to identify which data set similarities and differences, as well as whether the median from one data set, fell within the 75th and 25th percentile range of the other data sets.

Probability plots are a useful first step for visually comparing two data sets in a single graph. Probability plots are graphs of the quantiles of a data set against the quantiles of standard normal distributions

(USEPA, 2006). If the site and background distributions were exactly identical, the plotted values would lie on a straight line through the origin. Deviations from this line show the differences between the two distributions. If the site and background distributions are similar, the scattering of the two data sets will be mixed. If plotted points representing one data set cluster toward one end of the plot and the points representing the other data sets cluster toward the other end, then data sets are most likely different. When small site data sets are involved, however, it is possible for one site data set to cluster toward the upper or lower end of the plot even though the data sets are not from different populations; so this possibility was considered during the qualitative evaluation.

Histograms are a visual representation of the data collected into groups. The data range is divided into several bins or classes, and the data are sorted by bins. The x-axis displays the chemical concentration range for the bin and the y-axis shows the number of observations that fall within the bin. The histograms of the site and background datasets were overlaid to facilitate a comparison of the shapes of the two distributions, overall concentration ranges, positions of the distribution peaks, and ranges of concentrations that have the most samples.

4.3.2 Hypothesis Tests

The background threshold value test involved comparing the site maximum concentration to the background UTL. For statistical background comparisons involving UTLs, if the site maximum detected concentration exceeded the UTL, then it was concluded that site concentrations exceed background concentrations; otherwise, site concentrations were concluded to be consistent with background concentrations.

Two types of hypothesis tests were conducted: one comparing the central tendency of the data sets and one comparing the right tails of the data sets. The Two Sample T-test, Wilcoxon Rank Sum (WRS) test, Gehan test, and the Two Sample Proportion Test were used to compare the central tendency of the site and background data sets. The Slippage Test and Quantile test were used to compare the right tails of the site and background datasets. All hypothesis tests were conducted using a five percent significance level meaning that if the p-value associated with the hypothesis test is less than 0.05 there is statistically significant evidence that the null hypothesis (H_o or assumed hypothesis) is false. The p-value of a test can be thought of as the credibility of the null hypothesis; p-values greater than 0.05 indicate that the null hypothesis is credible whereas p-values less than 0.05 indicate otherwise. The results of the hypotheses tests are summarized in Tables 4-1 (surface soil) and 4-2 (subsurface soil) for Subarea C and Tables 4-3 (surface soil) and 4-4 (subsurface soil) for Subarea F.

The Two Sample T-Test tests for a difference between the mean values of two populations when it can be assumed that the data are approximately normally distributed or sample sizes are large enough (m and n at least 30) and the data are all detected. If the variances of the two data sets were not equal, then the Two Sample T-Test with unequal variance was computed. The null and alternative hypotheses were:

H_o: Site Average ≥ Background Average + Background Standard Deviation
H_A: Site Average < Background Average + Background Standard Deviation

The WRS nonparametric test is used to test for a difference between median concentrations between two independent populations. The WRS test was used when the data were not normally distributed and there were less than three reporting limits if non-detected concentrations were present. The null and alternative hypotheses were:

H_o: Site Median ≥ Background Median + Background Standard Deviation
H_A: Site Median < Background Median + Background Standard Deviation

The Gehan nonparametric test is used to test for a difference between median concentrations of two independent populations. The Gehan test can be used when the background or site datasets contain multiple non-detects with different reporting limits. The Gehan test was used when the non-detects had more than three reporting limits. The null and alternative hypotheses are the same as the null and alternative hypothesis for the WRS test.

The two sample proportion test was used to compare site and background concentrations in surface and subsurface soil of a small number of subareas. If there is no action level (e.g., for essential nutrients such as sodium), the proportion of detected concentrations greater than the largest background non-detected concentration was compared. The proportion test was used when there were between 50 and 90 percent non-detects. The null and alternative hypotheses were:

H_o: Proportion Site = Proportion Background
H_A: Proportion Site ≠ Proportion Background

The Slippage Test and Quantile tests are used to test for a shift to the right in the extreme right-tail of the site versus the background concentrations. This is equivalent to asking if a set of the largest values of the site distribution are larger than the maximum value of the background distribution. If the slippage test

found the extreme right tail of the site data to be larger than the background data, it was concluded that the site concentrations are greater than background. The null and alternative hypotheses were:

H_o: Right Tail of Site Dataset ≤ Right Tail of the Background Dataset

H_A: Right Tail of the Site Dataset > Right Tail of the Background Dataset

4.3.3 Qualitative Evaluation

When the number of data points was limited for a subarea, the comparative statistical method was used to compare all surface soil and subsurface soil to the corresponding background data sets based on soil groups. The comparative method used multiple statistical techniques to compare site and background data. Because some of the site soil data sets were relatively small, however, some subareas had an insufficient number of data points to support a statistical comparison. In addition, one statistical test may have classified concentrations of chemicals in soil as being consistent with the background concentration range, whereas another statistical test may have indicated the opposite conclusion. This occurs most frequently when a test is more sensitive to a particular characteristic of the data distributions or when the site and background data are fairly similar. Therefore, after conducting the statistical tests, the data were evaluated qualitatively. In cases for which detections of a chemical in a particular data set were less than detection limits (i.e. non-detect), the data were compared to the known background concentration range. If the maximum non-detect value was within the background range, the metal concentrations were classified for that data set as being consistent with background concentrations because it is clear that the concentration of the metal did not exceed the maximum background value. If detection limits were greater than the maximum background value, no conclusion was drawn regarding the classification of the data sets as being consistent with or greater than background concentrations.

The qualitative evaluation was aided by comparing SWMU 18 metal concentrations for a particular soil data set to the corresponding UTL. The statistical tests designed to detect a difference of one standard deviation between the site and background data sets were also considered. If the difference between site and background data sets was greater than one standard deviation, the statistical conclusion was that the site data exceeded background concentrations. The 2001 background study, however, suggested that an exceedance of the background concentration should be at least two times the standard deviation of the background data; otherwise, the site data should be classified as not exceeding the background range. Therefore, the statistical calculations presented in this report are conservative, with a tendency to classify site data as exceeding background concentrations when they only marginally exceed the background concentration range.

4.4 FINAL BACKGROUND STATISTICAL CONCLUSIONS AND SOIL CLASSIFICATIONS

Statistical conclusions are presented in Tables 4-1 through 4-4 for each data set and for the overall statistical conclusion. A notable exception is that data set comparisons cannot be conducted when one data set has but a single value, which is the case for background Soil Group 9. Therefore, if a data set was represented by samples belonging to a mixture of Soil Groups 8 and 9, then a table was prepared only for Soil Group 8 data.

The overall statistical conclusion is presented in the column titled "FINAL STATISTICAL CONCLUSION." If a statistical test could not be conducted (e.g., the number of data points was too small or because of an insufficient number of detections), "NA" appears in the row for the affected metal in the affected statistical test. This is especially pertinent for Subarea F. In this case subsurface samples were represented only by Soil Group 9. Therefore, a table was constructed but most table entries are "NA" to signify that meaningful statistics could not be computed.

If the statistical tests were inconclusive or if no statistical tests could be conducted, "NA" appears in the "FINAL STATISTICS CONCLUSION" column. Because the statistical tests were conservative by design, an additional column was added to the right of the final statistical conclusions. This column, labeled "FINAL CONCLUSION," is the final conclusion regarding whether the site metal concentration is considered to exceed the background range based on a review of the statistical conclusions and the plots. In some cases the entry in the "FINAL STATISTICS CONCLUSION" column is "NA." In those cases, the classification of the metal concentration that appears in the "FINAL CONCLUSION" column cases was based solely on a qualitative review of the data. During these qualitative reviews, final conclusions for Soil Group 9 were combined with final conclusions for Soil Group 8 to render a single final subsurface soil classification. If either of these soil groups indicated that the subsurface soil exceeded the background range, the final conclusions was generally that the background concentration range is exceeded in subsurface soil for that particular subarea.

In some cases, the evaluation suggested that although a metal was classified as exceeding background by one or more statistical tests, the tests were either contradictory or the site data set appeared to be a subset of the larger background population. The opposite, however, is also true. In some cases, the statistical tests were contradictory and the final conclusion was that the metal in that subarea represents an exceedance of background concentrations. In some cases, elevated non-detect values prevented a direct comparison of site data to background data. If it was not evident whether non-detect values represent an exceedance of background, the classification typically was that the background range was exceeded. Again, this is a conservative approach that tends to classify soil samples as exceeding the

background concentration range when they might not actually exceed the background range. In other cases, however, the non-detect values were all less than the maximum background value. In those cases, the data were generally classified as being consistent with background concentrations. If all site values were non-detect, “Not Evaluated” appears in the tables to indicate that the data were not evaluated statistically and the final conclusion is based on a manual comparison of the data to the background concentration range.

Each qualitative evaluation considered multiple factors, but the type of logic described above was applied in all cases. Because the tendency was to favor the classification assigned by the statistics, it is likely that more metals were classified as exceeding background concentrations than actually exceed background levels. Final conclusions regarding classification of surface and subsurface soil are summarized in Table 4-5. Parameters that exceed the background range in each subarea are shaded.

TABLE 4-1

SURFACE SOIL BACKGROUND COMPARISONS - SUBAREA C
SWMU 18
NSA CRANE
CRANE, INDIANA

PARAMETER	SITE FOD	BACKGROUND FOD	SITE MAXIMUM DETECT (MG/KG)	BACKGROUND MAXIMUM DETECT (MG/KG)	SITE DISTRIBUTION	BACKGROUND DISTRIBUTION	HYPOTHESIS TEST	HYPOTHESIS TEST P-VALUE	HYPOTHESIS TEST CONCLUSION	SLIPPAGE TEST STATISTIC	SLIPPAGE CONCLUSION	QUANTILE TEST STATISTIC	QUANTILE CONCLUSION	FINAL STATISTICAL CONCLUSION	FINAL CONCLUSION
ARSENIC	7 / 7	15 / 15	19.6	10.2	Nonparametric	Normal	WRS	0.05305	>BG	1	BG	1	BG	>BG	BG
BARIUM	7 / 7	15 / 15	1940	153	Nonparametric	Nonparametric	WRS	0.06147	>BG	1	BG	1	BG	>BG	>BG
CADMIUM	2 / 7	10 / 15	1.21	3.6	Assumed Nonpara	Nonparametric	Gehan	0.0099	BG	0	BG	1	BG	BG	BG
CHROMIUM	7 / 7	15 / 15	97.5	21.7	Nonparametric	Normal	WRS	0.8382	>BG	3	BG	2	>BG	>BG	>BG
LEAD	7 / 7	15 / 15	117	21.5	Nonparametric	Normal	WRS	0.1153	>BG	2	BG	2	>BG	>BG	>BG
MERCURY	1 / 7	5 / 15	0.0383	0.05	Assumed Nonpara	Nonparametric	Proportion	0.114	>BG	0	BG	0	BG	>BG	BG
SELENIUM	0 / 7	5 / 15	--	0.64	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
SILVER	0 / 7	15 / 15	--	0.11	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated

Notes
Assumed Nonpara = Assumed to be nonparametric
BG = consistent with background concentration range
>BG = greater than background concentration range
Not Evaluated = Not evaluated because detection limits were greater than the background range and all results were less than detection limit. If all detection limits were within the background range, the soil was classified as "BG."
FOD = frequency of detection
mg/kg = milligram pe rkilogram
WRS = Wilcoxon Rank Sum

TABLE 4-2

SUBSURFACE SOIL BACKGROUND COMPARISONS - SUBAREA C
SWMU 18
NSA CRANE
CRANE, INDIANA

PARAMETER	SITE FOD	BACKGROUND FOD	SITE MAXIMUM DETECT (MG/KG)	BACKGROUND MAXIMUM DETECT (MG/KG)	SITE DISTRIBUTION	BACKGROUND DISTRIBUTION	HYPOTHESIS TEST	HYPOTHESIS TEST P-VALUE	HYPOTHESIS TEST CONCLUSION	SLIPPAGE TEST STATISTIC	SLIPPAGE CONCLUSION	QUANTILE TEST STATISTIC	QUANTILE CONCLUSION	FINAL STATISTICS CONCLUSION	FINAL CONCLUSION
ARSENIC	5 / 5	9 / 9	8.55	8.5	Normal	Normal	T-Test	0.1441	>BG	1	BG	NA	NA	>BG	BG
BARIUM	5 / 5	9 / 9	253	83.4	Nonparametric	Normal	WRS	0.2592	>BG	1	BG	NA	NA	>BG	>BG
CADMIUM	1 / 5	8 / 9	0.438	0.64	Assumed Nonpara	Normal	Gehan	0.1426	>BG	0	BG	NA	NA	>BG	BG
CHROMIUM	5 / 5	9 / 9	25.9	27.1	Normal	Normal	T-Test	0.02755	BG	0	BG	NA	NA	BG	BG
LEAD	5 / 5	9 / 9	17.2	15.2	Normal	Normal	T-Test	0.02653	BG	1	BG	NA	NA	BG	BG
MERCURY	2 / 5	1 / 9	0.193	0.14	Assumed Nonpara	Assumed Nonpara	Proportion	0.7253	>BG	1	BG	NA	NA	>BG	BG
SELENIUM	0 / 5	8 / 9	--	0.88	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	BG
SILVER	0 / 5	8 / 9	--	0.1	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated

Assumed Nonpara = Assumed to be nonparametric
BG = Consistent with background concentration range
>BG = Greater than background concentration range
Not Evaluated = Not evaluated because detection limits were greater than the background range and all results were less than detection limit. If all detection limits were within the background range, the soil was classified as "BG."

NOTE: All subsurface soil samples in this subarea belong to Soil Group 8.

TABLE 4-3

SURFACE SOIL BACKGROUND COMPARISONS - SUBAREA F
SWMU 18
NSA CRANE
CRANE, INDIANA

PARAMETER	SITE FOD	BACKGROUND FOD	SITE MAXIMUM DETECT (mg/kg)	BACKGROUND MAXIMUM DETECT (mg/kg)	SITE DISTRIBUTION	BACKGROUND DISTRIBUTION	HYPOTHESIS TEST	HYPOTHESIS TEST P-VALUE	HYPOTHESIS TEST CONCLUSION	SLIPPAGE TEST STATISTIC	SLIPPAGE CONCLUSION	QUANTILE TEST STATISTIC	QUANTILE CONCLUSION	FINAL STATISTICS CONCLUSION	FINAL CONCLUSION
ALUMINUM	3 / 3	15 / 15	11500	17400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
ANTIMONY	0 / 3	2 / 15	--	5.6	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	BG
ARSENIC	3 / 3	15 / 15	6.84	10.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
BARIUM	3 / 3	15 / 15	105	153	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
BERYLLIUM	3 / 3	0 / 15	0.872	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG
CADMIUM	0 / 3	10 / 15	--	3.6	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	BG
CALCIUM	3 / 3	14 / 15	36700	35300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG
CHROMIUM	3 / 3	15 / 15	15.5	21.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
COBALT	3 / 3	15 / 15	11.3	27.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
COPPER	3 / 3	15 / 15	14	17.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
IRON	3 / 3	15 / 15	20500	36200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
LEAD	3 / 3	15 / 15	13.8	21.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
MAGNESIUM	3 / 3	15 / 15	3080	2250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG
MANGANESE	3 / 3	15 / 15	2340	3040	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
MERCURY	2 / 3	5 / 15	0.0509	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
NICKEL	3 / 3	15 / 15	15.4	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
POTASSIUM	3 / 3	15 / 15	697	1490	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
SELENIUM	0 / 3	5 / 15	--	0.64	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
SILVER	0 / 3	15 / 15	--	0.11	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
SODIUM	0 / 3	5 / 15	--	23.7	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
THALLIUM	1 / 3	15 / 15	3.93	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG
VANADIUM	3 / 3	15 / 15	26.7	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
ZINC	3 / 3	14 / 15	115	60.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG

Data set consists of only three site samples; therefore, meaningful statistics cannot be computed.
Assumed Nonpara = Assumed to be nonparametric
BG = Consistent with background concentration range
>BG = Greater than background concentration range
FOD = Frequency of detection
mg/kg = Milligrams per kilogram
NA = Not available
Not Evaluated = Not evaluated because detection limits were greater than the background range and all results were less than detection limit. If all detection limits were within the background range, the soil was classified as "BG."
NSA = Naval Support Activity
SWMU = Solid Waste Management Unit

TABLE 4-4

SUBSURFACE SOIL BACKGROUND COMPARISONS - SUBAREA F
SWMU 18
NSA CRANE
CRANE, INDIANA

PARAMETER	SITE FOD	BACKGROUND FOD	SITE MAXIMUM DETECT (mg/kg)	BACKGROUND MAXIMUM DETECT (mg/kg)	SITE DISTRIBUTION	BACKGROUND DISTRIBUTION	HYPOTHESIS TEST	HYPOTHESIS TEST P-VALUE	HYPOTHESIS TEST CONCLUSION	SLIPPAGE TEST STATISTIC	SLIPPAGE CONCLUSION	QUANTILE TEST STATISTIC	QUANTILE CONCLUSION	FINAL STATISTICS CONCLUSION	FINAL CONCLUSION
ALUMINUM	3/3	1/1	20800	5430	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
ANTIMONY	0/3	0/1	--	--	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
ARSENIC	3/3	1/1	6.1	2.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
BARIUM	3/3	1/1	99.5	24.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
BERYLLIUM	3/3	0/1	0.969	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG
CADMIUM	0/3	1/1	--	0.14	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
CALCIUM	3/3	1/1	722	53.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
CHROMIUM	3/3	1/1	25.1	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
COBALT	3/3	1/1	27.7	8.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>BG
COPPER	3/3	1/1	18.1	5.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
IRON	3/3	1/1	21200	11300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
LEAD	3/3	1/1	10.6	11.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
MAGNESIUM	3/3	1/1	1790	654	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
MANGANESE	3/3	1/1	697	327	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
MERCURY	2/3	0/1	0.0319	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
NICKEL	3/3	1/1	20	4.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
POTASSIUM	3/3	1/1	891	353	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
SELENIUM	0/3	1/1	--	0.28	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
SILVER	0/3	1/1	--	0.05	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
SODIUM	0/3	0/1	--	--	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
THALLIUM	0/3	1/1	--	0.09	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
VANADIUM	3/3	1/1	31.3	14.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG
ZINC	3/3	1/1	48.5	11.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BG

The site data set consists of samples from Soil Group 9 only and the background data set for Soil Group 9 contains just one sample; therefore, meaningful statistics cannot be computed. Final conclusions regarding background classification are based on inspection of the data.
Not Evaluated = Not evaluated because detection limits were greater than the background range and all results were less than detection limit. If all detection limits were within the background range, the soil was classified as "BG."

FOD = Frequency of detection
mg/kg = Milligrams per kilogram
NSA = Naval Support Activity
SWMU = Solid Waste Management Unit

TABLE 4-5

FINAL BACKGROUND COMPARISON CONCLUSIONS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, IN

PARAMETER	SUBAREA C		SUBAREA F	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
ALUMINUM	---	---	BG	BG
ANTIMONY	---	---	BG	NE
ARSENIC	BG	BG	BG	BG
BARIUM	>BG	>BG	BG	BG
BERYLLIUM	---	---	>BG	>BG
CADMIUM	BG	BG	BG	NE
CALCIUM	---	---	>BG	BG
CHROMIUM	>BG	BG	BG	BG
COBALT	---	---	BG	>BG
COPPER	---	---	BG	BG
IRON	---	---	BG	BG
LEAD	>BG	BG	BG	BG
MAGNESIUM	---	---	>BG	BG
MANGANESE	---	---	BG	BG
MERCURY	BG	BG	BG	BG
NICKEL	---	---	BG	BG
POTASSIUM	---	---	BG	BG
SELENIUM	NE	BG	NE	NE
SILVER	NE	NE	NE	NE
SODIUM	---	---	NE	NE
THALLIUM	---	---	>BG	NE
VANADIUM	---	---	BG	BG
ZINC	---	---	>BG	BG

BG = Consistent with background concentration range
>BG = Greater than background concentration range

NA = Not applicable
NE = not evaluated because detection limits were slightly greater than background range.
--- = parameter not analyzed for

5.0 FATE AND TRANSPORT

This section presents an overview of the movement of contaminants at SWMU 18 among the environmental media. The focus is placed on major contaminant groups (explosives, metals, fuel oil constituents, ammonia, and VOCs), which might be attributed to site operations and have been detected in environmental media at SWMU 18. The information presented in this section is used to:

- Provide information on the chemical and physical properties which affect the mobility, migration, biodegradation, and persistence of the principal COPCs at SWMU 18.

- Assist in evaluating human health and ecological risks presented in Sections 6 through 9.

- Assist in risk management decisions.

- Assess whether movement of contaminants among environmental media will result in significant future changes to exposure point concentrations to receptors or in significant exposure to receptors not currently exposed or at locations where not currently exposed.

- Assess whether the potential exists for contaminant concentrations to decrease over time in various media.

Present a conceptual site model which identifies contamination sources, contaminant migration pathways, and potential receptors.

COPCs present at SWMU 18 belong to five primary groups: energetic compounds, fuel oil constituents, polycyclic aromatic hydrocarbons (PAHs), metals, and VOCs. Other COPCs identified in Sections 6 through 9 were detected infrequently or at low concentrations, and were determined not to pose a significant risk; these chemicals are not discussed in this section. This section concentrates on the COPCs that are considered to be the primary COCs at the subareas.

5.1 CHEMICAL AND PHYSICAL PROPERTIES AFFECTING COPC MOBILITY

Table 5-1 presents physical and chemical properties of the COPCs as determined in the human health and ecological risk assessments in the subarea-specific sections (Sections 6 through 9). These

properties can be used to estimate the environmental mobility and fate of site contaminants. The properties that are discussed include the following:

- Specific gravity
- Vapor pressure
- Water solubility
- Octanol/water partition coefficient
- Organic carbon partition coefficient
- Henry's Law constant
- Bioconcentration factor
- Mobility index

Empirically determined literature values of these properties are presented, when available. Calculated values, which were obtained using approximation methods, are presented when literature values were not available. A discussion of the environmental significance of each of these parameters follows.

5.1.1 Specific Gravity

Specific gravity is the ratio of the weight of a given volume of pure chemical at a specified temperature to the weight of the same volume of water at a given temperature. Its primary use is to determine whether a chemical will have a tendency to float or sink in water if it is present as a pure chemical or at very high concentrations. Chemicals with a specific gravity greater than 1, including halogenated aliphatics, PAHs, phthalate esters, explosives, and pesticides, will tend to sink. Chemicals with a specific gravity less than 1 (e.g., ketones) will tend to float. This parameter becomes important only when the chemicals are at very high concentrations and are liquid when they are in pure phase. None of the COPCs at SWMU 18 are at high enough concentrations in groundwater or surface water to suspect that there is a non-aqueous phase liquid (NAPL).

5.1.2 Vapor Pressure

Vapor pressure provides an indication of the rate at which a chemical volatilizes from both soil and water. It is of primary importance at environmental interfaces such as surface soil/air and surface water/air. Volatilization from stream sediments could also be significant under low-flow conditions (i.e., during summer months and drought conditions) when the sediments are exposed to the atmosphere in a dry creek bed. Volatilization is a significant process that causes loss of VOCs from the surface water, particularly during hot summer weather and turbulent high-flow conditions. Volatilization is not as

important when evaluating contaminated groundwater and subsurface soils that are not exposed to the atmosphere. Vapor pressures for ketones and halogenated aliphatics are generally many times greater than vapor pressures for PAHs, phthalate esters, and dioxins/furans. Some of the energetic compounds [e.g., 2,4-dinitrotoluene (DNT) and TNT] have moderate vapor pressure values, so they can be subject to a low volatilization rate. Chemicals with higher vapor pressures are expected to enter the atmosphere much more readily than chemicals with lower vapor pressures. Volatilization is a significant loss process for VOCs in surface water or surface soil. Volatilization is not significant for inorganics. Surface soils and surface waters at SWMU 18 do not contain high concentrations of VOCs. Therefore, volatilization from soil is not likely to be an important loss mechanism at the subareas.

5.1.3 Water Solubility

The rate at which a chemical is leached from a waste deposit or contaminated soils by infiltrating precipitation is proportional to its water solubility. More soluble chemicals are more readily leached than less soluble chemicals. The water solubilities presented in Table 5-1 indicate that the VOCs (ketones and halogenated aliphatics) and the energetic compounds are usually several orders of magnitude more water soluble than pesticides, the dioxins/furans, and some of the PAHs. Chemicals with high solubilities have a tendency to migrate at a relatively rapid rate while in solution.

5.1.4 Henry's Law Constant

Both the vapor pressure and the water solubility are of use in determining volatilization rates from surface water bodies and from ground water. The ratio of these two parameters (Henry's Law constant) is used to calculate the equilibrium chemical concentrations in the vapor phase versus the liquid phase for the dilute solutions commonly encountered in environmental settings. In general, chemicals having a Henry's Law constant of less than 1×10^{-5} atmosphere-cubic meter per mole (atm-m^3/mole), such as pesticides and dioxins, should volatilize very little and should be present only in minute amounts in the atmosphere or soil gas. For chemicals with a Henry's Law constant greater than 5×10^{-3} atm-m^3/mole, such as many of the halogenated aliphatics, volatilization and diffusion into soil gas could be significant.

5.1.5 Octanol/Water Partition Coefficient

The octanol/water partition coefficient (K_{ow}) is a measure of the equilibrium partitioning of chemicals between octanol and water. A linear relationship between the K_{ow} and the uptake of chemicals by fatty tissues of animal and human receptors (the bioconcentration factor) has been established (Lyman et al., 1990). It is also useful in characterizing the sorption of compounds by organic soils where experimental values are not available. Pesticides, dioxins, and aromatic compounds lacking functional

groups that enhance water solubility are several orders of magnitude more likely to partition to fatty tissues than the more soluble VOCs. The K_{ow} is also used to estimate bioconcentration factors in aquatic organisms.

5.1.6 Organic Carbon-Water Partition Coefficient

The organic carbon partition coefficient (K_{oc}) indicates the tendency of a chemical to adhere to organic matter contained in soils. Nitrogen-containing compounds, such as TNT, 2-amino-4,6-dinitrotoluene (2ADNT), 4-amino-2,6-dinitrotoluene (4ADNT), HMX, and RDX, have relatively low K_{oc} values and tend to be fairly mobile in the environment. Chemicals with a high K_{oc} generally have low water solubilities and vice versa. This parameter may be used to infer the relative rates at which the more mobile chemicals (e.g., ketones and halogenated aliphatics) are transported in the groundwater. Chemicals such as most pesticides, PAHs, and dioxins/furans are relatively immobile in the soil and are preferentially bound to the soil. These compounds are not subject to groundwater transport to the extent that compounds with higher water solubilities are. However, these immobile chemicals can be transported by erosional processes when they are present in surface soils or sediments. Several factors affect the measured value of K_{oc}. For example, values of K_{oc} usually decrease with increasing temperature. The fine silt and clay fraction of soil and sediments may have a greater tendency to adsorb chemicals because they often have a greater concentration of organic matter (hence, a greater number of adsorption sites per unit volume).

5.1.7 Soil-Water Distribution Coefficient

The soil-water distribution coefficient (K_d) is a measure of the equilibrium distribution of a chemical in soil-water systems. The K_d of organic chemicals is a function of both the K_{oc} and the fraction of organic carbon (f_{oc}) in the soil:

$$K_d = K_{oc} \times f_{oc}$$

The degree to which organic chemicals sorb to soils is very important when assessing migration potential. If a chemical tends to sorb strongly to soil, then there is much less probability that the chemical will reach groundwater and affect groundwater quality. The presence and mobility of energetic compounds in soils at numerous federal facilities have been investigated and reported in scientific literature and USEPA and USACE reports. The K_d values estimated or measured for energetic compounds at a few of these sites are summarized in Table 5-1.

Low concentrations of PAHs were detected in surface and subsurface soils in Subareas C and F, but none were detected in the groundwater samples. Chemicals that migrate slowly through saturated or unsaturated soils have a relatively long time period during which they can be subjected to biodegradation processes before they reach a surface water body.

As a consequence of low migration potential, there is a very low probability that chemicals with very high K_d values (i.e., PAHs) will reach surface water bodies via groundwater flow. However, if PAHs are present at the ground surface, eroded, and transported in surface runoff with soil particles (as a sorbed phase), then there is potential for the compounds to reach surface water.

Five sediment samples collected from Boggs Creek were analyzed for total organic carbon (TOC). Values of TOC ranged from less than 4,380 to 11,000 mg/kg. This amount of TOC in the sediments provides a relatively large capacity for sorption of organic compounds.

5.1.8 Bioconcentration Factor

The bioconcentration factor (BCF) represents the ratio of aquatic-animal-tissue concentration to water concentration. The ratio is both contaminant- and species-specific. When site-specific values are not measured, literature values are used or the BCF is derived from the octanol/water coefficient. Many of the pesticides, dioxins, and PAHs will bioconcentrate at levels three to five orders of magnitude greater than those concentrations found in the water, but VOCs and energetic compounds are not as readily bioconcentrated.

5.1.9 Mobility Index

The mobility index (MI) is a quantitative assessment of mobility that uses water solubility (S), vapor pressure (VP), and K_{oc} (Laskowski, et al., 1983). It is defined as

$$MI = \log ((S \times VP)/K_{oc})$$

A scale to evaluate MI, as presented by Ford and Gurba (1984), is as follows:

Relative MI	Mobility Description
> 5	extremely mobile
0 to 5	very mobile
-5 to 0	slightly mobile
-10 to –5	immobile
< -10	very immobile

Of the organic chemicals detected at SWMU 18, chlorinated solvents and ketones generally have MIs greater than 5 and are considered extremely mobile. Lighter molecular weight PAHs, such as naphthalene, have MIs ranging from -5 to 0 and are considered slightly mobile. Heavier molecular weight PAHs [e.g., benzo(a)pyrene] are classified as very immobile, with MIs less than -10.

5.1.10 Inorganic COPCs

The solubility and mobility of inorganics are strongly influenced by their valence states and mineral forms present in soils (e.g., silicates, hydroxides, oxides, carbonates, etc.). The solubility of a metal also depends on pH, Eh (redox potential) ORP, temperature, and other ionic species in solution (the Debye-Huckel theory). Nearly all metals are more soluble at water pH values less than 5.0. Iron, manganese, and chromium are metals that have more than one valence and are more soluble in the reduced valence states. As a result, these metals are more soluble under reducing conditions. The solubility products reported in the literature vary with the type of complex formed, but generally it can be noted that, for example, cadmium and copper complexes are more soluble than lead and nickel complexes.

The K_d for inorganic constituents is the ratio of the concentration adsorbed on soil surfaces to the concentration in water. K_d for metals varies over several orders of magnitude because the K_d is dependent on the size and charge of the ion and the soil properties governing exchange sites on soil surfaces. Relative mobilities of inorganic COPCs, as a function of environmental conditions in soil, are presented in Table 5-1. This table provides the relative mobilities in a qualitative fashion, in part because environmental conditions are seldom characterized well enough to permit more detail.

5.2 PROPERTIES AFFECTING ATTENUATION AND PERSISTENCE

The primary chemical and biological factors which affect the attenuation and persistence of chemicals are solubility, adsorption, desorption, biodegradation, photolysis, and plant uptake. These processes and their effects on fate and transport are discussed below.

5.2.1 Solubilities and Adsorption/Desorption Properties

Literature values and regulatory guidance values for solubilities, K_{oc}, K_d, and biodegradation rates are summarized in Table 5-1. These values are based on field investigations, laboratory experiments, and theoretical calculations that are described in scientific literature. In most instances, the values found for each parameter for each chemical have an extremely wide range. Thus, the parameter values listed in

Table 5-1 may not be accurate or entirely applicable to the SWMU 18 setting, but they are useful for comparative purposes to rank COPCs against each other in terms of their relative mobilities and biodegradation potential.

As shown in Table 5-1, the PAHs have the lowest solubilities and generally have the highest affinities for sorbing to organic carbon and soil. Like the PAHs, many of the metals also have high affinities for sorbing to soil (e.g., aluminum, beryllium, chromium, lead, and vanadium). For these COPCs, the concentrations dissolved in groundwater should be low and the rates of migration through surface water, soil, and groundwater systems should be very slow or insignificant.

The remaining metals (antimony, arsenic, cadmium, cobalt, copper, iron, manganese, nickel, and zinc), most of the energetic compounds, VOCs, and ammonia have moderate affinities for sorption to soil and therefore can move through the environment more quickly than the COPCs listed above. However, their mobility and migration rates are still impeded by sorption and in some cases solubility constraints.

The COPCs with the lowest affinities for sorption (i.e., lowest K_{oc} and K_d values) are RDX, 2ADNT, 4ADNT, and nitrate. These compounds have the greatest mobilities and should migrate more quickly through soil, groundwater, and surface water systems. Widespread detections of elevated nitrate concentrations have also occurred in groundwater and surface water samples.

The K_d values for metals are intermediate to high and indicate that the metals should be relatively immobile. However, the natural soils and groundwater associated with Pennsylvanian age rocks in southern Indiana are slightly to strongly acidic because:

- The Pennsylvanian shales, coals, and sandstone units typically contain pyrite, which forms sulfuric acid when oxidized;

- The near-surface rocks have undergone chemical and physical weathering through a very long period of geologic time, which has allowed the oxidation of pyrite and the leaching and removal of any carbonate minerals that may have once been present in the rocks; and

- The residual soils and near-surface rock units have been subjected to acid rain in recent decades.

Because of lower pH values in the soils, bedrock, and groundwater, the solubilities of most metals are generally higher than would be expected at near-neutral pH values. In addition, the K_d values of most of

the metals are depressed. Therefore, the higher concentrations of metals causing screening level exceedances may be due in large part to the lower pH values that are naturally prevalent.

Another factor that greatly affects the solubilities and mobilities of iron, manganese, chromium, and arsenic are their valence states. Each of these metals has more than one valence state which is stable in nature. The oxidation-reduction conditions of the soil, bedrock, groundwater, or surface water systems where these metals reside will control the valence states of the metals in each specific environment and location. Iron and manganese are much more soluble and mobile under reducing conditions, where the reduced forms of these metals (Fe^{+2}, Mn^{+2}) are most prevalent. Chromium is more soluble and mobile under oxidizing conditions (i.e., surface soils and surface waters), where the oxidized ionic species (Cr^{+6}) should be most prevalent.

Even though the PAHs and many of the metals have high affinities for adsorption to soil and sediment, they can still move through the environment away from a source area via erosion and sediment transport (i.e., surface water pathway) or via wind erosion and transport.

5.2.2 Biodegradation

As shown in Table 5-1, the degradation half-lives for the PAHs are on the order of 2 to 10 years. Metals do not degrade at all; therefore it is probable that the total mass of metals at SWMU 18 will remain relatively stable over time. VOCs biodegrade with half-lives in groundwater ranging from about 0.02 to 7.0 years as shown in Table 5-1. Hence, it is probable that the total mass of the PAHs and VOCs at SWMU 18 will decrease over time as a result of degradation (chemical and biological).

TCE is a chlorinated ethene compound with three chlorine atoms. At sites contaminated with chlorinated solvents, most of the solvent degradation occurs by reductive (anaerobic) dechlorination (RD) (USEPA, 1998), although aerobic processes can also biodegrade the less-chlorinated ethenes. RD is a microbially mediated reaction whereby a chlorine atom on a chlorinated solvent is replaced by a hydrogen atom (Vogel and McCarty, 1987). In aerobic bioremediation processes, an organic contaminant such as benzene acts as an electron donor, and another compound (e.g., oxygen, nitrate, or sulfate) acts as the electron acceptor. However, during RD, hydrogen acts as the electron donor, and the halogenated aliphatics act as the electron acceptors and thus become reduced, as shown in the following half-reaction (Aziz et al., 2000):

$$R\text{-}Cl + H^{+} + 2e^{-} \rightarrow R\text{-}H + Cl^{-}$$

where, R = alkyl group
Cl = chlorine
H+ = hydrogen ion
e- = electron

During RD, hydrogen atoms are consumed (i.e., alkalinity is produced) and chloride ions are produced.

TCE is part of a biodegradation chain that involves the sequential dechlorination of ethene compounds as follows:

TCE → dichloroethene (DCE) → vinyl chloride → ethene

One molecule of DCE is created for each molecule of TCE degraded and so on down the chain. Three DCE isomers (cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCE) can be produced during RD. However, the cis-1,2-DCE isomer is typically produced in much greater quantities compared to the other two isomers during RD of TCE (Vogel and McCarty, 1985; Vogel and McCarty, 1987; Aziz et al., 2000).

TCE is the one of the primary chlorinated ethenes released at SWMU 18. The other ethene compounds detected in groundwater at SWMU 18 (i.e., cis-1,2-DCE, vinyl chloride, and ethene) are most likely degradation products resulting from RD and/or aerobic biodegradation processes. The fact that cis-1,2-DCE and vinyl chloride are present almost everywhere and in every medium as TCE strongly suggests that RD of TCE is actively occurring at the site.

Numerous laboratory studies and past site investigations at DoD facilities have yielded information on the biodegradation of energetic compounds. TNT in soils, groundwater, and surface water can degrade biotically or abiotically and can degrade under a fairly wide range of pH and Eh conditions (Price et al., 1997; Brannon et al., 1998; Talmage et al., 1999). The two most common degradation products of TNT found in soils and groundwater have been 2ADNT and 4ADNT (Li et al., 1981; Daun et al., 1998; Pennington et al., 1999a,b,c). These compounds subsequently degrade to diaminonitrotoluene compounds and other less reactive compounds. Detections of 2ADNT and 4ADNT at SWMU 18 provide evidence that microbial biodegradation of TNT is occurring in soils, surface water, and groundwater, and that the degradation products of TNT are more mobile than TNT itself.

Scientific studies have shown that HMX and RDX are also biodegraded in soils and groundwater, however, the half-lives of HMX and RDX are thought by most researchers to be relatively long (e.g., 20 to 40 years), especially in soils (Table 5-1). DNX, MNX, and TNX are typically cited as the most prevalent

daughter products of RDX biodegradation. These three degradation compounds have been detected at SWMU 18 in numerous samples where RDX was detected. Thus, the products of RDX biodegradation appear to be present almost everywhere that RDX is present, albeit in lower concentrations.

HMX is the energetic compound detected at SWMU 18 that is theoretically most resistant to biodegradation. Although HMX degradation is most likely occurring at a slow rate at SWMU 18, there are no known compounds which can be identified at SWMU 18 which are explicitly attributable to HMX degradation.

5.2.3 Abiotic Degradation

Organic chemicals can degrade abiotically. One means of abiotic degradation is hydrolysis, where the compound reacts with water to form two or more new compounds. "At neutral or acidic pH values, RDX does not hydrolyze to an appreciable extent in freshwater or seawater (Talmage et al., 1999)." Reported hydrolysis half-lives of 170 days to several years indicate that hydrolysis is not a significant degradation process for RDX in natural water (Sikka et al., 1980; Spanggord et al., 1980a). Hydrolysis of other organic contaminants at SWMU 18 is not known to be significant.

Photolysis can be a primary abiotic degradation mechanism in translucent surface water (e.g., ponds, creeks, drainage ditches, and streams). Photolysis is the decomposition of a compound into simpler units when the parent compound absorbs radiation from sunlight. Photolytic degradation rates are typically slowed by high turbidity and increasing depth of water. RDX absorbs ultraviolet light with wavelengths between 240 and 350 namometers (Etnier, 1986) and undergoes rapid photolysis in water (Sikka et al., 1980; Spanggord et al., 1980b). Spanggord and others (1980b) measured half-lives for RDX of 13, 14, and 9 days in distilled water, Holsten River water (Tennessee), and pond water, respectively. The photolytic degradation rate of RDX in the three types of water were much higher than the degradation rate of HMX (Spanggord et al., 1980b). This was attributed to the fact that RDX has greater molar absorptivity. Nitrite, nitrate, and formaldehyde were identified as photolytic transformation products of RDX and HMX.

Just and Schnoor (2004) determined that RDX was photodegraded in reed canary grass leaves exposed to simulated sunlight. The primary degradation products were nitrous oxide and 4-nitro-2,4-diazabutanal. This is the first time that 4-nitro-2,4-diazabutanal has been measured in plant tissues following phytotransformation of RDX. These compounds, along with nitrite and formaldehyde, were also detected in aqueous RDX systems exposed to the same simulated sunlight. Results showed that the initial products of RDX photodegradation in translucent plant tissues were similar to products formed from

aqueous photolysis of RDX. The detection of similar RDX degradation products in both aqueous and plant-based systems suggests that RDX may be initially transformed by similar mechanisms in both systems. Direct photolysis of RDX via ultraviolet irradiation passing into the leaves is hypothesized by Just and Schnoor (2004) to be responsible for the observed transformations. In addition, membrane-bound "trap chlorophyll" in the chloroplasts may shuttle electrons to RDX as an indirect photolysis transformation mechanism.

TNT is another energetic compound that is susceptible to photolytic degradation. In laboratory studies (Spanggord et al., 1980b; Talmage et al., 1999), TNT photolyzed rapidly in natural water, with half-lives of 0.5 to 22 hours. In field studies, TNT concentrations declined within a short distance of discharge points. Because photolytic degradation decreases with the intensity of the irradiating light, this type of degradation is least likely or least rapid when dissolved in turbid water or in water bodies shaded by tree canopy. At NSA Crane, many of the drainage channels are tree-lined. Hence, photolysis is expected to be retarded, except in areas where drainage channels receive ample sunlight.

Photolysis is not believed to be a potentially significant degradation mechanism for the other site-related organic contaminants.

TABLE 5-1

CHEMICAL AND DEGRADATION CHARACTERISTICS OF SITE CONTAMINANTS
SWMU 18
NSWC CRANE
CRANE, INDIANA

Chemical	Solubility (mg/L)	K_{oc} (L/kg)	K_d (L/kg)	Biodegradation Half-Life (years)
Energetic Compounds				
HMX	5.0 [4], 6.6 [7], 2,556 [1]	631 [7], 1,853 [1]	0.505 - 14.8 [10]	39 [6]
RDX	38.4 [7], 42.0 [4], 59.7 [1]	7.6 - 251 [7], 195.4 [1]	0.1 - 7.8 [8]	0.88 - 36 [9]
DNX	N/A	N/A	N/A	N/A
MNX	N/A	N/A	N/A	N/A
2,4,6-trinitrotoluene	130 [1,4]	1,585 [7], 1,834 [1]	0.08 - 22.2 [8]	0.1 - 10.7 [9]
2-amino-4,6-dinitrotoluene	1,223 [1], 2,800 [4,7]	100.5 [1]	4 [7]	< 0.05 [9]
4-amino-2,6-dinitrotoluene	1,223 [1], 2,800 [4,7]	100.5 [1]	4 [7]	< 0.05 [9]
VOCs				
1,1,1-trichloroethane	2,870[1], 2,970[2]	93.3[2], 106.8[1]	0.205 - 0.235[10]	0.02 - 0.5[5]
1,1,2-trichloroethane	1,100[1], 4,420[2]	50.1[2], 67.7[1]	0.110 - 0.149[10]	0.22 - 0.43[11]
1,1-dichloroethene	2,250[2], 2,420[1]	35.04[1], 58.9[2]	0.077 - 0.130[10]	0.08 - 0.5[5]
1,2-dichloroethane	5,100[1], 8,520[2]	17.4[2], 43.79[1]	0.038 - 0.096[10]	0.58 - 3.47[11]
chloroethane	6,710[1]	23.74[1]	0.0522[10]	0.038 - 0.154[5]
trichloroethene	1,100[2], 1,280[1]	67.7[1], 166[2]	0.149 - 0.365[10]	0.22 - 2.31[11]
cis-1,2-dichloroethene	3,500[1,2]	35.5[2], 43.79[1]	0.078 - 0.096[10]	0.03 - 6.93[11]
trans-1,2-dichloroethene	3,500[1,2]	35.5[2], 43.79[1]	0.078 - 0.096[10]	0.03 - 6.93[11]
1,1-dichloroethene	2,250[2], 2,420[1]	35.04[1], 58.9[2]	0.077 - 0.130[10]	0.154 - 0.361[5]
vinyl chloride	2,760[2], 8,800[1]	18.6[2], 23.74[1]	0.041 - 0.052[10]	0.06 - 1.73[11]
PAHs				
benzo(a)anthracene	0.0094 [1,2]	231,000 [1], 398,000 [2]	185 - 318 [10]	3.73 [5]
benzo(a)pyrene	0.00162 [1,2]	787,000 [1], 1,020,000 [2]	630 - 816 [10]	2.9 [5]
benzo(b)fluoranthene	0.0015 [1,2]	803,000 [1] - 1,230,000 [2]	642 - 984 [10]	3.34 [5]
fluoranthene	0.206 [1,2]	49,096 [1], 107,000 [2]	39.3 - 85.6 [10]	2.41 [5]
pyrene	0.135 [1,2]	67,992 [1], 105,000 [2]	54.4 - 84.0 [10]	10.4 [5]
Metals				
aluminum	59400 [1]	NA	1500 [1]	0
antimony	23000 [1]	NA	45 [1,3]	0
arsenic	34700 [1]	NA	29 [1,2], 200 [3]	0
beryllium	149000 [1]	NA	650 [3], 790 [1,2]	0
cadmium	123000 [1]	NA	6.4 [3], 75 [1,2]	0
chromium, total	12000 [1]	NA	850 [1,3]	0
cobalt	87500 [1]	NA	45 [1]	0
copper	421000 [1]	NA	35 [1]	0
iron	624000 [1]	NA	25 [1]	0
lead	9581 [1]	NA	900 [1]	0
manganese	87200 [1]	NA	65 [1]	0
nickel	422000 [1]	NA	65 [1,2], 150 [3]	0
vanadium	86400 [1]	NA	1000 [1,3]	0
zinc	344000 [1]	NA	38 [3], 62 [1,2]	0
Nitrogen Compounds				
ammonia-N	3740 [1]	NA	NA	N/A
nitrate/nitrite-N	90900 [1]	NA	NA	N/A

N/A = Not Available
NA = Not Applicable
mg/L - milligrams per liter
L/kg - Liters per kilogram
References:

1 Oak Ridge National Laboratory (2005)
2 U.S. EPA (2002, Tables C-1 and C-4, pH = 6.8)
3 Baes and Sharp (1983) and Baes et al. (1984)
4 U.S.EPA (2005)
5 Howard et al. (1991)
6 Tomkins (2000)
7 Talmage et al. (1999)
8 Table 6-2
9 Table 6-3
10 K_d calculated by multiplying K_{oc} times f_{oc} value of 0.0008 (average measurement of two SWMU 13 soil samples)
11 Aziz et al (2002)

TABLE 5-2

BIODEGRADATION CHARACTERISTICS OF ENERGETIC COMPOUNDS
SWMU 18
NSWC CRANE
CRANE, INDIANA

Compound	Half-Life[(1)] (years)	Reference
RDX	36 0.88 - 10.7+ (10.6)	DuBois and Baytos, 1991 Pennington et al., 1999c
TNT	1.0 0.1 0.88 - 10.7+ (4.1) 1.11	DuBois and Baytos, 1991 Cataldo et al., 1989 Pennington et al., 1999c May et al., 2003
2ADNT	< 0.05 < 0.05	Funk et al., 1993 Alvarez et al., 1995
4ADNT	NA	NA

1 Individual values or range of values listed in column; average value shown in parentheses.
RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine
TNT - 2,4,6-trinitrotoluene
2ADNT - 2-amino-4,6-dinitrotoluene
4ADNT - 4-amino-2,6-dinitrotoluene
NA - Not Available

6.0 SUBAREA B – BUILDINGS 101, 102, AND 103 AREA

6.1 SUBAREA B DESCRIPTION

Subarea B – Buildings 101, 102, and 103 Area - is located in the northern portion of SWMU 18 along Highway 10 (Figure 6-1). The subarea includes the three principal buildings (Buildings 101, 102, and 103), multiple small outbuildings and support structures (e.g., storage bunkers), and the adjacent land area.

Building 101 has been identified as the Underwater Sound Signal Assembly Building (Tetra Tech, 2011). Based on NSA Crane Public Works drawings, the first floor of Building 101 was equipped with a grease tank, Vergon Press, hoists, and conveyors. A hopper room and conveyor shaft were located on the second floor. Multiple floor drains were located in each room of the building, and notably under the press tables. Two-foot-deep pits were located at the end of the cartridge conveyor belts in the cartridge assembly room. Drawings from 1992 show a sewer manhole located at the southeastern corner of the building and a drainage ditch east of Building 101. During the 2009 PR/VSI site inspection, floor drains were noted throughout the building. The building was equipped with exhaust fans and vents in the roof. Downspouts from the roof drain into pipes in the ground, presumably discharging to surface water drainages. A drainage swale runs parallel to the southern side of the building. Two outbuildings, an air compressor housing unit (Building 3231) and paint locker (Building 182), are located near Building 101. Building 3214 is located between Buildings 101 and 102, and is referred to as the Office Lunch and Locker Building.

Building 102 has been used for demilitarization of 30mm depleted uranium ammunition and high-explosive rounds (Tetra Tech, 2011). Smokeless powder from demilitarization is collected in drums and sent to the Ammunition Burning Grounds (ABG) (SWMU 03). It was noted during the 2009 PR/VSI site inspection that the interior floor drains have been plugged, but the roof still drains to the outside ground surface. The first floor of Building 102 consisted of the assembly room, tanking room, spray paint booth, conveyors, hoists, foaming machine, and wax melting plate. A powder storage area was located on the second floor of the building. The spray booth contained roof ventilation and a cast iron drain and settling pump that discharged to an unknown location. Multiple floor drains were located in the building. Public Works drawing PWSK1447 notes a “natural outlet to drain pit, 20 feet below pit”, referring to a discharge from the building to the hill slope approximately 450 feet south. The discharge was not located during the RFI. A drainage ditch is located south of Building 102. Outbuildings 2137 and 192 are a meter house

and oil and paint storage locker, respectively. Building 3349 is a collector building for Building 102. Single- and double-based propellants are handled in Building 102.

Building 103 is not in use and has been designated for demolition. Two magazines (Building 110 and 111) are located on either side of the north entrance to the building. Building 103 housed four major areas: powder, sewing, folding and packing, and filling. The primary materials handled were black powder, propellant charges, and igniters. A gravity vent was located in the ceiling; it was replaced in the early 1980s with a continuous aluminum ridge vent. Buildings 110 and 111 were storage bunkers for Building 103.

The area around and between Buildings 101, 102, and 103 is grass covered, and the remainder of the area is wooded. Paved roads are located to the north and south of the three buildings, and railroad tracks are located south of the buildings. The buildings are located along a ridge at an elevation of approximately 700 feet. Surface water runoff in the eastern portion of Subarea B flows toward Boggs Creek and in the western portion of the area flows toward a tributary of Boggs Creek.

6.1.1 Historical Use

Buildings 101, 102, and 103 and the associated structures were constructed in 1942 for the purpose of supporting Navy gun ammunition during World War II (WWII), principally black powder and smokeless powder operations (Tetra Tech, 2011). Specifically, the types of ammunition items ranged from 5-inch/38 (caliber) to 16 inch/55.

Black powder and smokeless powder operations were conducted in Building 101, including cartridge tanking and assembly. Building 101 was also used for loading propellant charges for medium-caliber cartridges. The propellant entered the building via a vertical elevator to the loft and was placed in large hoppers. The empty cartridge cases were conveyed underneath the hopper and filled by weight with propellant.

Bag charge and assembly operations were conducted in Building 102. Building 102 was designed to support bag charge loading for major-caliber ammunition, such as 16-inch/50 used by Iowa-class battleships. In the early 1970s, after the Vietnam War had ended, the specialized powder-handling equipment used exclusively for Navy major-caliber ammunition was removed, and the building was converted to an equipment test-out facility for the Naval Ammunition Production Engineering Center (NAPEC). Renovation of 16-inch/50 ammunition (including bag charges) was required for President Reagan's strategic plan in the 1980s to support the reactivation of four battleships for the 600-ship Navy

program. The CAAA assumed operation of the building and returned it to a bag charge handling facility. With newer fire suppression technology, the building was used in the mid-1980s for renovation of bag charges using 16-inch/50 powder and 16-inch/45 powder to meet loading specifications. Powder stacking machines built in 1933 were used in the loading process to precisely stack the ammunition grains to meet loading specifications. The powder was dropped from a hopper in the loft down tubes that placed each grain side by side in layers. The layers were then removed by hand and placed in the bag until all of the required layers had been loaded. A trim layer (a few grains at a time) was added to meet the required loading weight prior to the bag being sewn shut. The equipment was removed in the early 2000s, and the building was converted for demilitarization of 30mm depleted uranium ammunition, which continues for that purpose to date. In the demilitarization process, the all-up rounds are delinked and loaded into a breakdown machine. The machine breaks the cartridge case from the projectile and dumps the propellant from the case, which is then vacuumed to the accumulator building (Building 3349). The projectiles are containerized for further storage. There is no action to disturb the depleted uranium-filled projectile.

Site operations at Buildings 103 included ignition filling and packing activities from approximately 1942 to the late 1980s or early 1990s. Building 103, identified as an igniter loading building, was used to load black powder into a number of ignition devices used with propellant charges. The facility was last used to produce black powder patches that were sewn to each 16-inch/50 bag charge. The building has four separate very small cells that housed a sewing machine and operator. Black powder was remotely dumped into a hopper that was separated from the loading room by a concrete wall. The facility has had no significant changes since it was first constructed during WWII.

6.1.2 Known Releases/Previous Investigations

There are no known releases from Subarea B, and no previous investigations have been conducted at Subarea B.

6.2 GEOLOGY/HYDROGEOLOGY

The geology at Subarea B was interpreted from soil borings advanced during the RFI. Soil boring logs are provided in Appendix B. The overburden at Subarea B consists of silty clay overburden ranging from approximately 2 feet to 8 feet in thickness overlying the bedrock of the Raccoon Creek Group. Soil borings were advanced to refusal at Subarea B, and it is assumed that bedrock was reached at the depth of refusal.

Due to the operations conducted in this area and the materials handled or used (principally, black powder), no monitoring wells were installed within the limits of Subarea B. It is assumed groundwater conditions are similar to other subareas within SWMU 18 and NSA Crane with shallow groundwater occurring at 25 to 30 feet bgs, and groundwater flow mimicking topography. Groundwater is expected to flow south from Subarea B toward tributaries to Boggs Creek.

6.3 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contaminants at Subarea B was evaluated based on environmental samples collected during the 2011 RFI. A summary of samples collected is provided in Table 2-1 and the sample locations are shown on Figure 6-2. A summary of detections tables are provided in Tables 6-1 and 6-2. Screening values are also provided in the summary tables for comparison of results to regulatory criteria. The distribution of analytes detected in soil at Subarea B is shown on Figure 6-3. Appendix G contains the full set of validated laboratory results. Chemical contamination is defined for Subarea B as concentrations of explosives in soil that exceed human health or ecological screening levels and could therefore potentially result in unacceptable human health or ecological risks. Exceedances of screening levels are highlighted in Tables 6-1 and 6-2. Because explosive chemicals do not occur naturally, detections of compounds at Subarea B were considered to be site-related. The following subsections discuss the nature and extent of contaminants detected in media at Subarea B.

6.3.1 Soil Results

Table 6-1 summarizes results for parameters detected in at least one surface and subsurface soil sample for SWMU 18 Subarea B with comparison to screening levels. Table 6-2 summarizes results for parameters detected in at least one composite soil sample for SWMU 18 Subarea B with comparisons to screening levels.

6.3.1.1 Surface Soil

Ten surface soil samples were collected at Subarea B during the RFI and were analyzed for explosives plus NG. Seven explosives were detected in one or more surface soil samples collected at Subarea B. The explosives were detected at two locations: 18BSB002 on the northern side of Building 102, and 18BSB004 on the northeastern corner of Building 101. The compounds 1,3-dinitrobenzene, DNT, nitrobenzene, and RDX were detected at levels that exceeded screening levels. At 18BSB002, nitrobenzene and RDX exceeded the human health screening level for protection of groundwater. At 18SB004, nitrobenzene and RDX exceeded the human health screening level for protection of groundwater, and 1,3-dinitrobenzene exceeded ecological and human health screening levels for

protection of groundwater. None of these detections exceeded the human health screening levels for residential direct contact. Tetryl was also detected in the surface soil at 18BSB002, and TNT was detected in the surface soil sample from 18BSB004; however, the detections were less than human health and ecological screening levels. Nitroglycerin was not detected in the surface soil at Subarea B.

6.3.1.2 Subsurface Soil

Three subsurface soil samples were collected at Subarea B during the RFI and analyzed for explosives plus NG. RDX was the only compound detected in the subsurface at boring 18BSB001, located on the east of Building 102 and south of Building 3349 (Collector Building), at a concentration (0.0238 mg/kg) that exceeded the human health screening level for protection of groundwater. The concentration did not exceed the human health screening level for direct contact. Nitroglycerin was not detected in the subsurface soil at Subarea B.

6.3.1.3 PCB Composite Soil Results

Three composite soil samples were collected at Subarea B during the RFI and analyzed for PCBs. Table 6-2 summarizes the results of the composite soil sampling, with comparison to screening levels.

Aroclor-1260 was detected in all three composite soil samples collected from Subarea B at concentrations ranging from 0.00168 J mg/kg – 0.039 J mg/kg, which exceeded the ecological screening level (0.000332 mg/kg). The maximum Aroclor-1260 concentration was detected at location 18BCP002, located south of Building 113 (former Condensate Lift Station). No other PCBs were detected.

6.4 SUBAREA B CONCEPTUAL SITE MODEL

The principal potential contaminants in Subarea B were considered to be related to gun propellant loading operations. Gun propellants (black powder and smokeless powder) have historically been used at Buildings 101, 102, and 103. Black powder is principally nitrocellulose and is not considered a concern. Smokeless powders may contain nitrocellulose, NG, or nitroguanidine as the major ingredients, depending on the type (i.e., single-, double-, or triple-based); the nitramines (e.g., RDX) may also be used in gun propellants. Oil and paint have also been identified as being used but in small quantities. PCBs may also be potential contaminants due to transformers and compressors that may have contained PCBs in oils used at the subarea. The potential fate and transport of these constituents is discussed in Section 5.

Figure 6-4 presents the contaminant exposure pathway analysis for Subarea B. The principal exposure pathways at Subarea B are contact with soil, surface water, and sediment by human and ecological receptors. Potential exposure to groundwater is indirect through transport and discharge to surface water. Potential human and ecological receptors are discussed further in the human health and ecological risk assessments for Subarea B (Sections 6.5 and 6.6, respectively).

6.5 BASELINE HUMAN HEALTH RISK ASSESSMENT

This section presents the HHRA for exposures to surface soil and subsurface soil at Subarea B at SWMU 18. The HHRA was prepared using the methodology presented in Appendix I. Section 6.5.1 contains a discussion of the selection of COPCs; Section 6.5.2 contains information on the potential receptors and potential exposure pathways; Section 6.5.3 contains the numerical results of the risk assessment; Section 6.5.4 presents site-specific uncertainties associated with the risk assessment; and, Section 6.5.5 summarizes the results of the HHRA.

6.5.1 Data Evaluation

COPCs were identified for Subarea B using the screening levels presented and discussed in Section 2.2 of the HHRA methodology in Appendix I. A discussion of direct contact exposure COPCs (i.e., those chemicals detected at concentrations in excess of USEPA and IDEM direct contact exposure criteria) and COPCs selected using migration criteria are presented below. COPCs selected using migration criteria are not quantitatively evaluated in the HHRA because they are not considered to be significant contributors to the direct contact exposure pathways identified for potential human receptors.

COPC selection information for each medium is presented in Tables 6-3 and 6-4. Table 6-5 presents a summary of the chemicals retained as COPCs for Subarea B. Samples used in the HHRA for Subarea B are listed in Appendix I. Risk Assessment Guidance for Superfund (RAGS) Part D tables for COPC selection are included in Appendix I.

6.5.1.1 Surface Soil

Seven explosives were detected in the surface soil samples collected at Subarea B. A comparison of maximum detected surface soil concentrations to screening levels based on USEPA regional screening levels (RSLs) and IDEM screening levels for residential exposure to soil is presented in Table 6-3. The concentrations of all chemicals were less than the screening criteria. Therefore, no chemicals were retained as COPCs for direct contact with surface soil at Subarea B.

A comparison of maximum detected surface soil concentrations to USEPA soil screening levels (SSL) and IDEM screening levels for chemical migration from surface soil to groundwater is presented in Table 6-3. The maximum concentrations of the following chemicals detected in surface soil exceeded the screening levels for migration from soil to groundwater and were retained as COPCs for surface soil at Subarea B:

Explosives (1,3-dinitrobenzene, DNT, nitrobenzene and RDX)

6.5.1.2 Subsurface Soil

RDX was the only chemical detected in the subsurface soil samples collected at Subarea B. A comparison of maximum detected subsurface soil concentrations of RDX to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 6-4. Concentrations of RDX in subsurface soil were less than the screening levels; therefore, no COPCs were identified for direct contact exposure to subsurface soil at Subarea B.

A comparison of maximum detected subsurface soil concentrations of RDX to USEPA SSLs and IDEM screening levels for chemical migration from subsurface soil to groundwater is presented in Table 6-4. Concentrations of RDX exceeded the screening levels for migration from subsurface soil to groundwater; therefore RDX was retained as a COPC at Subarea B.

6.5.1.3 Summary

Table 6-5 summarizes the chemicals retained as COPCs for surface soil and subsurface soil at Subarea B. RAGS Part D tables for COPC selection are included in Appendix I.4.2.

6.5.2 Exposure Assessment

This section presents the exposure assessment for Subarea B. The general exposure assessment approach and the exposure factors, which serve as the basis of the risk assessment, are provided in Section 3.0 of the HHRA methodology presented in Appendix I. The exposure assessment is designed to depict the physical setting of the site, identify potentially exposed populations and applicable exposure pathways, calculate EPCs, and estimate chemical intakes under the identified exposure scenarios. The compilation of likely exposure pathways and receptors is referred to as the conceptual site model (CSM). The CSM for Subarea B is presented in Section 6.4.

Potential Receptors and Exposure Pathways

Receptors potentially exposed to media at Subarea B included construction workers, industrial workers, adolescent trespassers, recreational users, and hypothetical residents. The media of interest at Subarea B are surface soil and subsurface soil. As discussed in Section 6.5.1, no COPCs were identified for direct contact with surface soil and subsurface soil; consequently, there are no complete exposure pathways for Subarea B. Therefore, cancer risks and hazard indices were not calculated for exposures to surface soil and subsurface soil at Subarea B.

6.5.3 Human Health Risk Assessment Summary

A baseline HHRA was performed to characterize the potential risks to likely human receptors under current and potential future land use for Subarea B at SWMU 18. Potential receptors under current land use are industrial workers, construction workers, and trespassers. Potential receptors under future land use are child and adult recreational users, and hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future receptors were evaluated in the baseline HHRA, primarily for decision making purposes.

No COPCs were identified for direct contact to surface or subsurface soil. The COPCs identified for chemical migration from soil to groundwater include:

- Surface soil – 1,3-dinitrobenzene, DNT, nitrobenzene, and RDX
- Subsurface Soil – RDX

These chemicals were detected in two or fewer soil samples, indicating that a significant source area does not exist for these chemicals. Therefore, no chemicals were retained as COCs for migration from soil to groundwater.

Because no COPCs were identified for direct contact with surface soil and subsurface soil, there are no complete exposure pathways for Subarea B. Therefore, cancer risks and hazard indices were not calculated for exposures to surface soil and subsurface soil at Subarea B.

6.6 ECOLOGICAL RISK ASSESSMENT

This section presents the ERA for exposures to surface soil at Subarea B. The ERA was prepared using the methodology presented in Appendix J. Section 6.6.1 contains a discussion of the environmental setting at Subarea B; Section 6.6.2 contains a discussion of the selection of COPCs; Section 6.6.3

contains a discussion on the refinement of COPCs; and, Section 6.6.4 provides a summary and conclusions of the ecological risk assessment.

6.6.1 Environmental Setting

Subarea B is located in the northern portion of SWMU 18 and covers approximately 90 acres; however, the potentially impacted area is only approximately 14 acres. The site includes areas of mowed grass and forest. The site includes several buildings and is intersected by roads. Section 6.1 presents additional details on Subarea B.

6.6.2 Tier 1, Step 2: Selection of Contaminants of Potential Concern

Table 6-6 provides the results of the COPC selection for surface soil. Table 6-7 summarizes the results of the Tier 1 inputs food chain modeling for mammals and birds for Subarea B surface soil. Chemicals eliminated due to background are not included in this evaluation. Appendix J presents the food chain model calculation worksheets.

Terrestrial Plants

Three explosives (1,3-dinitrobenzene, nitrobenzene, and tetryl) were selected as COPCs because screening levels were not available.

Soil Invertebrates

Two explosives (1,3-dinitrobenzene and tetryl) were selected as COPCs because screening levels were not available.

Wildlife

The following text summarizes the results of the food chain modeling for terrestrial receptors using maximum concentrations and Tier 1 input parameters:

- Herbivorous receptors: No chemicals had an ecological effects quotient (EEQ) greater than 1.0 in the food chain model.
- Invertivorous mammals: One PCB had an EEQ greater than 1.0 in the food chain model.
- Invertivorous birds: No chemicals had an EEQ greater than 1.0 in the food chain model.

6.6.3 Tier 2, Step 3a: COPC Refinement

Summaries of the Step 3a evaluation for soil invertebrates and terrestrial plants are presented in Table 6-8. As part of the Step 3a evaluation for terrestrial wildlife, Table 6-9 presents the results of the food chain model for surface soil using Step 3a exposure assumptions and chemical concentrations. A detailed discussion of the Step 3a evaluation is presented in the following sections.

Terrestrial Plants

Three explosives (1,3-dinitrobenzene, nitrobenzene, and tetryl) were selected as COPCs because screening levels were not available. These explosives were detected infrequently in one or two samples out of six samples and at a low concentration relative to the screening values for other explosives. Therefore, although there is some uncertainty on whether these explosives are impacting plants, based on their low detection frequency and low concentrations relative to screening levels for other explosives, it is not likely that plants are being significantly impacted by 1,3-dinitrobenzene, nitrobenzene, and tetryl in the soil. Therefore, these explosives were eliminated as COPCs.

Soil Invertebrates

1,3-Dinitrobenzene and tetryl were eliminated as COPCs for soil invertebrates for reasons similar to those presented above for plants.

Mammals and Birds

As presented in Section 6.6.2, the EEQs from the food chain modeling were greater than 1.0 for one PCB using maximum chemical concentrations and Tier 1 exposure assumptions. Therefore, as part of the Step 3a refinement, risks were recalculated using average chemical concentrations and the Tier 2, Step 3a exposure parameters as presented in Appendix J. The food chain model calculation sheets are also provided in Appendix J.

The following text summarizes the results of the food chain modeling for terrestrial receptors using average concentrations and the Tier 2, Step 3a input parameters:

- Herbivorous receptors: No EEQs were greater than 1.0; therefore, impacts to herbivorous mammals and birds are not expected from chemicals detected in surface soil at Subarea B.

- Invertivorous receptors: No EEQs were greater than 1.0; therefore, impacts to invertivorous mammals and birds are not expected from chemicals detected in surface soil at Subarea B.

6.6.4 Ecological Risk Summary and Conclusions

This ERA evaluated surface soil from Subarea B. Based on the initial screening of the chemical data, four chemicals were initially selected as COPCs in surface soil because they had EEQs greater than 1.0 in the conservative food chain model or because they did not have screening levels.

These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. The following presents the results of the ERA.

Terrestrial Plants and Soil Invertebrates

No chemicals were retained as COPCs for potential risks to terrestrial plants and soil invertebrates.

Mammals and Birds

No chemicals were retained as COPCs for mammals and birds.

6.7 SUMMARY AND RECOMMENDATIONS

Seven explosives were detected in the surface soil at two locations in Subarea B: boring 18SB002 on the northern side of Building 102 and 18BSB004 on the northeastern corner of Building 101. Of the explosives compounds detected, 1,3-dinitrobenzene, DNT, nitrobenzene, and RDX exceeded human health for protection of groundwater and/or ecological screening levels. RDX was the only explosive compound detected in subsurface soil at 18BSB001. The concentration of RDX in the subsurface soil (0.0238 mg/kg) exceeded the human health screening level for protection of groundwater. None of the concentrations exceeded the human health screening level for residential direct contact. The PCB Aroclor-1260 was detected in the three composite soil samples collected from Subarea B. The concentrations of Aroclor-1260 (0.00168 J mg/kg to 0.039 J mg/kg) exceed the ecological screening level (0.000332 mg/kg).

The baseline HHRA, performed to characterize the potential risks to likely human receptors under current and potential future land use scenarios for Subarea B , identified no COCs in surface soil or subsurface soil through direct contact or migration to groundwater. Therefore, cancer risks and hazard indices were not calculated for exposures to surface soil and subsurface soil at Subarea B; no unacceptable risk is considered to exist for exposure to soils at Subarea B. Similarly, the ecological risk assessment, performed to characterize the potential risks to likely ecological receptors at Subarea B, identified no COPCs in surface soil.

The purpose of this RFI was to identify possible contaminant releases that would require further investigation or pose a threat to human health or the environment. A site that does not require further investigation and does not pose an unacceptable risk to human health and the environment may be designated as requiring NFA and may be removed from further consideration. Based on the results of the human health and ecological risk assessments, NFA is recommended for Subarea B.

TABLE 6-1

SUMMARY OF SOIL RESULTS - SUBAREA B
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE SUBMATRIX	ECO [1]	ECO REF	HH [2]	HH REF	18BSB001 18BSB0010002 10/19/2011 SS	18BSB001 18BSB0010608 10/19/2011 SB	18BSB002 18BSB0020002 10/19/2011 SS	18BSB002 18BSB0020507 10/19/2011 SB	18BSB002 18BSB0020507-D 10/19/2011 SB	18BSB003 18BSB0030002 10/20/2011 SS	18BSB003 18BSB0030203 10/20/2011 SB	18BSB004 18BSB0040002 10/19/2011 SS
EXPLOSIVES (MG/KG)												
1,3,5-TRINITROBENZENE	0.376	(4)	34	(8)	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U	0.0381 U	0.0385 U	0.0392 U
1,3-DINITROBENZENE	0.079	(6)	0.028	(8)	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U	0.0381 U	0.0385 U	**0.0833 J**
2,4,6-TRINITROTOLUENE	6	(5)	0.26	(8)	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U	0.0381 U	0.0385 U	**0.0559 J**
2,4-DINITROTOLUENE	1.28	(4)	0.0056	(8)	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U	0.0381 U	0.0385 U	**0.0436 J**
NITROBENZENE	1.31	(4)	0.00158	(8)	0.0385 U	0.04 U	**0.0227 J**	0.04 U	0.0396 U	0.0381 U	0.0385 U	**0.054 J**
RDX	12	(6)	0.0046	(8)	0.0385 U	**0.0238 J**	**0.0356 J**	0.04 U	0.0396 U	0.0381 U	0.0385 U	0.0392 U
TETRYL	0.99	(6)	11.8	(8)	0.0385 U	0.04 U	**0.0537 J**	0.04 U	0.0396 U	0.0381 U	0.0385 U	0.0392 U

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil samples are only compared to human health criteria.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

Acronyms:
Eco - Ecological
Eco Ref - Ecological Reference
HH - Human Health
HH Ref - Human Health Reference
mg/kg - Milligrams per kilogram
NA - Not Available / Not Analyzed
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

Light gray shading indicates positive result.
Dark shading indicates exceedance of criteria.

TABLE 6-1

SUMMARY OF SOIL RESULTS - SUBAREA B
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE SUBMATRIX	ECO [1]	ECO REF	HH [2]	HH REF	18BSB005 18BSB0050002 10/19/2011 SS	18BSB006 18BSB0060002 10/20/2011 SS	18BSS001 18BSS0010002 10/20/2011 SS	18BSS002 18BSS0020002 10/20/2011 SS	18BSS003 18BSS0030002 10/20/2011 SS	18BSS003 18BSS0030002-D 10/20/2011 SS	18BSS004 18BSS0040002 10/20/2011 SS
EXPLOSIVES (MG/KG)											
1,3,5-TRINITROBENZENE	0.376	(4)	34	(8)	**0.0261 J**	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U
1,3-DINITROBENZENE	0.079	(6)	0.028	(8)	0.0381 U	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U
2,4,6-TRINITROTOLUENE	6	(5)	0.26	(8)	0.0381 U	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U
2,4-DINITROTOLUENE	1.28	(4)	0.0056	(8)	0.0381 U	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U
NITROBENZENE	1.31	(4)	0.00158	(8)	0.0381 U	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U
RDX	12	(6)	0.0046	(8)	0.0381 U	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U
TETRYL	0.99	(6)	11.8	(8)	0.0381 U	0.04 U	0.04 U	0.0392 U	0.0385 U	0.04 U	0.0385 U

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

TABLE 6-2

SUMMARY OF COMPOSITE SOIL RESULTS - SUBAREA B
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE SUBMATRIX	ECO (1)	ECO REF	HH (2)	HH REF	18BCP001 18BCP0010002 10/20/2011 SS	18BCP001 18BCP0010002-D 10/20/2011 SS	18BCP002 18BCP0020002 10/20/2011 SS	18BCP003 18BCP0030002 10/20/2011 SS
PCBS (MG/KG)								
AROCLOR-1260	0.000332	(4)	0.22	(7)	**0.00345 J**	**0.00191 J**	**0.039 J**	**0.00168 J**

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil samples are only compared to human health criteria.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

ACRONYMS:
Eco - Ecological
Eco Ref - Ecological Reference
HH - Human Health
HH Ref - Human Health Reference
mg/kg - Milligrams per kilogram
NSA - Naval Support Activity
PCB - Polychlorinated Biphenyl
SWMU - Solid Waste Management Unit

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

Light gray shading indicates positive result.
Dark shading indicates exceedance of criteria.

TABLE 6-3

OCCURENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	DIRECT CONTACT				SURFACE SOIL TO GROUNDWATER					
										Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]	USEPA RSL Protection of Groundwater[7]		IDEM Migration to Groundwater[5]		COPC Flag	Rationale for Contaminant Deletion or Selection[6]
PCBs																			
11096-82-5	Aroclor-1260	0.00168 J	0.039 J	mg/kg	18BCP0020002	3/3	-	0.039	NA	0.22 C	3.1 C	No	BSL	0.48		4.8	C	No	BSL
Explosives																			
99-35-4	1,3,5-Trinitrobenzene	0.0261 J	0.0261 J	mg/kg	18BSB0050002	1/10	0.0381 - 0.04	0.0261	NA	220 N	3,100 N	No	BSL	34		33	N	No	BSL
99-65-0	**1,3-Dinitrobenzene**	0.0833 J	0.0833 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0833	NA	0.61 N	8.5 N	No	BSL	**0.028**		**0.027**	**N**	**Yes**	ASL
118-96-7	2,4,6-Trinitrotoluene	0.0559 J	0.0559 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0559	NA	3.6 N[8]	50 N	No	BSL	0.26		0.89	N	No	BSL
121-14-2	**2,4-Dinitrotoluene**	0.0436 J	0.0436 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0436	NA	1.6 C	22 C	No	BSL	**0.0056**		0.054	C	**Yes**	ASL
98-95-3	**Nitrobenzene**	0.0227 J	0.054 J	mg/kg	18BSB0040002	2/10	0.0381 - 0.04	0.054	NA	4.8 C	67 C	No	BSL	**0.00158**		**0.016**	**C**	**Yes**	ASL
121-82-4	**RDX**	0.0356 J	0.0356 J	mg/kg	18BSB0020002	1/10	0.0381 - 0.04	0.0356	NA	5.6 C	78 C	No	BSL	**0.0046**		0.046	C	**Yes**	ASL
479-45-8	Tetryl	0.0537 J	0.0537 J	mg/kg	18BSB0020002	1/10	0.0381 - 0.04	0.0537	NA	24 N	340 N	No	BSL	11.8		12	N	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Background data is only available for inorganics.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
8 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Acronyms and Abbreviations:
C = Carcinogen
CAS = Chemical Abstract Service
COPC = Chemical Of Potential Concern
IDEM = Indiana Deparment of Environmental Management
J = Estimated value
mg/kg = Milligrams per kilogram
N = Noncarcinogen
NA = Not Applicable/Not Available
PCB = Polychlorinated Biphenyl
RSL = Regional Screening Level
RDX =
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples:
18BSB0010002 18BSS0020002
18BSB0020002 18BSS0030002
18BSB0030002 18BSS0040002
18BSB0040002 18BCP0010002
18BSB0050002 18BCP0020002
18BSB0060002 18BCP0030002
18BSS0010002

TABLE 6-4

OCCURENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	DIRECT CONTACT				SUBSURFACE SOIL TO GROUNDWATER			
										Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]	USEPA RSL Protection of Groundwater[7]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Explosives																	
121-82-4	**RDX**	0.0238 J	0.0238 J	mg/kg	18BSB0010608	1/3	0.0385 - 0.04	0.0238	NA	5.6 C	78 C	No	BSL	**0.0046**	0.046 C	**Yes**	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Background data is only available for inorganics.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
CAS = Chemical Abstract Service
C = Carcinogen
COPC = Chemical Of Potential Concern
IDEM = Indiana Department of Environmental Management
J = Estimated value
mg/kg = Milligrams per kilogram
NA = Not Applicable/Not Available
RDX = Cyclotrimethylenetrinitramine
RSL = Regional Screening Level
SWMU = Solid Waste Management Unit

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples:
18BSB0010608
18BSB0020507
18BSB0030203

TABLE 6-5

CHEMICALS RETAINED AS COPCs - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Chemical	Surface Soil		Subsurface Soil	
	Direct Contact	Soil to Groundwater	Direct Contact	Soil to Groundwater
Explosives				
1,3-Dinitrobenzene		E, I		
2,4-Dinitrotoluene		E		
Nitrobenzene		E, I		
RDX		E		E

Notes
COPC - Chemical of potential concern
E - Chemical exceeded USEPA screening criteria and was retained as a COPC.
I - Chemical exceeded IDEM screening criteria and was retained as a COPC.
IDEM - Indiana Department of Environmental Management
RDX - Cyclotrimethylenetrinitramine
SWMU - Solid Waste Management Unit
USEPA - United States Environmental Protection Agency

TABLE 6-6

SURFACE SOIL COPC SELECTION - SUBAREA B
SMWU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Sample of Maximum Detection	Averge of Positive Results[1]	Average of All Results[2]	Similar to Background[3]	Ecological Screening Level[4]				Ecological Effects Quotient[5]				Deletion or Selection of COPCs for Invertebrates/Plants		Further Evaluated in Terrestrial Food Chain Modeling[6]	
								Plant	Invertebrate	Avian	Mammal	Plant	Invertebrate	Avian	Mammal	COPC (yes/no)?	Rationale	Evaluated (yes/no)?	Rationale
EXPLOSIVES (MG/KG)																			
1,3-DINITROBENZENE	1/6	0.0833 J	0.0833 J	18BSB0040002	0.083	0.030	NA	NA	NA	0.079	0.655	**NA**	**NA**	**1.1**	0.13	**YES**	NSL	**YES**	ASL
2,4,6-TRINITROTOLUENE	1/6	0.0559 J	0.0559 J	18BSB0040002	0.056	0.026	NA	6	12	6.4	80	0.0093	0.0047	0.0087	0.00070	NO	BSL	NO	BSL
2,4-DINITROTOLUENE	1/6	0.0436 J	0.0436 J	18BSB0040002	0.044	0.024	NA	6	20	NA	1.28	0.0073	0.0022	**NA**	0.034	NO	BSL	NO	NONBIO
NITROBENZENE	2/6	0.0227 J	0.054 J	18BSB0040002	0.038	0.026	NA	NA	40	NA	1.31	**NA**	0.0014	**NA**	0.041	**YES**	NSL	NO	NONBIO
RDX	1/6	0.0356 J	0.0356 J	18BSB0020002	0.036	0.022	NA	9537	98	12	130	0.000004	0.00036	0.0030	0.00027	NO	BSL	NO	BSL
TETRYL	1/6	0.0537 J	0.0537 J	18BSB0020002	0.054	0.025	NA	NA	NA	NA	0.99	**NA**	**NA**	**NA**	0.054	**YES**	NSL	NO	NONBIO
PCBS (MG/KG)																			
AROCLOR-1260	3/3	0.0017 J	0.039 J	18BCP0020002	0.015	0.015	NA	33	33	0.88	0.000332	0.0012	0.0012	0.044	**117**	NO	BSL	**YES**	ASL

Ecological effects quotients are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available. Other cells are shaded if the chemical is retained as a COPC for plants or invertebrates or if the chemical is retained for food chain modeling.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - Background data not available.
4 - Sources of ecological screening levels are presented in Table J.2.
5 - EEQs were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
6 - Chemicals with EEQs for birds or mammals greater than 1.0 or bioaccumulative chemicals without bird or mammal screening values are retained for food chain modeling.

COPC Selection Rationale:
ASL = Above Screening Level
BIO = Bioaccumulative chemical
BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level

COPC - Chemical of Potential Concern
EEQ - Ecological Effects Quotient
mg/kg - Milligrams per kilogram
NA - Not applicable/not available
ND - Not detected
J - Estimated concentration
PCB - Polychlorinated Biphenyl
RDX - Cyclotrimethylenetrinitramine
SWMU - Solid Waste Management Unit

TABLE 6-7

TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO, SUBAREA B
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
Chemical	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
EXPLOSIVES								
1,3-DINITROBENZENE	1.1E-01	1.1E-02	2.3E-01	9.7E-02	4.2E-02	4.2E-03	1.3E-01	5.5E-02
POLYCLORINATED BIPHENYLS								
AROCLOR-1260	3.1E-03	3.1E-04	1.1E-03	1.1E-04	6.4E-01	6.4E-02	1.6E+00	1.6E-01

Cells are shaded if the value is greater than 1.0

Acronyms
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient
SWMU - Solid Waste Management Unit

TABLE 6-8

STEP 3A EVALUATION FOR RISKS TO PLANTS AND INVERTEBRATES
SURFACE SOIL COPCs - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]		Maximum EEQ[2]		Step 3a Evaluation[3]		Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?	
							Step 3a Factors Considered in Evaluation				
			Plants	Invertebrates	Plants	Invertebrates	Plants	Invertebrates		Plants	Invertebrates
EXPLOSIVES (MG/KG)											
1,3-DINITROBENZENE	1/6	0.0833	NA	NA	NA	NA	Low detection frequency and relatively low concentration.		Acceptable	No	No
NITROBENZENE	2/6	0.054	NA	40	NA	0.0014	Relatively low concentration.	Not a COPC.	Acceptable	No	No
TETRYL	1/6	0.0537	NA	NA	NA	NA	Low detection frequency and relatively low concentration.		Acceptable	No	No

Footnotes:
1 Sources of ecological screening levels presented in Appendix J Table J.2.
2 Maximum detection divided by screening level. Values are unitless.
3 See Section 6.6.3 for a more detailed Step 3a evaluation.

Acronyms:
COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quotient
mg/kg = Milligrams per kilogram
NA = Not Available or Not Applicable
SWMU = Solid Waste Management Unit

TABLE 6-9

TERRESTRIAL FOOD CHAIN MODEL - TIER 2, STEP 3A SCENARIO, SUBAREA B
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
Chemical	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
POLYCLORINATED BIPHENYLS								
AROCLOR-1260	4.1E-04	4.1E-05	1.3E-04	1.3E-05	7.3E-02	7.3E-03	1.4E-01	1.4E-02

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient
SWMU - Solid Waste Management Unit

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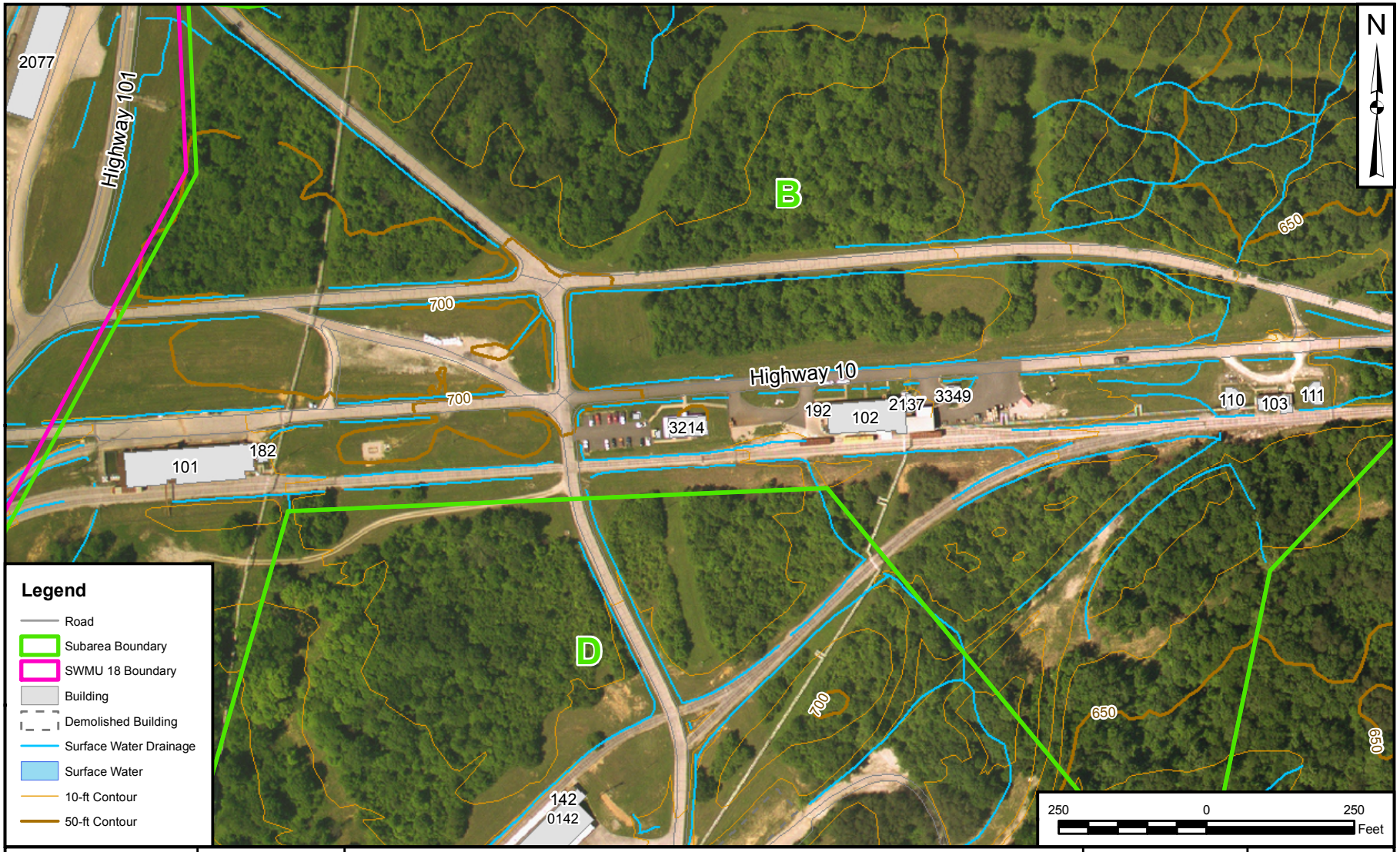

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CHECKED BY	DATE
C. RUMER	11/21/12
REVISED BY	DATE
J. NOVAK	11/21/12
SCALE	
AS NOTED	

NAVFAC

SUBAREA B - BUILDINGS 101, 102 AND 103 AREA
SITE LAYOUT
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
___	F201
APPROVED BY	DATE
__	__
APPROVED BY	DATE
__	__
FIGURE NO.	REV
FIGURE 6-1	0

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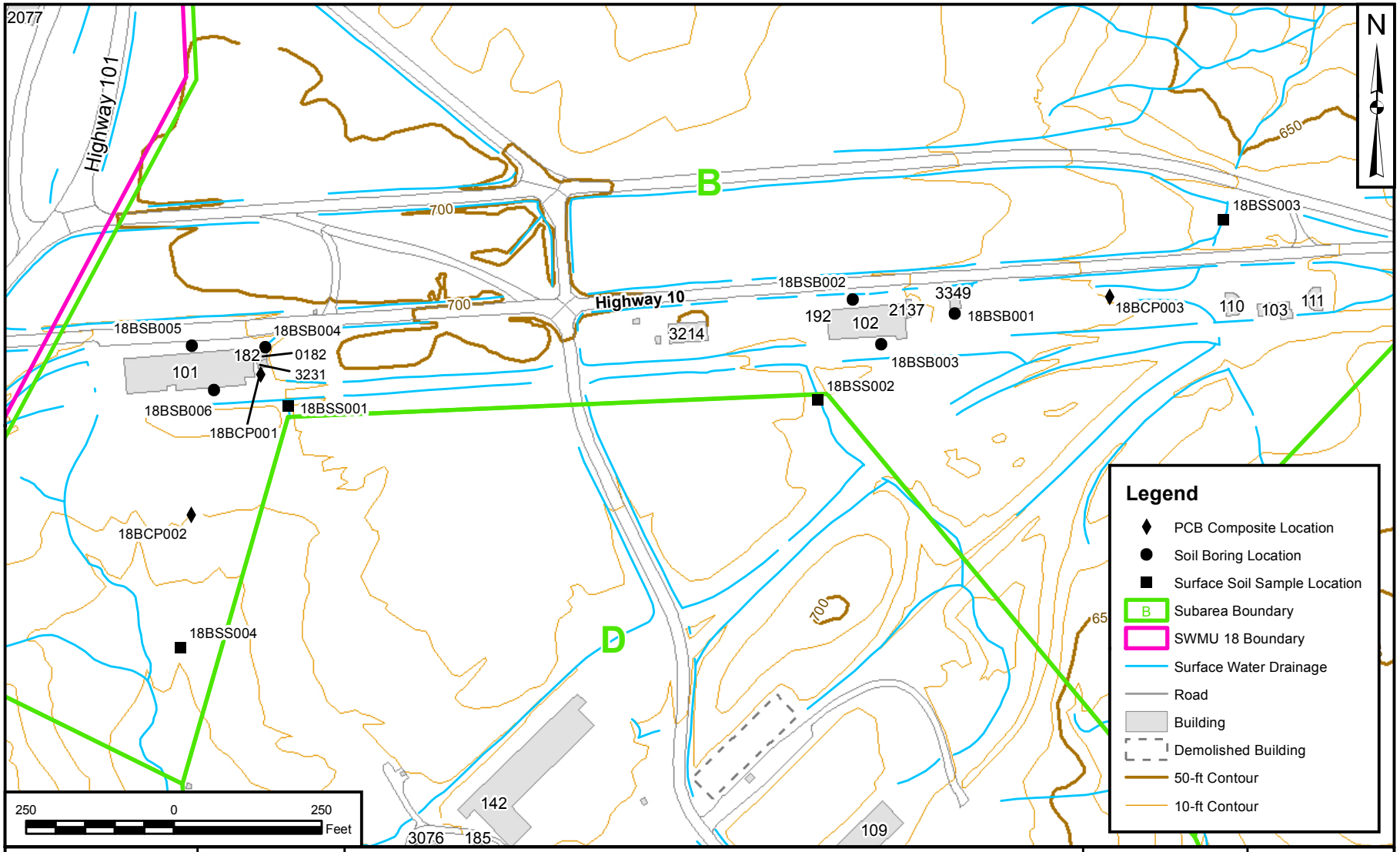

DRAWN BY	J. ENGLISH
DATE	02/15/12
CHECKED BY	C. RUMER
DATE	11/21/12
REVISED BY	J. NOVAK
DATE	11/21/12
SCALE	AS NOTED

NAVFAC

SUBAREA B - BUILDINGS 101, 102 AND 103 AREA
SAMPLE LOCATIONS
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	1851
CTO NUMBER	F201
APPROVED BY	—
DATE	—
APPROVED BY	—
DATE	—
FIGURE NO.	FIGURE 6-2
REV	0

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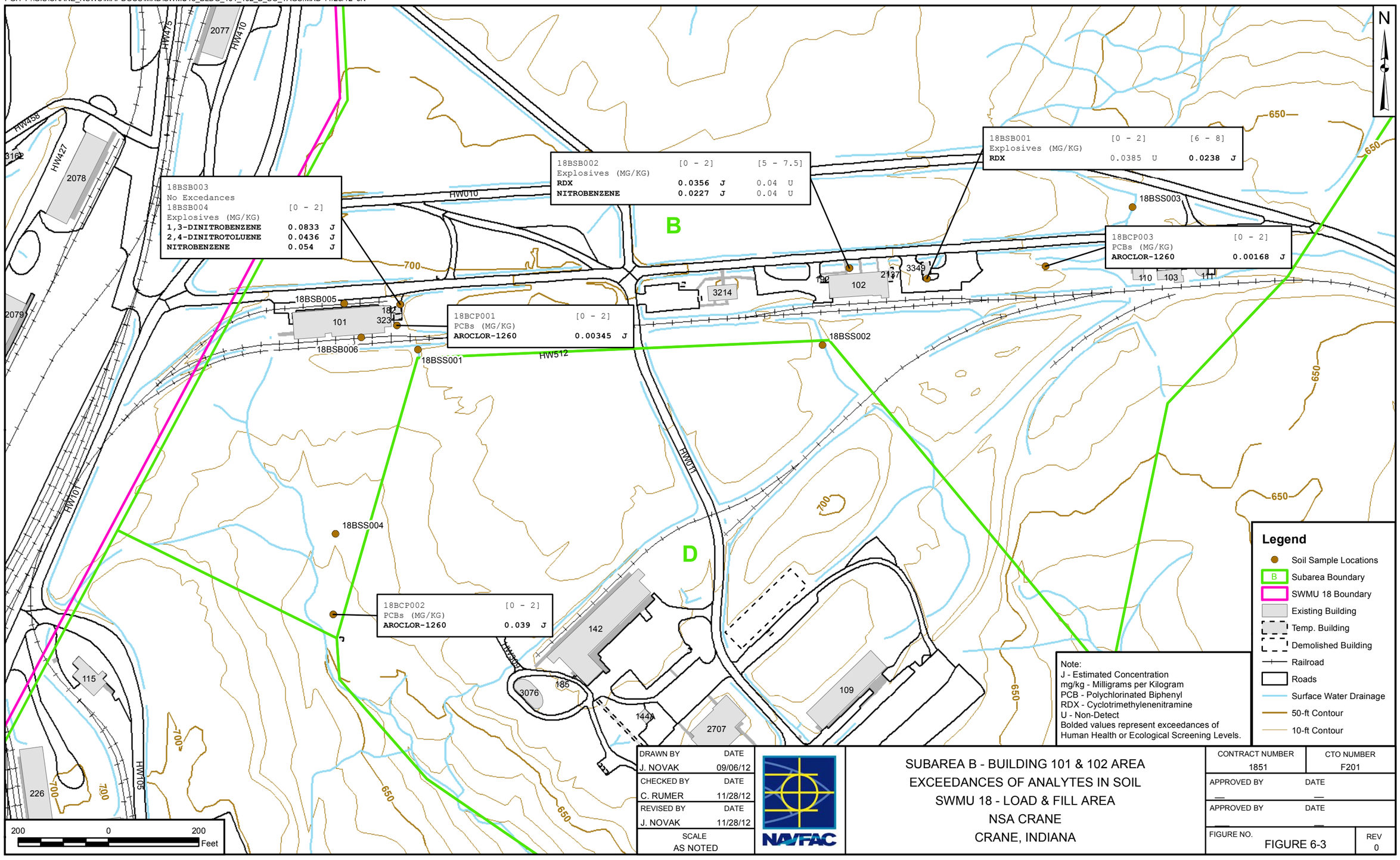


DRAWN BY	DATE
J. NOVAK	09/06/12
CHECKED BY	DATE
C. RUMER	11/28/12
REVISED BY	DATE
J. NOVAK	11/28/12
SCALE	
AS NOTED	

NAVFAC

SUBAREA B - BUILDING 101 & 102 AREA
EXCEEDANCES OF ANALYTES IN SOIL
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

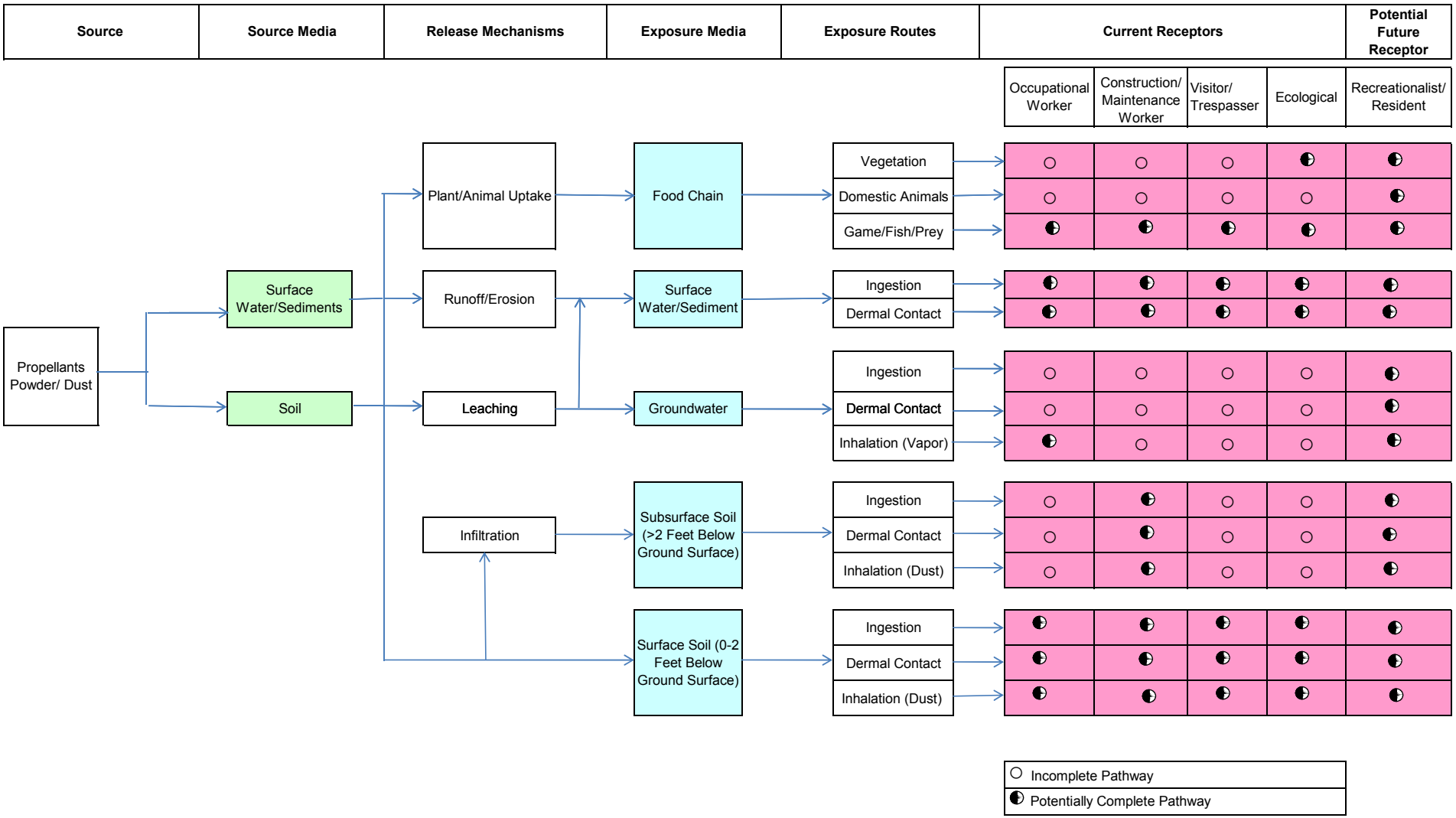
CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 6-3	0

FIGURE 6-4

CONTAMINANT EXPOSURE PATHWAY ANALYSIS

SWMU 18 SUBAREA B - BUILDINGS 101, 102 & 103 AREA

NSA CRANE, INDIANA



7.0 SUBAREA C – INERT OPERATION AREA

7.1 SUBAREA C DESCRIPTION

Subarea C – Inert Operation Area - is located in the western portion of SWMU 18, off of Highway 101 and within the area operated by CAAA (Figure 7-1). The three main buildings in Subarea C include Buildings 119, 226, and 227, which were part of operations associated with Buildings 106 and 107 for overhaul of projectile tanks and cases. The five buildings were connected by a series of covered walkways. Building 227 was used for storage of dirty projectile cases and tanks which were transferred to Building 106 for cleaning with caustics, degreasers, and acids and finished in Building 107 with grit blasters, degreasers, and paint. Building 119 was used for clean cases, and Building 226 was used for clean tanks. Finishing and painting was also conducted in Buildings 119 and 227. No explosive materials were handled or stored in Buildings 119, 226, or 227 (Tetra Tech, 2011).

Roof drains from the buildings emptied to concrete culverts, and ridge vents were located along the roof. Paint disposal traps and paint spray booths were constructed at Buildings 119 and 227. The paint disposal traps were located outside of the buildings, and overflow pipes discharged to nearby concrete swales. Exhaust hoods were located above the paint booth and buffing stations in Building 227. Other areas in Building 227 included a grit blast area, sanders, and heater area. Additional areas in Building 119 included a plastic beading machine, gas drying oven, lathes, and a paint booth.

Heating oil USTs were located east of each of the major buildings (Building 119, 226, and 227). The 3,100-gallon UST for Building 119 was removed in 1992 (Tetra Tech, 2011). Fuel oil aboveground storage tanks (ASTs) (2676, 2676A, 2676B, and 2676C) were located at the boiler house (Building 115).

The area surrounding the buildings is grass covered or paved. Highway 104 and a railroad track run along the western side of these buildings. The buildings are located on a north-south trending ridge at an elevation of approximately 690 feet, and the subarea slopes to the west. Surface drainage in the western portion of the subarea is to the western hill slope. Runoff adjacent to the buildings and from roof downspouts is to concrete or unlined drainage swales. Runoff north of Building 226 is conveyed to a drainageway north of the site. Runoff south of Building 226 is conveyed to the drainageway on the western hill slope or to the southern hill slope. In contrast, surface drainage on the eastern side of Buildings 106 and 107 (SWMU 08) flows to a drainageway east of the ridge; ultimately, drainage from the area north of Building 226 flows to this eastern drainageway. Tributaries from the hill flow to a stream south of the subarea, which flows to Boggs Creek, approximately 4,900 feet east of the subarea.

SWMU 08, which consists of Buildings 106 and 107 and Building 106 Pond, is located immediately east of and abuts Subarea C. SWMU 11 (Old Storage Building 225) is located west of the area, across Highway 101.

7.1.1 Historical Use

Buildings 119, 226, and 227 were built in 1941 and 1942 and were originally used for inert processing and storage of projectile tanks and cases. Building 3331 was built in 1999 and used for Army Strategic Mobility Program container maintenance. Other structures of note in the area include a boiler house (Building 115) and an acid storage building (Building 2651) that were constructed in 1943 and 1950, respectively.

7.1.2 Known Releases/Previous Investigations

A release of No. 2 fuel oil from the secondary containment for the ASTs at Building 115 occurred in February 1994. The release was concluded to have been the result of ice damage to a valve on one of the fuel oil ASTs associated with Building 115 (Boiler House). Fuel oil was released from the valve and collected in the secondary containment of the AST; however, product leaked from the sump in the secondary containment to a sanitary sewer line and a storm sewer line (via an overflow from the sanitary sewer line). Product was discharged from the storm sewer to a surface water drainage east of Building 115, which flowed to Boggs Creek. The Navy initiated a spill response the day of the release, recovering approximately 11,000 gallons of the 13,800 gallons of fuel oil released by May 1994. The release reportedly extended from the storm sewer discharge to the confluence with Boggs Creek.

Site characterization and corrective action have been conducted at SWMU 08 (Building 106 Pond), located east of Subarea C, to address soil and groundwater contamination (Tetra Tech, 2008). During the investigation at SWMU 08, TCE was detected in a monitoring well (08MWT008) installed near the southeastern corner of Building 227 at concentrations of 0.7 and 1.7 micrograms per liter (µg/L) in 2005.

7.2 GEOLOGY/HYDROGEOLOGY

The geology at Subarea C was interpreted from information gathered during the RFI for SWMU 18, as well as from information from investigations at adjacent SWMUs 08 and 11. Soil boring logs from SWMU 18 Subarea C are provided in Appendix C. Figure 7-2 shows the location of three geologic cross sections (A-A', B-B', and C-C') through Subarea C. The geologic cross sections are illustrated on Figures 7-3, 7-4 and 7-5, respectively.

The overburden at Subarea C is fine-grained silts and clays, ranging in thickness from approximately 1 foot to 18 feet. Underlying the overburden is weathered sandstone, grading into competent bedrock of the Pennsylvanian Raccoon Creek Group. The bedrock at Subarea C is a silty sandstone overlying beds of sandstone, siltstone, shale, and coal.

Water-bearing fractures were encountered in bedrock typically at depths between 23 to 33 feet bgs. The static water levels in the monitoring wells, however, were 3 to 13 feet bgs, suggesting semi-confined conditions. Figure 7-6 illustrates the groundwater potentiometric contours at Subarea C. The figure includes groundwater elevations from wells 08MWT008 and 08MWT012 at SWMU 08 and wells 11MWT001 through 11MWT004 at SWMU 11, which were measured at the same time. Groundwater flow at Subarea C is to the west in the central portion of Subarea C toward the drainages west of SWMU 11 and to the west-southwest in the southern portion of the subarea the drainage along the western side of Subarea C.

7.3 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contaminants at Subarea C were evaluated based on environmental samples collected during the 2011 RFI. A summary of samples collected is provided in Table 2-1, and the locations of the samples are shown on Figure 7-7. A summary of detection tables, by media, are provided in Tables 7-1 through 7-4. Screening values are also provided in the summary tables for comparison of the results to regulatory criteria. The distributions of analytes detected in environmental site media are shown on Figures 7-8 (soil) and 7-9 (groundwater). Appendix G contains the full set of validated laboratory results. Chemical contamination is defined for Subarea C as concentrations of explosives in soil that exceed human health or ecological screening levels and could therefore potentially result in unacceptable human health or ecological risks. Exceedances of screening levels are highlighted in Table 6-1 and 6-2. Because explosive chemicals do not occur naturally, detections of compounds at Subarea B were considered to be site-related.

Chemical contamination for organic and explosive constituents is defined for Subarea C chemical concentrations in soil, surface water, and sediment that exceed human health or ecological screening levels and could therefore potentially result in unacceptable human health or ecological risks. Exceedances of screening levels are highlighted in Tables 7-1 through 7-4. Because explosive chemicals do not occur naturally and organic chemicals were assumed not to occur naturally, detections of organic compounds at Subarea C were generally considered to be site-related, unless the site history and observed concentrations or concentration patterns indicate that the contaminants are from non-site-related sources. For example, chemicals such as methylene chloride are often detectable and

attributable to laboratory contamination. Other lesser-used chemicals such as chloroform may also fit this description depending on the laboratory and time period in which the samples were analyzed. Laboratory contamination is often indicated by low concentrations of a chemical in field blanks or laboratory blanks and in multiple samples regardless of the origin of the samples. When present as a laboratory contaminant, the contaminating chemical is usually detected at concentrations that appear to be relatively uniform in magnitude regardless of the location from which the sample was collected

Metals contamination is defined as metals concentrations that exceed screening levels and the background. Samples with concentrations of metals that are within the background were not considered to represent site-related contamination. The following subsections discuss the nature and extent of contaminants detected in media at Subarea C.

7.3.1 Soil Results

Table 7-1 summarizes results for parameters detected in at least one surface or subsurface soil sample from Subarea C, with comparison to screening levels. Table 7-2 summarizes results for parameters detected in at least one composite soil sample from Subarea C, with comparison to screening levels.

7.3.1.1 Surface Soil

Ten surface soil samples were collected at Subarea C during the RFI investigation. Seven surface soil samples were analyzed for VOCs and RCRA metals, and three surface soil samples from borings 18CSB001, 18CSB004, and 18CSB007 were analyzed for fuel oil parameters (TPH-diesel range organics (DRO); TPH-extended range organics (ERO); PAHs; benzene, toluene, ethylbenzene, and total xylenes (BTEX); and naphthalene).

Six RCRA metals (arsenic, barium, cadmium, chromium, lead, and mercury) were detected in one or more surface soil samples collected at Subarea C. The concentrations for each metal exceeded the minimum human health and/or ecological screening levels in at least one sample; however, arsenic, cadmium, and mercury were within background levels. Arsenic and chromium exceeded their respective human health for protection of groundwater and residential direct contact, respectively, and/or ecological screening levels in the seven surface soil samples analyzed for RCRA metals; however, arsenic and chromium were within background levels. The maximum barium concentration (1,940 mg/kg) was detected in the surface soil sample from 18CSB009, located at the former settling basin south of Building 119. The maximum cadmium, chromium, and lead concentrations (1.7, 97.5, and 117 mg/kg, respectively) were detected in the sample from 18CSB005, located near the settling basin north of

Building 227. The maximum arsenic and mercury concentrations (19.6 and 0.0383 mg/kg, respectively) were detected in the sample from location 18CSS001.

Eight VOCs were detected in one or more surface soil samples collected at Subarea C. However, only methylene chloride was detected at levels that exceeded minimum human health screening levels. Methylene chloride exceeded the human health screening level of 0.023 mg/kg in three samples and the maximum concentration (0.0371 mg/kg) was detected in the sample from 18CSB009, located at the former settling basin south of Building 119. However, methylene chloride is a common laboratory contaminant and may not be site-related. The maximum concentrations of BTEX occurred in the samples from 18CSN007, located at the former UST associated with Building 227. TCE was detected in one sample from boring 18CSB006 at a concentration of 0.00216 mg/kg, less than the human health screening level of 0.0032 mg/kg.

TPH-DRO (C08-C28), which contains between 8 and 28 carbon atoms per molecule, and TPH-ERO (C08-C34), which contains between 8 and 34 carbon atoms per molecule, were detected at the three surface soil sample locations which were located near fuel oil sources in Subarea C (i.e., ASTs near Building 115 and the former USTs associated with Buildings 226 and 227). Neither TPH range exceeded the minimum human health screening level. Ecological screening levels are not available for petroleum hydrocarbons.

Eight PAHs were detected in one or more surface soil samples collected at Subarea C. Only naphthalene was detected at a concentration that exceeded the minimum human health screening level (0.0094 mg/kg). Naphthalene was detected at a concentration of 0.0109 mg/kg in the sample from 18CSB007, located at the former UST associated with Building 227. No PAHs exceeded ecological screening levels. PAHs were analyzed in samples from locations near fuel oil sources in Subarea C (i.e., ASTs near Building 115 and the former USTs associated with Buildings 226 and 227).

7.3.1.2 Subsurface Soil

Eight subsurface soil samples were collected from Subarea C during the RFI. Five subsurface soil samples were analyzed for VOCs and RCRA metals, and three subsurface soil samples were analyzed for fuel oil parameters (TPH-DRO, TPH-ERO, PAHs, BTEX, and naphthalene).

Six RCRA metals were detected in one or more subsurface soil samples collected at Subarea C. Arsenic and chromium were detected at concentrations that exceeded their respective minimum human health screening levels for protection of groundwater and residential direct contact in all five subsurface soil

samples collected; however, concentrations of both metals were within background levels. The maximum arsenic concentration of 8.55 mg/kg was detected in the 2-to-4-foot sample from 18CMWT003, located in the southern portion of Subarea C. The maximum chromium concentration of 25.9 mg/kg was detected in the 2-to-3-foot sample from 18CSB006, located west of Building 227.

TPH-DRO (C08-C28) and TPH-ERO (C08-C34) were detected in subsurface soil samples from 18CSB001 (2 to 4 feet) and 18CSB007 (4 to 6 feet) at concentrations that exceeded their respective minimum human health screening level. The maximum TPH-DRO (C08-C28) and TPH-ERO (C08-C34) concentrations (4,010 and 4,030 mg/kg, respectively) were detected in the sample from 18CSB007, located at the location of the former UST associated with Building 227. TPH-ERO was detected in the sample from 18CSB004 but at a concentration less than the human health screening level.

Twelve PAHS were detected in one or more subsurface soil samples collected at Subarea C but at concentrations less than their respective minimum human health screening levels.

Ten VOCs were detected in one or more subsurface soil samples collected at Subarea C, but only TCE was detected at a concentration exceeding its minimum human health screening level of 0.0032 mg/kg. TCE was detected in the 2-to-3-foot sample from 18CSB006, located west of Building 227, at a concentration of 0.00837 mg/kg.

7.3.1.3 PCB Composite Soil Results

One composite soil sample was collected at Subarea C during the RFI and analyzed for PCBs. The sample (18CCP0010002) was collected near the transformers between Buildings 227 and 107. Table 7-2 summarizes the results of the composite soil sampling, with a comparison to screening levels.

One PCB, Aroclor-1260, was detected at a concentration of 0.0185 mg/kg, which exceeded the minimum ecological screening level of 0.000332 mg/kg. No other PCB was detected.

7.3.2 Sediment Results (Settling Basin)

One sediment sample (18CSD0030006) was collected from the settling basin located north of Building 227. The sample was analyzed for RCRA metals and VOCs. Table 7-3 summarizes the results for parameters detected in the sediment sample with comparison to human health screening levels. The sediment basin sample location is not considered habitat for ecological receptors; therefore, the results were not compared to ecological screening levels.

Six RCRA metals were detected in the sediment sample from the settling basin. Four of the metals (arsenic, cadmium, chromium, and lead) were detected at concentrations exceeding their respective minimum human health screening levels for protection of groundwater and residential direct contact.

Seven VOCs were detected in the sediment sample from the settling basin; however, none of the VOCs exceeded the minimum human health screening levels.

7.3.3 Surface Water/Sediment Results

Two collocated surface water and sediment samples were collected from surface water drainages within Subarea C. The surface water drainage is along the boundary of Subareas C and D. The 1990 release of fuel oil from the Building 115 ASTs was to the drainage; therefore, the surface water and sediment samples collected for the RFI were analyzed for fuel oil parameters (TPH-DRO, TPH-ERO, PAHs, BTEX, and naphthalene).

No fuel oil parameters were detected in the two surface water samples (see Appendix G).

Table 7-3 summarizes the results for parameters detected in at least one sediment sample, with comparisons to screening levels.

TPH-DRO (C08-C28) and TPH-ERO (C08-C34) were detected in both sediment samples but at concentrations less than the minimum human health screening level.

Fifteen PAHs were detected in one or more sediment samples collected at Subarea C. Four PAHs [acenaphthylene, benzo(a)pyrene, benzo(b)fluoroanthene, and dibenzo(a,h)anthracene] were detected in the sediment sample from 18CSD002 at concentrations that exceeded the minimum human health and/or ecological screening levels; 18CSD002 was located in the upper (upstream) portion of the drainage and closest to the reported point of the No. 2 fuel oil release in the northern area of Subarea C. Concentrations of PAHs detected in the sediment sample from 18CSD0010006, located in the lower (downstream) portion of the drainage, were less than the screening levels.

7.3.4 Groundwater Results

Five groundwater samples were collected from three new SWMU 18 monitoring wells and two existing SWMU 08 monitoring wells in Subarea C. The groundwater samples were analyzed for VOCs and total

RCRA metals. A filtered sample was also collected for dissolved RCRA metals analysis for three groundwater samples due to sample turbidity (>10 NTUs). Table 7-4 summarizes the results for parameters detected in at least one groundwater sample for SWMU 18 Subarea C with comparison to screening levels.

Six total RCRA metals and five dissolved RCRA metals were detected in one or more groundwater samples collected at Subarea C. Three total RCRA metals (arsenic, cadmium, and chromium) and two dissolved RCRA metals (arsenic and chromium) were detected at levels that exceeded the minimum human health screening levels. The arsenic concentration of 1.79 µg/L (total) was detected in the sample from 18CMWT001, located west of Building 227. The sole detection of cadmium [0.898 mg/kg (total)] was detected in the sample from 18CMWT002, located west of Building 119; cadmium was not detected in the filtered sample from this well. The maximum total chromium concentration of 1.6 µg/L was detected in sample 18CGWT002, while the maximum dissolved chromium concentration of 4.1 µg/L was detected in sample 18CGWT003.

Four VOCs were detected in one or more groundwater samples collected at Subarea C. The benzene concentration exceeded the human health screening level in the sample from 18CMWT002, located west of Building 119. TCE was detected at a concentration of 0.568 µg/L, which exceeded the human health screening value (0.26 µg/L) in the sample from SWMU 08 well 08GWT008, located between Buildings 227 and 119. This concentration is less than the result (0.7 µg/L) from the previous sampling event in 2006 associated with the SMWU 08 RFI (Tetra Tech, 2008).

7.4 SUBAREA C CONCEPTUAL SITE MODEL

Potential sources of contaminants in Subarea C are related to operations associated with Buildings 106 and 107 for overhaul of projectile tanks and cases. Building 227 was used for storage of dirty projectile cases and tanks which were transferred to Building 106 for cleaning with caustics, degreasers, and acids, then finished in Building 107 with grit blasters, degreasers, and paint. Building 119 was used to store clean cases, and Building 226 was used to store clean tanks. Finishing and painting were also conducted in Buildings 119 and 227. Explosive materials were reportedly not handled or stored in Building 119, 226, or 227. Paint disposal traps and paint spray booths were constructed in Buildings 119 and 227. The paint disposal traps were located outside of the buildings, with overflow pipes discharged to nearby concrete swales. Other potential sources of contamination include fuel oil ASTs located at the boiler house (Building 115) and USTs located east of each of the major buildings (Buildings 119 and 227). The 3,100 gallon UST for Building 119 was removed in 1992.

Figure 7-10 presents the contaminant exposure pathway analysis for Subarea C. The principal exposure pathways for the site are direct contact with soil, surface water, and sediment by human and ecological receptors. Potential exposure to groundwater is indirect through transport and discharge to surface water. The potential fate and transport of these constituents is discussed in Section 5.

Potential historical contaminant migration pathways at Subarea C include air, soil, groundwater, and surface water. Wastewater from painting may have impacted soil and groundwater. During wet weather conditions, sumps likely overflowed into drainage ditches located near the buildings, which could have contaminated soil. Soils present at the site are well drained or moderately well drained, indicating that contaminants could leach from the soil to groundwater. Although this area ultimately drains to Boggs Creek, there is no perennial surface water present at this subarea. However, contaminants may have leached into the tributaries to Boggs Creek, potentially impacting surface water and sediment in these water bodies. Potential human and ecological receptors are discussed further in the human health and ecological risk assessments for Subarea C.

7.5 BASELINE HUMAN HEALTH RISK ASSESSMENT

This section presents the HHRA for exposures to surface soil, subsurface soil, groundwater, and sediment at Subarea C. The HHRA was prepared using the methodology presented in Appendix I. Section 7.5.1 contains a discussion of the selection of COPCs; Section 7.5.2 contains information on the potential receptors and potential exposure pathways; Section 7.5.3 contains the numerical results of the risk assessment; and, Section 7.5.4 presents site-specific uncertainties associated with the risk assessment.

7.5.1 Data Evaluation

COPCs were identified for Subarea C using the screening levels presented and discussed in Section 2.2 of the HHRA methodology in Appendix I. A discussion of direct contact exposure COPCs (i.e., those chemicals detected at concentrations in excess of USEPA and IDEM direct contact exposure criteria) and COPCs selected using migration criteria are presented below. COPCs selected using migration criteria are not quantitatively evaluated in the HHRA because they are not considered to be significant contributors to the direct contact exposure pathways identified for potential human receptors. The sediment sample collected form within the settling basin was not used in this HHRA because it is unlikely that receptors would have significant exposure to this material. Risks from potential exposure to the material in the settling basin are discussed in Section 7.5.3.5.

COPC selection information for each medium is presented in Tables 7-5 through 7-8. Table 7-9 presents a summary of the chemicals retained as COPCs for Subarea C. Samples used in the HHRA for Subarea C are listed in Appendix I. RAGS Part D tables for COPC selection are included in Appendix I.

7.5.1.1 Surface Soil

Eight VOCs, eight PAHs, Aroclor-1260, six metals, and TPH were detected in the surface soil samples collected at Subarea C. A comparison of maximum detected surface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to surface soil is presented in Table 7-5.

Barium and chromium were the only chemicals detected at concentrations exceeding the screening levels for direct contact; therefore, barium and chromium were retained as COPCs for surface soil at Subarea C. The maximum detected concentration of barium exceeded the screening toxicity levels [set at a hazard quotient (HQ) of 0.1]; however, it did not exceed the RSL. Also, concentrations of barium exceeded the screening criteria based on the RSL but were less than the IDEM residential screening level. Concentrations of arsenic also exceeded the screening levels but were within site background levels and are not considered to be site related; therefore, arsenic was not retained as a COPC for direct contact with surface soil at Subarea C.

A comparison of maximum detected surface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from surface soil to groundwater is presented in Table 7-5. Maximum concentrations of the following chemicals detected in surface soil exceeded the screening levels for migration from soil to groundwater and were retained as COPCs for surface soil at Subarea C:

- VOCs (methylene chloride)
- PAHs (naphthalene)
- Metals (barium and chromium)

The single detection of naphthalene exceeded the screening level based on RSLs but was less than the IDEM screening level for migration from soil to groundwater. Concentrations of methylene chloride and barium exceeded the IDEM soil screening levels but were less than the screening levels based on RSLs. Concentrations of cadmium also exceeded the screening levels but were within site background levels and are not considered to be site related; therefore, cadmium was not retained as a COPC for migration from surface soil to groundwater at investigation Subarea C.

7.5.1.2 Subsurface Soil

Ten VOCs, 12 PAHs, six RCRA metals, and TPH were detected in the subsurface soil samples collected at Subarea C. A comparison of maximum detected subsurface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to subsurface soil is presented in Table 7-6. The following chemicals were detected in subsurface soils at maximum concentrations exceeding the direct contact risk-based COPC screening levels for residential land use and were retained as COPCs for subsurface soil at Subarea C:

- TPH-DRO (C08-C28) and TPH-ERO (C08-C34)

Concentrations of arsenic and chromium also exceeded the screening levels but were within site background levels and are not considered to be site related; therefore, these chemicals were not retained as COPCs for direct contact with subsurface soil at Subarea C.

A comparison of maximum detected subsurface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from subsurface soil to groundwater is presented in Table 7-6. The following chemicals were detected in subsurface soil at maximum concentrations exceeding the screening levels for migration from soil to groundwater and were retained as COPCs for subsurface soil at Subarea C:

- VOCs (trichloroethene)
- TPH-DRO (C08-C28) and TPH-ERO (C08-C34)

Concentrations of arsenic and chromium also exceeded the screening levels but were within site background levels and are not considered to be related to site activities; therefore, these chemicals were not retained as COPCs for migration from subsurface soil to groundwater at Subarea C.

7.5.1.3 Groundwater

Three VOCs and six metals were detected in groundwater samples collected from the Subarea C monitoring wells. TCE was detected in the monitoring well associated with SWMU 08. TCE was not detected in the monitoring wells installed as part of the SWMU 18 RFI; therefore, TCE was not considered as a COPC in groundwater for Subarea C. A comparison of maximum detected groundwater concentrations to screening levels based on RSLs, IDEM screening levels for tap water, and USEPA MCLs is presented in Table 7-7. Maximum concentrations of the following chemicals exceeded screening levels and were retained as COPCs for groundwater at Subarea C:

- VOCs (benzene)
- Metals (total) [arsenic, cadmium, and chromium]
- Metals (filtered) [arsenic and chromium]

A comparison of maximum detected groundwater VOC concentrations to USEPA and IDEM screening levels for chemical migration from groundwater through building foundations and into indoor air is presented in Table 7-7. Concentrations of all chemicals were less than the screening levels for migration from groundwater through building foundations into indoor air.

7.5.1.4 Surface Water

No chemicals were detected in surface water samples collected at Subarea C.

7.5.1.5 Sediment

Fifteen PAHs and TPH-DRO (C08-C28) were detected in the sediment samples collected from the surface water drainage at Subarea C. A comparison of maximum detected sediment concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 7-8. Maximum concentrations of the following chemicals detected in sediment exceeded the direct contact risk-based COPC screening levels for residential land use and were retained as COPCs for sediment at Subarea C:

- PAHs [benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a)anthracene]

7.5.1.6 Summary

Table 7-9 summarizes the chemicals retained as COPCs for surface soil, subsurface soil, groundwater, and sediment at Subarea C. RAGS Part D tables for COPC selection are included in Appendix I.

7.5.2 Exposure Assessment

This section presents the exposure assessment for Subarea C. The general exposure assessment approach and the exposure factors, which serve as the basis of the risk assessment, are provided in Section 3.0 of the HHRA methodology presented in Appendix I. The exposure assessment is designed to depict the physical setting of the site, identify potentially exposed populations and applicable exposure pathways, calculate exposure point concentrations (EPCs), and estimate chemical intakes under the

identified exposure scenarios. The compilation of likely exposure pathways and receptors is referred to as the CSM. The CSM for Subarea C is presented in Section 7.4.

Potential Receptors and Exposure Pathways

Receptors potentially exposed to media at Subarea C included construction workers, industrial workers, adolescent trespassers, recreational users, and hypothetical residents. The media of interest for Subarea C are surface soil, groundwater, and sediment. Table 7-10 provides a site-specific summary of the potential receptors evaluated for Subarea C. TPH was the only chemical detected at concentrations exceeding the screening criteria for subsurface soil. No toxicity criteria are available for TPH; consequently, exposures to TPH in subsurface soil could not be evaluated in the HHRA. No chemicals were detected in surface water samples collected at Subarea C. The following paragraphs briefly discuss relevant exposure pathways for each receptor evaluated in this HHRA.

Construction workers are plausible receptors under current or future land use. No construction activities are currently planned for the study area. However, this receptor could be exposed to contaminants in surface soil (incidental ingestion; dermal contact), shallow groundwater (dermal contact), or air (inhalation of airborne contaminants emanating from soil or groundwater).

Industrial workers are plausible receptors under current and future land use. This includes adult military or civilian personnel assigned to routine daily work tasks in the SWMU 18 area. This receptor could be exposed to contaminants in surface soil (incidental ingestion; dermal contact) and air (inhalation). Potential exposures to VOCs migrating to the indoor air of a building from contaminated groundwater via vapor intrusion were not evaluated because no COPCs were identified for the vapor intrusion pathway.

Adolescent trespassers are plausible receptors under current or future land use. Although access to the base is controlled, once inside the base, access to the study areas is not limited by any physical constraints. This receptor may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact), air (inhalation), and sediments (incidental ingestion; dermal contact) in the drainage ditches. Direct contact with groundwater is not anticipated for this receptor.

Child and adult recreational users are plausible receptors under future land use. If NSA Crane were to close, the property could be converted to a park. A recreational user may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact), air (inhalation), and sediments (incidental ingestion; dermal contact). NSA Crane is not expected to close because principal base operations, the demilitarization of munitions, are critical to the support of the United States Naval fleet.

Given the anticipated future land use for much of SWMU 18 (industrial), residents are a very unlikely future receptor. However, the hypothetical future residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical future resident may be exposed to surface soils (incidental ingestion; dermal contract), groundwater (ingestion, dermal contact), air (inhalation), and sediment (incidental ingestion; dermal contact). Potential exposures to VOCs migrating to the indoor air of a building from contaminated groundwater via vapor intrusion were not evaluated because no COPCs were identified for the vapor intrusion pathway.

Exposure Point Concentrations

EPCs for Subarea C are presented in Table 7-11. The 95 percent upper confidence limit (UCL) was used as the EPC for all COPCs in surface soil and sediment. There were an insufficient number of samples to calculate EPCs for COPCs in groundwater; therefore the maximum detected concentration was used as the EPC. USEPA's ProUCL Version 4.1.00 was used to calculate the EPCs for exposures to surface soil. Copies of the ProUCL printouts are included in Appendix I.

7.5.3 Risk Characterization

This section contains a summary of the results of the risk characterization for Subarea C. Quantitative risk estimates for potential human receptors are developed for those chemicals identified as COPCs. Uncertainties associated with the risk estimates are discussed in Section 7.5.4. The methodology used to calculate the risks presented in this section is provided in Section 2 of the HHRA methodology presented in Appendix I. Potential cancer risks and hazard indices were calculated for construction workers, industrial workers, adolescent trespassers, recreational users, and hypothetical residents under the RME and CTE scenarios and are summarized in Tables 7-12 and 7-13, respectively. Sample calculations are included in Appendix I and the results of the risk assessment in RAGS Part D format are included in Appendix I. Table 7-14 presents the chemicals of concern (COCs) for Subarea C.

7.5.3.1 Noncarcinogenic Risks

Tables 7-12 and 7-13 and Figures 7-11a through 7-11d present the HIs for the RME and CTE scenarios at Subarea C. Cumulative HIs for all receptors were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

7.5.3.2 Carcinogenic Risks

RME Scenario

Table 7-12 and Figures 7-12a and 7-12b present the ILCRs for the RME scenario at Subarea C. ILCRs for all receptors under the RME scenario were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6} with the exception of hypothetical child and lifelong residents. The ILCR for hypothetical lifelong residents exposed to groundwater under the RME scenario was equal to the upper bound of USPEA's and IDEM's target risk range. The ILCRs for exposures to surface soil by hypothetical child (ILCR = 2×10^{-4}) and lifelong residents (ILCR = 2×10^{-4}) exceeded USEPA's and IDEM's target risk range. Chromium was the major contributor to the ILCRs for hypothetical child and lifelong residents exposed to surface soil. Chromium speciation was not performed on the groundwater samples; therefore, chromium was evaluated as hexavalent chromium in this HHRA. If chromium had been evaluated as trivalent chromium, then all ILCRs would have been within USEPA's and IDEM's target risk levels.

CTE Scenario

Table 7-13 and Figures 7-12c and 7-12d present the ILCRs for the CTE scenario at Subarea C. ILCRs for all receptors under the CTE scenario were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

7.5.3.3 Risk Estimates Due to Chemicals Attributable to Background

COPCs for Subarea C were selected, in part, using available background concentrations for soil. A statistical site dataset to background dataset comparison was conducted to determine whether site concentrations exceeded background concentrations for chemicals detected at concentrations exceeding screening criteria (see Section 4.0). At Subarea C, arsenic concentrations were within background levels in surface soil and arsenic and chromium concentrations were within background levels in subsurface soil. Table 7-15 presents the cancer risks and hazard indices for the RME scenario associated with these metals. RAGS Part D tables for these chemicals are presented in Appendix I.5.4.

HIs were less than the acceptable level of 1 for all receptors at Subarea C under the RME scenario. ILCRs for all receptors were within USEPA's and IDEM's target risk range for the RME scenario at Subarea C.

7.5.3.4 Evaluation of Chemical Migration from Soil to Groundwater

The following chemicals were selected as COPCs for evaluation of migration from soil to groundwater in Sections 7.5.1.2 and 7.5.1.3:

- Surface soil – Methylene chloride, naphthalene, barium, chromium, and lead
- Subsurface Soil – TCE, TPH-DRO (C08-C28), and TPH-ERO (C08-C34)

Of the chemicals listed above, only chromium was identified as a COPC in groundwater. Chromium is only a COPC for direct contact with groundwater and migration from soil to groundwater if it is evaluated as hexavalent chromium. Methylene chloride and TCE were not detected in groundwater samples collected at Subarea C. TCE was detected in monitoring well 08MWT008. This well is associated with SWMU 08, and TCE has been evaluated under the RFI associated with SWMU 08. Naphthalene was only detected in one surface soil sample and was not detected in subsurface soil indicating that there is not a large source area of naphthalene in soil. Arsenic was the only chemical detected at concentrations in groundwater exceeding IDEM groundwater criteria. Concentrations of all chemicals detected in groundwater were less than USEPA MCLs. Risks from exposures to groundwater were within USEPA's and IDEM's target risk range indicating that groundwater has not been adversely impacted by site activities; therefore methylene chloride, TCE, naphthalene, barium, chromium, and lead were not retained as COCs for migration from soil to groundwater.

IDEM does not require groundwater samples to be analyzed for TPH, and there are no USEPA screening criteria for TPH-DRO (C08-C28), consequently groundwater samples were not analyzed for TPH. TPH is retained as a COC for migration from soil to groundwater since it exceeded the IDEM criteria for migration from soil to groundwater.

7.5.3.5 Sediments in Settling Basin

As discussed in Section 7.3.2 concentrations of several chemicals in sediments in the settling basin at Subarea C exceeded the human health screening levels. There are no potential exposures to the material in the sumps under current land use. Future construction workers could be exposed to the sediments in the settling basin if the settling basin was excavated. Although such exposure are expected to be negligible because it is anticipated it would take at most a day to remove the settling basin. If the sediments in the settling basins were somehow deposited on surrounding surface soil then future receptors could potentially be exposed to the sediments. Risk estimates were developed for future industrial workers and hypothetical residents hypothetically exposed to those sediments using the USEPA

RSLs (representing the $1x10^{-6}$ cancer risk level or a hazard index of 1), the chemical concentrations detected in the sediments, and the following simple ratio technique:

$$\frac{\text{EPA RSLs}}{\text{Chemical Concentration}} = \frac{\text{Hazard Index of 1 or Cancer Risk Estimate of 1 x } 10^{-6}}{\text{"X" (Calculated Hazard Index or Cancer Risk Estimate for Chemical Detected in the Sediments)}}$$

Tables 7-22 and -23 present the estimated risks for future industrial workers and hypothetical residents exposed to sediments from the settling basin (assuming that they have been deposited onto surface soils). Assuming chromium is present as hexavalent chromium, the ILCRs of $3x10^{-2}$ for hypothetical residents and $2x10^{-3}$ for industrial workers exceed the USEPA and IDEM target risk range of 10^{-4} to 10^{-6}. The ILCRs would be $1x10^{-4}$ for hypothetical residents and $3x10^{-5}$ for industrial workers if chromium is assumed to be present as trivalent chromium. Thus, unless hexavalent chromium is actually present in the sediment (an unlikely scenario), risk estimates (calculated assuming chronic, long-term exposure) do not exceed the USEPA's target cancer risk range ($1x10^{-4}$ to $1x10^{-6}$).

HIs for residential exposures assuming chromium is present as hexavalent chromium (total HI=45) and as trivalent chromium (total HI=3) exceed the acceptable level of 1. If it is assumed that chromium is present as trivalent chromium, arsenic (HI=2) is the major contributor to the HI. For industrial workers, the HI exceeds the acceptable level of 1 if chromium is assumed to be present as hexavalent chromium (total HI=3) and is less than 1 if chromium is assumed to be present as trivalent chromium (total HI=0.2).

The above estimated HIs are based on chronic toxicity criteria and assume long term exposures. Most likely exposures to sediments from the settling basins would be of short duration (less than 14 days), which are considered to be acute exposures. ATSDR has publishes an acute reference dose of 0.005 mg/kg/day for arsenic which is an order of magnitude less than the chronic reference dose of 0.0003 mg/kg/day used to calculate the RSL. If the acute reference dose was used to estimate the risks, then the HI for exposure to arsenic would be less than the acceptable level of 1.

The detected lead concentration of 1,310 J mg/kg exceeds the USEPA RSLs of 400 mg/kg for residential exposures and 800 mg/kg for industrial exposures; and the IDEM screening levels of 400 mg/kg for residential exposures, 1,300 mg/kg for industrial exposures, and 970 mg/kg for excavation works. These exceedances of criteria indicate a potential human health risk for chronic or subchronic exposures; however, given the magnitude of the exceedances, human health risks associated with acute exposures are unlikely. Even risks associated with chronic or subchronic exposures would be limited by the fact that

the exposure actually experienced by a receptor would be limited once the sediments were dispersed/intermixed with soils.

At present the settling basin is intact but if the integrity of the settling basin was compromised in the future then chemicals present in the sediments could migrate to the underling soil and groundwater. Table 7-24 presents a comparison of chemical concentrations in the sediments to the screening criteria for migration from soil to groundwater. The detected concentrations of ethylbenzene and total xylenes exceed the USEPA SSLs for migration from soil to groundwater. The detected concentrations of arsenic, cadmium, chromium (as hexavalent chromium), and lead exceed both the USEPA SSLs and the IDEM screening levels. The impact of the risk to the groundwater resource is limited by the small volume of sediments in the settling basin.

In summary, unless hexavalent chromium is actually present in the sediments of the settling basin (an unlikely scenario), cancer risk estimates and hazard indices for acute or subchronic exposures would not exceed EPA or IDEM risk management benchmarks. The hazard index calculated assuming that a hypothetical future resident is chronically exposed to arsenic in the sediments does exceed EPA/IDEM risk management benchmarks. Lead concentrations in the sediments exceed EPA/IDEM screening levels established for chronic and subchronic exposures; but, adverse effects resulting from acute exposures are unlikely. Chemical concentrations in settling basin sediments exceed EPA/IDEM screening levels for the migration of chemicals from soils to groundwater; but, the volume of sediments in the settling basin represents a very limited source. In conclusion, adverse health impacts are not anticipated for a construction/excavation worker excavating the settling basin. However risk management and disposal decisions for the settling basin should consider the potential risks (albeit very limited) associated with long-term exposures to the sediments and the protection of the underlying groundwater resource should the sediments be dispersed/intermixed with surrounding soils.

7.5.4 Uncertainty Analysis

A detailed discussion of uncertainties associated with the various aspects of the HHRA, in general, was presented in Section 6 of the HHRA methodology. Site-specific uncertainties for Subarea C are presented below.

Chromium was retained as a COC in surface soil. Chromium speciation was not performed on the surface soil samples; therefore chromium was evaluated as hexavalent chromium in this HHRA. If chromium had been evaluated as trivalent chromium then all ILCRs would have been within USEPA's and IDEM's target risk levels.

7.5.5 Human Health Risk Assessment Summary

This section summarizes the results of the baseline HHRA for Subarea C, which was performed to characterize the potential risks to likely human receptors under current and potential future land use scenarios. Potential receptors under current land use scenarios are industrial workers, construction workers, and trespassers. Potential receptors under future land use scenarios are child and adult recreational users, and hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future receptors were evaluated primarily for decision-making purposes.

The COPCs for direct contact to soil are:

- Surface soil – Barium and chromium
- Subsurface Soil – TPH-DRO (C08-C28) and TPH-ERO (C08-C34)

The COPCs for chemical migration from soil to groundwater are:

- Surface soil – Methylene chloride, naphthalene, barium, and chromium
- Subsurface Soil – TCE, TPH-DRO (C08-C28), and TPH-ERO (C08-C34)

Risks from exposures to groundwater were within USEPA's and IDEM's target risk range, indicating that groundwater has not been adversely impacted by site activities; therefore methylene chloride, TCE, naphthalene, barium, chromium, and lead were not retained as COCs for migration from soil to groundwater. IDEM does not require groundwater samples to be analyzed for TPH-DRO (C08-C28) and there are no USEPA screening criteria for TPH-DRO (C08-C28). Consequently groundwater samples were not analyzed for TPH-DRO (C08-C28). However, TPH-DRO (C08-C28) is retained as a COC for migration from soil to groundwater since it exceeded the IDEM criteria for migration from soil to groundwater.

The COPCs for direct contact to groundwater are:

- Benzene, arsenic, cadmium, and chromium.
- No COPCs were identified for vapor intrusion.
- The COPCs for direct contact to sediment are:
- Benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene.

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. Cumulative HIs for all receptors under the RME and CTE scenarios were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

ILCRs for all receptors under the RME scenario were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6} with the exception of hypothetical child and lifelong residents. The ILCRs for exposures to surface soil by hypothetical child and lifelong residents exceeded USEPA's and IDEM's target risk range. Chromium was the major contributor to the ILCRs for hypothetical child and lifelong residents exposed to surface soil. However, chromium was conservatively evaluated as hexavalent chromium in this HHRA. Based on the operations at the site, chromium is unlikely to be present in the hexavalent valence. ILCRs for trivalent chromium are within USEPA's and IDEM's target risk levels.

ILCRs for all receptors under the CTE scenario were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

No toxicity criteria are available for TPH, consequently exposures to TPH in subsurface soil could not be evaluated in the HHRA.

7.6 ECOLOGICAL RISK ASSESSMENT

This section presents the subarea-specific ERA for exposures to surface soil at Subarea C. The ERA was prepared using the methodology presented in Appendix J. Section 7.6.1 contains a discussion of the environmental setting at Subarea A; Section 7.6.2 contains a discussion of the selection of COPCs; Section 7.6.3 contains a discussion on the refinement of COPCs; and, Section 7.6.4 provides a summary and conclusions of the ecological risk assessment.

7.6.1 Environmental Setting

Subarea C is located in the western portion of SWMU 18 and covers approximately 75 acres; however, the area of interest is approximately 35 acres. The site includes areas of mowed grass, forests, and several buildings. Section 7.1 presents additional details on Subarea C.

7.6.2 Tier 1, Step 2: Selection of Contaminants of Potential Concern

Tables 7-16 and 7-17 provide the results of the COPC selection for surface soil and sediment, respectively. Table 7-18 present the results of the Tier 1 food chain model for Subarea C surface soil. Chemicals consistent with background concentrations were eliminated as COPCs and are not included in this evaluation. Appendix J presents the food chain model calculation worksheets. Surface water samples were also collected; however, no chemicals were detected above detection limit in surface water.

Terrestrial Plants

Two VOCs and five PAHs were selected as COPCs because screening levels were not available. Two metals were selected as COPCs because maximum detected concentrations resulted in an EEQ greater than 1.0.

Soil Invertebrates

Three volatiles were selected as COPCs because screening levels were not available. Three metals were selected as COPCs because maximum detected concentrations resulted in an EEQ greater than 1.0.

Sediment Invertebrates

Three PAHs were selected as COPCs because maximum detected concentrations resulted in an EEQ greater than 1.0.

Wildlife

The following summarizes the results of the food chain modeling for terrestrial receptors using maximum concentrations and Tier 1 input parameters:

- Herbivorous mammal: No chemicals had an EEQ greater than 1.0 in the food chain model.
- Herbivorous bird: One metal had an EEQ greater than 1.0 in the food chain model.
- Invertivorous mammal: One metal had an EEQ greater than 1.0 in the food chain model.
- Invertivorous bird: Three metals had EEQs greater than 1.0 in the food chain model.

7.6.3 Tier 2, Step 3a: COPC Refinement

Summaries of the Step 3a evaluation for soil invertebrates and terrestrial plants are presented in Table 7-19 and for sediment invertebrates in Table 7-20. As part of the Step 3a evaluation for terrestrial wildlife, Table 7-21 presents the results of the food chain model for surface soil using Step 3a exposure assumptions and chemical concentrations. A detailed discussion of the Step 3a evaluation is presented in the following subsections.

Terrestrial Plants

Two VOCs (2-butanone and acetone) were selected as COPCs because screening levels were not available. The detected concentrations of the VOCs were less than the screening levels for the other VOCs detected at the site. Therefore, based on their low concentrations relative to screening levels, it is not likely that plants are being significantly impacted by VOCs in the soil. Also, 2-butanone and acetone are common laboratory contaminants. For these reasons, 2-butanone and acetone are eliminated as COPCs.

Several PAHs were selected as COPCs because screening levels were not available. An ecological soil screening level (Eco SSL) is not available for plants for PAHs. However, data presented in Table 3.1 in the Eco SSL document for PAHs (USEPA, 2007) shows that PAHs are typically not toxic to plants except at high soil concentrations, with the lowest listed effects concentration 50 percent (EC_{50}) of 30 mg/kg from Mitchell et al. (1988). All concentrations of PAHs in soil at Subarea C are well below this value. Also, concentrations for all PAHs in soil at Subarea C are less than the Canadian soil quality guideline (SQG) for anthracene of 2.5 mg/kg (CCME, 2010). It does not appear that PAH concentrations in soil are likely to impact plants because all detected concentrations are significantly less than these benchmarks. Therefore, PAHs are not expected to impact plants at the site and are eliminated as COPCs.

Barium was selected as a COPC because it exceeded its screening level. One sample had a barium concentration (1,940 mg/kg) that exceeded the screening level (500 mg/kg). The maximum barium concentration was from 18CSB009, which was collected adjacent to a settling basin south of Building 119. This sample is located adjacent to a road within a small mowed grass area, so any potential impacts to plants would be limited to a small area. Also, because the site is vegetated, it does not appear that barium is bioavailable and plants are not being significantly impacted. For these reasons, barium is eliminated as a COPC for plants.

Soil Invertebrates

Only one sample had a barium concentration (1,940 mg/kg) that exceeded the screening level (330 mg/kg). As discussed above for plants, this sample is located adjacent to a road within a small mowed grass area, so any potential impacts would be limited to a small area; therefore, barium was eliminated as a COPC for soil invertebrates.

Chromium was selected as a COPC because the maximum concentration exceeded its screening value. The Region 5 ecological screening level for chromium is 0.4 mg/kg, which is a screening benchmark for hexavalent chromium. This value is overly conservative because it is well below background levels and is based on a chromium salt in solution being added to the soil. This makes the chromium much more bioavailable than it would be in the environment. A more appropriate benchmark is the Canadian SQG for plants/invertebrates of 78 mg/kg because it is based on a more robust data set (CCME, 1999a). All concentrations of chromium were less than this benchmark. For these reasons, chromium was eliminated as a COPC.

Three VOCs (2-butanone, acetone, and methylene chloride) were selected as COPCs because screening levels were not available. The maximum detected concentrations of the VOCs were less than screening values for other VOCs. Therefore, based on their low concentrations relative to screening levels, it is not likely that soil invertebrates are being significantly impacted by VOCs in the soil. Also, 2-butanone, acetone, and methylene chloride are common laboratory contaminants. For these reasons, 2-butanone, acetone, and methylene chloride are eliminated as COPCs.

Sediment Invertebrates

Three PAHs [acenaphthylene, benzo(a)pyrene, and dibenzo(a,h)anthracene] were selected as COPCs because concentrations exceeded screening levels in one sample (18CSD002) of two samples analyzed. The screening level for acenaphthylene is the threshold effects level (TEL). However, acenaphthylene concentrations were less than the probable effects level (PEL) of 0.128 mg/kg, which is a higher effects benchmark (Buchman, 2008). The screening levels for benzo(a)pyrene and dibenzo(a,h)anthracene are the threshold effects concentrations (TEC) from MacDonald et al. (2000), which is the concentration below which effects to sediment invertebrates are not expected. The benzo(a)pyrene concentration is much lower than the probable effects concentration (PEC) of 1.45 mg/kg for benzo(a)pyrene from MacDonald et al. (2000), which is the concentration above which effects to sediment invertebrates are expected. Concentrations of dibenzo(a,h)anthracene were less than a higher effects benchmark of 0.135 mg/kg (PEL; Buchman, 2008). Also, the concentration of total PAHs in sample 18CSD002

(1.17 mg/kg) was less than the TEC (1.61 mg/kg) from MacDonald et al (2000). Therefore, risks to sediment invertebrates from exposure to PAHs are not likely and PAHs are eliminated as COPCs.

Mammals and Birds

As presented in Section 7.6.2, the EEQs from the food chain modeling for surface soil were greater than 1.0 for three metals using maximum chemical concentrations and Tier 1 exposure assumptions. Therefore, as part of the Step 3a refinement, risks were recalculated using average chemical concentrations and the Tier 2, Step 3a exposure parameters as presented in Appendix J. The food chain model calculation sheets are also provided in Appendix J.

The following summarizes the results of food chain modeling for terrestrial receptors using average concentrations and the Tier 2, Step 3a input parameters:

- Herbivorous receptors: No EEQs were greater than 1.0; therefore, impacts to herbivorous mammals and birds are not expected from chemicals detected in surface soil at Subarea C.

- Invertivorous receptors: No EEQs were greater than 1.0; therefore, impacts to invertivorous mammals and birds are not expected from chemicals detected in surface soil at Subarea C.

7.6.4 Ecological Risk Summary and Conclusions

This ERA evaluated surface soil and sediment from Subarea C. Based on the initial screening of the chemical data, several chemicals were initially selected as COPCs in surface soil and sediment because they were detected at concentrations that exceeded conservative screening levels, they had EEQs greater than 1.0 in the conservative food chain model, or because they did not have screening levels.

These chemicals were further evaluated to refine the list of COPCs and to better characterize risks to ecological receptors. The following presents the results of the ERA.

Terrestrial Plants and Soil Invertebrates

No chemicals were retained as a COPC for potential risks to terrestrial plants and soil invertebrates.

Sediment Invertebrates

No chemicals were retained as a COPC for potential risks to sediment invertebrates.

Mammals and Birds

No chemicals were retained as COPCs for mammals and birds.

7.7 SUMMARY AND RECOMMENDATIONS

Eight VOCs, eight PAHs, Aroclor-1260, six metals, and TPH were detected in the surface soil samples collected at Subarea C; however, only methylene chloride was detected at levels that exceeded minimum human health screening levels. TPH-DRO (C08-C28) and TPH-ERO (C08-C34) were detected at three surface soil sample locations near fuel oil sources in Subarea C (ASTs near Building 115 and the former USTs associated with Buildings 226 and 227). Neither TPH range exceeded the minimum human health screening level. Eight PAHs were detected in one or more surface soil samples collected at Subarea C; however, only naphthalene was detected at a concentration (0.0109 mg/kg in the sample from 18CSB007, located at the former UST associated with Building 227) that exceeded the minimum human health screening level (0.0094 mg/kg). Six RCRA metals (arsenic, barium, cadmium, chromium, lead, and mercury) were detected in one or more surface soil samples collected at Subarea C. The concentrations exceeded the minimum human health and/or ecological screening levels in at least one sample. However, arsenic, cadmium, and mercury in surface soil were within backgrounds, as were all of the RCRA metals except barium in subsurface soil.

Ten VOCs, 12 PAHs, six RCRA metals, and TPH were detected in the subsurface soil samples collected at Subarea C. Of VOCs detected, only TCE was detected at a concentration exceeding the minimum human health level of 0.0032 mg/kg. TCE was detected in the 2- to 3-foot bgs interval from 18CSB006, located west of Building 227, at a concentration of 0.00837 mg/kg. Six RCRA metals were detected in one or more subsurface soil samples collected at Subarea C. Arsenic and chromium were detected at concentrations that exceeded their respective minimum human health screening levels in all five subsurface soil samples collected. TPH-DRO (C08-C28) and TPH-ERO (C08-C34) were detected in subsurface soil samples from 18CSB001 (2 to 4 feet bgs) and 18CSB007 (4 to 6 feet bgs) at concentrations that exceeded their respective minimum human health screening level. The maximum TPH-DRO (C08-C28) and TPH-ERO (C08-C34) concentrations (4,010 and 4,030 mg/kg, respectively) were detected in the sample from 18CSB007, located at the location of the former UST associated with Building 227. Twelve PAHs were detected in one or more subsurface soil samples collected at Subarea C but at concentrations less than their respective minimum human health screening levels. One PCB, Aroclor-1260, was detected at a concentration of 0.0185 mg/kg, which exceeded the minimum ecological screening level of 0.000332 mg/kg.

One sediment sample (18CSD0030006) was collected from the settling basin located north of Building 227. Six RCRA metals were detected in the sediment sample from the settling basin. Four of the metals (arsenic, cadmium, chromium, and lead) were detected at concentrations exceeding their respective minimum human health screening levels. Seven VOCs were detected in the sediment sample from the settling basin; however, none of the VOCs exceeded the minimum human health screening levels.

Two collocated surface water and sediment samples were collected from surface water drainages within Subarea C. No parameters were detected in the two surface water samples. Fifteen PAHs were detected in one or more sediment samples collected at Subarea C. Four PAHs [acenaphthylene, benzo(a)pyrene, benzo(b)fluoroanthene, and dibenzo(a,h)anthracene] were detected in the sediment sample from 18CSD002, at concentrations that exceeded the minimum human health and/or ecological screening levels; 18CSD002 was located in the upper (upstream) portion of the drainage and closest to the reported No. 2 fuel oil point of release in the northern area of Subarea C. Concentrations of PAHs detected in the sediment sample from 18CSD0010006, located in the lower (downstream) portion of the drainage, were less than the screening levels. BTEX and naphthalene were not detected in the two sediment samples collected from the surface water drainage at Subarea C.

Five groundwater samples were collected in Subarea C from three new monitoring wells in SWMU 18 and two existing monitoring wells in SWMU 08. Three VOCs and six metals were detected in groundwater samples collected from the Subarea C monitoring wells. TCE was detected in the monitoring well associated with the SWMU 08 RFI. TCE was not detected in the monitoring wells installed as part of the SWMU 18 RFI; therefore, TCE was not considered as a COPC in groundwater for Subarea C. Benzene was detected and exceeded the human health screening level in the sample from 18CMWT002, located west of Building 119. Three total RCRA metals (arsenic, cadmium, and chromium) and two dissolved RCRA metals (arsenic and chromium) were detected at levels that exceeded the minimum human health screening levels.

The baseline HHRA, performed to characterize the potential risks to likely human receptors under current and potential future land uses for Subarea C at SWMU 18, identified barium, chromium, methylene chloride and naphthalene as COPCs in surface soil and TPH-DRO (C08-C28) and TCE as COPCs in subsurface soil. Benzene, arsenic, cadmium, and chromium were identified as COPCs in groundwater, and benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene were identified as COPCs in sediment. Cumulative HIs for all receptors under the RME and CTE scenarios were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined

exposure conditions. ILCRs for all receptors under the RME scenario were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}. Concentrations of TPH-DRO (C08-C28) exceed the IDEM UST standards; however, risk estimates cannot be calculated for TPH-DRO (C08-C28). Individual petroleum-related constituents were evaluated for risk estimates, and no unacceptable risk exists to potential receptors.

The ERA for Subarea C evaluated surface soil and sediment from Subarea C. No chemicals were retained in the ERA as COPCs for potential ecological receptors.

The purpose of this RFI was to identify possible contaminant releases that would require further investigation or pose a threat to human health or the environment. A site that does not require further investigation and does not pose an unacceptable risk to human health and the environment may be designated as requiring NFA and may be removed from further consideration. Based on the results of the human health and ecological risk assessments, NFA is recommended for Subarea C.

TABLE 7-1

SUMMARY OF SOIL RESULTS - SUBAREA C
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION	ECO [1]	ECO REF	HH [2]	HH REF	18CMWT003	18CSB001		18CSB002		18CSB003	18CSB004		18CSB005	
SAMPLE ID					18CMWT0030204	18CSB0010002	18CSB0010204	18CSB0020002	18CSB0020507	18CSB0030002	18CSB0040002	18CSB0040507	18CSB0050002	18CSB0050002-D
SAMPLE DATE					11/2/2011	10/19/2011	10/19/2011	10/20/2011	10/20/2011	10/19/2011	10/20/2011	10/20/2011	10/19/2011	10/19/2011
SUBMATRIX					SB	SS	SB	SS	SB	SS	SS	SB	SS	SS
METALS (MG/KG)														
ARSENIC	6.8	(6)	0.026	(8)	**8.55**	NA	NA	**4.42**	**5.45**	**2.42 J**	NA	NA	**5.73**	**6.43**
BARIUM	110	(6)	1500	(7)	**54.8**	NA	NA	**36.4**	**48.4**	**45.2**	NA	NA	**69.2**	**103**
CADMIUM	0.36	(3)	7	(7)	0.113 U	NA	NA	0.559 U	0.584 U	0.568 U	NA	NA	**1.21 J**	**1.7**
CHROMIUM	0.35	(6)	0.0118	(8)	**14.8**	NA	NA	**14.6**	**21**	**17**	NA	NA	**97.5**	**66.9**
LEAD	11	(3)	270	(10)	**9.66**	NA	NA	**8.82**	**11.7**	**7.09**	NA	NA	**117**	**74.9**
MERCURY	0.013	(6)	0.66	(8)	**0.0179 J**	NA	NA	0.0321 U	0.0419 U	0.0328 U	NA	NA	0.0361 U	**0.0225 J**
MISCELLANEOUS PARAMETERS (S.U.)														
PH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)														
DRO (C08-C28)	NA	NA	230	(10)	NA	**183**	**437**	NA	NA	NA	**8.75**	9.45 U	NA	NA
ERO (C08-C34)	NA	NA	230	(10)	NA	**224**	**463**	NA	NA	NA	**23.8**	**35.5**	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)														
2-METHYLNAPHTHALENE	29	(3)	2.8	(8)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
ACENAPHTHENE	0.25	(6)	82	(8)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	**0.00266 J**	NA	NA
ACENAPHTHYLENE	29	(3)	82	(8)	NA	**0.0125**	**0.0103**	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
ANTHRACENE	6.8	(6)	840	(8)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	**0.00247 J**	NA	NA
BENZO(A)PYRENE	1.1	(3)	0.015	(7)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
BENZO(B)FLUORANTHENE	1.1	(3)	0.15	(7)	NA	**0.00611 J**	**0.00257 J**	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
BENZO(G,H,I)PERYLENE	1.1	(3)	170	(7)	NA	**0.0666**	0.00373 U	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
BENZO(K)FLUORANTHENE	1.1	(3)	1.5	(7)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
FLUORANTHENE	29	(3)	230	(7)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	**0.00897 J**	NA	NA
FLUORENE	29	(3)	80	(8)	NA	0.00393 U	**0.0158**	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
INDENO(1,2,3-CD)PYRENE	1.1	(3)	0.15	(7)	NA	**0.011**	**0.00429 J**	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
NAPHTHALENE	1	(6)	0.0094	(8)	NA	0.00393 U	0.00373 U	NA	NA	NA	0.00395 U	0.00476 U	NA	NA
PHENANTHRENE	29	(3)	170	(7)	NA	0.00393 U	**0.0294**	NA	NA	NA	**0.00242 J**	**0.0118**	NA	NA
PYRENE	1.1	(3)	170	(7)	NA	**0.00779 J**	**0.0108**	NA	NA	NA	0.00395 U	**0.00731 J**	NA	NA
VOLATILES (MG/KG)														
2-BUTANONE	89.6	(4)	20	(8)	0.00493 UJ	NA	NA	0.00488 UJ	0.00707 UJ	0.0056 UJ	NA	NA	0.00454 U	**0.019**
ACETONE	2.5	(4)	48	(8)	**0.01 J**	NA	NA	**0.0124 J**	**0.0196 J**	**0.00927 J**	NA	NA	**0.0318 J**	**0.148 J**
BENZENE	0.255	(4)	0.004	(8)	0.00247 U	0.00242 U	0.118 U	0.00244 U	0.00353 U	0.0028 U	0.00462 U	0.00296 U	0.00227 U	0.00291 U
CYCLOHEXANE	NA	NA	260	(8)	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U	NA	NA	0.00227 U	0.00291 U
ETHYLBENZENE	5.16	(4)	0.03	(8)	0.00247 U	0.00242 U	0.118 U	0.00244 U	0.00353 U	0.0028 U	0.00462 U	0.00296 U	0.00227 U	0.00291 U
METHYL CYCLOHEXANE	NA	NA	NA	NA	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U	NA	NA	0.00227 U	0.00291 U
METHYLENE CHLORIDE	4.05	(4)	0.025	(10)	**0.0152**	NA	NA	0.0087 U	0.0192 U	**0.0266**	NA	NA	0.00454 U	0.00582 U
TOLUENE	5.45	(4)	11.8	(8)	0.00247 U	**0.00096 J**	0.118 U	0.00244 U	0.00353 U	0.0028 UJ	0.00462 U	0.00296 U	0.00227 U	0.00291 U
TOTAL XYLENES	1.4	(6)	3.8	(8)	0.0074 U	0.00242 U	0.118 U	0.00732 U	0.0106 U	0.0084 U	0.00462 U	0.00296 U	0.00681 U	0.00873 U
TRICHLOROETHENE	12.4	(4)	0.0032	(8)	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U	NA	NA	0.00227 U	0.00291 U

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil samples are only compared to human health criteria.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

ACRONYMS
DRO - Diesel Range Organics
Eco - Ecological
Eco Ref - Ecological Reference
ERO - Extended Range Organics
HH - Human Health
HH Ref - Human Health Reference
NA - Not Available / Not Analyzed
mg/kg - Milligrams per kilogram
SB - Subsurface Soil
SS - Surface Soil
S.U. - Standard Unit
SWMU - Solid Waste Management Unit

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

SHADING
Light gray shading indicates positive result.
Dark shading indicates exceedance of criteria.
Shading indicates exceedance of criteria but within background levels (see Tables 4-1, 4-2, and 4-5).

TABLE 7-1

SUMMARY OF SOIL RESULTS - SUBAREA C
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION	ECO [1]	ECO REF	HH [2]	HH REF	18CSB006		18CSB007		18CSB008		18CSB009			18CSS001	
SAMPLE ID					18CSB0060002	18CSB0060203	18CSB0070002	18CSB0070406	18CSB0080002	18CSB0080305	18CSB009_0002	18CSB0090002	18CSB0090204	18CSS0010002	18CSS0010002-D
SAMPLE DATE					10/19/2011	10/19/2011	10/20/2011	10/20/2011	10/18/2011	10/18/2011	10/18/2011	10/25/2011	10/18/2011	10/19/2011	10/19/2011
SUBMATRIX					SS	SB	SS	SB	SS	SB	SS	SS	SB	SS	SS
METALS (MG/KG)															
ARSENIC	6.8	(6)	0.026	(8)	**4.83**	**7.55**	NA	NA	**5.96**	**6.62**	**9.18**	NA	**4.35**	**19.6**	**15.8**
BARIUM	110	(6)	1500	(7)	**130**	**41.8**	NA	NA	**56.2**	**76**	**1940**	NA	**253**	**104**	**105**
CADMIUM	0.36	(3)	7	(7)	0.613 U	0.576 U	NA	NA	0.605 U	**0.438 J**	**0.561 J**	NA	0.575 U	0.626 U	0.578 U
CHROMIUM	0.35	(6)	0.0118	(8)	**19.7**	**25.9**	NA	NA	**15.6**	**20**	**26.8**	NA	**9.45**	**47.5**	**29.1**
LEAD	11	(3)	270	(10)	**8.4**	**7.97**	NA	NA	**11.2**	**17.2**	**16.6**	NA	**5.35**	**32.8**	**26.7**
MERCURY	0.013	(6)	0.66	(8)	0.032 U	0.0322 U	NA	NA	0.0369 U	**0.193**	0.0409 U	NA	0.0282 U	**0.0383 J**	**0.0375 J**
MISCELLANEOUS PARAMETERS (S.U.)															
PH	NA	NA	NA	NA	**6.84**	NA	NA	NA	NA	NA	NA	NA	NA	**7.65**	**7.31**
PETROLEUM HYDROCARBONS (MG/KG)															
DRO (C08-C28)	NA	NA	230	(10)	NA	NA	**33.7**	**4010**	NA	NA	NA	NA	NA	NA	NA
ERO (C08-C34)	NA	NA	230	(10)	NA	NA	**54.7**	**4030**	NA	NA	NA	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)															
2-METHYLNAPHTHALENE	29	(3)	2.8	(8)	NA	NA	**0.0514**	0.00399 U	NA	NA	NA	NA	NA	NA	NA
ACENAPHTHENE	0.25	(6)	82	(8)	NA	NA	0.00387 U	0.00399 U	NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	29	(3)	82	(8)	NA	NA	0.00387 U	0.00399 U	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	6.8	(6)	840	(8)	NA	NA	0.00387 U	0.00399 U	NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	1.1	(3)	0.015	(7)	NA	NA	0.00387 U	**0.00445 J**	NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	1.1	(3)	0.15	(7)	NA	NA	0.00387 U	**0.00596 J**	NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	1.1	(3)	170	(7)	NA	NA	**0.00855**	**0.0122**	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1.1	(3)	1.5	(7)	NA	NA	0.00387 U	**0.00275 J**	NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	29	(3)	230	(7)	NA	NA	0.00387 U	0.00399 U	NA	NA	NA	NA	NA	NA	NA
FLUORENE	29	(3)	80	(8)	NA	NA	0.00387 U	0.00399 U	NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	1.1	(3)	0.15	(7)	NA	NA	0.00387 U	**0.0101**	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	1	(6)	0.0094	(8)	NA	NA	**0.0109**	0.00399 U	NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	29	(3)	170	(7)	NA	NA	**0.0128**	**2.21**	NA	NA	NA	NA	NA	NA	NA
PYRENE	1.1	(3)	170	(7)	NA	NA	**0.00307 J**	**0.109**	NA	NA	NA	NA	NA	NA	NA
VOLATILES (MG/KG)															
2-BUTANONE	89.6	(4)	20	(8)	0.00473 U	0.00465 UJ	NA	NA	**0.0074 J**	**0.0407**	NA	0.00607 U	**0.00425 J**	**0.0218 J**	**0.00369 J**
ACETONE	2.5	(4)	48	(8)	**0.00535 J**	**0.00604 J**	NA	NA	**0.0481 J**	**0.161 J**	NA	**0.0185 J**	**0.0386 J**	**0.152 J**	**0.0721 J**
BENZENE	0.255	(4)	0.004	(8)	0.00237 U	0.00233 U	**0.00125 J**	**0.00045 J**	0.00233 U	0.00282 U	NA	0.00303 U	0.0021 U	0.00244 U	0.00226 U
CYCLOHEXANE	NA	NA	260	(8)	0.00237 U	0.00233 U	NA	NA	0.00233 U	**0.00441 J**	NA	0.00303 U	0.0021 U	0.00244 U	0.00226 U
ETHYLBENZENE	5.16	(4)	0.03	(8)	0.00237 U	0.00233 U	**0.0014 J**	**0.00138 J**	0.00233 U	0.00282 U	NA	0.00303 U	0.0021 U	0.00244 U	0.00226 U
METHYL CYCLOHEXANE	NA	NA	NA	NA	0.00237 U	**0.00173 J**	NA	NA	0.00233 U	**0.00531 J**	NA	0.00303 U	0.0021 U	0.00244 U	0.00226 U
METHYLENE CHLORIDE	4.05	(4)	0.025	(10)	0.0473 U	0.0193 U	NA	NA	0.00615 U	0.00563 U	NA	**0.0371**	0.00419 U	**0.0313**	**0.0279**
TOLUENE	5.45	(4)	11.8	(8)	0.00237 U	0.00233 U	**0.00344 J**	**0.00139 J**	0.00233 U	**0.00205 J**	NA	0.00303 U	0.0021 U	0.00244 UJ	0.00226 UJ
TOTAL XYLENES	1.4	(6)	3.8	(8)	0.0071 U	0.00698 U	**0.00233 J**	**0.00356 J**	0.00699 U	0.00845 U	NA	0.0091 U	0.00629 U	0.00732 U	0.00678 U
TRICHLOROETHENE	12.4	(4)	0.0032	(8)	**0.00216 J**	**0.00837**	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U	0.0021 U	0.00244 U	0.00226 U

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil s
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

ACRONYMS
DRO - Diesel Range Organics
Eco - Ecological
Eco Ref - Ecological Reference
ERO - Extended Range Organics
HH - Human Health
HH Ref - Human Health Reference
NA - Not Available / Not Analyzed
mg/kg - Milligrams per kilogram
SB - Subsurface Soil
SS - Surface Soil
S.U. - Standard Unit
SWMU - Solid Waste Management Unit

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

SHADING
Light gray shading indicates positive result.
Dark shading indicates exceedance of criteria.
Shading indicates exceedance of criteria but within background levels (see Tables 4-1, 4-2, and 4-5).

TABLE 7-2

SUMMARY OF COMPOSITE SOIL RESULTS - SUBAREA C
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION	ECO (1)	ECO REF	HH (2)	HH REF	18CCP001
SAMPLE ID					18CCP0010002
SAMPLE DATE					10/19/2011
SUBMATRIX					SS
PCBS (MG/KG)					
AROCLOR-1260	0.000332	(4)	0.22	(7)	**0.0185 J**

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil samples are only compared to human health criteria.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

ACRONYMS:
Eco - Ecological
Eco Ref - Ecological Reference
HH - Human Health
HH Ref - Human Health Reference
mg/kg - Milligrams per kilogram
SS - Surface Soil
SWMU - Solid Waste Management Unit
Dark shading indicates exceedance of criteria.

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

TABLE 7-3

SUMMARY OF SEDIMENT RESULTS - SUBAREA C
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION					18CSD003		18CSD001		18CSD002
SAMPLE ID	ECO (1)	ECO REF	HH (2)	HH REF	18CSD0030006	18CSD0030006-D	18CSD0010006	18CSD0010006-D	18CSD0020006
SAMPLE DATE					10/18/2011	10/18/2011	10/19/2011	10/19/2011	10/19/2011
MATRIX					SD	SD	SD	SD	SD
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX					SETTLING BASIN	SETTLING BASIN	SD	SD	SD
METALS (MG/KG)									
ARSENIC	9.79	(3)	0.39	(6)	**51.8 J**	**68 J**	NA	NA	NA
BARIUM	NA	NA	1500	(6)	394 J	353 J	NA	NA	NA
CADMIUM	0.99	(3)	7	(6)	**25.7 J**	**25.6 J**	NA	NA	NA
CHROMIUM	43.4	(3)	0.29	(6)	**9660 J**	**11900 J**	NA	NA	NA
LEAD	35.8	(3)	400	(6)	**1310 J**	**1360 J**	NA	NA	NA
MERCURY	0.174	(3)	2.3	(6)	0.0997 J	0.091 J	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)									
DRO (C08-C28)	NA	NA	3100	(7)	NA	NA	41.4	32.1	49.8
ERO (C08-C34)	NA	NA	3100	(7)	NA	NA	68.8	59	91.7
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)									
2-METHYLNAPHTHALENE	0.0202	(3)	31	(6)	NA	NA	0.00419 U	0.00414 U	0.0081 J
ACENAPHTHENE	0.00671	(3)	340	(6)	NA	NA	0.00419 U	0.00414 U	0.00336 J
ACENAPHTHYLENE	0.00587	(3)	340	(6)	NA	NA	0.00419 U	0.00414 U	**0.0367**
ANTHRACENE	0.0572	(3)	1700	(6)	NA	NA	0.00419 U	0.00414 U	0.0167
BENZO(A)ANTHRACENE	0.108	(3)	0.15	(6)	NA	NA	0.00419 U	0.00721 J	0.0903
BENZO(A)PYRENE	0.15	(3)	0.015	(6)	NA	NA	0.004 J	0.00794 J	**0.17**
BENZO(B)FLUORANTHENE	10.4	(3)	0.15	(6)	NA	NA	0.00734 J	0.0149	**0.217**
BENZO(G,H,I)PERYLENE	0.17	(3)	170	(6)	NA	NA	0.00505 J	0.0113	0.143
BENZO(K)FLUORANTHENE	0.24	(3)	1.5	(6)	NA	NA	0.00314 J	0.00565 J	0.0829
CHRYSENE	0.166	(3)	15	(6)	NA	NA	0.00419 U	0.0109	0.145
DIBENZO(A,H)ANTHRACENE	0.033	(3)	0.015	(6)	NA	NA	0.00419 U	0.00413 J	**0.0385**
FLUORANTHENE	0.423	(3)	230	(6)	NA	NA	0.00513 J	0.0106	0.0302
INDENO(1,2,3-CD)PYRENE	0.2	(3)	0.15	(6)	NA	NA	0.00501 J	0.00915	0.141
PHENANTHRENE	0.204	(3)	170	(6)	NA	NA	0.00251 J	0.00388 J	0.0162
PYRENE	0.195	(3)	170	(6)	NA	NA	0.0049 J	0.0115	0.0358
VOLATILES (MG/KG)									
CYCLOHEXANE	NA	NA	700	(6)	1.21 J	0.801 UJ	NA	NA	NA
ETHYLBENZENE	0.175	(3)	5.4	(6)	1.09 J	0.801 UJ	0.0025 U	0.00265 U	0.00339 U
ISOPROPYLBENZENE	0.08	(4)	210	(6)	27.3 J	5.1 J	NA	NA	NA
M+P-XYLENES	0.433	(3)	59	(6)	5.25 J	1.4 J	NA	NA	NA
METHYL ACETATE	NA	NA	7800	(6)	1.99 UJ	0.932 J	NA	NA	NA
METHYL CYCLOHEXANE	NA	NA	NA	NA	24.9 J	5.78 J	NA	NA	NA
TOTAL XYLENES	0.433	(3)	63	(6)	5.65 J	1.64 J	0.0025 U	0.00265 U	0.00339 U

NOTES:
Only analytes with at least one detection are shown on this table.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Region 5 (USEPA, 2003)
(4) Region 3, freshwater (USEPA, 2006)
(5) Sunahara (Sunahara, et al., 2009)
(6) Adjusted USEPA Regional Screening Level Direct Contact Residential
(7) Indiana Department of Environmental Management Soil - Direct

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

Light gray shading indicates detection.
Dark shading indicates exceedance of at least one criterion.

ACRONYMS

DRO - Diesel Range Organics
Eco - Ecological
Eco Ref - Ecological Reference
ERO - Extended Range Organics
HH - Human Health
HH Ref - Human Health Reference
mg/kg - Milligrams per kilogram
NA - Not Available / Not Analyzed
NSA - Naval Support Activity
SD - Sediment
SWMU - Solid Waste Mansagement Unit
USEPA - United States Environmental Proteciton Agency

TABLE 7-4

SUMMARY OF GROUNDWATER RESULTS - SUBAREA C
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE MATRIX	HH [2]	HH REF	08MWT008 08GWT008 1/11/2012 GW	08MWT012 08GWT012 1/10/2012 GW	18CMWT001 18CGWT001 12/17/2011 GW	18CMWT002 18CGWT002 12/16/2011 GW	18CMWT003 18CGWT003 12/16/2011 GW
DISSOLVED METALS (UG/L)							
ARSENIC	0.045	(3)	1.5 U	NA	**1.62**	NA	**1.71**
BARIUM	290	(3)	38	NA	14.3	NA	36.4
CHROMIUM	0.031	(3)	1 U	NA	**2.94**	NA	**4.1**
LEAD	15	(3)	0.75 U	NA	0.75 U	NA	1.83
SELENIUM	7.8	(3)	1.25 U	NA	1.25 U	NA	1.66
METALS (UG/L)							
ARSENIC	0.045	(3)	**1.24**	**1.28**	**1.79**	1.5 U	1.5 U
BARIUM	290	(3)	61.4	8.57 J	14 J	33.7	29.3
CADMIUM	0.69	(3)	0.5 U	0.5 U	1 U	**0.898**	0.5 U
CHROMIUM	0.031	(3)	**1.18**	5 U	2 U	**1.6**	1 U
LEAD	15	(3)	0.956	3.75 U	1.5 U	1.5 U	1.5 U
SELENIUM	7.8	(3)	1.25 U	1.25 U	2.5 U	1.25 U	1.81 J
VOLATILES (UG/L)							
BENZENE	0.039	(3)	0.5 U	0.5 U	0.5 U	**0.286**	0.5 U
CHLOROMETHANE	19	(3)	0.421 J	0.489 J	0.5 U	0.5 UJ	1.93 J
TOLUENE	86	(3)	0.5 U	0.5 U	0.5 U	0.4 J	0.5 U
TRICHLOROETHENE	0.26	(3)	**0.568**	0.5 U	0.5 U	0.5 U	0.5 U

NOTES:
Only analytes with at least one detection are shown on this table.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Adjusted USEPA Regional Screening Level Tap Water
(4) USEPA Maximum Contaminant Level
(5) USEPA Groundwater Volatilization Criteria
(6) Indiana Department of Environmental Management Groundwater - Residential

ACRONYMS
GW - Groundwater
HH - Human Health
HH Ref - Human Health Reference
NA - Not available/analyzed
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit
µg/L - Micrograms per liter

DATA QUALIFIERS:
U = Indicate Light gray shading indicates detection.
J = Indicate Dark shading indicates exceedance of at least one criterion.
UJ = Indicates that the result was not detected but estimated.

TABLE 7-5

OCCURENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Direct Contact				Soil-to-Groundwater			
										Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]	USEPA RSL Protection of Groundwater[7]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Volatile Organic Compounds																	
78-93-3	2-Butanone	0.0074 J	0.0218 J	mg/kg	18CSS0010002	2/7	0.00454 - 0.00607	0.0218	NA	2,800 N	28,000 S	No	BSL	20	21 N	No	BSL
67-64-1	Acetone	0.00535 J	0.152 J	mg/kg	18CSS0010002	7/7	-	0.152	NA	6,100 N	85,000 N	No	BSL	48	49 N	No	BSL
71-43-2	Benzene	0.00125 J	0.00125 J	mg/kg	18CSB0070002	1/10	0.00227 - 0.00462	0.00125	NA	1.1 C	15 C	No	BSL	0.004	0.051 M	No	BSL
100-41-4	Ethylbenzene	0.0014 J	0.0014 J	mg/kg	18CSB0070002	1/10	0.00227 - 0.00462	0.0014	NA	5.4 C	76 C	No	BSL	0.03	16 M	No	BSL
75-09-2	**Methylene Chloride**	0.0266	0.0371	mg/kg	18CSB0090002	3/7	0.00454 - 0.0473	0.0371	NA	36 N[8]	150 C	No	BSL	0.05	**0.025 M**	**Yes**	ASL
108-88-3	Toluene	0.00096 J	0.00344 J	mg/kg	18CSB0070002	2/10	0.00227 - 0.00462	0.00344	NA	500 N	820 S	No	BSL	11.8	14 M	No	BSL
1330-20-7	Total Xylenes	0.00233 J	0.00233 J	mg/kg	18CSB0070002	1/10	0.00242 - 0.0091	0.00233	NA	63 N	260 S	No	BSL	3.8	200 M	No	BSL
79-01-6	Trichloroethene	0.00216 J	0.00216 J	mg/kg	18CSB0060002	1/7	0.00227 - 0.00303	0.00216	NA	0.44 N[8]	6 N	No	BSL	0.0032	0.036 M	No	BSL
Polycyclic Aromatic Hydrocarbons																	
91-57-6	2-Methylnaphthalene	0.0514	0.0514	mg/kg	18CSB0070002	1/3	0.00393 - 0.00395	0.0514	NA	31 N	370 S	No	BSL	2.8	2.8 N	No	BSL
208-96-8	Acenaphthylene	0.0125	0.0125	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.0125	NA	340 N[9]	NA	No	BSL	82 [9]	NA	No	BSL
205-99-2	Benzo(b)fluoranthene	0.00611 J	0.00611 J	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.00611	NA	0.15 C	2 C	No	BSL	0.7	7 C	No	BSL
191-24-2	Benzo(g,h,i)perylene	0.00855	0.0666	mg/kg	18CSB0010002	2/3	0.00395 - 0.00395	0.0666	NA	170 N[10]	NA	No	BSL	190 [10]	NA	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.011	0.011	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.011	NA	0.15 C	2 C	No	BSL	2.4	23 C	No	BSL
91-20-3	**Naphthalene**	0.0109	0.0109	mg/kg	18CSB0070002	1/3	0.00393 - 0.00395	0.0109	NA	3.6 C	50 C	No	BSL	**0.0094**	0.092 C	**Yes**	ASL
85-01-8	Phenanthrene	0.00242 J	0.0128	mg/kg	18CSB0070002	2/3	0.00393 - 0.00393	0.0128	NA	170 N[10]	NA	No	BSL	190 [10]	NA	No	BSL
129-00-0	Pyrene	0.00307 J	0.00779 J	mg/kg	18CSB0010002	2/3	0.00395 - 0.00395	0.00779	NA	170 N	2,400 N	No	BSL	190	190 N	No	BSL
PCBs																	
11096-82-5	Aroclor-1260	0.0185 J	0.0185 J	mg/kg	18CCP0010002	1/1	-	0.0185	NA	0.22 C	3 C	No	BSL	0.48	4.8 C	No	BSL
Metals																	
7440-38-2	Arsenic	2.42 J	19.6	mg/kg	18CSS0010002	7/7	-	19.6	No	**0.39 C**	**6 C**	No	BKG	**0.026**	**5.9 M**	No	BKG
7440-39-3	**Barium**	36.4	1,940	mg/kg	18CSB009_0002	7/7	-	1940	Yes	**1,500 N**	21,000 N	**Yes**	ASL	2,400	**1,700 M**	**Yes**	ASL
7440-43-9	Cadmium	0.561 J	1.21 J	mg/kg	18CSB0050002	2/7	0.559 - 0.626	1.21	No	7 N	98 N	No	BSL, BKG	10.4	7.5 M	No	BSL, BKG
7440-47-3	**Chromium**	14.6	97.5	mg/kg	18CSB0050002	7/7	-	97.5	Yes	**0.29 C[12]**	**4 C[12]**	**Yes**	ASL	**0.0118 [12]**	**0.12 C[12]**	**Yes**	ASL
7439-92-1	Lead	7.09	117	mg/kg	18CSB0050002	7/7	-	117	Yes	400	400	No	BSL	280 [14]	270 M	No	BSL
7439-97-6	Mercury	0.0383 J	0.0383 J	mg/kg	18CSS0010002	1/7	0.032 - 0.0409	0.0383	No	2.3 N[13]	32 N[13]	No	BSL, BKG	0.66	2.1 M	No	BSL, BKG
Petroleum Hydrocarbons																	
- -	DRO (C08-C28)	8.75	183	mg/kg	18CSB0010002	3/3	-	183	NA	NA	3,100	No	BSL	NA	230	No	BSL
- -	ERO (C08-C34)	23.8	224	mg/kg	18CSB0010002	3/3	-	224	NA	NA	3,100	No	BSL	NA	230	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7- USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
8 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
9 - Value is for acenaphthene.
10 - Value is for pyrene.
11 - Value is for total PCBs.
12 - Value is for hexavalent chromium.
13 - Value is for mercuric chloride (and other mercury salts).
14- Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstract Service Registry Number
COPC = Chemical Of Potential Concern
DRO = Diesel Range Organics
ERO = Extended Range Organics
IDEM = Indiana Department of Environmental Management
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.
M = Maximum Contaminant Level
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
PCB = Polychlorinated Biphenyl
RSL = Regional Screening Level
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level

Associated Samples:
18CSB0010002
18CSB0020002
18CSB0030002
18CSB0040002
18CSB0050002
18CSB0060002
18CSB0070002
18CSB0080002
18CSB009_0002
18CSB0090002
18CSS0010002
18CCP0010002

TABLE 7-6

OCCURENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Direct Contact				Soil-to-Groundwater			
										Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]	USEPA RSL Protection of Groundwater[7]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Volatile Organic Compounds																	
78-93-3	2-Butanone	0.00425 J	0.0407	mg/kg	18CSB0080305	2/5	0.00465 - 0.00707	0.0407	NA	2,800 N	28,000 S	No	BSL	20	21 N	No	BSL
67-64-1	Acetone	0.00604 J	0.161 J	mg/kg	18CSB0080305	5/5	-	0.161	NA	6,100 N	85,000 N	No	BSL	48	49 N	No	BSL
71-43-2	Benzene	0.00045 J	0.00045 J	mg/kg	18CSB0070406	1/8	0.0021 - 0.118	0.00045	NA	1.1 C	15 C	No	BSL	0.004	0.051 M	No	BSL
110-82-7	Cyclohexane	0.00441 J	0.00441 J	mg/kg	18CSB0080305	1/5	0.0021 - 0.00353	0.00441	NA	700 N	120 S	No	BSL	260	270 N	No	BSL
100-41-4	Ethylbenzene	0.00138 J	0.00138 J	mg/kg	18CSB0070406	1/8	0.0021 - 0.118	0.00138	NA	5.4 C	76 C	No	BSL	0.03	16 M	No	BSL
108-87-2	Methyl Cyclohexane	0.00173 J	0.00531 J	mg/kg	18CSB0080305	2/5	0.0021 - 0.00353	0.00531	NA	NA	NA	No	NTX	NA	NA	No	NTX
75-09-2	Methylene Chloride	0.0152	0.0152	mg/kg	18CMWT0030204	1/5	0.00419 - 0.0193	0.0152	NA	36 N[8]	150 C	No	BSL	0.05	0.025 M	No	BSL
108-88-3	Toluene	0.00139 J	0.00205 J	mg/kg	18CSB0080305	2/8	0.0021 - 0.118	0.00205	NA	500 N	820 S	No	BSL	11.8	14 M	No	BSL
1330-20-7	Total Xylenes	0.00356 J	0.00356 J	mg/kg	18CSB0070406	1/8	0.00296 - 0.118	0.00356	NA	63 N	260 S	No	BSL	3.8	200 M	No	BSL
79-01-6	Trichloroethene	0.00837	0.00837	mg/kg	18CSB0060203	1/5	0.0021 - 0.00353	0.00837	NA	0.44 N[8]	6.2 N	No	BSL	**0.0032**	0.036 M	**Yes**	ASL
Polycyclic Aromatic Hydrocarbons																	
83-32-9	Acenaphthene	0.00266 J	0.00266 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00266	NA	340 N	4,800 N	No	BSL	82	82 N	No	BSL
208-96-8	Acenaphthylene	0.0103	0.0103	mg/kg	18CSB0010204	1/3	0.00399 - 0.00476	0.0103	NA	340 N[9]	NA	No	BSL	82 [9]	NA	No	BSL
120-12-7	Anthracene	0.00247 J	0.00247 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00247	NA	1,700 N	24,000 N	No	BSL	840	860 N	No	BSL
50-32-8	Benzo(a)pyrene	0.00445 J	0.00445 J	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.00445	NA	0.015 C	0.21 C	No	BSL	0.07	4.7 M	No	BSL
205-99-2	Benzo(b)fluoranthene	0.00257 J	0.00596 J	mg/kg	18CSB0070406	2/3	0.00476 - 0.00476	0.00596	NA	0.15 C	2.1 C	No	BSL	0.7	7 C	No	BSL
191-24-2	Benzo(g,h,i)perylene	0.0122	0.0122	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.0122	NA	170 N[10]	NA	No	BSL	190 [10]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	0.00275 J	0.00275 J	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.00275	NA	1.5 C	21 C	No	BSL	7	68 C	No	BSL
206-44-0	Fluoranthene	0.00897 J	0.00897 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00897	NA	230 N	3,200 N	No	BSL	1,400	1400 N	No	BSL
86-73-7	Fluorene	0.0158	0.0158	mg/kg	18CSB0010204	1/3	0.00399 - 0.00476	0.0158	NA	230 N	3,200 N	No	BSL	80	81 N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.00429 J	0.0101	mg/kg	18CSB0070406	2/3	0.00476 - 0.00476	0.0101	NA	0.15 C	2.1 C	No	BSL	2.4	23 C	No	BSL
85-01-8	Phenanthrene	0.0118	2.21	mg/kg	18CSB0070406	3/3	-	2.21	NA	170 N[10]	NA	No	BSL	190 [10]	NA	No	BSL
129-00-0	Pyrene	0.00731 J	0.109	mg/kg	18CSB0070406	3/3	-	0.109	NA	170 N	2,400 N	No	BSL	190	190 N	No	BSL
Metals																	
7440-38-2	Arsenic	4.35	8.55	mg/kg	18CMWT0030204	5/5	-	8.55	No	**0.39 C**	**5.5 C**	No	BKG	**0.026**	**5.9 M**	No	BKG
7440-39-3	Barium	41.8	253	mg/kg	18CSB0090204	5/5	-	253	Yes	1,500 N	21,000 N	No	BSL	2,400	1700 M	No	BSL
7440-43-9	Cadmium	0.438 J	0.438 J	mg/kg	18CSB0080305	1/5	0.113 - 0.584	0.438	No	7 N	98 N	No	BSL, BKG	10.4	7.5 M	No	BSL, BKG
7440-47-3	Chromium	9.45	25.9	mg/kg	18CSB0060203	5/5	-	25.9	No	**0.29 C[11]**	**4.1 C[11]**	No	BKG	**0.0118 [11]**	**0.12 C[11]**	No	BKG
7439-92-1	Lead	5.35	17.2	mg/kg	18CSB0080305	5/5	-	17.2	No	400	400	No	BSL, BKG	280 [13]	270 M	No	BSL, BKG
7439-97-6	Mercury	0.0179 J	0.193	mg/kg	18CSB0080305	2/5	0.0282 - 0.0419	0.193	No	2.3 N[12]	32 N[12]	No	BSL, BKG	0.66	2.1 M	No	BSL, BKG
Petroleum Hydrocarbons																	
- -	**DRO (C08-C28)**	437	4,010	mg/kg	18CSB0070406	2/3	9.45 - 9.45	4010	NA	NA	**3,100**	**Yes**	ASL	NA	**230**	**Yes**	ASL
- -	**ERO (C08-C34)**	35.5	4,030	mg/kg	18CSB0070406	3/3	-	4030	NA	NA	**3,100**	**Yes**	ASL	NA	**230**	**Yes**	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
8 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
9 - Value is for acenaphthene.
10 - Value is for pyrene.
11 - Value is for hexavalent chromium.
12 - Value is for mercuric chloride (and other mercury salts).
13 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
CAS = Chemical Abstract Service Registry Number
COPC = Chemical Of Potential Concern
DRO = Diesel Range Organics
ERO = Extended Range Organics
IDEM = Indiana Department of Environmental Management
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.
M = Maximum Contaminant Level
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
PCB = Polychlorinated Biphenyl
RSL = Regional Screening Level
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Associated Samples:
18CMWT0030204
18CSB0010204
18CSB0020507
18CSB0040507
18CSB0060203
18CSB0070406
18CSB0080305
18CSB0090204

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration

BSL = Below COPC Screening Level
NTX = No toxicity criteria available

TABLE 7-7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

												Direct Contact			Vapor Intrusion			
CAS Number	**Chemical**	**Minimum Concentration**	**Maximum Concentration**	**Units**	**Sample of Maximum Concentration**	**Frequency of Detection**	**Range of Nondetects[1]**	**Concentration Used for Screening[2]**	**Range of Background Concentrations[3]**	**Adjusted USEPA RSL Tapwater[4]**	**USEPA MCL[5]**	**IDEM Groundwater Residential[6]**	**COPC Flag**	**Rationale for Contaminant Deletion or Selection[7]**	**USEPA Groundwater Volatilization Criterion[4]**	**IDEM Vapor Exposure[5]**	**COPC Flag**	**Rationale for Contaminant Deletion or Selection[6]**
Volatile Organic Compounds																		
71-43-2	**Benzene**	0.286 J	0.286 J	ug/L	18CGWT002	1/3	0.5 - 0.5	0.286	NA	**0.039 C**	5	5 M	**Yes**	ASL	1.4 C	24 C	No	BSL
74-87-3	Chloromethane	1.93 J	1.93 J	ug/L	18CGWT003	1/3	0.5 - 0.5	1.93	NA	19 N	NA	190 N	No	BSL	26 N	NA	No	BSL
108-88-3	Toluene	0.4 J	0.4 J	ug/L	18CGWT002	1/3	0.5 - 0.5	0.4	NA	86 N	1,000	1000 M	No	BSL	NA	NA	No	NTX
Metals (Total)																		
7440-38-2	**Arsenic**	1.79 J	1.79 J	ug/L	18CGWT001	1/3	1.5 - 1.5	1.79	1.24 - 1.28	**0.045 C**	10	10 M	**Yes**	ASL	NA	NA	No	NTX
7440-39-3	Barium	14 J	33.7	ug/L	18CGWT002	3/3	-	33.7	8.57 - 61.4	290 N	2,000	2000 M	No	BSL	NA	NA	No	NTX
7440-43-9	**Cadmium**	0.898 J	0.898 J	ug/L	18CGWT002	1/3	0.5 - 1	0.898	NA	**0.69 N**	5	5 M	**Yes**	ASL	NA	NA	No	NTX
7440-47-3	**Chromium**	1.6 J	1.6 J	ug/L	18CGWT002	1/3	1 - 2	1.6	1.18	**0.031 C[8]**	100 [9]	**0.31 C[9]**	**Yes**	ASL	NA	NA	No	NTX
7782-49-2	Selenium	1.81 J	1.81 J	ug/L	18CGWT003	1/3	1.25 - 2.5	1.81	NA	7.8 N	50	50 M	No	BSL	NA	NA	No	NTX
Metals (Filtered)																		
7440-38-2	**Arsenic**	1.62 J	1.71 J	ug/L	18CGWT003	2/2	-	1.71	NA	**0.045 C**	10	10 M	**Yes**	ASL	NA	NA	No	NTX
7440-39-3	Barium	14.3	36.4	ug/L	18CGWT003	2/2	-	36.4	38	290 N	2,000	2000 M	No	BSL	NA	NA	No	NTX
7440-47-3	**Chromium**	2.94	4.1 J	ug/L	18CGWT003	2/2	-	4.1	NA	**0.031 C[8]**	100 [9]	**0.31 C[9]**	**Yes**	ASL	NA	NA	No	NTX
7439-92-1	Lead	1.83	1.83	ug/L	18CGWT003	1/2	0.75 - 0.75	1.83	NA	15	15 [10]	15 M	No	BSL	NA	NA	No	NTX
7782-49-2	Selenium	1.66	1.66	ug/L	18CGWT003	1/2	1.25 - 1.25	1.66	NA	7.8 N	50	50 M	No	BSL	NA	NA	No	NTX

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Data is for monitoring wells 08MWT008 (upgradient) and 08MWT012 (cross gradient).
4 - USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2012. RSLs for carcinogens correspond to an integrated lifetime cancer risk (ILCR) of 1E-06; adjusted RSLs for noncarcinogens correspond to a hazard quotient (HQ) of 0.1.
5 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Values are for hexavalent chromium.
9 - Value is for total chromium.
10 - The MCL for this parameter is actually a treatment technique. The SDWA action level (at the tap) has been presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18CGWT001
18CGWT002
18CGWT003

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical Of Potential Concern
IDEM = Indiana Department of Environmental Management
J = Estimated value
MCL = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available
NSA = Naval Support Activity
RSL = Regional Screening Level
SDWA = Safe Drinking Water Act
SWMU = Solid Waste Management Unit
ug/L = Micrograms per liter
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level
NTX = No Toxicity criteria available

TABLE 7-8

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SEDIMENT - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Polycyclic Aromatic Hydrocarbons													
91-57-6	2-Methylnaphthalene	0.0081 J	0.0081 J	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0081	NA	31 N	370 S	No	BSL
83-32-9	Acenaphthene	0.00336 J	0.00336 J	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.00336	NA	340 N	4,800 N	No	BSL
208-96-8	Acenaphthylene	0.0367	0.0367	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0367	NA	340 N[7]	NA	No	BSL
120-12-7	Anthracene	0.0167	0.0167	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0167	NA	1,700 N	24,000 N	No	BSL
56-55-3	Benzo(a)anthracene	0.0903	0.0903	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0903	NA	0.15 C	2.1 C	No	BSL
50-32-8	**Benzo(a)pyrene**	0.004 J	0.17	mg/kg	18CSD0020006	2/2	-	0.17	NA	**0.015 C**	0.21 C	**Yes**	ASL
205-99-2	**Benzo(b)fluoranthene**	0.00734 J	0.217	mg/kg	18CSD0020006	2/2	-	0.217	NA	**0.15 C**	2.1 C	**Yes**	ASL
191-24-2	Benzo(g,h,i)perylene	0.00505 J	0.143	mg/kg	18CSD0020006	2/2	-	0.143	NA	170 N[8]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	0.00314 J	0.0829	mg/kg	18CSD0020006	2/2	-	0.0829	NA	1.5 C	21 C	No	BSL
218-01-9	Chrysene	0.145	0.145	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.145	NA	15 C	210 C	No	BSL
53-70-3	**Dibenzo(a,h)anthracene**	0.0385	0.0385	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0385	NA	**0.015 C**	0.21 C	**Yes**	ASL
206-44-0	Fluoranthene	0.00513 J	0.0302	mg/kg	18CSD0020006	2/2	-	0.0302	NA	230 N	3,200 N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.00501 J	0.141	mg/kg	18CSD0020006	2/2	-	0.141	NA	0.15 C	2.1 C	No	BSL
85-01-8	Phenanthrene	0.00251 J	0.0162	mg/kg	18CSD0020006	2/2	-	0.0162	NA	170 N[8]	NA	No	BSL
129-00-0	Pyrene	0.0049 J	0.0358	mg/kg	18CSD0020006	2/2	-	0.0358	NA	170 N	2,400 N	No	BSL
Petroleum Hydrocarbons													
- -	DRO (C08-C28)	41.4	49.8	mg/kg	18CSD0020006	2/2	-	49.8	NA	NA	3,100	No	BSL
- -	ERO (C08-C34)	68.8	91.7	mg/kg	18CSD0020006	2/2	-	91.7	NA	NA	3,100	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - No background data is available for sediment.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
2 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - Value is for acenaphthene.
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18CSD0010006
18CSD0020006

Definitions:
C = Carcinogen
CAS = Chemical Abstract Service Registry Number
COPC = Chemical Of Potential Concern
DRO = Diesel Range Organics
ERO = Extended Range Organics
IDEM = Indiana Department of Environmental Management
J = Estimated value
mg/kg = Milligrams per kilogram
N = Noncarcinogen
NA = Not Applicable/Not Available
NSA = Naval Support Activity
RSL = Regional Screening Level
S = Soil saturation limit.
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 7-9

CHEMICALS RETAINED AS COPCs - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil		Subsurface Soil		Groundwater		Surface Water	Sediment
	Direct Contact	Soil to Groundwater	Direct Contact	Soil to Groundwater	Direct Contact	Vapor Intrusion		
Volatile Organic Compounds								
Benzene					E			
Methylene Chloride		I						
Trichloroethene				E				
Polycyclic Aromatic Hydrocarbons								
Benzo(a)pyrene								E
Benzo(b)fluoranthene								E
Dibenzo(a,h)anthracene								E
Naphthalene		E						
Metals								
Arsenic					E, I			
Barium	E	I						
Cadmium					E			
Chromium	E, I	E,I			E, I			
Lead								
Total Petroleum Hydrocarbons								
DRO (C08-C28)			I	I				
ERO (C08-C34)			I	I				

Notes:
E - Chemical exceeded USEPA screening criteria and was retained as a COPC.
I - Chemical exceeded IDEM screening criteria and was retained as a COPC.
Acronyms:
DRO - Diesel Range Organics
ERO - Extended Range Organics
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

TABLE 7-10

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSA CRANE
CRANE INDIANA
PAGE 1 OF 4

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	Subarea C	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Trespassers may contact surface soil while at the site.
		Air	Subarea C	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during work activities.
				Trespassers	Adolescent	Inhalation	Quant	Trespassers may be exposed to fugitive dust and volatile emissions while at the site.
	Subsurface Soil	Subsurface Soil	Subarea C	Construction Workers	Adult	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
				Industrial Worker	Adult	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
				Trespassers	Adolescent	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
		Air	Subarea C	Construction Workers	Adult	Inhalation	None	No COPCs were identified for subsurface soil.
				Industrial Worker	Adult	Inhalation	None	No COPCs were identified for subsurface soil.
				Trespassers	Adolescent	Inhalation	Quant	No COPCs were identified for subsurface soil.
	Groundwater	Groundwater	Subarea C	Construction Workers	Adult	Ingestion Dermal	None Quant	Construction workers may have contact with groundwater during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	None	Industrial workers are not exposed to groundwater.
				Trespassers	Adolescent	Ingestion Dermal	None None	Current trespassers are not exposed to groundwater.
		Air	Subarea C	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to chemicals which have volatilized from groundwater.
				Industrial Worker	Adult	Inhalation	None	Industrial workers are not exposed to be exposed to COPCs that have volatilized from groundwater.
				Trespassers	Adolescent	Inhalation	None	Trespassers are not exposed to COPCs that have volatilized from groundwater.
			Vapor Intrusion	Industrial Worker	Adult	Inhalation	None	No COPCs were identified for vapor intrusion.

TABLE 7-10

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSA 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 Water	Surface Water	Subarea C	Construction Workers	Adult	Ingestion Dermal	None None	No chemicals were detected in surface water.
				Industrial Worker	Adult	Ingestion Dermal	None None	No chemicals were detected in surface water.
				Trespassers	Adolescent	Ingestion Dermal	None None	No chemicals were detected in surface water.
	Sediment	Sediment	Subarea C	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not exposed to sediment.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not exposed to sediment.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Current trespassers may be exposed to sediment while at the site.
Future	Surface Soil	Surface Soil	Subarea C	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	
		Air	Subarea C	Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
	Subsurface Soil	Subsurface Soil	Subarea C	Recreational Users	Child	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
					Adult	Ingestion Dermal	None None	
				Residents	Child	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
					Adult	Ingestion Dermal	None None	
		Air	Subarea C	Recreational Users	Child	Inhalation	None	No COPCs were identified for subsurface soil.
					Adult	Inhalation	None	

TABLE 7-10

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSA 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
Future	Subsurface Soil	Air	Subarea C	Residents	Child	Inhalation	None	No COPCs were identified for subsurface soil.
					Adult	Inhalation	None	
	Groundwater	Groundwater	Subarea C	Recreational Users	Child	Ingestion Dermal	None None	Recreational users are not expected to be exposed to groundwater.
					Adult	Ingestion Dermal	None None	
				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	
		Air	Subarea C	Recreational Users	Child	Inhalation	None	Recreational users are not expected to be exposed to groundwater.
					Adult	Inhalation	None	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
			Vapor Intrusion	Residents	Child	Inhalation	None	No COPCs were identified for vapor intrusion.
					Adult	Inhalation	None	
	Surface Water	Surface Water	Subarea C	Recreational Users	Child	Ingestion Dermal	None None	No chemicals were detected in surface water.
					Adult	Ingestion Dermal	None None	
				Residents	Child	Ingestion Dermal	None None	No chemicals were detected in surface water.
					Adult	Ingestion Dermal	None None	
	Sediment	Sediment	Subarea C	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to sediment while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	

TABLE 7-10

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSA 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

Notes:
Qual - Qualitative.
Quant - Quantitative.

Acronyms:
COPC - Chemical of Potential Concern
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

TABLE 7-11

EXPOSURE POINT CONCENTRATIONS - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil (mg/kg)	Subsurface Soil (mg/kg)	Groundwater (ug/L)	Sediment (mg/kg)
Volatile Organic Compounds				
Benzene	NA	NA	0.286	NA
PAHs				
Benzo(a)pyrene	NA	NA	NA	0.17
Benzo(b)fluoranthene	NA	NA	NA	0.217
Dibenzo(a,h)anthracene	NA	NA	NA	0.0385
Inorganics				
Arsenic	NA	NA	1.79	NA
Barium	1500	NA	NA	NA
Cadmium	NA	NA	0.898	NA
Chromium	64.4	NA	1.6	NA

Notes:
The exposure point concentrations (EPCs) were calculated according to USEPA's ProUCL guidance. See the RAGS PART D Table 3s in Appendix N for details concerning the EPCs.
Acronyms:
mg/kg - Milligrams per kilogram
NA - Not applicable. Not a COPC for this media.
NSA - Naval Support Activity
PAH - Polycyclic aromatic hydrocarbon
RAGS - Risk Assessment Guidance for Superfund Sites
ug/L - Micrograms per liter
USEPA - United States Environmental Protection Agency

TABLE 7-12

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Construction Workers	Surface Soil	Incidental Ingestion	9E-07	--	--	--	0.06	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	8E-06	--	--	Chromium	0.10	--
		Total	9E-06	--	--	Chromium	0.2	--
	Groundwater	Incidental Ingestion	0E+00	--	--	--	0	--
		Dermal Contact	1E-08	--	--	--	0.001	--
		Inhalation	2E-11	--	--	--	0.000002	--
		Total	1E-08	--	--	--	0.001	--
		Total Surface Soil and Groundwater	9E-06				0.2	
Industrial Workers	Surface Soil	Incidental Ingestion	1E-05	--	--	Chromium	0.03	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	3E-07	--	--	--	0.0006	--
		Total	1E-05	--	--	Chromium	0.03	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	2E-06	--	--	Chromium	0.005	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	2E-08	--	--	--	0.00003	--
		Total	2E-06	--	--	Chromium	0.005	--
	Sediment	Incidental Ingestion	4E-08	--	--	--	0	--
		Dermal Contact	6E-08	--	--	--	0	--
		Total	1E-07	--	--	--	0	--
		Total Surface Soil and Sediment	2E-06				0.005	
Child Recreational Users	Surface Soil	Incidental Ingestion	1E-05	--	--	Chromium	0.03	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	4E-08	--	--	--	0.00007	--
		Total	1E-05	--	--	Chromium	0.03	--
	Sediment	Incidental Ingestion	7E-07	--	--	--	0	--
		Dermal Contact	5E-07	--	--	--	0	--
		Total	1E-06	--	--	--	0	--
		Total Surface Soil and Sediment	2E-05				0.03	
Adult Recreational Users	Surface Soil	Incidental Ingestion	2E-06	--	--	Chromium	0.003	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	3E-08	--	--	--	0.00003	--
		Total	2E-06	--	--	Chromium	0.003	--
	Sediment	Incidental Ingestion	1E-07	--	--	--	0	--
		Dermal Contact	1E-07	--	--	--	0	--
		Total	2E-07	--	--	--	0	--
		Total Surface Soil and Sediment	2E-06				0.003	
Lifelong Recreational Users	Surface Soil	Incidental Ingestion	2E-05	--	--	Chromium	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	8E-08	--	--	--	NA	--
		Total	2E-05	--	--	Chromium	NA	--
	Sediment	Incidental Ingestion	8E-07	--	--	--	NA	--
		Dermal Contact	6E-07	--	--	--	NA	--
		Total	1E-06	--	--	--	NA	--
		Total Surface Soil and Sediment	2E-05				NA	

TABLE 7-12

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Child Residents	Surface Soil	Incidental Ingestion	2E-04	Chromium	--	--	0.4	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	2E-06	--	--	Chromium	0.003	--
		Total	2E-04	Chromium	--	--	0.4	--
	Groundwater	Incidental Ingestion	4E-05	--	Chromium	Arsenic	0.5	--
		Dermal Contact	1E-05	--	--	Chromium	0.04	--
		Inhalation	1E-08	--	--	--	0.0007	--
		Total	5E-05	--	Chromium	Arsenic	0.6	--
	Sediment	Incidental Ingestion	7E-07	--	--	--	0	--
		Dermal Contact	5E-07	--	--	--	0	--
		Total	1E-06	--	--	--	0	--
Total Surface Soil, Groundwater, and Sediment			2E-04				0.4	
Adult Residents	Surface Soil	Incidental Ingestion	3E-05	--	Chromium	--	0.04	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	2E-06	--	--	Chromium	0.003	--
		Total	3E-05	--	Chromium	--	0.04	--
	Groundwater	Incidental Ingestion	4E-05	--	Arsenic	Chromium	0.2	--
		Dermal Contact	6E-06	--	--	Chromium	0.01	--
		Inhalation	6E-08	--	--	--	0.0007	--
		Total	5E-05	--	Arsenic, Chromium	--	0.2	--
	Sediment	Incidental Ingestion	1E-07	--	--	--	0	--
		Dermal Contact	1E-07	--	--	--	0	--
		Total	2E-07	--	--	--	0	--
Total Surface Soil, Groundwater, and Sediment			3E-05				0.04	
Lifelong Residents	Surface Soil	Incidental Ingestion	2E-04	Chromium	--	--	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	4E-06	--	--	Chromium	NA	--
		Total	2E-04	Chromium	--	--	NA	--
	Groundwater	Incidental Ingestion	8E-05	--	Arsenic, Chromium	--	NA	--
		Dermal Contact	2E-05	--	Chromium	--	NA	--
		Inhalation	7E-08	--	--	--	NA	--
		Total	1E-04	--	Arsenic, Chromium	--	NA	--
	Sediment	Incidental Ingestion	8E-07	--	--	--	NA	--
		Dermal Contact	6E-07	--	--	--	NA	--
		Total	1E-06	--	--	--	NA	--
Total Surface Soil, Groundwater, and Sediment			2E-04					

TABLE 7-13

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Construction Workers	Surface Soil	Incidental Ingestion	2E-07	--	--	--	0.01	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	4E-06	--	--	Chromium	0.05	--
		Total	4E-06	--	--	Chromium	0.06	--
	Groundwater	Incidental Ingestion	0E+00	--	--	--	0	--
		Dermal Contact	4E-09	--	--	--	0.0003	--
		Inhalation	5E-12	--	--	--	0.0000005	--
		Total	4E-09	--	--	--	0.0003	--
	Total Surface Soil and Groundwater		4E-06				0.06	
Industrial Workers	Surface Soil	Incidental Ingestion	2E-06	--	--	Chromium	0.01	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	1E-07	--	--	--	0.0006	--
		Total	2E-06	--	--	Chromium	0.01	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	6E-07	--	--	--	0.001	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	5E-09	--	--	--	0.000008	--
		Total	6E-07	--	--	--	0.001	--
	Sediment	Incidental Ingestion	9E-09	--	--	--	0	--
		Dermal Contact	9E-09	--	--	--	0	--
		Total	2E-08	--	--	--	0	--
	Total Surface Soil and Sediment		6E-07				0.001	
Child Recreational Users	Surface Soil	Incidental Ingestion	1E-06	--	--	--	0.007	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	5E-09	--	--	--	0.00002	--
		Total	1E-06	--	--	--	0.007	--
	Sediment	Incidental Ingestion	7E-08	--	--	--	0	--
		Dermal Contact	2E-08	--	--	--	0	--
		Total	1E-07	--	--	--	0	--
	Total Surface Soil and Sediment		2E-06				0.007	
Adult Recreational Users	Surface Soil	Incidental Ingestion	1E-07	--	--	--	0.0007	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	4E-09	--	--	--	0.00002	--
		Total	1E-07	--	--	--	0.0008	--
	Sediment	Incidental Ingestion	7E-09	--	--	--	0	--
		Dermal Contact	2E-09	--	--	--	0	--
		Total	9E-09	--	--	--	0	--
	Total Surface Soil and Sediment		1E-07				0.0008	
Lifelong Recreational Users	Surface Soil	Incidental Ingestion	2E-06	--	--	Chromium	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	8E-09	--	--	--	NA	--
		Total	2E-06	--	--	Chromium	NA	--
	Sediment	Incidental Ingestion	8E-08	--	--	--	NA	--
		Dermal Contact	2E-08	--	--	--	NA	--
		Total	1E-07	--	--	--	NA	--
	Total Surface Soil and Sediment		2E-06				NA	

TABLE 7-13

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Child Residents	Surface Soil	Incidental Ingestion	3E-05	--	Chromium	--	0.1	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	5E-07	--	--	--	0.002	--
		Total	3E-05	--	Chromium	--	0.1	--
	Groundwater	Incidental Ingestion	2E-05	--	--	Arsenic, Chromium	0.2	--
		Dermal Contact	3E-06	--	--	Chromium	0.008	--
		Inhalation	3E-10	--	--	--	0.00005	--
		Total	2E-05	--	--	Arsenic, Chromium	0.2	--
	Sediment	Incidental Ingestion	7E-08	--	--	--	0	--
		Dermal Contact	2E-08	--	--	--	0	--
		Total	1E-07	--	--	--	0	--
Total Surface Soil, Groundwater, and Sediment			3E-05				0.1	
Adult Residents	Surface Soil	Incidental Ingestion	2E-06	--	--	Chromium	0.01	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	4E-07	--	--	--	0.002	--
		Total	3E-06	--	--	Chromium	0.02	--
	Groundwater	Incidental Ingestion	5E-06	--	--	Arsenic, Chromium	0.1	--
		Dermal Contact	6E-07	--	--	--	0.005	--
		Inhalation	1E-09	--	--	--	0.00005	--
		Total	6E-06	--	--	Arsenic, Chromium	0.1	--
	Sediment	Incidental Ingestion	7E-09	--	--	--	0	--
		Dermal Contact	2E-09	--	--	--	0	--
		Total	9E-09	--	--	--	0	--
Total Surface Soil, Groundwater, and Sediment			3E-06				0.02	
Lifelong Residents	Surface Soil	Incidental Ingestion	3E-05	--	Chromium	--	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	9E-07	--	--	--	NA	--
		Total	3E-05	--	Chromium	--	NA	--
	Groundwater	Incidental Ingestion	2E-05	--	--	Arsenic, Chromium	NA	--
		Dermal Contact	3E-06	--	--	Chromium	NA	--
		Inhalation	1E-09	--	--	--	NA	--
		Total	3E-05	--	Chromium	Arsenic	NA	--
	Sediment	Incidental Ingestion	8E-08	--	--	--	NA	--
		Dermal Contact	2E-08	--	--	--	NA	--
		Total	1E-07	--	--	--	NA	--
Total Surface Soil, Groundwater, and Sediment			3E-05					

TABLE 7-14

CHEMICALS RETAINED AS CHEMICALS OF CONCERN - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Receptor									Migration from Soil to Groundwater
	Construction Workers	Industrial Workers	Adolescent Trespassers	Child Recreational Users	Adult Recreational Users	Lifelong Recreational Users	Child Residents	Adult Residents	Lifelong Residents	
Surface Soil										
Chromium[(1)]							X		X	
Subsurface Soil										
DRO (C08-C28)							X	X	X	X
DRO (C08-C34)							X	X	X	X
Groundwater										
No COCs identified for groundwater.										
Sediment										
No COCs identified for sediment.										

X - Chemical is retained as a chemical of concern (COC).
A chemical is retained as a COC if it contributed to a total cancer risk greater than 1×10^{-4} or to a target organ hazard index greater than 1.
A chemical is retained as a COC for migration from soil to groundwater if it exceeded the screening levels for migration from soil to groundwater and contributed to an unacceptable risk in groundwater.
1 - Chromium is only a COC if evaluated as hexavalent chromium.

TABLE 7-15

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
CURRENT/FUTURE CONSTRUCTION WORKERS		
Surface Soil		
Site Risk[1]	9E-06	0.2
Background Risk[2]	7E-07	0.2
Site + Background Risk[3]	1E-05	0.4
Subsurface Soil		
Site Risk	0E+00	0
Background Risk	4E-06	0.2
Site + Background Risk	4E-06	0.2
Groundwater	1E-08	0.001
Site Totals		
Total Surface Soil and Groundwater	9E-06	0.2
Total Subsurface Soil and Groundwater	1E-08	0.001
Site and Background Totals		
Total Surface Soil and Groundwater	1E-05	0.4
Total Subsurface Soil and Groundwater	4E-06	0.2

CURRENT/FUTURE INDUSTRIAL WORKERS		
Surface Soil		
Site Risk	1E-05	0.03
Background Risk	8E-06	0.05
Site + Background Risk	2E-05	0.08
Subsurface Soil		
Site Risk	0E+00	0
Background Risk	9E-06	0.04
Site + Background Risk	9E-06	0.04

TABLE 7-15

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
CURRENT/FUTURE ADOLESCENT TRESPASSERS		
Surface Soil		
Site Risk	2E-06	0.005
Background Risk	6E-07	0.009
Site + Background Risk	3E-06	0.01
Subsurface Soil		
Site Risk	0E+00	0
Background Risk	1E-06	0.007
Site + Background Risk	1E-06	0.007
Sediment	1E-07	0
Site Totals		
Total Surface Soil and Sediment	1E-07	0
Total Subsurface Soil and Sediment	1E-07	0
Site and Background Totals		
Total Surface Soil and Sediment	3E-06	0.01
Total Subsurface Soil and Sediment	1E-06	0.007

FUTURE CHILD RECREATIONAL USERS		
Surface Soil		
Site Risk	1E-05	0.03
Background Risk	2E-06	0.05
Site + Background Risk	1E-05	0.08
Subsurface Soil		
Site Risk	0E+00	0
Background Risk	6E-06	0.04
Site + Background Risk	6E-06	0.04
Sediment	1E-06	0
Site Totals		
Total Surface Soil and Sediment	1E-05	0.03
Total Subsurface Soil and Sediment	1E-06	0
Site and Background Totals		
Total Surface Soil and Sediment	3E-06	0.05
Total Subsurface Soil and Sediment	7E-06	0.04

TABLE 7-15

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
FUTURE ADULT RECREATIONAL USERS		
Surface Soil		
Site Risk	2E-06	0
Background Risk	9E-07	0.006
Site + Background Risk	3E-06	0.006
Subsurface Soil		
Site Risk	0E+00	0.03
Background Risk	1E-06	0.005
Site + Background Risk	1E-06	0.04
Sediment	2E-07	0.02
Site Totals		
Total Surface Soil and Sediment	2E-06	0.02
Total Subsurface Soil and Sediment	2E-07	0.05
Site and Background Totals		
Total Surface Soil and Sediment	1E-06	0.03
Total Subsurface Soil and Sediment	1E-06	0.03

FUTURE LIFELONG RECREATIONAL USERS		
Surface Soil		
Site Risk	2E-05	NA
Background Risk	3E-06	NA
Site + Background Risk	2E-05	NA
Subsurface Soil		
Site Risk	0E+00	NA
Background Risk	7E-06	NA
Site + Background Risk	7E-06	NA
Sediment	1E-06	NA
Site Totals		
Total Surface Soil and Sediment	2E-05	NA
Total Subsurface Soil and Sediment	1E-06	NA
Site and Background Totals		
Total Surface Soil and Sediment	4E-06	NA
Total Subsurface Soil and Sediment	8E-06	NA

TABLE 7-15

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
HYPOTHETICAL CHILD RESIDENTS		
Surface Soil		
Site Risk	2E-04	0.4
Background Risk	2E-05	0.6
Site + Background Risk	2E-04	1
Subsurface Soil		
Site Risk	0E+00	0
Background Risk	9E-05	0.5
Site + Background Risk	9E-05	0.5
Groundwater	5E-05	0.6
Sediment	1E-06	0
Site Totals		
Total Surface Soil, Groundwater, and Sediment	3E-04	1
Total Subsurface Soil, Groundwater, and Sediment	5E-05	0.6
Site and Background Totals		
Total Surface Soil, Groundwater, and Sediment	3E-04	2
Total Subsurface Soil, Groundwater, and Sediment	1E-04	1
HYPOTHETICAL ADULT RESIDENTS		
Surface Soil		
Site Risk	3E-05	0.04
Background Risk	1E-05	0.07
Site + Background Risk	4E-05	0.1
Subsurface Soil		
Site Risk	0E+00	0
Background Risk	2E-05	0.05
Site + Background Risk	2E-05	0.05
Groundwater	5E-05	0.2
Sediment	2E-07	0
Site Totals		
Total Surface Soil, Groundwater, and Sediment	8E-05	0.2
Total Subsurface Soil, Groundwater, and Sediment	5E-05	0.2
Site and Background Totals		
Total Surface Soil, Groundwater, and Sediment	9E-05	0.3
Total Subsurface Soil, Groundwater, and Sediment	7E-05	0.3

TABLE 7-15

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
HYPOTHETICAL LIFELONG RESIDENTS		
Surface Soil		
Site Risk	2E-04	NA
Background Risk	3E-05	NA
Site + Background Risk	2E-04	NA
Subsurface Soil		
Site Risk	0E+00	NA
Background Risk	1E-04	NA
Site + Background Risk	1E-04	NA
Groundwater	1E-04	NA
Sediment	1E-06	NA
Site Totals		
Total Surface Soil, Groundwater, and Sediment	3E-04	NA
Total Subsurface Soil, Groundwater, and Sediment	1E-04	NA
Site and Background Totals		
Total Surface Soil, Groundwater, and Sediment	3E-04	NA
Total Subsurface Soil, Groundwater, and Sediment	2E-04	NA

Notes:
ILCR = Incremental Lifetime Cancer Risk
HI = Hazard Index
NA = Not available/analyzed
1 - Cancer risk or hazard index from only site-related chemicals detected at concentrations exceeding screening levels.
2 - Cancer risk or hazard index from only chemicals present at naturally occurring levels detected at concentrations exceeding screening levels. Arsenic was within background levels in surface soil and arsenic and chromium were within background levels in subsurface soil.
3 - Cancer risk or hazard index from all chemicals detected at concentrations exceeding screening levels.

TABLE 7-16

SURFACE SOIL COPC SELECTION - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Sample of Maximum Detection	Averge of Positive Results[1]	Average of All Results[2]	Similar to Background[3]	Ecological Screening Level[4]				Ecological Effects Quotient[5]				Deletion or Selection of COPCs for Invertebrates/Plants		Further Evaluated in Terrestrial Food Chain Modeling[6]	
								Plant	Invertebrate	Avian	Mammal	Plant	Invertebrate	Avian	Mammal	COPC (yes/no)?	Rationale	Evaluated (yes/no)?	Rationale
METALS (MG/KG)																			
ARSENIC	4/4	2.42 J	19.6	18CSS0010002	8.91	8.91	YES	18	17	43	46	1.1	1.2	0.46	0.43	NO	BKG	NO	BSL, BKG
BARIUM	4/4	36.4	1940	18CSB009_0002	531	531	NO	500	330	820	2000	**3.9**	**5.9**	**2.4**	0.97	**YES**	ASL	**YES**	ASL
CADMIUM	1/4	0.561 J	0.561 J	18CSB009_0002	0.561	0.359	YES	32	140	0.77	0.36	0.018	0.0040	0.7	1.6	NO	BSL, BKG	NO	BKG
CHROMIUM	4/4	14.6	47.5	18CSS0010002	26.5	26.5	NO	78	0.4	26	34	0.61	**119**	**1.8**	**1.4**	**YES**	ASL	**YES**	ASL
LEAD	4/4	7.09	32.8	18CSS0010002	16.3	16.3	NO	120	1700	11	56	0.27	0.019	**3.0**	0.6	NO	BSL	**YES**	ASL
MERCURY	1/4	0.0383 J	0.0383 J	18CSS0010002	0.038	0.023	YES	12	0.1	0.013	1.7	0.0032	0.38	2.9	0.023	NO	BSL, BKG	NO	BKG
MISCELLANEOUS PARAMETERS (S.U.)																			
PH	1/1	7.65	7.65	18CSS0010002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)																			
DRO (C08-C28)	3/3	8.75	183	18CSB0010002	75.2	75.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO	[7]	NO	[7]
ERO (C08-C34)	3/3	23.8	224	18CSB0010002	101	101	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO	[7]	NO	[7]
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)																			
2-METHYLNAPHTHALENE	1/3	0.0514	0.0514	18CSB0070002	0.051	0.018	NA	NA	29	NA	100	**NA**	0.0018	**NA**	0.00051	**YES**	NSL	NO	NONBIO
ACENAPHTHYLENE	1/3	0.0125	0.0125	18CSB0010002	0.013	0.005	NA	20	29	NA	100	0.00063	0.00043	**NA**	0.00013	NO	BSL	**YES**	BIO
BENZO(B)FLUORANTHENE	1/3	0.0061 J	0.00611 J	18CSB0010002	0.006	0.003	NA	18	18	NA	1.1	0.00034	0.00034	**NA**	0.0056	NO	BSL	**YES**	BIO
BENZO(G,H,I)PERYLENE	2/3	0.0086	0.0666	18CSB0010002	0.038	0.026	NA	NA	18	NA	1.1	**NA**	0.0037	**NA**	0.061	**YES**	NSL	**YES**	BIO
INDENO(1,2,3-CD)PYRENE	1/3	0.011	0.011	18CSB0010002	0.011	0.005	NA	NA	18	NA	1.1	**NA**	0.00061	**NA**	0.010	**YES**	NSL	**YES**	BIO
NAPHTHALENE	1/3	0.0109	0.0109	18CSB0070002	0.011	0.005	NA	1	29	3.4	100	0.01090	0.00038	0.0032	0.00011	NO	BSL	NO	BSL
PHENANTHRENE	2/3	0.0024 J	0.0128	18CSB0070002	0.008	0.006	NA	NA	29	NA	100	**NA**	0.00044	**NA**	0.00013	**YES**	NSL	**YES**	BIO
PYRENE	2/3	0.0031 J	0.00779 J	18CSB0010002	0.005	0.004	NA	NA	18	34	1.1	**NA**	0.00043	0.00023	0.0071	**YES**	NSL	NO	BSL
VOLATILES (MG/KG)																			
2-BUTANONE	1/4	0.0218 J	0.0218 J	18CSS0010002	0.022	0.008	NA	NA	NA	NA	89.6	**NA**	**NA**	**NA**	0.00024	**YES**	NSL	NO	NONBIO
ACETONE	4/4	0.0093 J	0.152 J	18CSS0010002	0.048	0.048	NA	NA	NA	7.5	2.5	**NA**	**NA**	0.020	0.061	**YES**	NSL	NO	BSL
BENZENE	1/7	0.0013 J	0.00125 J	18CSB0070002	0.001	0.001	NA	31	31	NA	0.255	0.000040	0.000040	**NA**	0.0049	NO	BSL	NO	NONBIO
ETHYLBENZENE	1/7	0.0014 J	0.0014 J	18CSB0070002	0.001	0.001	NA	55	55	NA	5.16	0.000025	0.000025	**NA**	0.00027	NO	BSL	NO	NONBIO
METHYLENE CHLORIDE	3/4	0.0266	0.0371	18CSB0090002	0.032	0.025	NA	1600	NA	NA	4.05	0.000023	**NA**	**NA**	0.0092	**YES**	NSL	NO	NONBIO
TOLUENE	2/7	0.001 J	0.00344 J	18CSB0070002	0.002	0.002	NA	75	75	NA	5.45	0.000046	0.000046	**NA**	0.00063	NO	BSL	NO	NONBIO
TOTAL XYLENES	1/7	0.0023 J	0.00233 J	18CSB0070002	0.002	0.003	NA	10	65	41	1.4	0.00023	0.000036	0.000057	0.0017	NO	BSL	NO	BSL
PCBS (MG/KG)																			
AROCLOR-1260	1/1	0.0185 J	0.0185 J	18CCP0010002	NA	NA	NA	33	33	0.88	0.000332	0.00056	0.00056	0.021	**55.7**	NO	BSL	**YES**	ASL

Ecological effects quotients (EEQs) are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available unless the chemical concentration is similar to background. EEQs are not shaded if the chemical concentration is similar to background. Other cells are shaded if the chemical is retained as a COPC for plants or invertebrates or if the chemical is retained for food chain modeling.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - Data from Crane Basewide Background Report (Tetra Tech, 2001). Statistical evaluation in Section 5.
4 - Sources of ecological screening levels are presented in Table O.2.
5 - EEQs were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
6 - Chemicals with EEQs for birds or mammals greater than 1.0 or bioaccumulative chemicals without bird or mammal screening values are retained for food chain modeling.
7 - Risks from parameter considered by evaluating volatiles and PAHs.

COPC Selection Rationale:
ASL = Above Screening Level
BIO = Bioaccumulative chemical
BKG = Similar to Background
BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level

DRO - Diesel Range Organics
ERO - Extended Range Organics
NA - Not applicable/not available
J - Estimated concentration
mg/kg - Milligrams per kilogram
NSA - Naval Support Activity
PCB - Polychlorinated Biphenyl
SWMU - Solid Waste Management Unit

TABLE 7-17

SEDIMENT COPC SELECTION - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Detection	Maximum Detection	Sample of Maximum Detection	Average of Detections[1]	Average of All Results[2]	Ecological Screening Level[3]		EEQ[4]	Deletion or Selection of COPCs for Sediment Invertebrates	
							Value	Source		COPC (yes/no)?	Rationale
PETROLEUM HYDROCARBONS (MG/KG)											
DRO (C08-C28)	2/2	41.4	49.8	18CSD0020006	45.6	45.6	NA	NA	NA	NO	[5]
ERO (C08-C34)	2/2	68.8	91.7	18CSD0020006	80.3	80.3	#N/A	#N/A	NA	NO	[5]
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)											
2-METHYLNAPHTHALENE	1/2	0.0081 J	0.0081 J	18CSD0020006	0.008	0.005	0.0202	Region 5	0.40	NO	BSL
ACENAPHTHENE	1/2	0.00336 J	0.00336 J	18CSD0020006	0.003	0.003	0.00671	Region 5	0.50	NO	BSL
ACENAPHTHYLENE	1/2	0.0367	0.0367	18CSD0020006	0.037	0.019	0.00587	Region 5	**6.3**	**YES**	ASL
ANTHRACENE	1/2	0.0167	0.0167	18CSD0020006	0.017	0.009	0.0572	Region 5	0.29	NO	BSL
BENZO(A)ANTHRACENE	1/2	0.0903	0.0903	18CSD0020006	0.090	0.046	0.108	Region 5	0.84	NO	BSL
BENZO(A)PYRENE	2/2	0.004 J	0.17	18CSD0020006	0.087	0.087	0.15	Region 5	**1.13**	**YES**	ASL
BENZO(B)FLUORANTHENE	2/2	0.00734 J	0.217	18CSD0020006	0.112	0.112	10.4	Region 5	0.02	NO	BSL
BENZO(G,H,I)PERYLENE	2/2	0.00505 J	0.143	18CSD0020006	0.074	0.074	0.17	Region 5	0.84	NO	BSL
BENZO(K)FLUORANTHENE	2/2	0.00314 J	0.0829	18CSD0020006	0.043	0.043	0.24	Region 5	0.35	NO	BSL
CHRYSENE	1/2	0.145	0.145	18CSD0020006	0.145	0.074	0.166	Region 5	0.87	NO	BSL
DIBENZO(A,H)ANTHRACENE	1/2	0.0385	0.0385	18CSD0020006	0.039	0.020	0.033	Region 5	**1.17**	**YES**	ASL
FLUORANTHENE	2/2	0.00513 J	0.0302	18CSD0020006	0.018	0.018	0.423	Region 5	0.07	NO	BSL
INDENO(1,2,3-CD)PYRENE	2/2	0.00501 J	0.141	18CSD0020006	0.073	0.073	0.2	Region 5	0.71	NO	BSL
PHENANTHRENE	2/2	0.00251 J	0.0162	18CSD0020006	0.009	0.009	0.204	Region 5	0.08	NO	BSL
PYRENE	2/2	0.0049 J	0.0358	18CSD0020006	0.020	0.020	0.195	Region 5	0.18	NO	BSL

Ecological effects quotients (EEQs) are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available. Other cells are shaded if the chemical is retained as a COPC for sediment invertebrates.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - In order of preference: USEPA Region 5 Ecological Sediment Screening Levels (USEPA, 2003), followed by USEPA Region 3 BTAG Freshwater Sediment Screening Levels (USEPA, 2006).
4 - EEQs were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
5 - Risks from parameter considered by evaluating volatiles and PAHs.

COPC Selection Rationale:
ASL = Above Screening Level
BSL = Below Screening Level

COPC - Chemicals of Potential Concern
DRO - Diesel Range Organics
EEQ - Ecological Effect Quotient
ERO - Extended Range Organics
mg/kg - Milligrams per kilogram
NA - Not applicable/not available
NSA - Naval Support Activity
J - Estimated concentration

TABLE 7-18

TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO, SUBAREA C
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
METALS								
BARIUM	2.8E+00	1.4E+00	4.1E-01	2.6E-01	4.3E+00	2.2E+00	7.7E-01	4.8E-01
CHROMIUM	3.3E-01	5.5E-02	8.4E-02	3.5E-03	1.5E+00	2.6E-01	1.1E+00	4.7E-02
LEAD	4.0E-01	6.7E-02	3.6E-02	5.7E-03	2.1E+00	3.5E-01	5.2E-01	8.1E-02
POLYCYCLIC AROMATIC HYDROCARBONS								
ACENAPHTHYLENE	5.9E-04	5.9E-05	9.2E-06	1.7E-06	2.6E-02	2.6E-03	7.4E-04	1.4E-04
BENZO(B)FLUORANTHENE	1.4E-04	1.4E-05	2.0E-04	3.2E-06	1.5E-03	1.5E-04	4.4E-03	7.1E-05
BENZO(G,H,I)PERYLENE	1.3E-03	1.3E-04	1.7E-03	2.8E-05	1.9E-02	1.9E-03	5.5E-02	8.8E-04
INDENO(1,2,3-CD)PYRENE	1.4E-04	1.4E-05	1.5E-04	2.4E-06	3.0E-03	3.0E-04	8.8E-03	1.4E-04
PHENANTHRENE	3.0E-03	3.0E-04	5.1E-05	9.4E-06	2.2E-03	2.2E-04	5.8E-05	1.1E-05
POLYCLORINATED BIPHENYLS								
AROCLOR-1260	1.5E-03	1.5E-04	5.2E-04	5.2E-05	3.0E-01	3.0E-02	7.4E-01	7.4E-02

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

TABLE 7-19

STEP 3A EVALUATION FOR RISKS TO PLANTS AND INVERTEBRATES
SURFACE SOIL COPCs - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]		Maximum EEQ[2]		Step 3a Evaluation[3]		Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?	
							Step 3a Factors Considered in Evaluation				
			Plants	Invertebrates	Plants	Invertebrates	Plants	Invertebrates		Plants	Invertebrates
METALS (MG/KG)											
BARIUM	4/4	1940	500	330	3.9	5.9	Potential impacts limited to small area.		Acceptable	No	No
CHROMIUM	4/4	47.5	78	0.4	0.6	118.8	Not a COPC.	Less than the Canadian SQG of 78 mg/kg based on protection of plants and soil invertebrates.	Acceptable	No	No
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)											
2-METHYLNAPHTHALENE	1/3	0.0514	NA	29	NA	0.0018	Concentrations less than benchmarks for other PAHs. PAHs are typically not toxic to plants except at high soil concentrations.	Not a COPC.	Acceptable	No	No
BENZO(G,H,I)PERYLENE	2/3	0.0666	NA	18	NA	0.0037			Acceptable	No	No
INDENO(1,2,3-CD)PYRENE	1/3	0.011	NA	18	NA	0.00061			Acceptable	No	No
PHENANTHRENE	2/3	0.0128	NA	29	NA	0.00044			Acceptable	No	No
PYRENE	2/3	0.00779	NA	18	NA	0.00043			Acceptable	No	No
VOLATILES (MG/KG)											
2-BUTANONE	1/4	0.0218	NA	NA	NA	NA	Less than the screening levels for the other VOCs.	Less than the screening levels for the other VOCs.	Acceptable	No	No
ACETONE	4/4	0.152	NA	NA	NA	NA			Acceptable	No	No
METHYLENE CHLORIDE	3/4	0.0371	1600	NA	0.000023	NA	Not a COPC.		Acceptable	No	No

Footnotes:
1 Sources of ecological screening levels presented in Appendix J Table J.2.
2 Maximum detection divided by screening level.
3 See Section 7.6.3 for a more detailed Step 3a evaluation.

Acronyms:
COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quoti
NA = Not Available or Not Applicable
mg/kg = Milligrams per kilogram
NSA = Naval Support Activity
PAH = Polycyclic aromatic hydrocarbon
SQG = Soil Quality Guideline
SWMU = Solid Waste Management Unit
VOC = Volatile organic compound

TABLE 7-20

STEP 3A EVALUATION FOR RISKS TO SEDIMENT INVERTEBRATES
SEDIMENT COPCs - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]	Maximum EEQ[2]	Step 3a Evaluation			Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?
					Higher Effects Benchmarks		Step 3a Factors Considered in Evaluation[3]		
					Value	Source			
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)									
ACENAPHTHYLENE	1/2	0.0367	0.00587	6.3	0.128	PEL	Less than higher effects benchmark. Total PAHs less than threshold effects concentration.	Acceptable	No
BENZO(A)PYRENE	2/2	0.17	0.15	1.13	1.45	PEC		Acceptable	No
DIBENZO(A,H)ANTHRACENE	1/2	0.0385	0.033	1.17	0.13	PEL		Acceptable	No

Footnotes:
1 Sources of ecological screening level presented in Appendix J Table J.2.
2 Maximum detection divided by the screening level.
3 See Section 7.6.3 for a more detailed Step 3a evaluation.

Acronyms:
COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quotient
NA = Not available
NSA = Naval Support Activity
PAH = Polycyclic Aromatic Hydrocarbon
PEC = Probable Effects Concentration (MacDonald, et al., 2000)
PEL = Probable Effects Level (Buchman, 2008)
SWMU = Solid Waste Management Unit

TABLE 7-21

TERRESTRIAL FOOD CHAIN MODEL - TIER 2, STEP 3A SCENARIO, SUBAREA C
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
Chemical	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
METALS								
BARIUM	4.5E-01	2.2E-01	8.4E-02	5.3E-02	5.3E-01	2.6E-01	1.0E-01	6.3E-02
CHROMIUM	8.3E-02	1.4E-02	2.8E-02	1.2E-03	4.9E-01	8.4E-02	3.4E-01	1.4E-02
LEAD	1.1E-01	1.9E-02	1.5E-02	2.4E-03	7.1E-01	1.2E-01	1.6E-01	2.5E-02

EEQ - Ecological Effects Quotient
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

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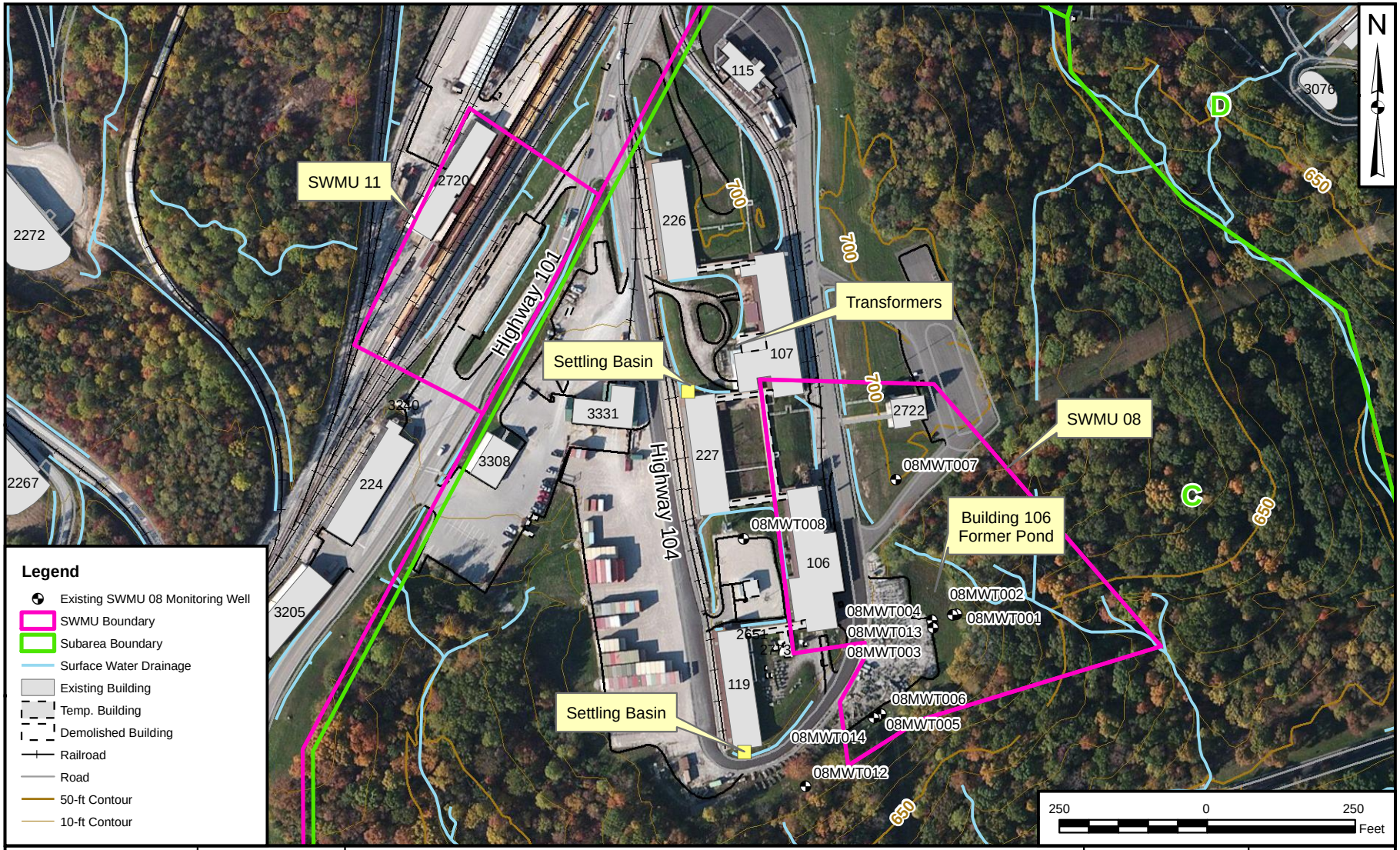

DRAWN BY	DATE
S. STROZ	07/17/09
CHECKED BY	DATE
T. EVANS	10/09/13
REVISED BY	DATE
J. ENGLISH	10/09/13
SCALE	
AS NOTED	

NAVFAC

SUBAREA C - INERT OPERATION AREA
SITE LAYOUT
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
___	F201
APPROVED BY	DATE
___	___
APPROVED BY	DATE
___	___
FIGURE NO.	REV
FIGURE 7-1	0

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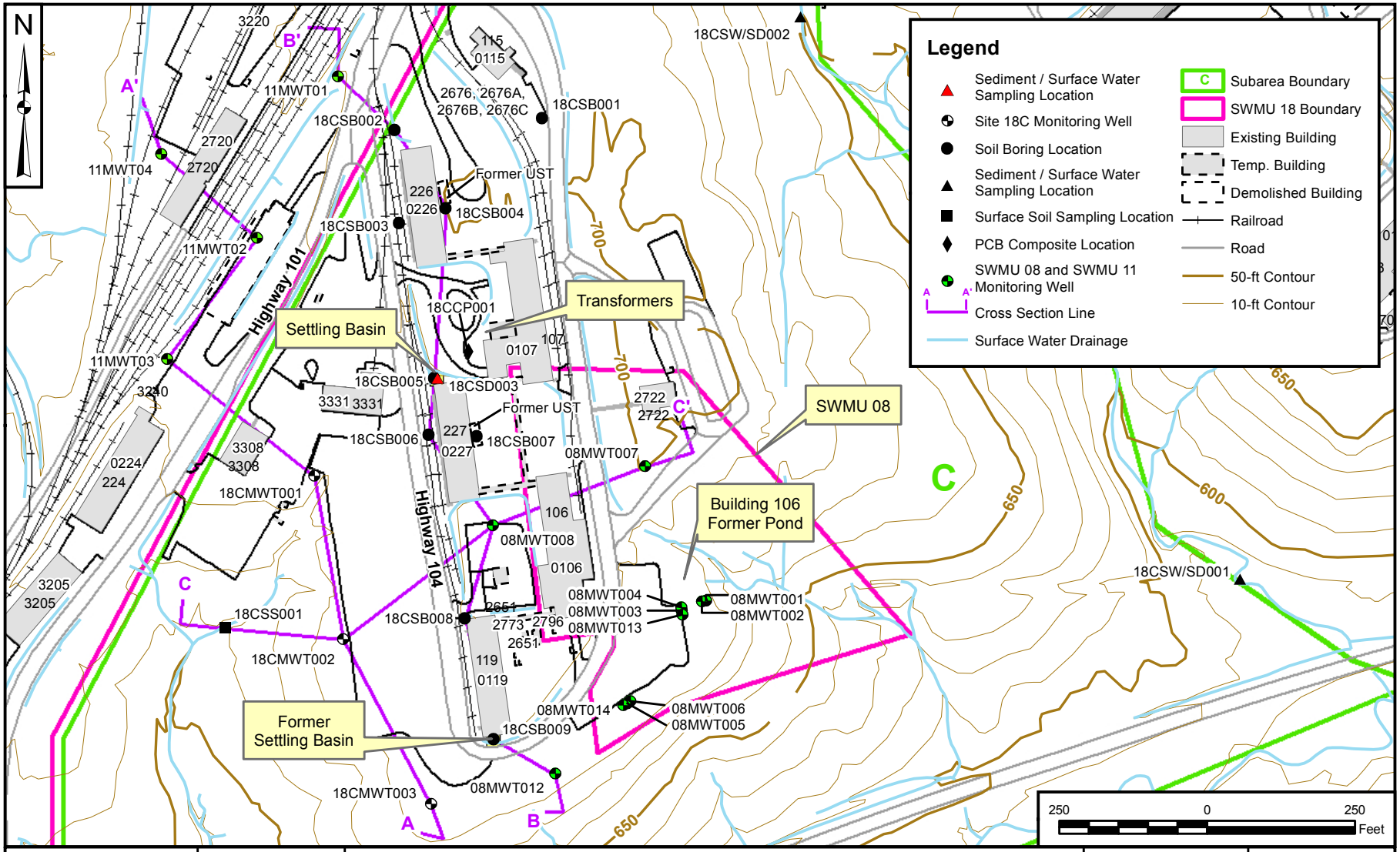

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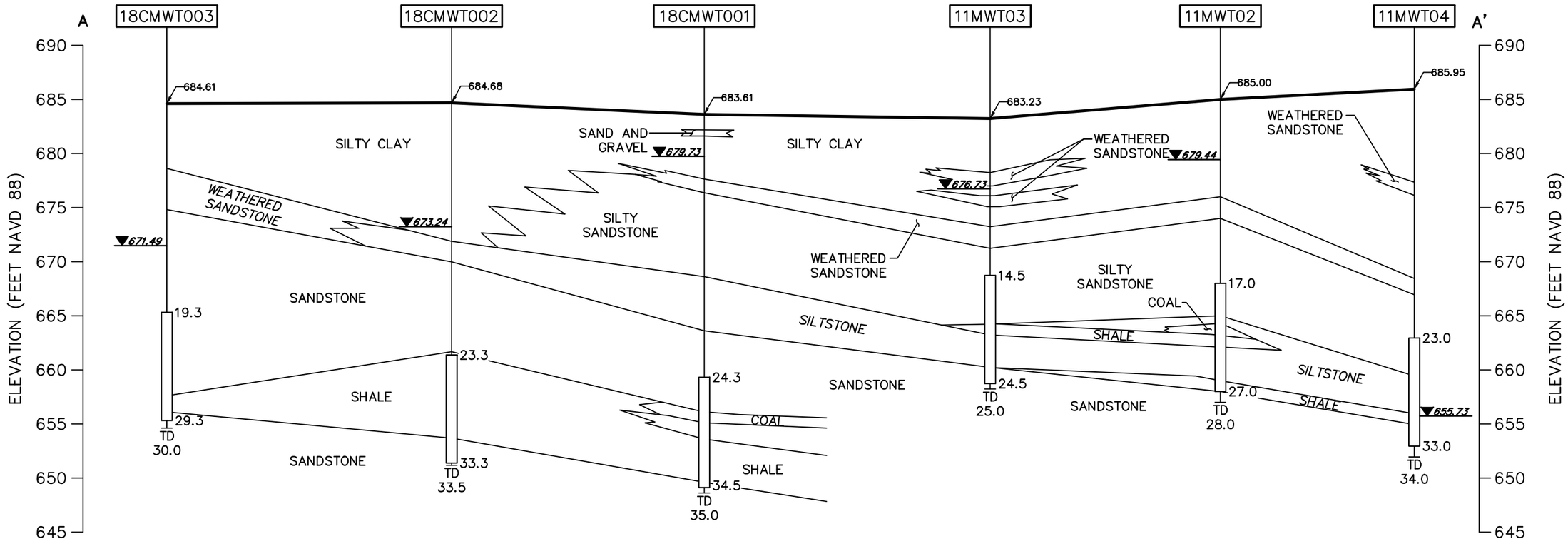
DATE	04/04/12
CHECKED BY	C. RUMER
DATE	11/21/12
REVISED BY	J. NOVAK
DATE	11/21/12
SCALE	AS NOTED

NAVFAC

SUBAREA C - INERT OPERATION AREA
GEOLOGIC CROSS SECTION LOCATIONS
SWMU 18 LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	1851
CTO NUMBER	F201
APPROVED BY	—
DATE	—
APPROVED BY	—
DATE	—
FIGURE NO.	FIGURE 7-2
REV	0



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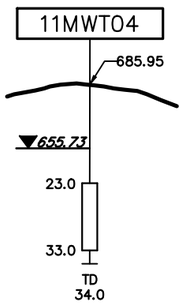

MONITORING WELL OR BORING NUMBER
GROUND SURFACE ELEVATION (FT NAVD 88)
GROUND SURFACE
WATER LEVEL (FT NAVD 88)
TOP OF MONITORED INTERVAL (FT BGS)
BOTTOM OF MONITORED INTERVAL (FT BGS)
TOTAL DEPTH OF WELL OR BORING (FT BGS)

ACRONYMS:

BGS	BELOW GROUND SURFACE
FT	FEET
NAVD88	NORTH AMERIAN VERTICAL DATUM 88

0 120 240
HORIZONTAL SCALE: 1" = 120'

0 10 20
VERTICAL SCALE: 1" = 10'

DRAWN BY NN	DATE 2/24/12	GEOLOGIC CROSS SECTION A–A' SWMU 18 – SUBAREA C NSA CRANE CRANE, INDIANA	CONTRACT NO. 1851
CHECKED BY	DATE		CTO NO.
REVISED BY	DATE		APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7–3 SIZE B REV. 0

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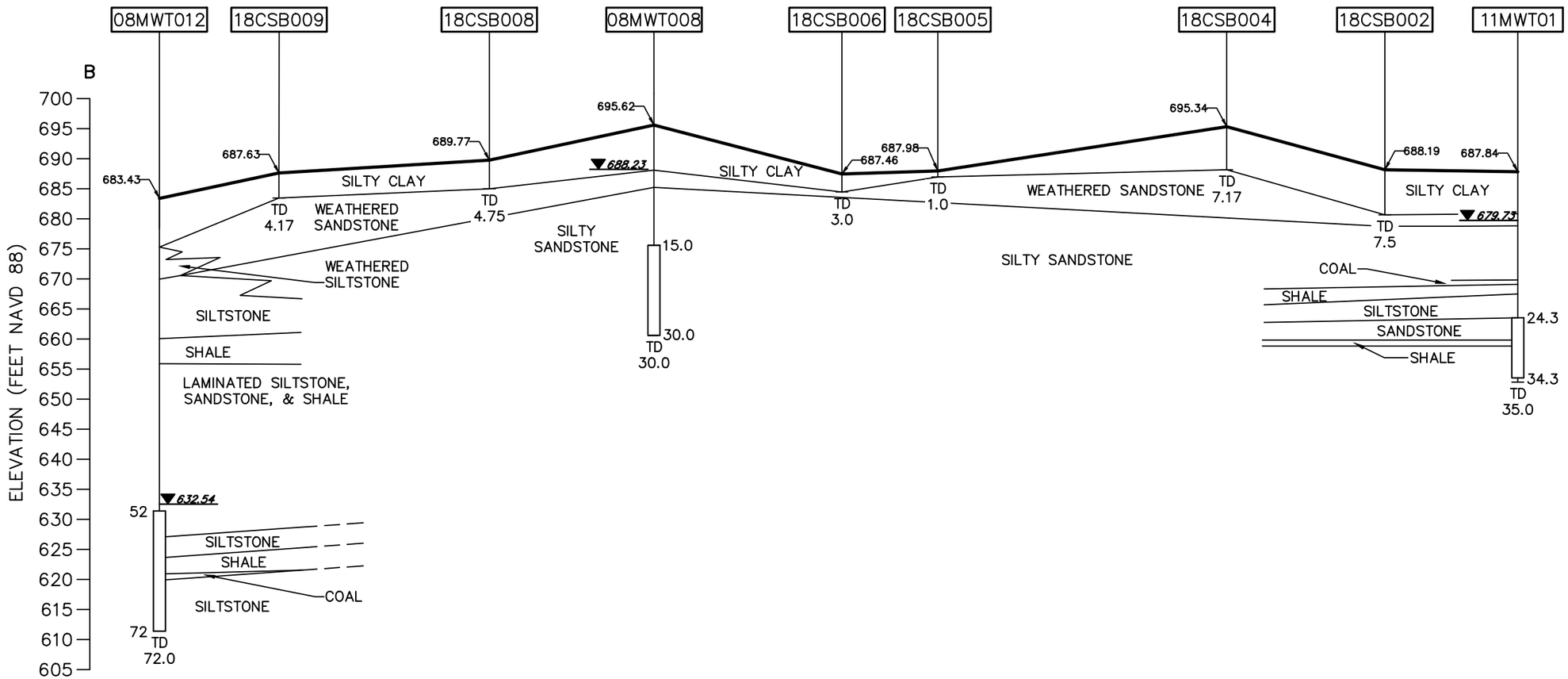

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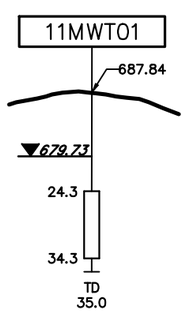

MONITORING WELL OR BORING NUMBER
GROUND SURFACE ELEVATION (FT NAVD 88)
GROUND SURFACE
WATER LEVEL (FT NAVD 88)
TOP OF MONITORED INTERVAL (FT BGS)
BOTTOM OF MONITORED INTERVAL (FT BGS)
TOTAL DEPTH OF WELL OR BORING (FT BGS)

ACRONYMS:

BGS	BELOW GROUND SURFACE
FT	FEET
NAVD88	NORTH AMERIAN VERTICAL DATUM 88

0 120 240
HORIZONTAL SCALE: 1" = 120'

0 20 40
VERTICAL SCALE: 1" = 20'

DRAWN BY NN	DATE 2/24/12	GEOLOGIC CROSS SECTION B–B' SWMU 18 – SUBAREA C NSA CRANE CRANE, INDIANA	CONTRACT NO. 1851
CHECKED BY	DATE		CTO NO.
REVISED BY	DATE		APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7–4 SIZE B REV. 0

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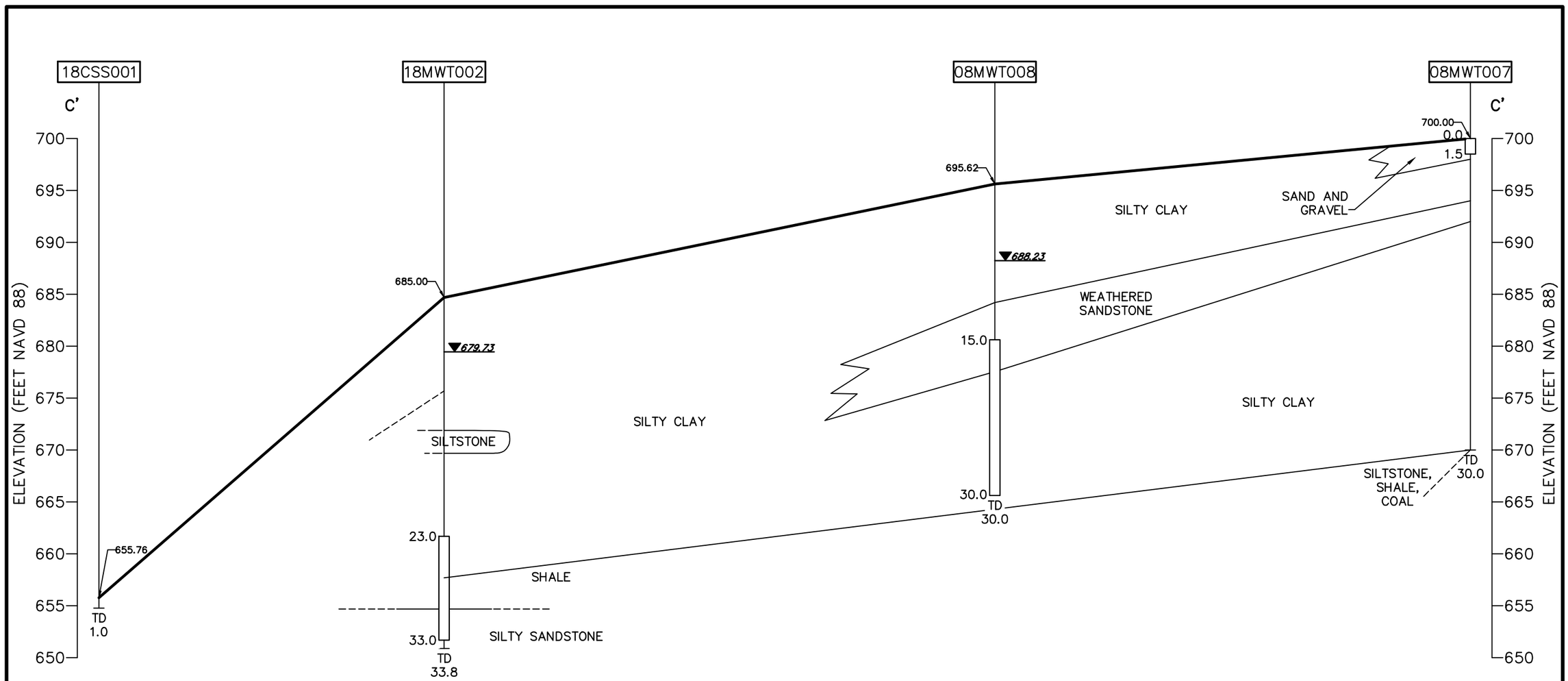

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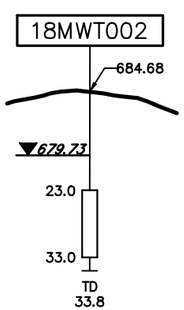

MONITORING WELL OR BORING NUMBER

GROUND SURFACE ELEVATION (FT NAVD 88)

GROUND SURFACE

WATER LEVEL (FT NAVD 88)

TOP OF MONITORED INTERVAL (FT BGS)

BOTTOM OF MONITORED INTERVAL (FT BGS)

TOTAL DEPTH OF WELL OR BORING (FT BGS)

ACRONYMS:

BGS	BELOW GROUND SURFACE
FT	FEET
NAVD88	NORTH AMERIAN VERTICAL DATUM 88

0 60 120

HORIZONTAL SCALE: 1" = 60'

0 10 20

VERTICAL SCALE: 1" = 10'

DRAWN BY NN	DATE 2/24/12	GEOLOGIC CROSS SECTION C–C' SWMU 18 – SUBAREA C NSA CRANE CRANE, INDIANA
CHECKED BY	DATE	
REVISED BY	DATE	
SCALE AS NOTED		

CONTRACT NO.	1851
CTO NO.	
APPROVED BY	DATE
DRAWING NO.	FIGURE 7–5
SIZE	B
REV.	0

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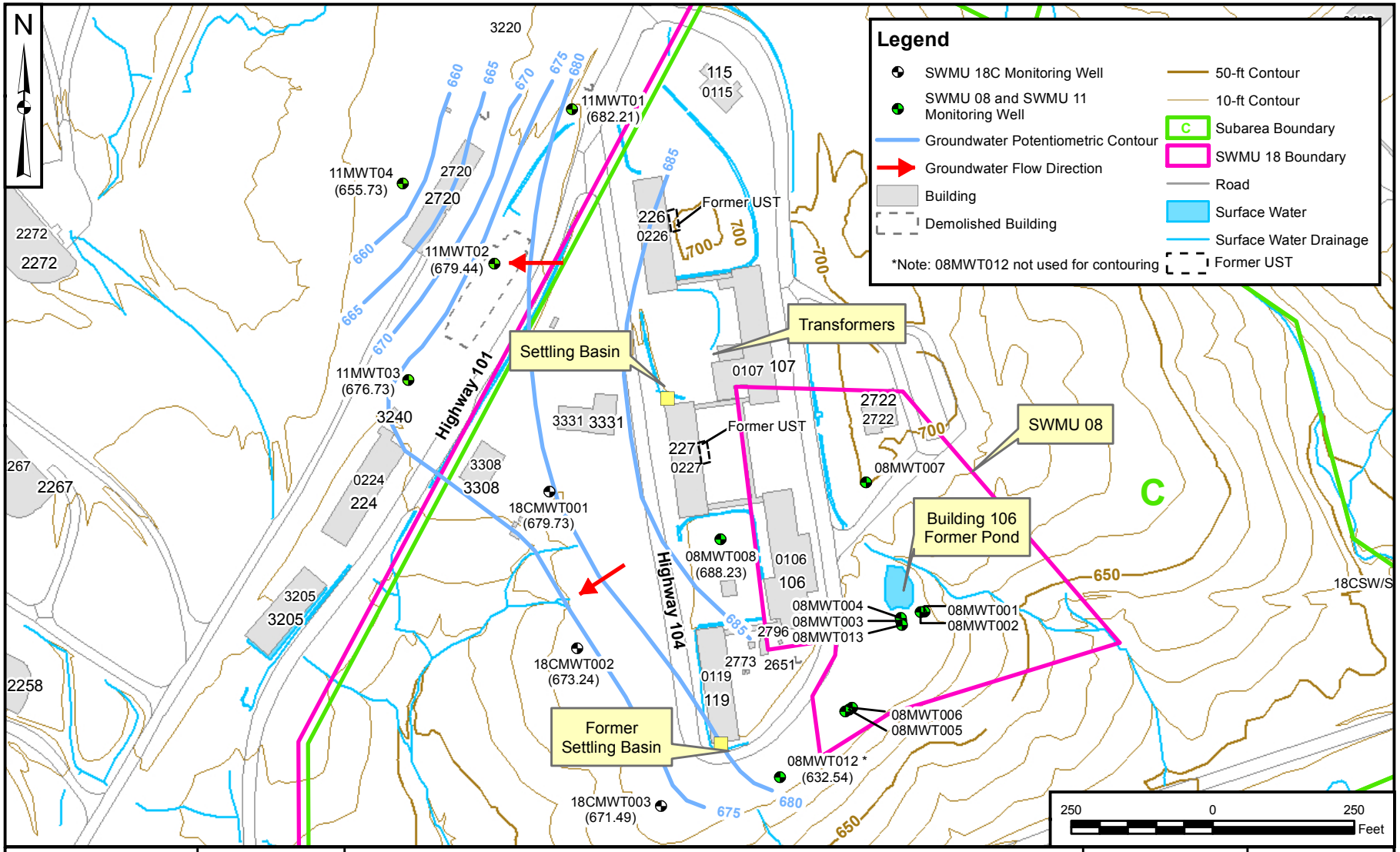

DRAWN BY J. ENGLISH	DATE 02/15/12
CHECKED BY C. RUMER	DATE 11/21/12
REVISED BY J. NOVAK	DATE 11/21/12
SCALE AS NOTED	

NAVFAC

SUBAREA C - INERT OPERATION AREA
GROUNDWATER POTENTIOMETRIC MAP - JANUARY 2012
SWMU 18 LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER 1851	CTO NUMBER F201
APPROVED BY —	DATE —
APPROVED BY —	DATE —
FIGURE NO. FIGURE 7-6	REV 0

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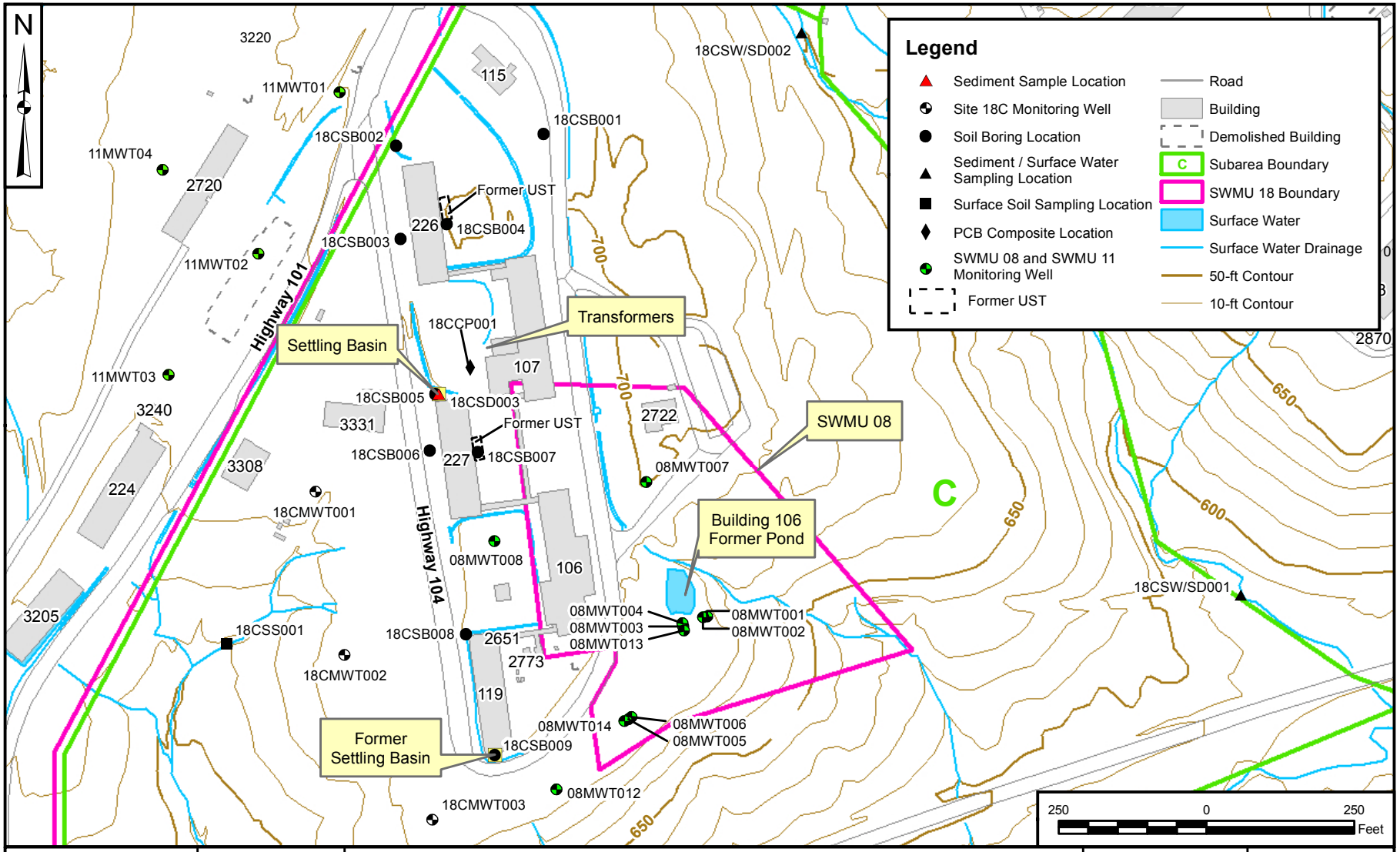

DRAWN BY J. ENGLISH	DATE 02/15/12	SUBAREA C - INERT OPERATION AREA SAMPLE LOCATIONS SWMU 18 LOAD & FILL AREA NSA CRANE CRANE, INDIANA	CONTRACT NUMBER 1851 / CTO NUMBER F201
CHECKED BY C. RUMER	DATE 11/21/12		APPROVED BY — DATE —
REVISED BY J. NOVAK	DATE 11/21/12		APPROVED BY — DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 7-7 / REV 0

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18CSB002 [0 - 2] [5 - 7]
Inorganics (MG/KG)
CHROMIUM **14.6 [H] [E]** 21

18CSB003 [0 - 2]
Inorganics (MG/KG)
CHROMIUM **17 [H] [E]**
Volatile Organics (MG/KG)
METHYLENE CHLORIDE **0.0266 [H]**

18CSB005 [0 - 2]
Inorganics (MG/KG)
CHROMIUM **97.5 [H] [E]**
LEAD **117 [E]**

18CSD003 [0 - 0.5]
Inorganics (MG/KG)
CHROMIUM **9660 J [H]**
LEAD **1310 J [H]**
Volatile Organics (MG/KG)
No Exceedances

18CSB006 [0 - 2] [2 - 3]
Inorganics (MG/KG)
BARIUM **130 [E]** 41.8
CHROMIUM **19.7 [H] [E]** 25.9
Volatile Organics (MG/KG)
TRICHLOROETHENE 0.00216 J **0.00837 [H]**

18CSS001 [0 - 2]
Inorganics (MG/KG)
CHROMIUM **47.5 [H] [E]**
LEAD **32.8 [H] [E]**
Volatile Organics (MG/KG)
METHYLENE CHLORIDE **0.0313 [H]**

18CSB001 [0 - 2] [2 - 4]
Petroleum Hydrocarbons (MG/KG)
DRO (C08-C28) 183 **437 [H]**
ERO (C08-C34) 224 **463 [H]**

18CSB004 [0 - 2] [5 - 7]
Petroleum Hydrocarbons (MG/KG)
No Exceedances

18CSD002 [0 - 0.5]
PAHs (MG/KG)
ACENAPHTHYLENE **0.0367 [H] [E]**
BENZO(A)PYRENE **0.17 [H] [E]**
BENZO(B)FLUORANTHENE **0.217 [H]**
DIBENZO(A,H)ANTHRACENE **0.0385 [H] [E]**

18CCP001 [0 - 2]
PCBs (MG/KG)
AROCLOR-1260 **0.0185 J [E]**

18CSB007 [0 - 2] [4 - 6]
PAHs (MG/KG)
NAPHTHALENE **0.0109 [H]** 0.00399 U
Petroleum Hydrocarbons (MG/KG)
DRO (C08-C28) 33.7 **4010 [H]**
ERO (C08-C34) 54.7 **4030 [H]**

18CSB008 [0 - 2] [3 - 5]
Inorganics (MG/KG)
CHROMIUM **15.6 [H] [E]** 20
LEAD **11.2 [H] [E]** 17.2

18CSB009 [0 - 2] [2 - 4]
Inorganics (MG/KG)
BARIUM **1940 [H] [E]** **253 [E]**
CHROMIUM **26.8 [H] [E]** 9.45
LEAD **16.6 [E]** 5.35
Volatile Organics (MG/KG)
METHYLENE CHLORIDE **0.0371 [H]** 0.00419 U

18CSD001 [0 - 0.5]
PAHs (MG/KG)
No Exceedances

18CMWT003 [2 - 4]
Inorganics (MG/KG)
CHROMIUM **14.5 [H] [E]**
Volatile Organics (MG/KG)
No Exceedances

Settling Basin
Transformers
SWMU 08
Building 106
Former Pond
Former Settling Basin
HW339
HW003
HW370
HW105
HW107
HW045
HW011
2272
2270
2267
2258
2722
115
226
107
227
106
119
142
3076
185
109
144A
2707
143
186
99
100
2870
650
700
600
D
C

Legend

- Soil Sample Locations
- Subarea Boundary
- SWMU 18 Boundary
- Existing Building
- Temp. Building
- Demolished Building
- Railroad
- Road
- Surface Water Drainage
- 50-ft Contour
- 10-ft Contour

Note:
Each tag is headlined with a Sample ID and depth interal in feet below ground surface
DRO - Diesel Range Organics
HW - Highway
J - Estimated Concentration
mg/kg - Milligrams per kilogram
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
SWMU - Solid Waste Management Unit
TPH - Total Petroleum Hydrocarbons
U - Non-Detect
Bolded values represent exceedances of Human Health [H] or Ecological Screening Levels [E], and background levels.

200 0 200 Feet

DRAWN BY	DATE
J. NOVAK	09/06/12
CHECKED BY	DATE
C. RUMER	10/09/13
REVISED BY	DATE
J. ENGLISH	10/09/13
SCALE	
AS NOTED	

NAVFAC

SUBAREA C - INERT OPERATION AREA
EXCEEDANCES OF ANALYTES IN SOIL AND SEDIMENT
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO.	REV
FIGURE 7-8	0

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N

Settling Basin

Transformers

SWMU 08

Building 106
Former Pond

Former
Settling Basin

18CMWT001
Total Inorganics (UG/L)
ARSENIC 1.79 J
Filtered Inorganics (UG/L)
ARSENIC 1.62 J
CHROMIUM 2.94

18CMWT002
Volatile Organics (UG/L)
BENZENE 0.286 J
Total Inorganics (UG/L)
CADMIUM 0.898 J
CHROMIUM 1.6 J

18CMWT003
Filtered Inorganics (UG/L)
ARSENIC 1.71 J
CHROMIUM 4.1 J

08MWT008
Total Inorganics (UG/L)
ARSENIC 1.24
CHROMIUM 1.18
Volatile Organics (UG/L)
TRICHLOROETHENE 0.568

08MWT012
Total Inorganics (UG/L)
ARSENIC 1.28

D

C

Legend

- Monitoring Well
- Subarea Boundary
- SWMU 18 Boundary
- Existing Building
- Temp. Building
- Demolished Building
- Railroad
- Road
- Surface Water Drainage
- 50-ft Contour
- 10-ft Contour

Note:
Each tag is headlined by a Sample ID.
HW - Highway
J - Estimated Concentration
SWMU - Solid Waste Management Unit
µg/L - Micrograms per Liter
Bolded values represent exceedances of Human Health Screening Levels.

200 0 200 Feet

DRAWN BY	DATE
J. NOVAK	09/06/12
CHECKED BY	DATE
C. RUMER	10/01/13
REVISED BY	DATE
J. ENGLISH	10/01/13
SCALE	
AS NOTED	

NAVFAC

SUBAREA C - INERT OPERATION AREA
EXCEEDANCES OF ANALYTES IN GROUNDWATER
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER 1851	CTO NUMBER F201
APPROVED BY —	DATE —
APPROVED BY —	DATE —
FIGURE NO. FIGURE 7-9	REV 0

FIGURE 7-10

CONTAMINANT EXPOSURE PATHWAY ANALYSIS

SWMU 18 SUBAREA C - INERT OPERATIONS AREA

NSA CRANE , INDIANA

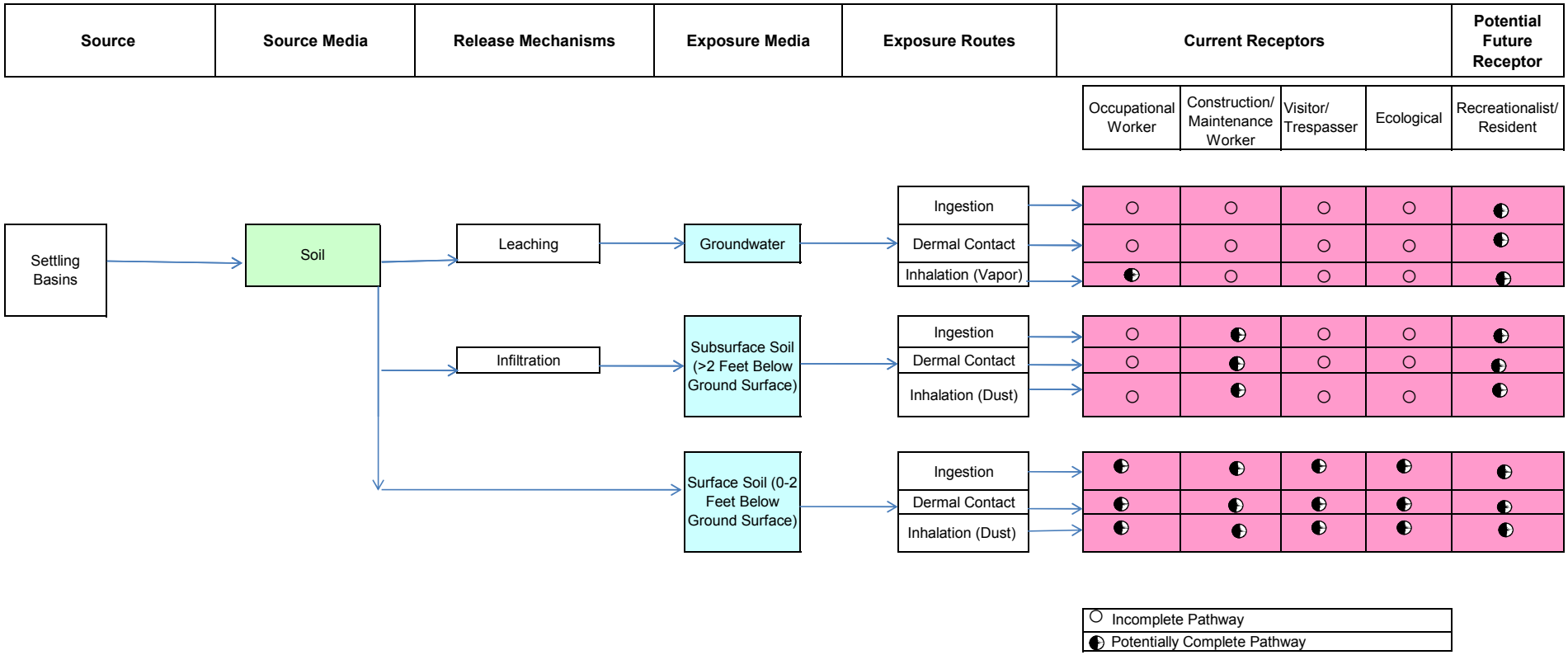


FIGURE 7-11a

SUMMARY OF CUMULATIVE HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

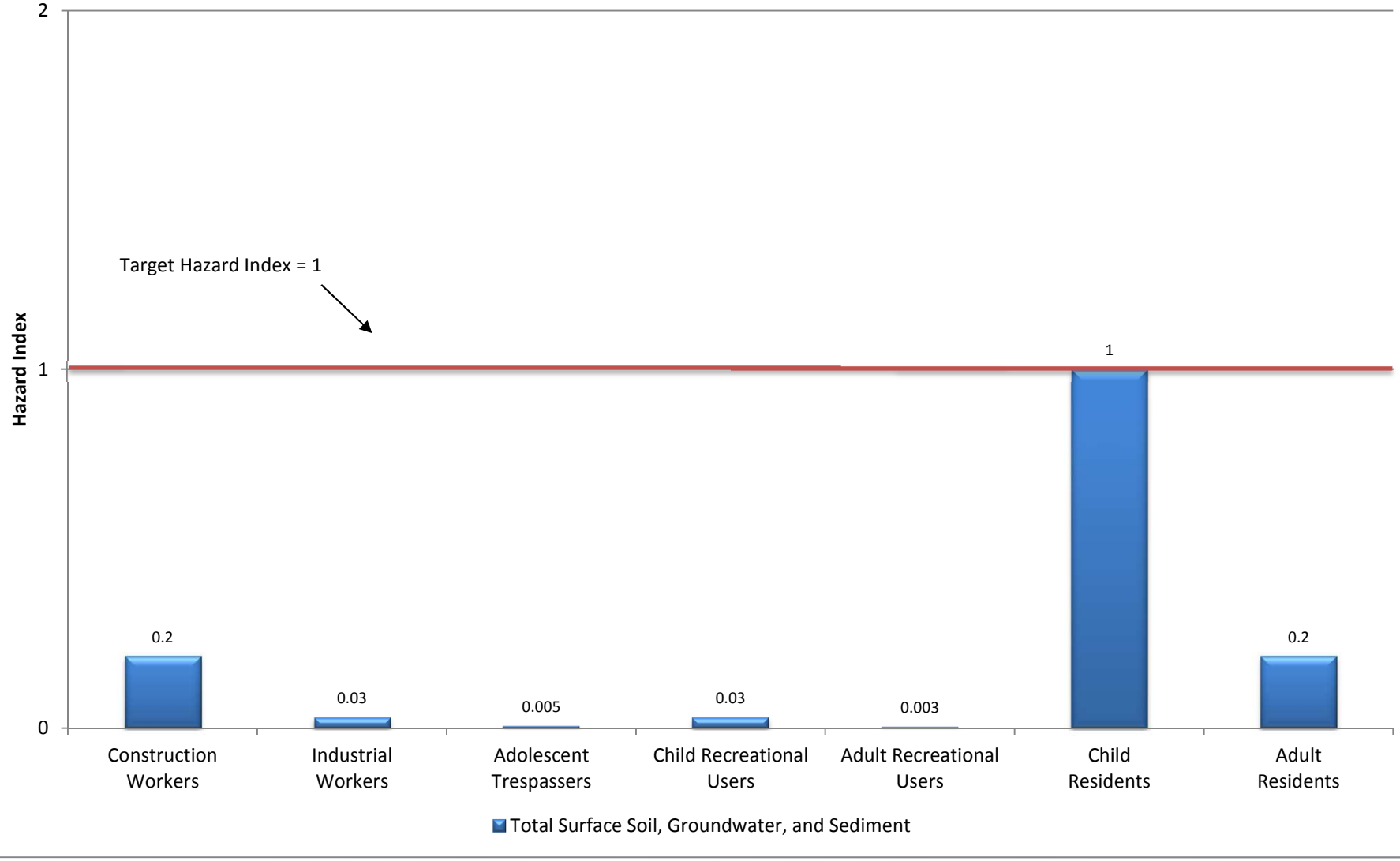


FIGURE 7-11b

SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

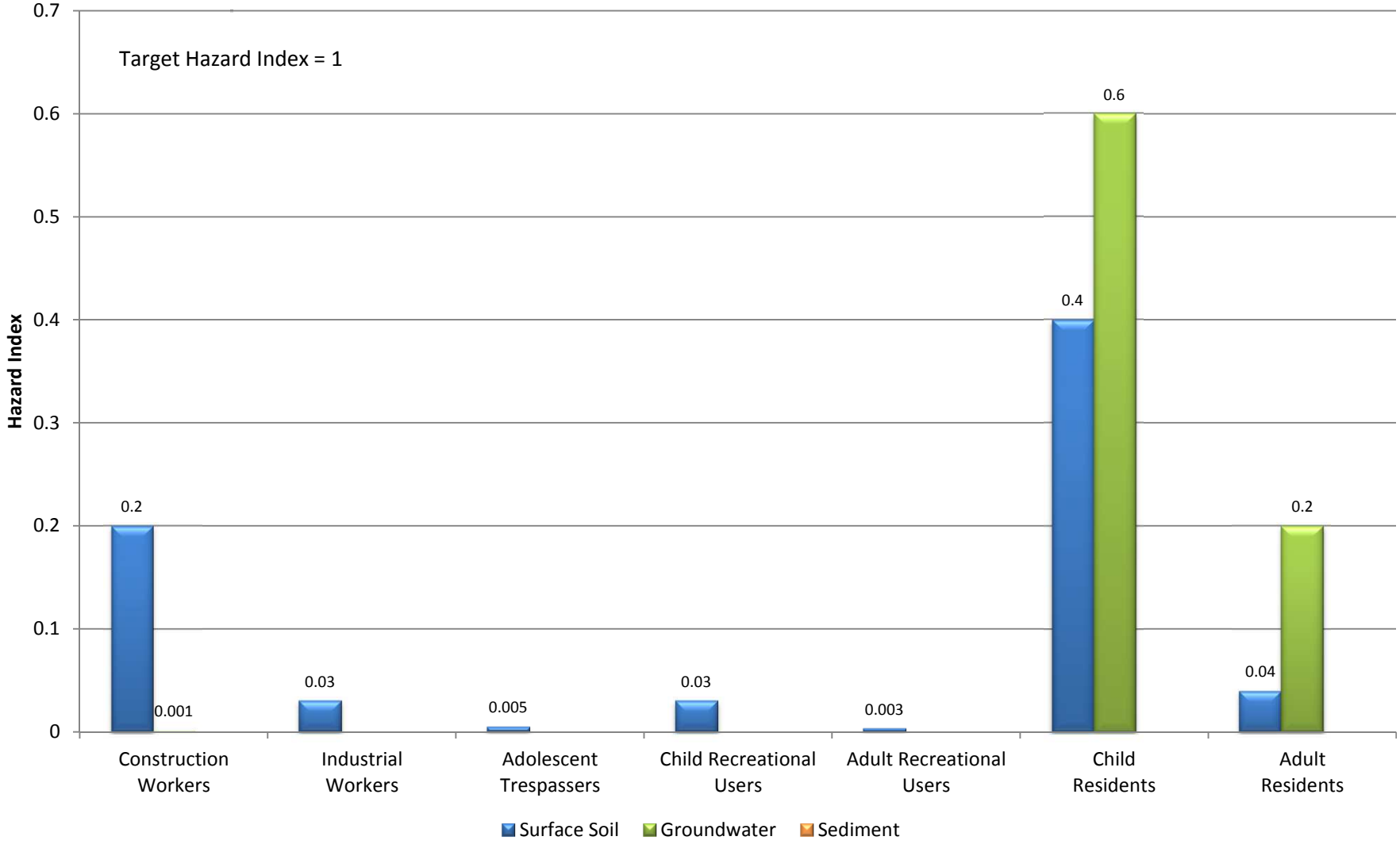


FIGURE 7-11c

SUMMARY OF CUMULATIVE HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

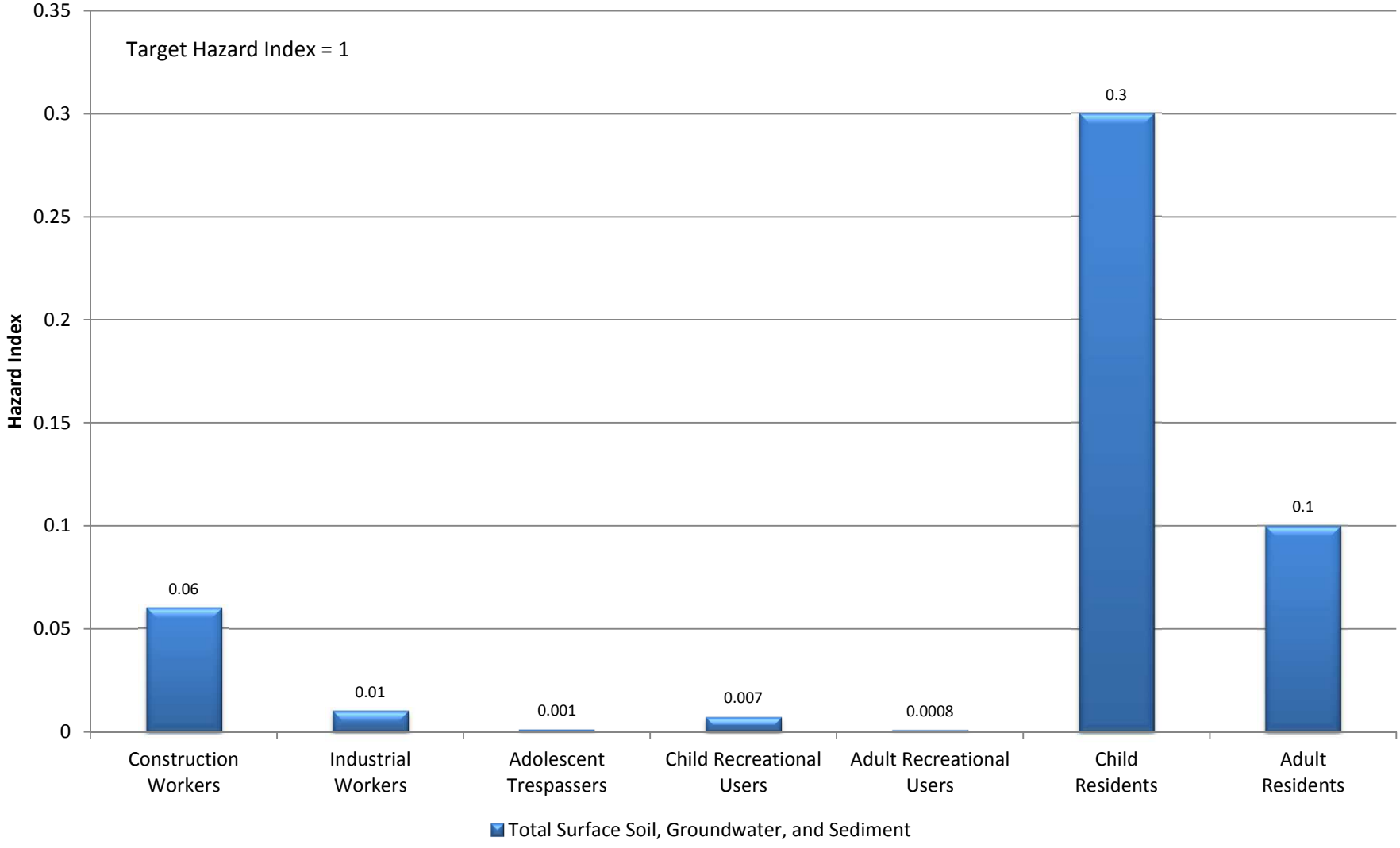


FIGURE 7-11d

SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

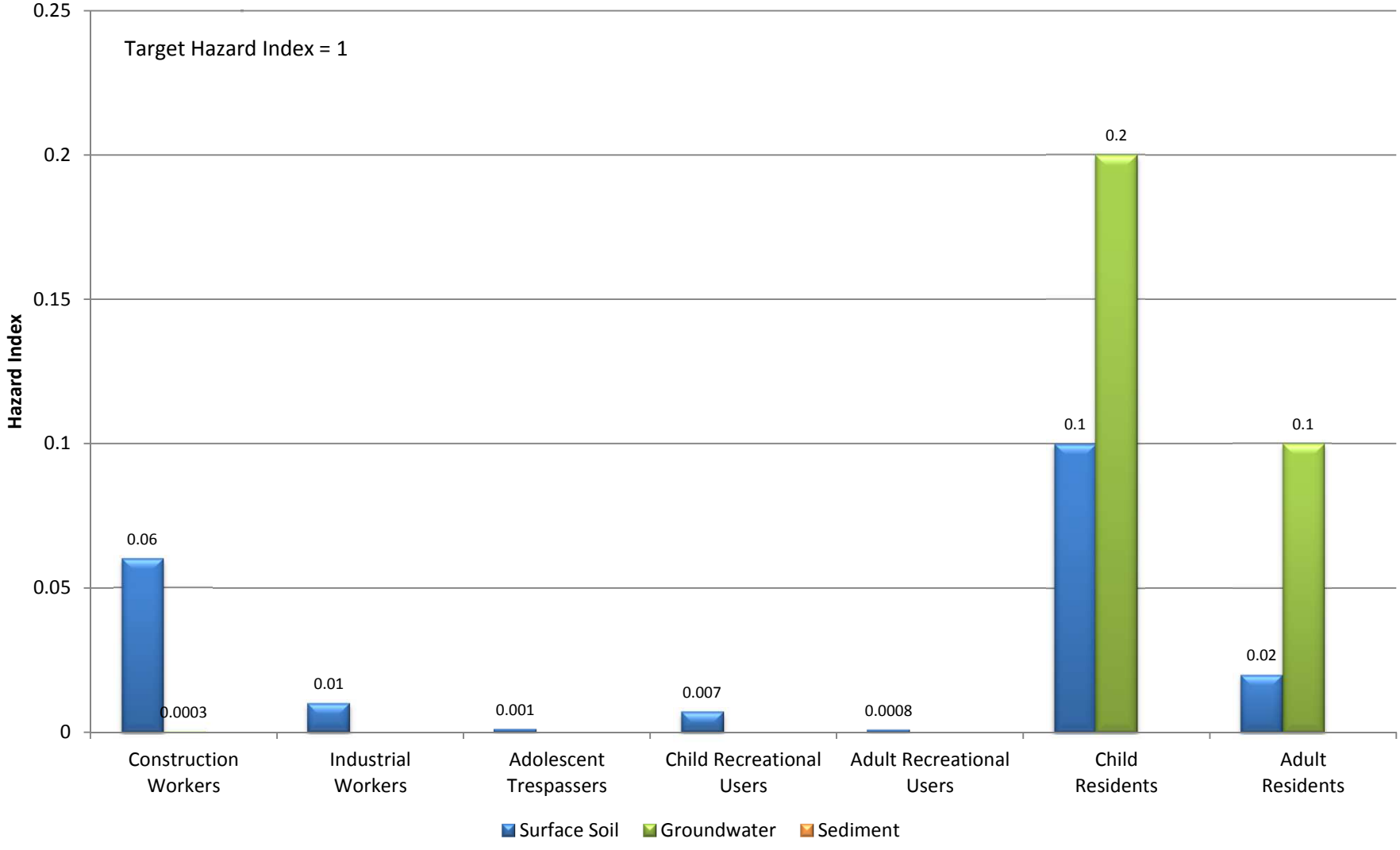


FIGURE 7-12a

SUMMARY OF CUMULATIVE CANCER RISKS - REASONABLE MAXIMUM EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

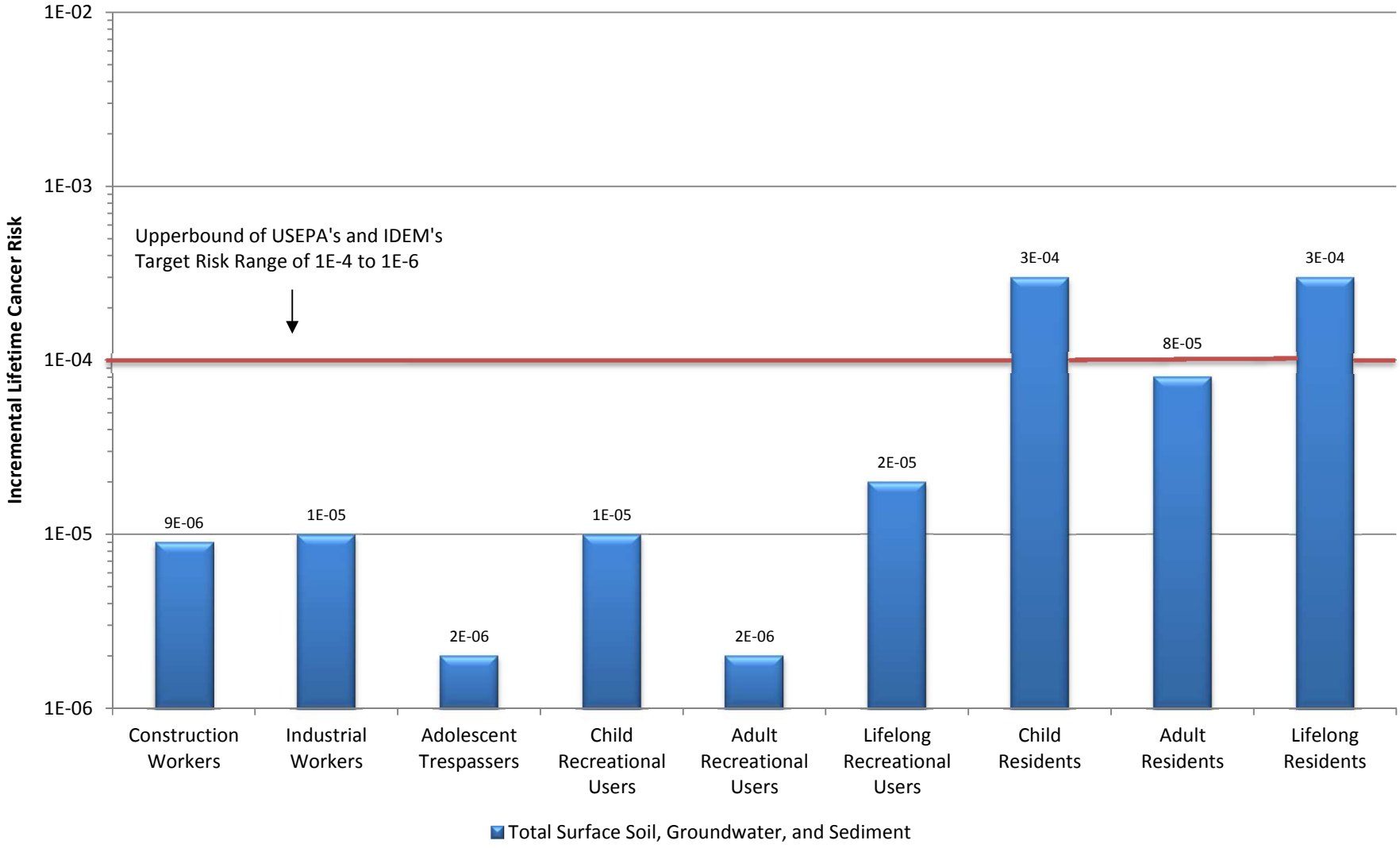


FIGURE 7-12b

SUMMARY OF MEDIA-SPECIFIC CANCER RISKS - REASONABLE MAXIMUM EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

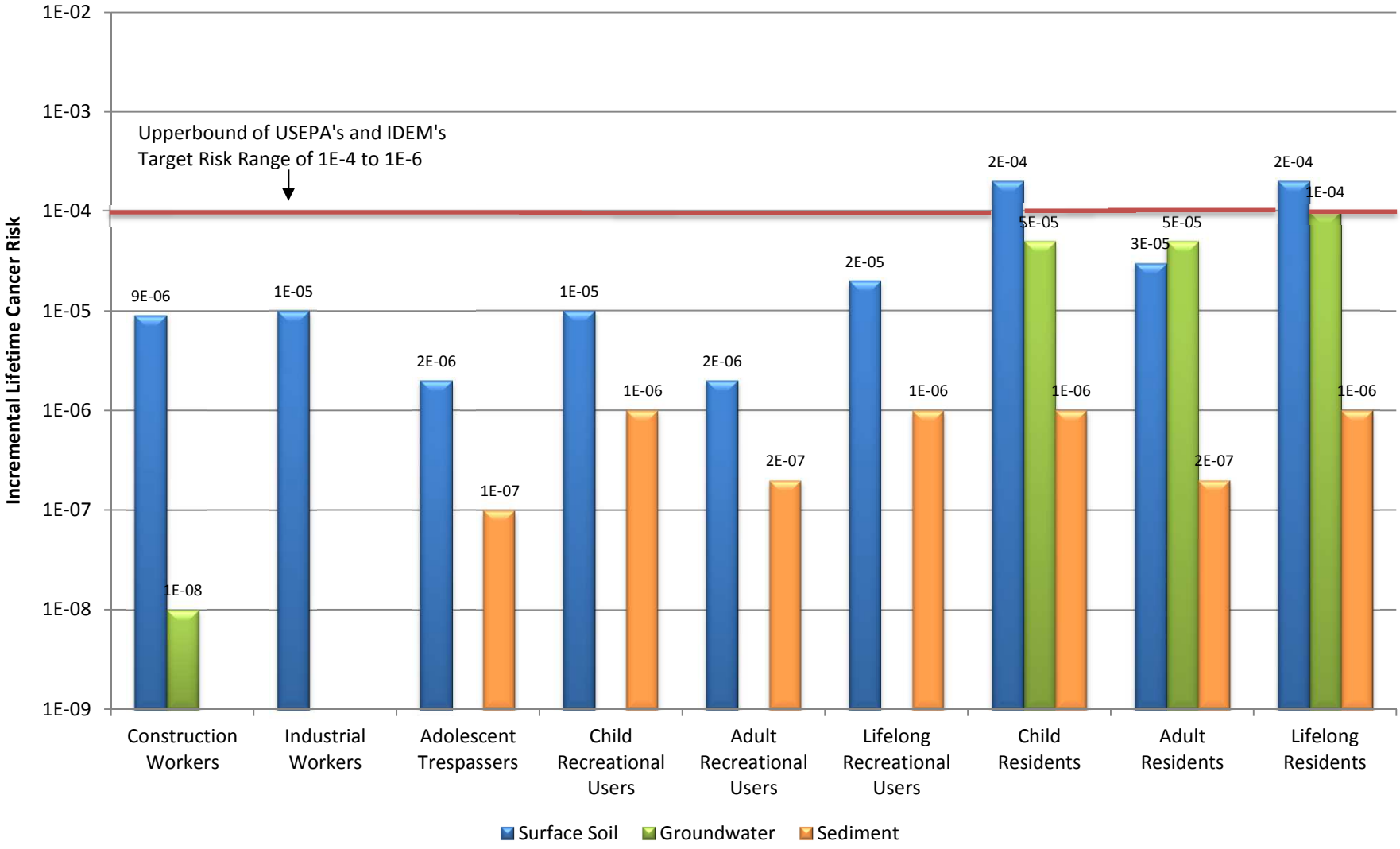


FIGURE 7-12c

SUMMARY OF CUMULATIVE CANCER RISKS - CENTRAL TENDENCY EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

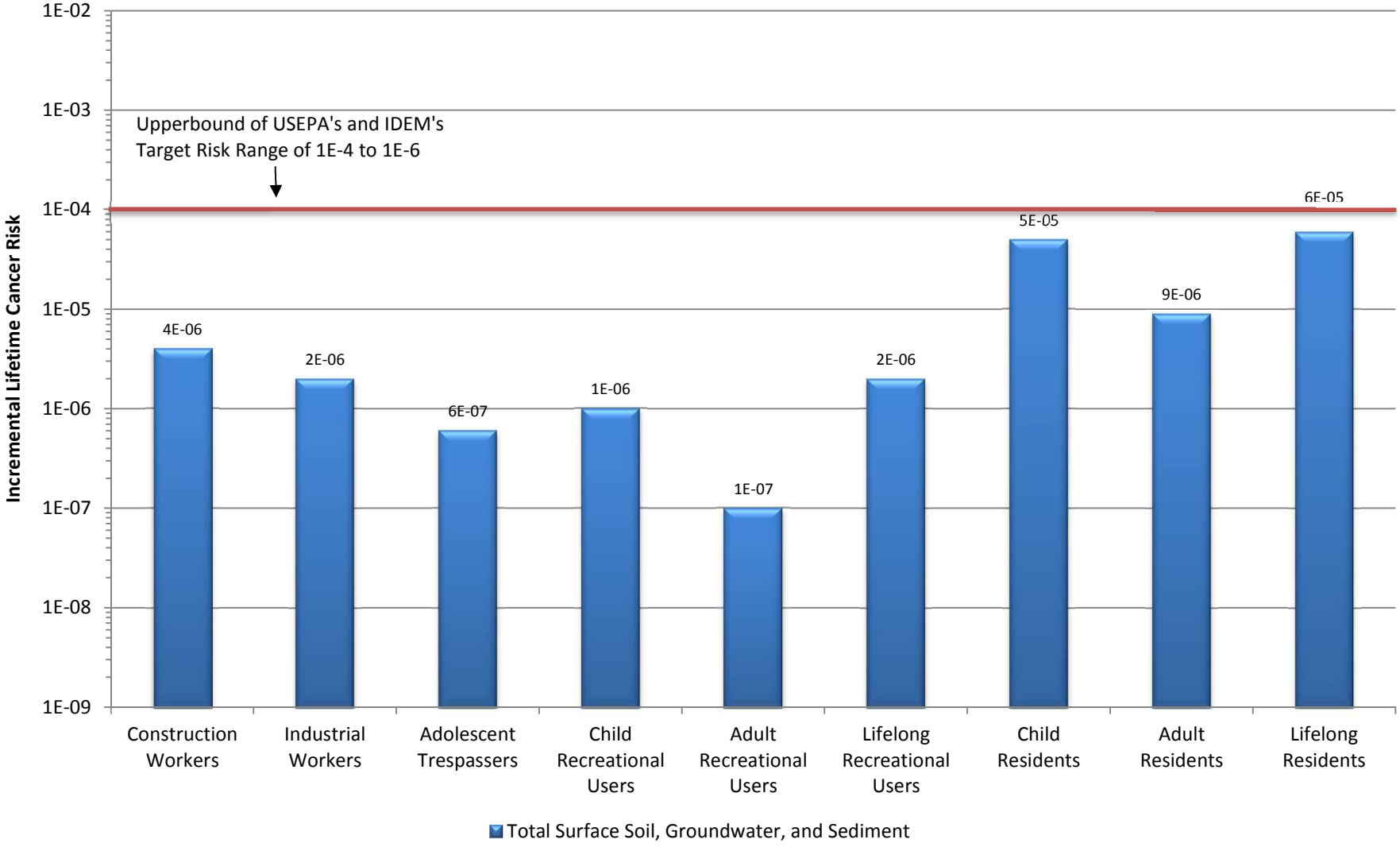
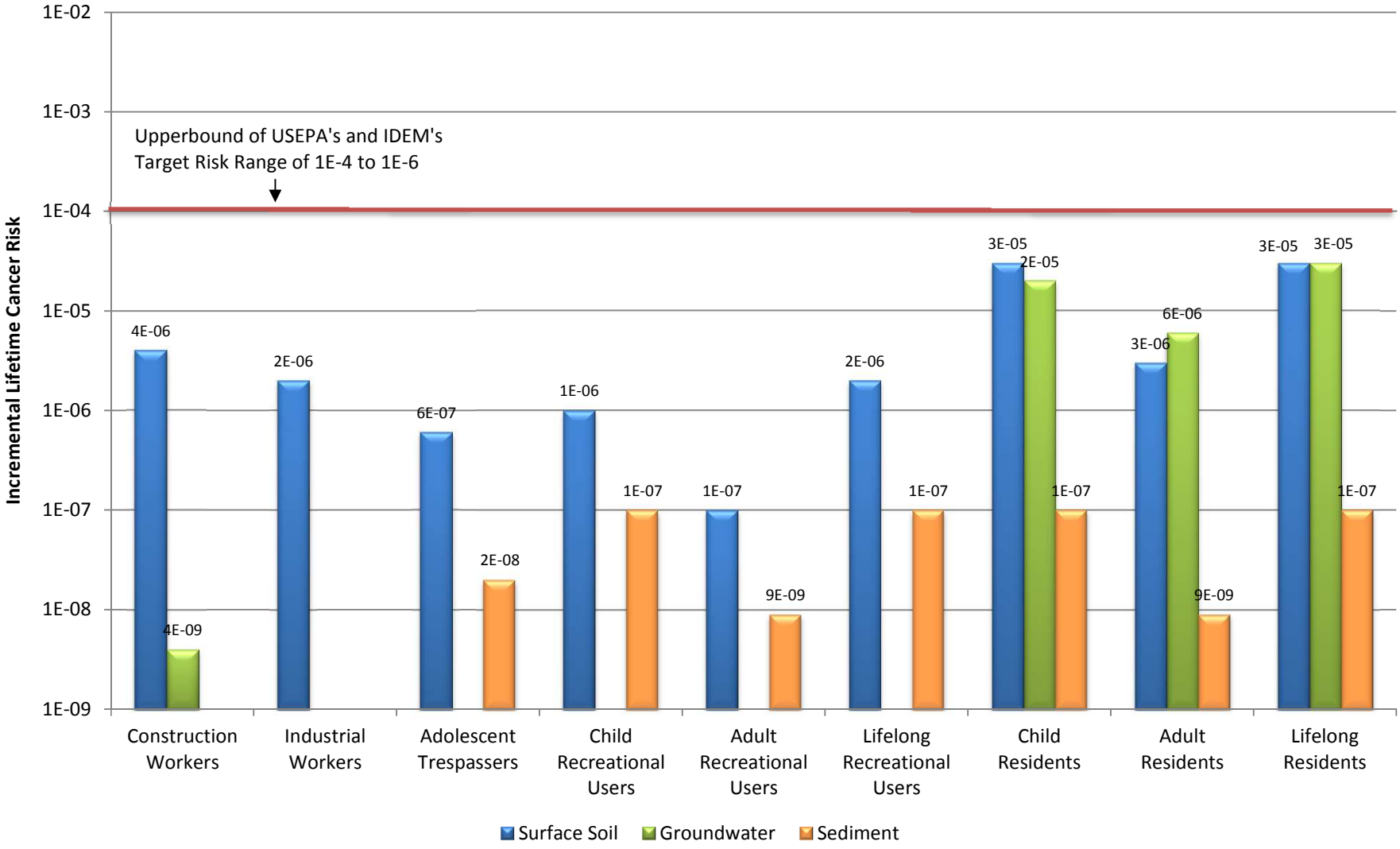


FIGURE 7-12d

SUMMARY OF MEDIA-SPECIFIC CANCER RISKS - CENTRAL TENDENCY EXPOSURES - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA



8.0 SUBAREA F – BUILDINGS 2084, 2085, AND 2540 AREA

8.1 SUBAREA F DESCRIPTION

Subarea F – Buildings 2084, 2085, and 2540 – is located in the southeastern portion of SWMU 18 along Highway 101 (Figure 8-1). Subarea F consists of three large buildings (Buildings 2084, 2085, and 2540), several small buildings and support structures (e.g., ASTs), and the adjacent land area. Buildings 2084 and 2085 are one-story concrete structures, and Building 2540 is constructed of brick. Floor drains were located throughout Building 2084, and the building was connected to a settling basin located southeast of Building 2084; the settling basin discharges to the sanitary sewer system. Machinery and operations at Building 2084 consisted of a paint booth, drying oven, vacuum system, sand room, and plaster loading room. Four trenches in the plaster loading room drained to the south side of the building. The ditches were lined with metal in 1961. A ditch was located on the southern side of the building.

Other structures in the area include Building 3323 (research and development offices), Building 199 (boiler house) with two 30,000-gallon ASTs in secondary containment, and Building 3317 (weather structure). Building 199 is a concrete structure housing three boilers, with drains at the building connected to a nearby sump. Multiple small ancillary buildings (Buildings 2160, 2932, 2933, 2934, 2935, and 2938) supported operations in this subarea; these buildings did not handle explosives. These buildings have been demolished (Tetra Tech, 2011).

Grass covers the area directly around and between the buildings, and a wooded area covers the remainder of the subarea, which is the hill slope to the north. The buildings in Subarea F are located along a ridge at an elevation of approximately 700 feet. Surface water runoff from the area north of Highway 101 drains to the north, and runoff from south of Highway 101 drains to the south. Surface water runoff from the tributaries north and south of the subarea feed tributaries to Boggs Creek.

8.1.1 Historical Use

Buildings 2084 and 2085 were built in 1946 and were originally used for ammunition engineering and inert materials storage, respectively. Building 2084 has been used for a number of functions through the years, including housing inert materials loading (dummy loads), plastic molding, ordnance engineering and now a general storage function. Building 2540 was built in 1945 and was originally used for ordnance engineering and development. The building is the largest at SWMU 18 and has an area of 29,483 square feet.

8.1.2 Known Releases/Previous Investigations

In 1997, four 5,000-gallon and one 10,000-gallon fuel oil USTs were removed from behind Building 199 (Sverdrup, 1997). Approximately 345 cubic yards of petroleum-impacted soil were also removed and disposed of at the Crane landfill. Sverdrup (1997) concluded that TPH concentrations were "below levels that are usually indicative of environmental soil contamination [i.e., TPH – 100 parts per million (ppm)]." The maximum TPH concentration of 218 mg/kg was collected from the bottom of UST # 3 excavation. This concentration is less than the current IDEM Risk Integrated System of Closure (RISC) value of 230 mg/kg for residential use. There are no other known releases of hazardous substances or petroleum products at Subarea F.

8.2 GEOLOGY/HYDROGEOLOGY

The geology at Subarea F was interpreted from information gathered during the RFI for SWMU 18. Soil boring logs from SWMU 18 Subarea F are provided in Appendix D. Figure 8-2 shows the location of the geologic cross section (A-A') through Subarea F. The geologic cross section is illustrated on Figure 8-3.

The overburden in the area of Building 2540 is fine-grained silts and clays to approximately 5 feet bgs and then approximately 1 foot of silty sand. Boring refusal was encountered in this area at 7 feet and is assumed to be the top of bedrock. In the area of Building 199, silty sand is present to 7 feet bgs and overlies 7 feet of fine-grained silts and clays. Weathered shale occurs at 14 to 16.5 feet bgs. Competent bedrock consists of units of the Pennsylvanian Raccoon Creek Group. Shale, siltstone, and coal occur to 26 feet bgs. Sandstone occurs from 26 feet bgs to the total boring depth of 30 feet.

Only one monitoring well (18FMWT001) was installed at Subarea F during the RFI. Water-bearing fractures were encountered in the well borehole beginning at depths between 19 to 21 feet bgs. The static water level in the monitoring well was 14 feet bgs, suggesting semi-confined conditions. Figure 8-4 illustrates the groundwater potentiometric contours at Subarea F. The figure includes groundwater elevations from Subareas G, H, and J. Groundwater flow in the area of Building 199 is to the south-southeast, toward the drainage south of Subarea F.

8.3 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contaminants at Subarea F was evaluated based on environmental samples collected during the 2011 RFI investigation. A summary of samples collected is provided in Table 2-1, and the locations of the samples are shown on Figure 8-5. A summary of soil sample detections is provided in Tables 8-1 and 8-2. Screening values are also provided in the summary tables for

comparison of the results to regulatory criteria. The distribution of analytes detected in soil at Subarea F is shown on Figure 8-6. Appendix G contains the full set of validated laboratory results. The following subsections discuss the nature and extent of contaminants detected in media at Subarea F.

8.3.1 Soil Results

Table 8-1 summarizes results for parameters detected in at least one surface or subsurface soil sample from Subarea F, with comparison to screening levels. Table 8-2 summarizes results for parameters detected in at least one composite soil sample from Subarea F, with comparison to screening levels.

8.3.1.1 Surface Soil

Five surface soil samples were collected at Subarea F. Two surface soil samples from the area of Building 199 were analyzed for fuel oil parameters (TPH-DRO, TPH-ERO, PAHs, BTEX, and naphthalene) and three surface soil samples from the area of Building 2540 were analyzed for explosives plus NG and TAL metals.

Of the fuel oil parameters, TPH-DRO (C08-C28), TPH-ERO (C08-C34), ten PAHs, benzene, and toluene were detected in surface soil samples 18FSS0010002 and/or 18FSS0020002. The only chemical detected at a concentration exceeding a screening level was benzo(a)pyrene, with a concentration of 0.0268 mg/kg in the surface soil sample from 18FSS002, located in the drainage pathway located approximately 275 feet south of Building 199.

No explosives, including NG, were detected in the surface soil samples collected at Subarea F.

Eighteen TAL metals were detected in one or more surface soil samples collected at Subarea F. Eleven metals (aluminum, arsenic, chromium, cobalt, iron, lead, manganese, mercury, thallium, vanadium, and zinc) were detected at levels that exceeded their respective minimum human health and/or ecological screening levels. Arsenic, chromium, cobalt, iron, and vanadium concentrations exceeded the minimum human health for residential direct contact and/or ecological screening levels in all surface soil samples. The maximum concentrations of metals were detected in the sample from 18FSB003, located east of Building 2540. The only detection of thallium and the only exceedances of minimum human health for residential direct contact and/or ecological screening levels by thallium and zinc concentrations detected in surface soil at Subarea F occurred in Sample 18FSB003.

8.3.1.2 Subsurface Soil

Three subsurface soil samples were collected at Subarea F and were analyzed for explosives plus NG and TAL metals. The subsurface soil samples were collected from the three borings located in the area of Building 2540.

Seventeen TAL metals were detected in one or more subsurface soil samples collected at Subarea F. Six metals (aluminum, arsenic, chromium, cobalt, iron, and manganese) were detected at concentrations that exceeded their respective minimum human health screening levels for residential direct contact. Arsenic, chromium, cobalt, iron, and manganese concentrations exceeded the minimum human health screening levels for residential direct contact in all subsurface soil samples. The maximum aluminum, arsenic, chromium, iron, and manganese concentrations were detected in the 5- to 7-foot sample interval from boring 18FSB003, located east of Building 2540. The maximum cobalt concentration was detected in in the 5 to 7-foot sample from 18FSB001, located north of Building 2540.

8.3.1.3 PCB Composite Soil

Two composite soil samples were collected at Subarea F and analyzed for PCBs. One sample (18FCP001) was collected from south of Building 199, and the other sample (18FCP002) was collected near the transformers north of Building 199. Table 8-2 summarizes results for parameters detected in at least one composite soil sample for SWMU 18 Subarea F with comparison to screening levels.

Two PCBs, Aroclor-1016 and Aroclor-1260, were detected at concentrations that exceeded their respective minimum ecological screening levels; neither PCB exceeded the minimum human health screening levels. Aroclor-1016 was detected in the sample from 18FCP001. Aroclor-1260 was detected in both composite samples with the maximum concentration detected in the sample from 18FCP002.

8.3.2 Groundwater Results

A groundwater sample was collected from the monitoring well (18FMWT001) installed in Subarea F and located downgradient of the location of the former fuel oil USTs, south of Building 199 . The sample was analyzed for fuel oil parameters (TPH-DRO, TPH-ERO, PAHs, BTEX, and naphthalene). No analytes were detected above the laboratory detection limits.

8.4 SUBAREA F CONCEPTUAL SITE MODEL

Potential sources of contamination for this subarea are related to former operations in Building 2540 (a machine shop with potential for degreaser use and metals contamination) and fuel oil ASTs and former USTs associated with Building 199. The potential for contamination related to fuel oils is considered low based on the low mobility of fuel oil compounds. Additionally, previous corrective actions addressed potential soil contamination associated with the former fuel oil USTs. Post-corrective action confirmation soil sampling results for TPH were less than the current IDEM RISC value (230 mg/kg) for residential use.

Figure 8-7 presents the contaminant exposure pathway analysis for Subarea F. The principal exposure pathways for the site are direct contact with soil by human and ecological receptors. Potential contaminant migration pathways at Subarea F include soil. Transport of impacted soils from the subarea may have impacted the drainages adjacent to the subarea. Although this area ultimately drains to Boggs Creek, there is no perennial surface water present at this subarea.

The potential fate and transport of constituents is discussed in Section 5. Potential human and ecological receptors are discussed further in the human health and ecological risk assessments for Subarea F.

8.5 BASELINE HUMAN HEALTH RISK ASSESSMENT

This section presents the site-specific HHRA for exposures to surface soil and subsurface soil at Subarea F at SWMU 18. The HHRA was prepared using the methodology presented in Appendix I. Section 8.5.1 contains a discussion of the selection of COPCs, Section 8.5.2 contains information on the potential receptors and potential exposure pathways, Section 8.5.3 contains the numerical results of the risk assessment, and Section 8.5.4 presents site-specific uncertainties associated with the risk assessment.

8.5.1 Data Evaluation

COPCs were identified for Subarea F using the screening levels presented and discussed in Section 2.2 of the HHRA methodology. A discussion of direct contact exposure COPCs (i.e., those chemicals detected at concentrations in excess of USEPA and IDEM direct contact exposure criteria) and COPCs selected using migration criteria are presented below. COPCs selected using migration criteria are not quantitatively evaluated in the HHRA because they are not considered to be significant contributors to the direct contact exposure pathways identified for potential human receptors.

COPC selection information for soil is presented in Tables 8-3 and 8-4. Table 8-5 presents a summary of the chemicals retained as COPCs for Subarea F. Samples used in the HHRA for Subarea F are listed in Appendix I.8.1. RAGS Part D tables for COPC selection are included in Appendix I.8.2.

8.5.1.1 Surface Soil

Ten PAHs, two PCBs, 18 metals, and TPH-DRO were detected in the surface soil samples collected at Subarea F. A comparison of maximum detected surface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to surface soil is presented in Table 8-3. The following chemicals were detected in surface soils at maximum concentrations exceeding the direct contact risk-based COPC screening levels for residential land use and were retained as COPCs for surface soil at Subarea F:

- PAHs [benzo(a)pyrene]
- Metals [thallium]

Concentrations of benzo(a)pyrene exceeded the screening criteria based on the RSL but were less than the IDEM screening level. Concentrations of aluminum, arsenic, chromium, cobalt, copper, and manganese also exceeded the screening levels but were within site background levels and are not considered to be site-related; therefore, these chemicals were not retained as COPCs for direct contact with surface soil at Subarea F.

A comparison of maximum detected surface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from subsurface soil to groundwater is presented in Table 8-3. Thallium was the only chemical detected at a concentration exceeding screening levels for migration from soil to groundwater. Therefore, thallium was retained as a COPC for surface soil at Subarea F. Concentrations of arsenic, chromium, cobalt, iron, and manganese also exceeded the screening levels but were within site background levels and are not considered to be site-related; therefore, these chemicals were not retained as COPCs for migration from surface soil to groundwater at Subarea F.

8.5.1.2 Subsurface Soil

Seventeen metals were detected in the subsurface soil samples collected at Subarea F. A comparison of maximum detected subsurface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to subsurface soil is presented in Table 8-4. Cobalt was the only chemical detected at concentrations exceeding the screening criteria; therefore cobalt was the only

chemical retained as a COPC for direct contact exposures to subsurface soil at Subarea F. Cobalt concentrations exceeded the screening levels based on RSLs but were less than the IDEM screening level for residential exposures to soil. Concentrations of aluminum, arsenic, chromium, iron, and manganese also exceeded the screening levels but were within site background levels and are not considered to be site related; therefore, these chemicals were not retained as COPCs for direct contact with subsurface soil at Subarea F.

A comparison of maximum detected subsurface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from subsurface soil to groundwater is presented in Table 8-4. Cobalt was the only chemical detected at concentrations exceeding the screening levels for migration from soil to groundwater. Therefore, cobalt was the only chemical retained as a COPC for migration from subsurface soil to groundwater at Subarea F. Concentrations of arsenic, chromium, iron, and manganese also exceeded the screening levels but were within site background levels and are not considered to be site-related; therefore, these chemicals were not retained as COPCs for migration from subsurface soil to groundwater at Subarea F.

8.5.1.3 Summary

Table 8-5 summarizes the chemicals retained as COPCs for surface soil and subsurface soil at Subarea F. RAGS Part D tables for COPC selection are included in Appendix I.

8.5.2 Exposure Assessment

This section presents the exposure assessment for Subarea F. The general exposure assessment approach and the exposure factors, which serve as the basis of the risk assessment, are provided in Section 3.0 of the HHRA methodology presented in Appendix I.1. The exposure assessment is designed to depict the physical setting of the site, identify potentially exposed populations and applicable exposure pathways, calculate EPCs, and estimate chemical intakes under the identified exposure scenarios. The compilation of likely exposure pathways and receptors is referred to as the CSM. The CSM for Subarea F is presented in Section 8.4.

Potential Receptors and Exposure Pathways

Receptors potentially exposed to media at Subarea F included construction workers, industrial workers, adolescent trespassers, recreational users, and hypothetical residents. The media of interest at Subarea F are surface soil and subsurface soil. Table 8-6 provides a site-specific summary of the

potential receptors evaluated for Subarea F. The following paragraphs briefly discuss relevant exposure pathways for each receptor evaluated in this HHRA.

Construction workers are plausible receptors under current or future land use scenarios. No construction activities are currently planned for the study area. However, this receptor could be exposed to surface and subsurface soils (incidental ingestion; dermal contact) as well as airborne contaminants emanating from these media (inhalation).

Industrial workers are plausible receptors under current and future land use scenarios. This includes adult military or civilian personnel assigned to routine daily work tasks in the SWMU 18 area. This receptor could be exposed to contaminants in surface soil (incidental ingestion; dermal contact) and air (inhalation). Industrial worker exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil contaminants via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions.

Adolescent trespassers are plausible receptors under current or future land use scenarios. Although access to the base is controlled, once inside the base, access to the study areas is not limited by any physical constraints. This receptor may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact) and soil contaminants in air (inhalation). Trespasser exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions.

Child and adult recreational users are plausible receptors under future land use. If NSA Crane were to close, the property could be converted to a park. A recreational user may be exposed to potentially contaminated surface soil (incidental ingestion; dermal contact) and soil contaminants in air (inhalation). Recreational exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions. NSA Crane is not expected to close because principal base operations (demilitarization of munitions), are critical to the support of the United States Naval fleet.

Given the anticipated future land use for much of SWMU 18 (industrial), residents are very unlikely future receptors. However, the hypothetical future residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be

eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical resident may be exposed to contaminants in surface soils (incidental ingestion; dermal contract) and soil contaminants in air (inhalation). Receptor exposure to subsurface soil contaminants would only occur if subsurface soil was excavated and deposited on existing surface soil. Although this is an unlikely scenario, it is included in this HHRA for purposes of completeness and to assist the risk managers in assessing the need for deed restrictions.

Exposure Point Concentrations

Exposure point concentrations for Subarea F are presented in Table 8-7. There were an insufficient number of samples to calculate UCLs; therefore the maximum detected concentration of a chemical was used as the EPC.

8.5.3 Risk Characterization

This section contains a summary of the results of the risk characterization for Subarea F. Quantitative risk estimates for potential human receptors are developed for those chemicals identified as COPCs. Uncertainties associated with the risk estimates are discussed in Section 8.5.4. The methodology used to calculate the risks presented in this section is provided in Section 2 of the HHRA methodology presented in Appendix I.1. Potential cancer risks and HIs were calculated for construction workers, industrial workers, adolescent trespassers, recreational users, and hypothetical residents under the RME and CTE scenarios and are summarized in Tables 8-8 and 8-9, respectively. Sample calculations are included in Appendix I.14 and the results of the risk assessment in RAGS Part D format are included in Appendix I.8.2.

8.5.3.1 Noncarcinogenic Risks

Tables 8-8 and 8-9 and Figures 8-8a through 8-8d present the HIs for the RME and CTE scenarios at Subarea F. No noncarcinogenic toxicity criteria are available for the identified COPCs in surface soil; therefore, HIs could not be estimated for exposures to surface soil. HIs for all receptors exposed to subsurface soil under the RME and CTE scenarios were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

8.5.3.2 Carcinogenic Risks

Tables 8-8 and 8-9 and Figures 8-9a through 8-9d present the ILCRs for the RME and CTE scenarios at Subarea F. ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

8.5.3.3 Risk Estimates Due to Chemicals Attributable to Background

COPCs for Subarea F were selected, in part, using available background concentrations for soil. A statistical site dataset to background dataset comparison was conducted to determine if site concentrations exceeded background concentrations for chemicals with concentrations exceeding screening criteria (see Section 4.0). At Subarea F, aluminum, arsenic, chromium, cobalt, copper, iron, and manganese concentrations were within background levels in surface soil; and aluminum, arsenic, chromium, iron, and manganese concentrations were within background levels in subsurface soil. Table 8-9 presents the cancer risks and HIs for the RME scenario associated with these metals. RAGS Part D tables for these chemicals are presented in Appendix I.

HIs calculated on a target organ basis (site risk plus background risk) were less than the threshold level of 1 for all receptors at Subarea F under the RME scenario with the exception of construction workers. The HI exceeded the threshold level of 1 for construction workers exposed to surface soil at Subarea F; manganese was the major COPC contributing to the HI. HIs calculated for the metals present at background concentrations exceed those calculated for site COPCs. HIs calculated for the site-related COPCs do not exceed 1.

ILCRs for all receptors (site risk plus background risk) were within USEPA's and IDEM's target risk range for the RME scenario.

8.5.4 Uncertainty Analysis

A detailed discussion of uncertainties associated with the various aspects of the HHRA, in general, was presented in Section 6 of the HHRA methodology. Site-specific uncertainties for Subarea F are presented below.

Thallium was retained as COPC for surface soil at Subarea F. The toxicity criteria for thallium were developed for screening purposes only and are not appropriate for quantifying risks. Therefore, risks were not estimated for exposures to thallium in surface soil. This results in an underestimation of risks for exposures to soil, although the magnitude of the underestimation is not known.

8.5.5 Human Health Risk Assessment Summary

This section summarizes the results of the baseline HHRA for Subarea F at SWMU 18 which was performed to characterize the potential risks to likely human receptors under current and potential future land use scenarios. Potential receptors under the current land use scenario are industrial workers, construction works, and trespassers. Potential receptors under future land use scenarios are child and adult recreational users, and hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future receptors were evaluated in the baseline HHRA, primarily for decision-making purposes.

The COPCs for direct contact to soil are:

- Surface soil – benzo(a)pyrene and thallium
- Subsurface soil – cobalt

The COPCs for chemical migration from soil to groundwater are:

- Surface soil – thallium
- Subsurface soil – cobalt

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. No noncarcinogenic toxicity criteria are available for the identified COPCs in surface soil; therefore, HIs could not be estimated for exposures to surface soil. HIs for all receptors exposed to subsurface soil under the RME and CTE scenarios were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

8.6 ECOLOGICAL RISK ASSESSMENT

This section presents the subarea-specific ERA for exposures to surface soil at Subarea F at SWMU 18. The ERA was prepared using the methodology presented in Appendix J. Section 8.6.1 contains a discussion of the environmental setting at Subarea A; Section 8.6.2 contains a discussion of the selection

of COPCs; Section 8.6.3 contains a discussion on the refinement of COPCs; and, Section 8.6.4 provides a summary and conclusions of the ecological risk assessment.

8.6.1 Environmental Setting

Subarea F is located in the southeastern portion of SWMU 18 and covers approximately 75 acres; however, the area of potential impacts is only approximately 5 acres. The site includes areas of mowed grass, forests, and several buildings. Section 8.1 presents additional details on Subarea F.

8.6.2 Tier 1, Step 2: Selection of Contaminants of Potential Concern

Table 8-11 provides the results of the COPC selection for surface soil. Table 8-12 presents the results of the Tier 1 food chain model for mammals and birds for Subarea F surface soil. Chemicals eliminated due to consistency with background concentrations are not included in this evaluation. Appendix J presents the calculation worksheets.

Terrestrial Plants

Six PAHs were selected as COPCs because screening levels were not available. One metal was selected as a COPC because the maximum detected concentration resulted in an EEQ greater than 1.0.

Soil Invertebrates

One metal was selected as a COPC because the maximum detected concentration resulted in an EEQ greater than 1.0.

Wildlife

The following summarizes the results of the food chain modeling for terrestrial receptors using maximum concentrations and Tier 1 input parameters:

- Herbivorous mammal: One metal had an EEQ greater than 1.0 in the food chain model.
- Herbivorous bird: No chemicals had an EEQ greater than 1.0 in the food chain model.
- Invertivorous mammals: One metal had an EEQ greater than 1.0 in the food chain model.
- Invertivorous birds: Two metals had an EEQ greater than 1.0 in the food chain model.

8.6.3 Tier 2, Step 3a: COPC Refinement

Summaries of the Step 3a evaluation for soil invertebrates and terrestrial plants are presented in Table 8-13. As part of the Step 3a evaluation for terrestrial wildlife, Table 8-14 presents the results of the food chain model for surface soil using Step 3a exposure assumptions and chemical concentrations. A detailed discussion of the Step 3a evaluation is presented in the following subsections.

Terrestrial Plants

Several PAHs were selected as COPCs because screening levels were not available. An Eco SSL is not available for plants for several PAHs; however, data presented on Table 3.1 in the Eco SSL document for PAHs (USEPA, 2007) shows that PAHs are typically not toxic to plants except at high soil concentrations with the lowest listed EC_{50} of 30 mg/kg from Mitchell et al. (1988). All concentrations of PAHs detected at Subarea F are well below this value. Also, concentrations for all PAHs are less than the Canadian SQG for anthracene of 2.5 mg/kg (CCME, 2010). It does not appear that PAH concentrations in soil are likely to impact plants because all detected concentrations are significantly less than these benchmarks. Therefore, PAHs are not expected to impact plants at Subarea F and are eliminated as COPCs.

Thallium was initially selected as a COPC for plants because it exceeded its screening level. The detected thallium concentration (3.93 mg/kg) from 18FSB003 located just east of Building 2540 exceeded its screening value. Because the site is vegetated, it does not appear that plants are being significantly impacted. Any impacts would be limited to a small area as the location is bounded by Building 2540 and an access road. For these reasons, any impacts to plants from thallium are expected to be minimal and thallium is eliminated as a COPC.

Soil Invertebrates

Thallium was selected as a COPC because the maximum concentration exceeded its screening value. The screening level is based on toxicity to plants. A no observed effect concentration (NOEC) for earthworms exposed to thallium was 12 mg/kg (CCME, 1999c). All concentrations detected at Subarea F were less than this value; therefore, thallium is eliminated as a COPC.

Mammals and Birds

As presented in Section 8.6.2, the EEQs from the food chain modeling were greater than 1.0 for two metals using maximum chemical concentrations and Tier 1 exposure assumptions. Therefore, as part of the Step 3a refinement, risks were recalculated using average chemical concentrations and the Tier 2,

Step 3a exposure parameters as presented in Appendix J. The food chain model calculation sheets are also provided in Appendix J.

The following summarizes the results of the food chain modeling for terrestrial receptors using average concentrations and the Tier 2, Step 3a input parameters:

- Herbivorous receptors: No EEQs were greater than 1.0; therefore, impacts to herbivorous mammals and birds are not expected from chemicals detected in surface soil at Subarea F.

- Invertivorous mammals: The EEQ for thallium (30) for the shrew was greater than 1.0 using the no observable adverse effect level (NOAEL) as the toxicity reference value (TRV). The lowest observed adverse effect level (LOAEL) EEQ for thallium (3) was also greater than 1.0 for the shrew. Because an earthworm bioaccumulation factor (BAF) was not available for thallium, a default BAF of 1 was used, which basically equates the tissue concentrations in the prey items to the soil concentrations. This is an overly conservative estimate as thallium is not considered a bioaccumulative chemical (see discussion in the ERA methodology uncertainty section presented in Appendix J). Receptors are unlikely to obtain their diet from only the open area near site activities (see discussion in the ERA methodology uncertainty section presented in Appendix J). Therefore, impacts to invertivorous mammals are expected to be minimal and thallium is eliminated as a COPC.

- Invertivorous birds: No EEQs were greater than 1.0; therefore, adverse effects to invertivorous birds are not expected from chemicals detected in surface soil at Subarea F.

8.6.4 Ecological Risk Summary and Conclusions

This ERA evaluated surface soil from Subarea F. Based on the initial screening of the chemical data, several chemicals were initially selected as COPCs in surface soil because they were detected at concentrations that exceeded conservative screening levels, they had EEQs greater than 1.0 in the conservative food chain model, or because they did not have screening levels.

These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. The following presents the results of the ERA.

Terrestrial Plants and Soil Invertebrates

No chemicals were retained as COPCs for terrestrial plants and soil invertebrates.

Mammals and Birds

No chemicals were retained as COPCs for mammals and birds.

8.7 SUMMARY AND RECOMMENDATIONS

TPH-DRO (C08-C28), TPH-ERO (C08-C34), ten PAHs, benzene, and toluene were detected in surface soil samples 18FSS0010002 and/or 18FSS0020002. The only chemical detected at a concentration that exceeded a screening level was benzo(a)pyrene, at a concentration of 0.0268 mg/kg in the surface soil sample from 18FSS002. This sample was collected from the drainage pathway located approximately 275 feet south of Building 199. No explosives, including NG, were detected in the surface soil samples collected at Subarea F. Eleven metals (aluminum, arsenic, chromium, cobalt, iron, lead, manganese, mercury, thallium, vanadium, and zinc) were detected in surface soil at levels that exceeded their respective minimum human health and/or ecological screening levels.

Six metals (aluminum, arsenic, chromium, cobalt, iron, and manganese) were detected in subsurface soil at Subarea F at concentrations that exceeded their respective minimum human health screening levels for residential direct contact. No explosives, including NG, were detected in the subsurface soil samples collected at Subarea F.

Two PCBs, Aroclor-1016 and Aroclor-1260, were detected at concentrations that exceeded their respective minimum ecological screening levels; neither PCB exceeded the minimum human health screening levels. Aroclor-1016 was detected in the sample from 18FCP001, collected south of Building 199. Aroclor-1260 was detected in both composite samples with the maximum concentration detected in the sample from 18FCP002, collected near the transformers north of Building 199.

No fuel oil parameters were detected in the groundwater sample collected from Subarea F.

The baseline HHRA, performed to characterize the potential risks to likely human receptors under current and potential future land use for Subarea F at SWMU 18, identified benzo(a)pyrene and thallium as COPCs in surface soil, and cobalt as a COPC in subsurface soil. ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

The ERA for Subarea C evaluated surface soil from Subarea F. No chemicals were retained in the ERA as COPCs for potential ecological receptors.

The purpose of this RFI was to identify possible contaminant releases that would require further investigation or pose a threat to human health or the environment. A site that does not require further investigation and does not pose an unacceptable risk to human health and the environment may be designated as requiring NFA and may be removed from further consideration. Based on the results of the human health and ecological risk assessments, NFA is recommended for Subarea F.

TABLE 8-1

SUMMARY OF SOIL RESULTS - SUBAREA F
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION					18FSB001		18FSB002		18FSB003		18FSS001		18FSS002
SAMPLE ID	ECO [1]	ECO REF	HH [2]	HH REF	18FSB0010002	18FSB0010507	18FSB0020002	18FSB0020507	18FSB0030002	18FSB0030507	18FSS0010002	18FSS0010002-D	18FSS0020002
SAMPLE DATE					10/22/2011	10/22/2011	10/22/2011	10/22/2011	10/22/2011	10/22/2011	10/22/2011	10/22/2011	10/22/2011
SUBMATRIX					SS	SB	SS	SB	SS	SB	SS	SS	SS
METALS (MG/KG)													
ALUMINUM	NA	NA	7700	(7)	**4400**	**6750**	10400	10500	11500	20800	NA	NA	NA
ARSENIC	6.8	(6)	0.026	(8)	2.39 J	1.94 J	5.09	2.28 J	6.84	6.1	NA	NA	NA
BARIUM	110	(6)	1500	(7)	**36.3 J**	**54.9 J**	**42.8 J**	**80 J**	**105 J**	**99.5 J**	NA	NA	NA
BERYLLIUM	2.5	(6)	16	(7)	**0.574 J**	**0.969 J**	**0.636 J**	**0.445 J**	**0.872 J**	**0.812 J**	NA	NA	NA
CALCIUM	NA	NA	NA	NA	**36700 J**	**706 J**	**1590 J**	**525 J**	**9510 J**	**722 J**	NA	NA	NA
CHROMIUM	0.35	(6)	0.0118	(8)	12.6 J	18 J	15.2 J	13.7 J	15.5 J	25.1 J	NA	NA	NA
COBALT	13	(3)	2.3	(7)	6.89	**27.7**	3.45 J	**7.08**	11.3	**8.72**	NA	NA	NA
COPPER	28	(3)	310	(7)	**7.52**	**11**	**9.2**	**18.1**	**14**	**13.5**	NA	NA	NA
IRON	NA	NA	5400	(8)	14400 J	13800 J	17400 J	12200 J	20500 J	21200 J	NA	NA	NA
LEAD	11	(3)	270	(10)	**9.95**	**7.03**	11.2	**6.23**	13.8	**10.6**	NA	NA	NA
MAGNESIUM	NA	NA	NA	NA	**1780 J**	**1440 J**	**1430 J**	**1110 J**	**3080 J**	**1790 J**	NA	NA	NA
MANGANESE	220	(3)	180	(7)	224	379	**150**	232	2340	697	NA	NA	NA
MERCURY	0.013	(6)	0.66	(8)	0.0359 U	0.0387 U	0.0327 J	**0.0175 J**	0.0509	**0.0319 J**	NA	NA	NA
NICKEL	38	(3)	150	(7)	**15.4**	**20**	**8.1**	**9.98**	**13.2**	**13.5**	NA	NA	NA
POTASSIUM	NA	NA	NA	NA	**697 J**	**891 J**	**493 J**	**628 J**	**564 J**	**805 J**	NA	NA	NA
THALLIUM	0.0569	(4)	0.078	(7)	1.12 U	1.14 U	1.11 U	1.19 U	**3.93**	1.23 U	NA	NA	NA
VANADIUM	0.025	(6)	39	(7)	10.2 J	**15.3 J**	24.7 J	**13.6 J**	26.7 J	**31.3 J**	NA	NA	NA
ZINC	46	(3)	2300	(7)	**35.1**	**26.1**	**20.9**	**32.7**	**115**	**48.5**	NA	NA	NA
MISCELLANEOUS PARAMETERS (S.U.)													
PH	NA	NA	NA	NA	NA	NA	NA	NA	**8.12**	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)													
DRO (C08-C28)	NA	NA	230	(10)	NA	NA	NA	NA	NA	NA	**20.8**	**21.1**	**31**
ERO (C08-C34)	NA	NA	230	(10)	NA	NA	NA	NA	NA	NA	**26.8**	**28**	**43.2**
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)													
2-METHYLNAPHTHALENE	29	(3)	2.8	(8)	NA	NA	NA	NA	NA	NA	0.00397 U	**0.00758 J**	**0.00244 J**
BENZO(A)ANTHRACENE	0.8	(6)	0.15	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0215**
BENZO(A)PYRENE	1.1	(3)	0.015	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0268**
BENZO(B)FLUORANTHENE	1.1	(3)	0.15	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0474**
BENZO(G,H,I)PERYLENE	1.1	(3)	170	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.028**
BENZO(K)FLUORANTHENE	1.1	(3)	1.5	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0161**
CHRYSENE	1.1	(3)	15	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0315**
FLUORANTHENE	29	(3)	230	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0464**
INDENO(1,2,3-CD)PYRENE	1.1	(3)	0.15	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0255**
PYRENE	1.1	(3)	170	(7)	NA	NA	NA	NA	NA	NA	0.00397 U	0.00392 U	**0.0414**
VOLATILES (MG/KG)													
BENZENE	0.255	(4)	0.004	(8)	NA	NA	NA	NA	NA	NA	0.00246 U	**0.00063 J**	0.00504 U
TOLUENE	5.45	(4)	11.8	(8)	NA	NA	NA	NA	NA	NA	0.00246 U	**0.001 J**	0.00504 U

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil samples are only compared to human health criteria.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater

ACRONYMS
DRO - Diesel Range Organics
Eco - Ecological
Eco Ref - Ecological Reference
ERO - Extended Range Organics
HH - Human Health
HH Ref - Human Health Reference
NA - Not Available / Not Analyzed
mg/kg - Milligrams per kilogram
SB - Subsurface Soil
SS - Surface Soil
S.U. - Standard Unit
SWMU - Solid Waste Management Unit

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

SHADING
Light gray shading indicates positive result.
Dark shading indicates exceedance of criteria.
Shading indicates exceedance of criteria but within background levels (see Tables 4-3, 4-4, and 4-5).

TABLE 8-2

SUMMARY OF COMPOSITE SOIL RESULTS - SUBAREA F
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE SUBMATRIX	ECO (1)	ECO REF	HH (2)	HH REF	18FCP001 18FCP0010002 10/22/2011 SS	18FCP002 18FCP0020002 10/22/2011 SS
PCBS (MG/KG)						
AROCLOR-1016	0.000332	(4)	0.39	(7)	**0.00367 J**	0.00188 UJ
AROCLOR-1260	0.000332	(4)	0.22	(7)	**0.00167 J**	**0.00269 J**

NOTES:
Only analytes with at least one detection are shown on this table.
Surface soil samples are compared to human health and ecological criteria. Subsurface soil samples are only compared to human health criteria.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Ecological Soil Screening Levels
(4) Region 5 (USEPA, 2003)
(5) Sunahara (Sunahara, et al., 2009)
(6) Los Alamos National Laboratory (LANL) (3.0 database; LANL, 2011)
(7) USEPA Adjusted Direct Contact Residential
(8) USEPA Protection of Groundwater
(9) Indiana Department of Environmental Management Soil - Direct
(10) Indiana Department of Environmental Management Migration to Groundwater
NA - Not Available / Not Analyzed
MG/KG - Milligrams per kilogram
Light gray shading indicates positive result.
Dark shading indicates exceedance of criteria.

DATA QUALIFIERS:
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

TABLE 8-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

										DIRECT CONTACT				SOIL TO GROUNDWATER			
CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]	USEPA RSL Protection of Groundwater[7]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Polycyclic Aromatic Hydrocarbons																	
91-57-6	2-Methylnaphthalene	0.00244 J	0.00244 J	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.00244	NA	31 N	370 S	No	BSL	2.8	2.8 N	No	BSL
56-55-3	Benzo(a)anthracene	0.0215	0.0215	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0215	NA	0.15 C	2.1 C	No	BSL	0.2	2.1 C	No	BSL
50-32-8	**Benzo(a)pyrene**	0.0268	0.0268	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0268	NA	**0.015 C**	0.21 C	**Yes**	ASL	0.07	4.7 M	No	BSL
205-99-2	Benzo(b)fluoranthene	0.0474	0.0474	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0474	NA	0.15 C	2.1 C	No	BSL	0.7	7 C	No	BSL
191-24-2	Benzo(g,h,i)perylene	0.028	0.028	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.028	NA	170 N[8]	NA	No	BSL	190 [8]	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	0.0161	0.0161	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0161	NA	1.5 C	21 C	No	BSL	7	68 C	No	BSL
218-01-9	Chrysene	0.0315	0.0315	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0315	NA	15 C	210 C	No	BSL	22	210 C	No	BSL
206-44-0	Fluoranthene	0.0464	0.0464	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0464	NA	230 N	3,200 N	No	BSL	1,400	1,400 N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.0255	0.0255	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0255	NA	0.15 C	2.1 C	No	BSL	2.4	23 C	No	BSL
129-00-0	Pyrene	0.0414	0.0414	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0414	NA	170 N	2,400 N	No	BSL	190	190 N	No	BSL
PCBs																	
12674-11-2	Aroclor-1016	0.00367 J	0.00367 J	mg/kg	18FCP0010002	1/2	0.00188 - 0.00188	0.00367	NA	0.39 N	5.5 N	No	BSL	1.84	2.1 N	No	BSL
11096-82-5	Aroclor-1260	0.00167 J	0.00269 J	mg/kg	18FCP0020002	2/2	-	0.00269	NA	0.22 C	3.1 C	No	BSL	0.48	4.8 C	No	BSL
Metals																	
7429-90-5	Aluminum	4,400	11,500	mg/kg	18FSB0030002	3/3	-	11,500	No	**7,700 N**	100,000 L	No	BKG	460,000	1,000,000 R	No	BSL, BKG
7440-38-2	Arsenic	2.39 J	6.84	mg/kg	18FSB0030002	3/3	-	6.84	No	**0.39 C**	**5.5 C**	No	BKG	0.026	5.9 M	No	BKG
7440-39-3	Barium	36.3 J	105 J	mg/kg	18FSB0030002	3/3	-	105	No	1,500 N	21,000 N	No	BSL, BKG	2,400	1,700 M	No	BSL, BKG
7440-41-7	Beryllium	0.574 J	0.872 J	mg/kg	18FSB0030002	3/3	-	0.872	Yes	16 N	220 N	No	BSL	260	63 M	No	BSL
7440-70-2	Calcium	1,590 J	36,700 J	mg/kg	18FSB0010002	3/3	-	36,700	Yes	NA	NA	No	NUT	NA	NA	No	NUT
7440-47-3	Chromium	12.6 J	15.5 J	mg/kg	18FSB0030002	3/3	-	15.5	No	**0.29 C[10]**	**4.1 C[10]**	No	BKG	0.0118 [10]	0.12 C[10]	No	BKG
7440-48-4	Cobalt	3.45 J	11.3	mg/kg	18FSB0030002	3/3	-	11.3	No	**2.3 N**	32 N	No	BKG	4.2	4.3 N	No	BKG
7440-50-8	Copper	7.52	14	mg/kg	18FSB0030002	3/3	-	14	No	310 N	4,300 N	No	BKG	440	920 M	No	BSL, BKG
7439-89-6	Iron	14,400 J	20,500 J	mg/kg	18FSB0030002	3/3	-	20,500	No	**5,500 N**	77,000 N	No	BKG	5,400	5,600 N	No	BKG
7439-92-1	Lead	9.95	13.8	mg/kg	18FSB0030002	3/3	-	13.8	No	400	400	No	BSL, BKG	280 [12]	270 M	No	BSL, BKG
7439-95-4	Magnesium	1,430 J	3,080 J	mg/kg	18FSB0030002	3/3	-	3,080	Yes	NA	NA	No	NUT	NA	NA	No	NUT
7439-96-5	Manganese	150	2,340	mg/kg	18FSB0030002	3/3	-	2,340	No	**180 N**	2,500 N	No	BKG	420	420 N	No	BKG
7439-97-6	Mercury	0.0327 J	0.0509	mg/kg	18FSB0030002	2/3	0.0359 - 0.0359	0.0509	No	2.3 N[11]	32 N[11]	No	BSL, BKG	0.66	2.1 M	No	BSL, BKG
7440-02-0	Nickel	8.1	15.4	mg/kg	18FSB0010002	3/3	-	15.4	No	150 N	2,100 N	No	BSL, BKG	400	17,000 N	No	BSL, BKG
7440-09-7	Potassium	493 J	697 J	mg/kg	18FSB0010002	3/3	-	697	No	NA	NA	No	NUT, BKG	NA	NA	No	NUT, BKG
7440-28-0	**Thallium**	3.93	3.93	mg/kg	18FSB0030002	1/3	1.11 - 1.12	3.93	Yes	**0.078 N**	**1.1 N**	**Yes**	ASL	0.22	2.9 M	Yes	ASL
7440-62-2	Vanadium	10.2 J	26.7 J	mg/kg	18FSB0030002	3/3	-	26.7	No	39 N	NA	No	BSL, BKG	1,560	NA	No	BSL, BKG
7440-66-6	Zinc	20.9	115	mg/kg	18FSB0030002	3/3	-	115	Yes	2,300 N	32,000 N	No	BSL	5,800	NA	No	BSL
Petroleum Hydrocarbons																	
- -	DRO (C08-C28)	20.8	31	mg/kg	18FSS0020002	2/2	-	31	NA	NA	3,100	No	BSL	NA	230	No	BSL
- -	ERO (C08-C34)	26.8	43.2	mg/kg	18FSS0020002	2/2	-	43.2	NA	NA	3,100	No	BSL	NA	230	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
8 - Value is for pyrene.
9 - Value is for total PCBs.
10 - Value is for hexavalent chromium.
11 - Value is for mercuric chloride (and other mercury salts).
12 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18FSB0010002
18FSB0020002
18FSB0030002
18FSS0010002
18FSS0020002
18FCP0010002
18FCP0020002

Definitions:
C = Carcinogen
CAS = Chemical Abstract Service Registry Number
COPC = Chemical Of Potential Concern
DRO = Diesel Range Organics
ERO = Extended Range Organics
IDEM = Indiana Department of Environmental Management
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.
M = Maximum Contaminant Level
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
PCB = Polychlorinated Biphenyl
RSL = Regional Screening Level
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

TABLE 8-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SUBSURFACE SOIL - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

										DIRECT CONTACT				SOIL TO GROUNDWATER			
CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]	USEPA RSL Protection of Groundwater[7]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Metals																	
7429-90-5	Aluminum	6,750	20,800	mg/kg	18FSB0030507	3/3	-	20,800	No	**7,700 N**	100,000 L	No	BKG	460,000	1,000,000 R	No	BSL, BKG
7440-38-2	Arsenic	1.94 J	6.1	mg/kg	18FSB0030507	3/3	-	6.1	No	**0.39 C**	**5.5 C**	No	BKG	0.026	5.9 M	No	BKG
7440-39-3	Barium	54.9 J	99.5 J	mg/kg	18FSB0030507	3/3	-	99.5	No	1,500 N	21,000 N	No	BSL, BKG	2,400	1,700 M	No	BSL, BKG
7440-41-7	Beryllium	0.445 J	0.969 J	mg/kg	18FSB0010507	3/3	-	0.969	No	16 N	220 N	No	BSL, BKG	260	63 M	No	BSL, BKG
7440-70-2	Calcium	525 J	722 J	mg/kg	18FSB0030507	3/3	-	722	No	NA	NA	No	NUT, BKG	NA	NA	No	NUT, BKG
7440-47-3	Chromium	13.7 J	25.1 J	mg/kg	18FSB0030507	3/3	-	25.1	No	**0.29 C[8]**	**4.1 C[8]**	No	BKG	0.0118 [8]	0.12 C[8]	No	BKG
7440-48-4	**Cobalt**	7.08	27.7	mg/kg	18FSB0010507	3/3	-	27.7	Yes	**2.3 N**	32 N	**Yes**	ASL	4.2	4.3 N	Yes	ASL
7440-50-8	Copper	11	18.1	mg/kg	18FSB0020507	3/3	-	18.1	No	310 N	4,300 N	No	BSL, BKG	440	920 M	No	BSL, BKG
7439-89-6	Iron	12,200 J	21,200 J	mg/kg	18FSB0030507	3/3	-	21,200	No	**5,500 N**	77,000 N	No	BKG	5,400	5,600 N	No	BKG
7439-92-1	Lead	6.23	10.6	mg/kg	18FSB0030507	3/3	-	10.6	No	400	400	No	BSL, BKG	280 [10]	270 M	No	BSL, BKG
7439-95-4	Magnesium	1,110 J	1,790 J	mg/kg	18FSB0030507	3/3	-	1,790	No	NA	NA	No	NUT, BKG	NA	NA	No	NUT, BKG
7439-96-5	Manganese	232	697	mg/kg	18FSB0030507	3/3	-	697	No	**180 N**	2,500 N	No	BKG	420	420 N	No	BKG
7439-97-6	Mercury	0.0175 J	0.0319 J	mg/kg	18FSB0030507	2/3	0.0387 - 0.0387	0.0319	No	2.3 N[9]	32 N[9]	No	BSL, BKG	0.66	2.1 M	No	BSL, BKG
7440-02-0	Nickel	9.98	20	mg/kg	18FSB0010507	3/3	-	20	No	150 N	2,100 N	No	BSL, BKG	400	17,000 N	No	BSL, BKG
7440-09-7	Potassium	628 J	891 J	mg/kg	18FSB0010507	3/3	-	891	No	NA	NA	No	NUT, BKG	NA	NA	No	NUT, BKG
7440-62-2	Vanadium	13.6 J	31.3 J	mg/kg	18FSB0030507	3/3	-	31.3	No	39 N	NA	No	BSL, BKG	1,560	NA	No	BSL, BKG
7440-66-6	Zinc	26.1	48.5	mg/kg	18FSB0030507	3/3	-	48.5	No	2,300 N	32,000 N	No	BSL, BKG	5,800	NA	No	BSL, BKG

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
8 - Value is for hexavalent chromium.
9 - Value is for mercuric chloride (and other mercury salts).
10 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18FSB0010507
18FSB0020507
18FSB0030507

Definitions:
C = Carcinogen
CAS = Chemical Abstract Service Registry Number
COPC = Chemical Of Potential Concern
IDEM = Indiana Department of Environmental Management
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.
MCL = Maximum contaminant level
mg/kg = Milligrams per kilogram
RSL = Regional Screening Level
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Associated Samples:
18CMWT0030204
18CSB0010204
18CSB0020507
18CSB0040507
18CSB0060203
18CSB0070406
18CSB0080305
18CSB0090204

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration

BSL = Below COPC Screening Level
NUT = Esstential Nutrient

TABLE 8-5

CHEMICALS RETAINED AS COPCs - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil		Subsurface Soil	
	Direct Contact	Soil to Groundwater	Direct Contact	Soil to Groundwater
Polycyclic Aromatic Hydrocarbons				
Benzo(a)pyrene	E			
Metals				
Cobalt			E	E, I
Thallium	E, I	E, I		

Notes
E - Chemical exceeded USEPA screening criteria and was retained as a COPC.
I - Chemical exceeded IDEM screening criteria and was retained as a COPC.
IDEM - Indiana Department of Environmental Management
SWMU - Solid Waste Management Unit
USEPA - United States Environmental Protection Agency

TABLE 8-6

SELECTION OF EXPOSURE PATHWAYS - SUBAREA F
SWMU 18 – LOAD AND FILL AREA
NSA 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	Subarea F	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Trespassers may contact surface soil while at the site.
		Air	Subarea F	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during work activities.
				Trespassers	Adolescent	Inhalation	Quant	Trespassers may be exposed to fugitive dust and volatile emissions while at the site.
	Subsurface Soil	Subsurface Soil	Subarea F	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by industrial workers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by trespassers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
		Air	Subarea F	Construction Workers	Adult	Inhalation	Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Industrial Worker	Adult	Inhalation	Quant	Although exposures to subsurface soil by industrial workers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Inhalation	Quant	Although exposures to subsurface soil by trespassers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
Future	Surface Soil	Surface Soil	Subarea F	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	
		Air	Subarea F	Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

TABLE 8-6

SELECTION OF EXPOSURE PATHWAYS - SUBAREA F
SWMU 18 – LOAD AND FILL AREA
NSA CRANE
CRANE INDIANA
PAGE 2 OF 2

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Subsurface Soil	Subsurface Soil	Subarea F	Recreational Users	Child	Ingestion	Quant	Although exposures to subsurface soil by recreational users is considered unlikely at the site this scenario is included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
				Residents	Child	Ingestion	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air	Subarea F	Recreational Users	Child	Inhalation	Quant	Although exposures to subsurface soil by recreational users is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

Notes:
Qual - Qualitative.
Quant - Quantitative.

TABLE 8-7

EXPOSURE POINT CONCENTRATIONS - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil (mg/kg)	Subsurface Soil (mg/kg)
PAHs		
Benzo(a)pyrene	0.0215	NA
Inorganics		
Cobalt	NA	27.7
Thallium	3.93	NA

Notes:
The exposure point concentrations (EPCs) were calculated according to USEPA's ProUCL guidance. See the RAGS PART D Table 3s in Appendix J for details concerning the EPCs.

mg/kg - Milligrams per kilogram
NA - Not applicable. Not a COPC for this media.
PAH - Polycyclic Aromatic Hydrocarbon
RAGS - Risk Assessment Guidance for Superfund
USEPA - United States Environmental Protection Agency

TABLE 8-8

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ Hazard Index > 1
Construction Workers	Surface Soil	Incidental Ingestion	4E-09	--	--	--	0	--
		Dermal Contact	2E-09	--	--	--	0	--
		Inhalation	3E-11	--	--	--	0	--
		Total	6E-09	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.02	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	4E-07	--	--	--	0.1	--
		Total	4E-07	--	--	--	0.2	--
Industrial Workers	Surface Soil	Incidental Ingestion	5E-08	--	--	--	0	--
		Dermal Contact	5E-08	--	--	--	0	--
		Inhalation	1E-12	--	--	--	0	--
		Total	1E-07	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.09	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	2E-08	--	--	--	0.0008	--
		Total	2E-08	--	--	--	0.09	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	1E-08	--	--	--	0	--
		Dermal Contact	1E-08	--	--	--	0	--
		Inhalation	9E-14	--	--	--	0	--
		Total	2E-08	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.02	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	3E-10	--	--	--	0.00004	--
		Total	3E-10	--	--	--	0.02	--
Child Recreational Users	Surface Soil	Incidental Ingestion	7E-08	--	--	--	0	--
		Dermal Contact	5E-08	--	--	--	0	--
		Inhalation	2E-13	--	--	--	0	--
		Total	1E-07	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.09	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	4E-10	--	--	--	0.00008	--
		Total	4E-10	--	--	--	0.09	--
Adult Recreational Users	Surface Soil	Incidental Ingestion	1E-08	--	--	--	0	--
		Dermal Contact	2E-08	--	--	--	0	--
		Inhalation	1E-13	--	--	--	0	--
		Total	3E-08	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.009	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	8E-10	--	--	--	0.00004	--
		Total	8E-10	--	--	--	0.009	--
Lifelong Recreational Users	Surface Soil	Incidental Ingestion	8E-08	--	--	--	NA	--
		Dermal Contact	7E-08	--	--	--	NA	--
		Inhalation	3E-13	--	--	--	NA	--
		Total	1E-07	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	1E-09	--	--	--	NA	--
		Total	1E-09	--	--	--	NA	--

TABLE 8-8

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ Hazard Index > 1
Child Residents	Surface Soil	Incidental Ingestion	9E-07	--	--	--	0	--
		Dermal Contact	3E-07	--	--	--	0	--
		Inhalation	8E-12	--	--	--	0	--
		Total	1E-06	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	1	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	2E-08	--	--	--	0.003	--
		Total	2E-08	--	--	--	1	--
Adult Residents	Surface Soil	Incidental Ingestion	1E-07	--	--	--	0	--
		Dermal Contact	7E-08	--	--	--	0	--
		Inhalation	1E-11	--	--	--	0	--
		Total	2E-07	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.1	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	6E-08	--	--	--	0.003	--
		Total	6E-08	--	--	--	0.1	--
Lifelong Residents	Surface Soil	Incidental Ingestion	1E-06	--	--	--	NA	--
		Dermal Contact	4E-07	--	--	--	NA	--
		Inhalation	2E-11	--	--	--	NA	--
		Total	1E-06	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	8E-08	--	--	--	NA	--
		Total	8E-08	--	--	--	NA	--

TABLE 8-9

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ Hazard Index > 1
Construction Workers	Surface Soil	Incidental Ingestion	1E-09	--	--	--	0	--
		Dermal Contact	3E-10	--	--	--	0	--
		Inhalation	2E-11	--	--	--	0	--
		Total	1E-09	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.004	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	2E-07	--	--	--	0.07	--
		Total	2E-07	--	--	--	0.08	--
Industrial Workers	Surface Soil	Incidental Ingestion	9E-09	--	--	--	0	--
		Dermal Contact	1E-09	--	--	--	0	--
		Inhalation	5E-13	--	--	--	0	--
		Total	1E-08	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.04	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	5E-09	--	--	--	0.0007	--
		Total	5E-09	--	--	--	0.04	--
Adolescent Trespassers	Surface Soil	Incidental Ingestion	3E-09	--	--	--	0	--
		Dermal Contact	2E-09	--	--	--	0	--
		Inhalation	2E-14	--	--	--	0	--
		Total	4E-09	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.004	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	8E-11	--	--	--	0.00001	--
		Total	8E-11	--	--	--	0.004	--
Child Recreational Users	Surface Soil	Incidental Ingestion	7E-09	--	--	--	0	--
		Dermal Contact	2E-09	--	--	--	0	--
		Inhalation	2E-14	--	--	--	0	--
		Total	9E-09	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.02	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	3E-11	--	--	--	0.00002	--
		Total	3E-11	--	--	--	0.02	--
Adult Recreational Users	Surface Soil	Incidental Ingestion	6E-10	--	--	--	0	--
		Dermal Contact	2E-10	--	--	--	0	--
		Inhalation	2E-14	--	--	--	0	--
		Total	8E-10	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.002	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	1E-10	--	--	--	0.00002	--
		Total	1E-10	--	--	--	0.002	--
Lifelong Recreational Users	Surface Soil	Incidental Ingestion	8E-09	--	--	--	NA	--
		Dermal Contact	2E-09	--	--	--	NA	--
		Inhalation	4E-14	--	--	--	NA	--
		Total	1E-08	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	1E-10	--	--	--	NA	--
		Total	1E-10	--	--	--	NA	--

TABLE 8-9

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ Hazard Index > 1
Child Residents	Surface Soil	Incidental Ingestion	1E-07	--	--	--	0	--
		Dermal Contact	2E-08	--	--	--	0	--
		Inhalation	2E-12	--	--	--	0	--
		Total	1E-07	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.4	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	3E-09	--	--	--	0.002	--
		Total	3E-09	--	--	--	0.4	--
Adult Residents	Surface Soil	Incidental Ingestion	1E-08	--	--	--	0	--
		Dermal Contact	2E-09	--	--	--	0	--
		Inhalation	2E-12	--	--	--	0	--
		Total	1E-08	--	--	--	0	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	0.04	--
		Dermal Contact	0E+00	--	--	--	0	--
		Inhalation	1E-08	--	--	--	0.002	--
		Total	1E-08	--	--	--	0.04	--
Lifelong Residents	Surface Soil	Incidental Ingestion	1E-07	--	--	--	NA	--
		Dermal Contact	2E-08	--	--	--	NA	--
		Inhalation	4E-12	--	--	--	NA	--
		Total	2E-07	--	--	--	NA	--
	Subsurface Soil	Incidental Ingestion	0E+00	--	--	--	NA	--
		Dermal Contact	0E+00	--	--	--	NA	--
		Inhalation	2E-08	--	--	--	NA	--
		Total	2E-08	--	--	--	NA	--

TABLE 8-10

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
CURRENT/FUTURE CONSTRUCTION WORKERS		
Surface Soil		
Site Risk[1]	6E-09	0
Background Risk[2]	3E-06	5
Site + Background Risk[3]	3E-06	5
Subsurface Soil		
Site Risk	4E-07	0.2
Background Risk	4E-06	2
Site + Background Risk	4E-06	2
CURRENT/FUTURE INDUSTRIAL WORKERS		
Surface Soil		
Site Risk	1E-07	0
Background Risk	7E-06	0.2
Site + Background Risk	7E-06	0.2
Subsurface Soil		
Site Risk	2E-08	0.09
Background Risk	8E-06	0.1
Site + Background Risk	8E-06	0.2
CURRENT/FUTURE ADOLESCENT TRESPASSERS		
Surface Soil		
Site Risk	2E-08	0
Background Risk	8E-07	0.04
Site + Background Risk	8E-07	0.04
Subsurface Soil		
Site Risk	3E-10	0.02
Background Risk	1E-06	0.02
Site + Background Risk	1E-06	0.04
FUTURE CHILD RECREATIONAL USERS		
Surface Soil		
Site Risk	1E-07	0
Background Risk	4E-06	0.2
Site + Background Risk	4E-06	0.2
Subsurface Soil		
Site Risk	4E-10	0.09
Background Risk	6E-06	0.1
Site + Background Risk	6E-06	0.2

TABLE 8-10

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
FUTURE ADULT RECREATIONAL USERS		
Surface Soil		
Site Risk	3E-08	0
Background Risk	1E-06	0.02
Site + Background Risk	1E-06	0.02
Subsurface Soil		
Site Risk	8E-10	0.009
Background Risk	1E-06	0.01
Site + Background Risk	1E-06	0.02
FUTURE LIFELONG RECREATIONAL USERS		
Surface Soil		
Site Risk	1E-07	NA
Background Risk	5E-06	NA
Site + Background Risk	5E-06	NA
Subsurface Soil		
Site Risk	1E-09	NA
Background Risk	7E-06	NA
Site + Background Risk	7E-06	NA
HYPOTHETICAL CHILD RESIDENTS		
Surface Soil		
Site Risk	1E-06	0
Background Risk	6E-05	3
Site + Background Risk	6E-05	3
Subsurface Soil		
Site Risk	2E-08	1
Background Risk	8E-05	1
Site + Background Risk	8E-05	2
HYPOTHETICAL ADULT RESIDENTS		
Surface Soil		
Site Risk	2E-07	0
Background Risk	1E-05	0.3
Site + Background Risk	1E-05	0.3
Subsurface Soil		
Site Risk	6E-08	0.1
Background Risk	2E-05	0.2
Site + Background Risk	2E-05	0.3

TABLE 8-10

RISKS ASSOCIATED WITH NATURALLY OCCURRING CHEMICALS - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Reasonable Maximum Exposures	
	ILCR	HI
HYPOTHETICAL LIFELONG RESIDENTS		
Surface Soil		
Site Risk	1E-06	NA
Background Risk	7E-05	NA
Site + Background Risk	7E-05	NA
Subsurface Soil		
Site Risk	8E-08	NA
Background Risk	1E-04	NA
Site + Background Risk	1E-04	NA

Notes:
1 - Cancer risk or hazard index from only site-related chemicals detected at concentrations exceeding screening levels.
2 - Cancer risk or hazard index from only chemicals present at naturally occurring levels detected at concentrations exceeding screening levels. Aluminum, arsenic, chromium, cobalt, iron, and manganese were within background levels in surface soil. Aluminum, arsenic, chromium, iron, and manganese were within background levels in subsurface soil.
3 - Cancer risk or hazard index from all chemicals detected at concentrations exceeding screening levels.

Acronyms:
HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk

TABLE 8-11

SURFACE SOIL COPC SELECTION - SUBAREA F
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Sample of Maximum Detection	Averge of Positive Results[1]	Average of All Results[2]	Similar to Background[3]	Ecological Screening Level[4]				Ecological Effects Quotient[5]				Deletion or Selection of COPCs for Invertebrates/Plants		Further Evaluated in Terrestrial Food Chain Modeling[6]	
								Plant	Invertebrate	Avian	Mammal	Plant	Invertebrate	Avian	Mammal	COPC (yes/no)?	Rationale	Evaluated (yes/no)?	Rationale
METALS (MG/KG)																			
ALUMINUM	2/2	10400	11500	18FSB0030002	10950	10950	YES	NA[7]	NA[7]	NA[7]	NA[7]	NA	NA	NA	NA	NO	pH, BKG	NO	pH, BKG, NONBIO
ARSENIC	2/2	5.09	6.84	18FSB0030002	5.97	5.97	YES	18	17	43	46	0.38	0.40	0.16	0.15	NO	BSL, BKG	NO	BSL, BKG
BARIUM	2/2	42.8 J	105 J	18FSB0030002	73.9	73.9	YES	500	330	820	2000	0.21	0.32	0.13	0.053	NO	BSL, BKG	NO	BSL, BKG, NONBIO
BERYLLIUM	2/2	0.636 J	0.872 J	18FSB0030002	0.754	0.754	NO	10	40	NA	21	0.087	0.022	**NA**	0.042	NO	BSL	NO	NONBIO
CALCIUM	2/2	1590 J	9510 J	18FSB0030002	5550	5550	NO	NA	NA	NA	NA	NA	NA	NA	NA	NO	NUT	NO	NUT
CHROMIUM	2/2	15.2 J	15.5 J	18FSB0030002	15.4	15.4	YES	78	0.4	26	34	0.20	38.8	0.60	0.46	NO	BKG	NO	BSL, BKG
COBALT	2/2	3.45 J	11.3	18FSB0030002	7.38	7.38	YES	13	1000	120	230	0.87	0.011	0.094	0.049	NO	BSL, BKG	NO	BSL, BKG, NONBIO
COPPER	2/2	9.2	14	18FSB0030002	11.6	11.6	YES	70	80	28	49	0.20	0.18	0.50	0.29	NO	BSL, BKG	NO	BSL, BKG
IRON	2/2	17400 J	20500 J	18FSB0030002	18950	18950	YES	NA[8]	200	NA	NA	NA	103	NA	NA	NO	BKG	NO	BKG, NONBIO
LEAD	2/2	11.2	13.8	18FSB0030002	12.5	12.5	YES	120	1700	11	56	0.12	0.0081	1.3	0.25	NO	BSL, BKG	NO	BKG
MAGNESIUM	2/2	1430 J	3080 J	18FSB0030002	2255	2255	NO	NA	NA	NA	NA	NA	NA	NA	NA	NO	NUT	NO	NUT
MANGANESE	2/2	150	2340	18FSB0030002	1245	1245	YES	220	450	4300	4000	10.6	5.2	0.54	0.59	NO	BKG	NO	BSL, BKG, NONBIO
MERCURY	2/2	0.0327 J	0.0509	18FSB0030002	0.042	0.042	YES	12	0.1	0.013	1.7	0.0042	0.51	3.9	0.030	NO	BSL, BKG	NO	BKG
NICKEL	2/2	8.1	13.2	18FSB0030002	10.7	10.7	YES	38	280	210	130	0.35	0.047	0.063	0.10	NO	BSL, BKG	NO	BSL, BKG
POTASSIUM	2/2	493 J	564 J	18FSB0030002	529	529	YES	NA	NA	NA	NA	NA	NA	NA	NA	NO	NUT, BKG	NO	NUT, BKG
THALLIUM	1/2	3.93	3.93	18FSB0030002	3.93	2.24	NO	1.4	1.4	0.9	0.0569	**2.8**	**2.8**	**4.4**	**69.1**	**YES**	ASL	**YES**	ASL
VANADIUM	2/2	24.7 J	26.7 J	18FSB0030002	25.7	25.7	YES	130	130	7.8	280	0.21	0.21	3.4	0.10	NO	BSL, BKG	NO	BKG, NONBIO
ZINC	2/2	20.9	115	18FSB0030002	68.0	68.0	NO	160	120	46	79	0.72	0.96	**2.5**	**1.5**	NO	BSL	**YES**	ASL
MISCELLANEOUS PARAMETERS (S.U.)																			
PH	1/1	8.12	8.12	18FSB0030002	NA(4)	NA(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)																			
DRO (C08-C28)	2/2	20.8	31	18FSS0020002	25.9	25.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO	(9)	NO	(9)
ERO (C08-C34)	2/2	26.8	43.2	18FSS0020002	35.0	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO	(9)	NO	(9)
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)																			
2-METHYLNAPHTHALENE	1/2	0.0024 J	0.00244 J	18FSS0020002	0.002	0.002	NA	NA	29	NA	100	**NA**	0.00008	**NA**	0.000024	**YES**	NSL	NO	NONBIO
BENZO(A)ANTHRACENE	1/2	0.0215	0.0215	18FSS0020002	0.022	0.012	NA	18	18	0.8	1.1	0.0012	0.0012	0.027	0.020	NO	BSL	NO	BSL
BENZO(A)PYRENE	1/2	0.0268	0.0268	18FSS0020002	0.027	0.014	NA	20	18	NA	1.1	0.0013	0.0015	**NA**	0.024	NO	BSL	**YES**	BIO
BENZO(B)FLUORANTHENE	1/2	0.0474	0.0474	18FSS0020002	0.047	0.025	NA	18	18	NA	1.1	0.0026	0.0026	**NA**	0.043	NO	BSL	**YES**	BIO
BENZO(G,H,I)PERYLENE	1/2	0.028	0.028	18FSS0020002	0.028	0.015	NA	NA	18	NA	1.1	**NA**	0.0016	**NA**	0.025	**YES**	NSL	**YES**	BIO
BENZO(K)FLUORANTHENE	1/2	0.0161	0.0161	18FSS0020002	0.016	0.009	NA	NA	18	NA	1.1	**NA**	0.00089	**NA**	0.015	**YES**	NSL	**YES**	BIO
CHRYSENE	1/2	0.0315	0.0315	18FSS0020002	0.032	0.017	NA	NA	18	NA	1.1	**NA**	0.0018	**NA**	0.029	**YES**	NSL	**YES**	BIO
FLUORANTHENE	1/2	0.0464	0.0464	18FSS0020002	0.046	0.024	NA	50	29	NA	100	0.00093	0.0016	**NA**	0.00046	NO	BSL	**YES**	BIO
INDENO(1,2,3-CD)PYRENE	1/2	0.0255	0.0255	18FSS0020002	0.026	0.014	NA	NA	18	NA	1.1	**NA**	0.0014	**NA**	0.023	**YES**	NSL	**YES**	BIO
PYRENE	1/2	0.0414	0.0414	18FSS0020002	0.041	0.022	NA	NA	18	34	1.1	**NA**	0.0023	0.0012	0.038	**YES**	NSL	NO	BSL
PCBS (MG/KG)																			
AROCLOR-1016	1/2	0.0037 J	0.00367 J	18FCP0010002	0.004	0.002	NA	33	33	NA	0.000332	0.00011	0.00011	**NA**	**11.1**	NO	BSL	**YES**	ASL
AROCLOR-1260	2/2	0.0017 J	0.00269 J	18FCP0020002	0.002	0.002	NA	33	33	0.88	0.000332	0.000082	0.000082	0.0031	**8.1**	NO	BSL	**YES**	ASL

Ecological effects quotients (EEQs) are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available unless the chemical concentration is similar to background. EEQs are not shaded if the chemical concentration is similar to background. Other cells are shaded if the chemical is retained as a COPC for plants or invertebrates or if the chemical is retained for food chain modeling.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - Data from Crane Basewide Background Report (Tetra Tech, 2001). Statistical evaluation in Section 5.
4 - Sources of ecological screening levels are presented in Table J.2.
5 - EEQs were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
6 - Chemicals with EEQs for birds or mammals greater than 1.0 or bioaccumulative chemicals without bird or mammal screening values are retained for food chain modeling.
7 - Only considered a COPC when the soil pH is less than 5.5.
8 - Not expected to be toxic to plants with a soil pH between 5 and 8.
9 - Risks from parameter considered by evaluating volatiles and PAHs.

COPC Selection Rationale:
ASL = Above Screening Level
BIO = Bioaccumulative chemical
BKG = Similar to Background
BSL = Below Screening Level
ERO = Extended Range Organics
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level
NUT = Essential nutrient
pH = Not toxic based on soil pH

Acronyms:
DRO - Diesel Range Organics
J - Estimated concentration
mg/kg - Milligrams per kilogram
NA - Not applicable/not available
NSA - Naval Support Activity
PCB - Polychlorinated Biphenyl
SWMU - Solid Waste Management Unit

TABLE 8-12

TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO, SUBAREA F
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
Chemical	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
METALS								
THALLIUM	1.6E-01	1.6E-02	1.1E+00	1.1E-01	2.4E+00	2.4E-01	9.3E+01	9.3E+00
ZINC	1.3E-01	4.9E-02	5.5E-02	1.4E-02	1.2E+00	4.5E-01	9.2E-01	2.3E-01
POLYCYCLIC AROMATIC HYDROCARBONS								
BENZO(A)ANTHRACENE	5.0E-04	5.0E-05	7.1E-04	1.1E-05	3.4E-03	3.4E-04	9.6E-03	1.5E-04
BENZO(A)PYRENE	3.8E-04	3.8E-05	4.4E-04	7.0E-06	3.7E-03	3.7E-04	1.0E-02	1.6E-04
BENZO(B)FLUORANTHENE	1.1E-03	1.1E-04	1.5E-03	2.5E-05	1.2E-02	1.2E-03	3.4E-02	5.5E-04
BENZO(G,H,I)PERYLENE	4.9E-04	4.9E-05	6.3E-04	1.0E-05	7.9E-03	7.9E-04	2.3E-02	3.7E-04
BENZO(K)FLUORANTHENE	2.8E-04	2.8E-05	3.6E-04	5.8E-06	4.1E-03	4.1E-04	1.2E-02	1.9E-04
CHRYSENE	6.5E-04	6.5E-05	9.1E-04	1.5E-05	7.1E-03	7.1E-04	2.0E-02	3.2E-04
FLUORANTHENE	1.5E-03	1.5E-04	2.2E-05	4.0E-06	1.4E-02	1.4E-03	3.7E-04	6.8E-05
INDENO(1,2,3-CD)PYRENE	3.2E-04	3.2E-05	3.4E-04	5.5E-06	7.0E-03	7.0E-04	2.0E-02	3.3E-04
POLYCLORINATED BIPHENYLS								
AROCLOR-1016	3.3E-04	3.3E-05	8.3E-06	3.3E-06	6.0E-02	6.0E-03	7.3E-03	2.9E-03
AROCLOR-1260	2.1E-04	2.1E-05	7.5E-05	7.5E-06	4.4E-02	4.4E-03	1.1E-01	1.1E-02

Cells are shaded if the value is greater than 1.0

Acronyms:
EEQ - Ecological Effects Quotient
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

TABLE 8-13

STEP 3A EVALUATION FOR RISKS TO PLANTS AND INVERTEBRATES
SURFACE SOIL COPCs - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]		Maximum EEQ[2]		Step 3a Evaluation[3]		Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?	
							Step 3a Factors Considered in Evaluation				
			Plants	Invertebrates	Plants	Invertebrates	Plants	Invertebrates		Plants	Invertebrates
METALS (MG/KG)											
THALLIUM	1/2	3.93	1.4	1.4	2.8	2.8	Potential impacts limited to small area.	Less than NOEC based on earthworms of 12 mg/kg (CCME, 1999).	Acceptable	No	No
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)											
2-METHYLNAPHTHALENE	1/2	0.00244	NA	29	NA	0.00008	PAHs are typically not toxic to plants except at high soil concentrations. All PAH concentrations are well below the lowest listed EC50 of 30 mg/kg from Mitchell et al. (1988) cited in Eco SSL document (USEPA, 2007).	Not a COPC.	Acceptable	No	No
BENZO(G,H,I)PERYLENE	1/2	0.028	NA	18	NA	0.0016			Acceptable	No	No
BENZO(K)FLUORANTHENE	1/2	0.0161	NA	18	NA	0.00089			Acceptable	No	No
CHRYSENE	1/2	0.0315	NA	18	NA	0.0018			Acceptable	No	No
INDENO(1,2,3-CD)PYRENE	1/2	0.0255	NA	18	NA	0.0014			Acceptable	No	No
PYRENE	1/2	0.0414	NA	18	NA	0.0023			Acceptable	No	No

Footnotes:
1 Sources of ecological screening levels presented in Appendix J Table J.2.
2 Maximum detection divided by screening level.
3 See Section 11.7.3 for a more detailed Step 3a evaluation.

Acronyms:
COPC = Chemical of Potential Concern
EC50 = Effective Concentration where 50 percent of organisms show a response
Eco SSL = Ecological Soil Screening Level
EEQ = Ecological Effects Quotient
mg/kg = Milligrams per kilogram
NA = Not Available or Not Applicable
NSA = Naval Support Activity
SWMU = Solid Waste Management Unit

TABLE 8-14

TERRESTRIAL FOOD CHAIN MODEL - TIER 2, STEP 3A SCENARIO, SUBAREA F
INSECTIVOROUS AND HERBIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		Woodcock		Short-Tailed Shrew	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
METALS								
THALLIUM	3.4E-02	3.4E-03	2.4E-01	2.4E-02	9.1E-01	9.1E-02	3.0E+01	3.0E+00
ZINC	6.7E-02	2.6E-02	3.3E-02	8.3E-03	7.0E-01	2.7E-01	4.4E-01	1.1E-01

Cells are shaded if the value is greater than 1.0

EEQ - Ecological Effects Quotient
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

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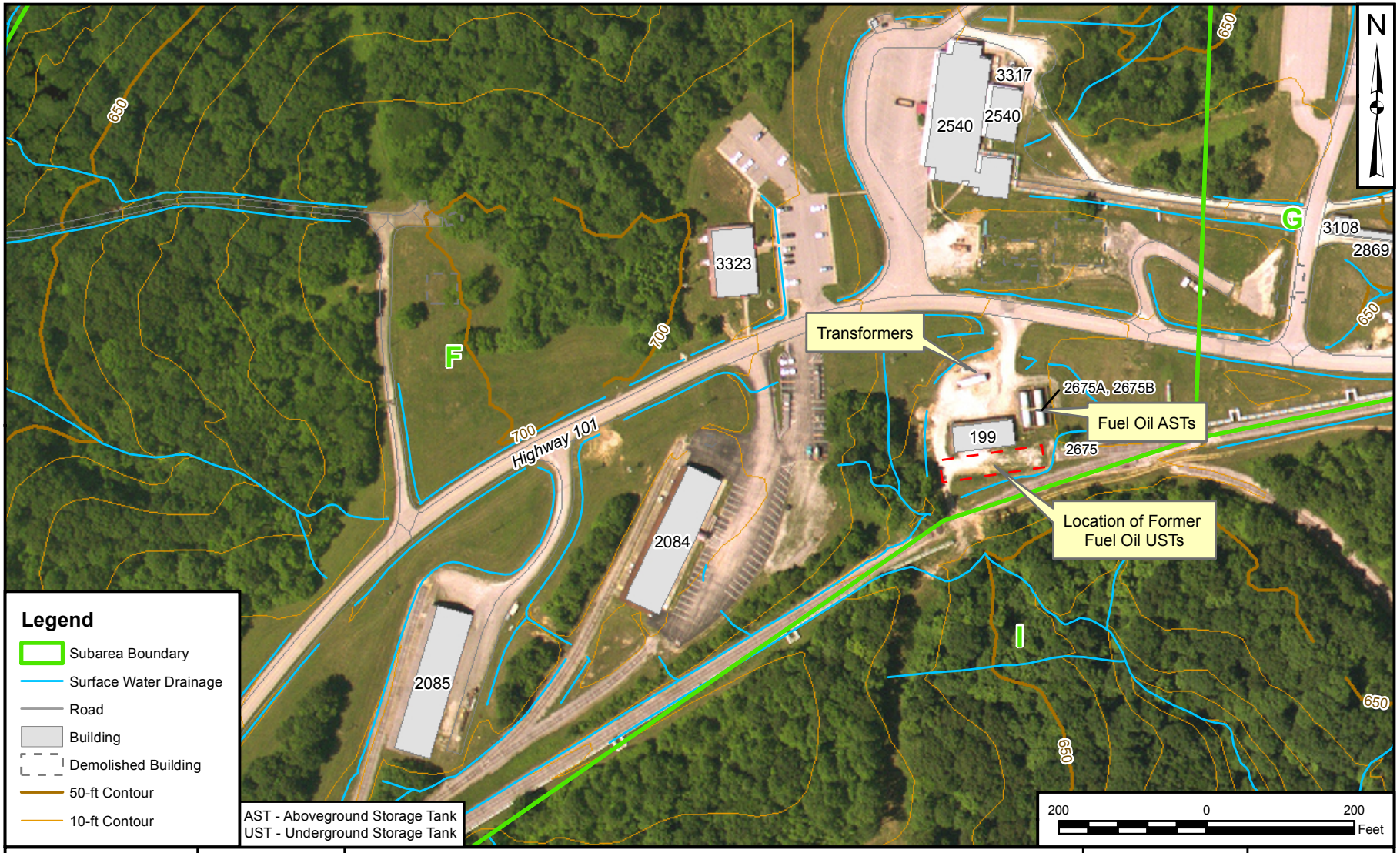

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S. STROZ	07/17/09		
CHECKED BY	DATE		
C. RUMER	11/21/12		
REVISED BY	DATE		
J. NOVAK	11/21/12		
SCALE			
AS NOTED			

CONTRACT NUMBER	CTO NUMBER
___	F201
APPROVED BY	DATE
___	___
APPROVED BY	DATE
___	___
FIGURE NO.	REV
FIGURE 8-1	0

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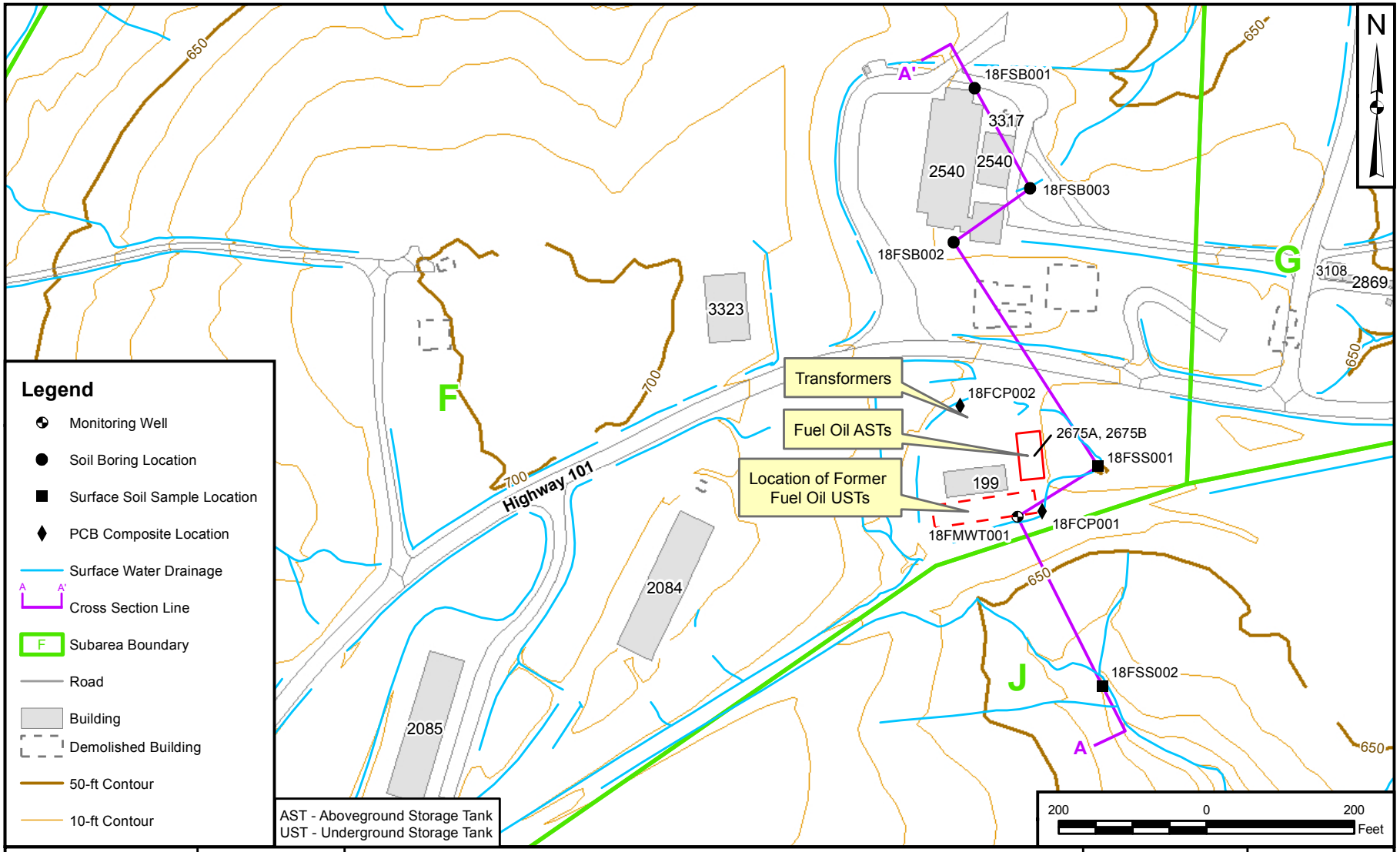
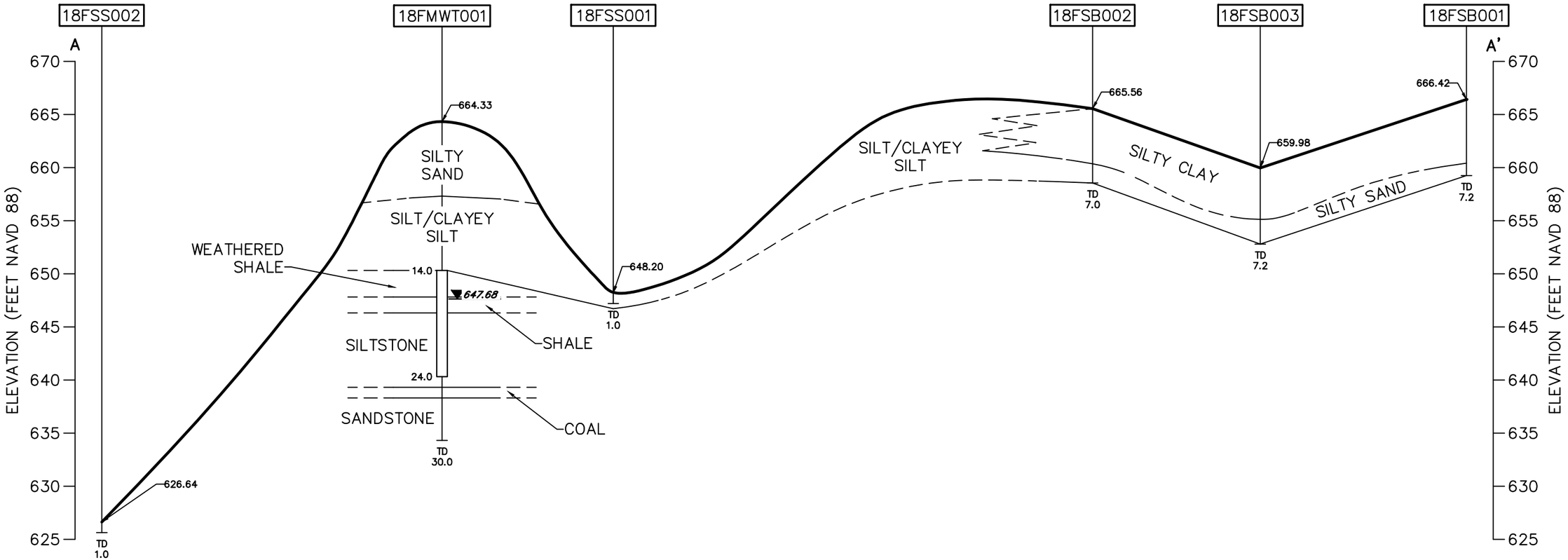


DRAWN BY / DATE	J. ENGLISH 04/04/12
CHECKED BY / DATE	C. RUMER 11/21/12
REVISED BY / DATE	J. NOVAK 11/21/12
SCALE	AS NOTED

NAVFAC

SUBAREA F- BUILDINGS 2084, 2085 AND 2540 AREA
GEOLOGIC CROSS SECTION LOCATIONS
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	1851
CTO NUMBER	F201
APPROVED BY / DATE	— —
APPROVED BY / DATE	— —
FIGURE NO.	FIGURE 8-2
REV	0



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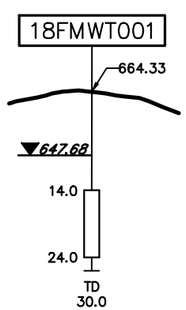

- MONITORING WELL OR BORING NUMBER
- GROUND SURFACE ELEVATION (FT NAVD 88)
- GROUND SURFACE
- WATER LEVEL (FT NAVD 88)
- TOP OF MONITORED INTERVAL (FT BGS)
- BOTTOM OF MONITORED INTERVAL (FT BGS)
- TOTAL DEPTH OF WELL OR BORING (FT BGS)

ACRONYMS:

BGS	BELOW GROUND SURFACE
FT	FEET
NAVD88	NORTH AMERIAN VERTICAL DATUM 88

0 80 160
HORIZONTAL SCALE: 1" = 80'

0 10 20
VERTICAL SCALE: 1" = 10'

DRAWN BY NN	DATE 3/15/12
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS NOTED	

NAVFAC

GEOLOGIC CROSS SECTION A–A'
SWMU 18 – SUBAREA F
NSA CRANE
CRANE, INDIANA

CONTRACT NO. 1851	
CTO NO.	
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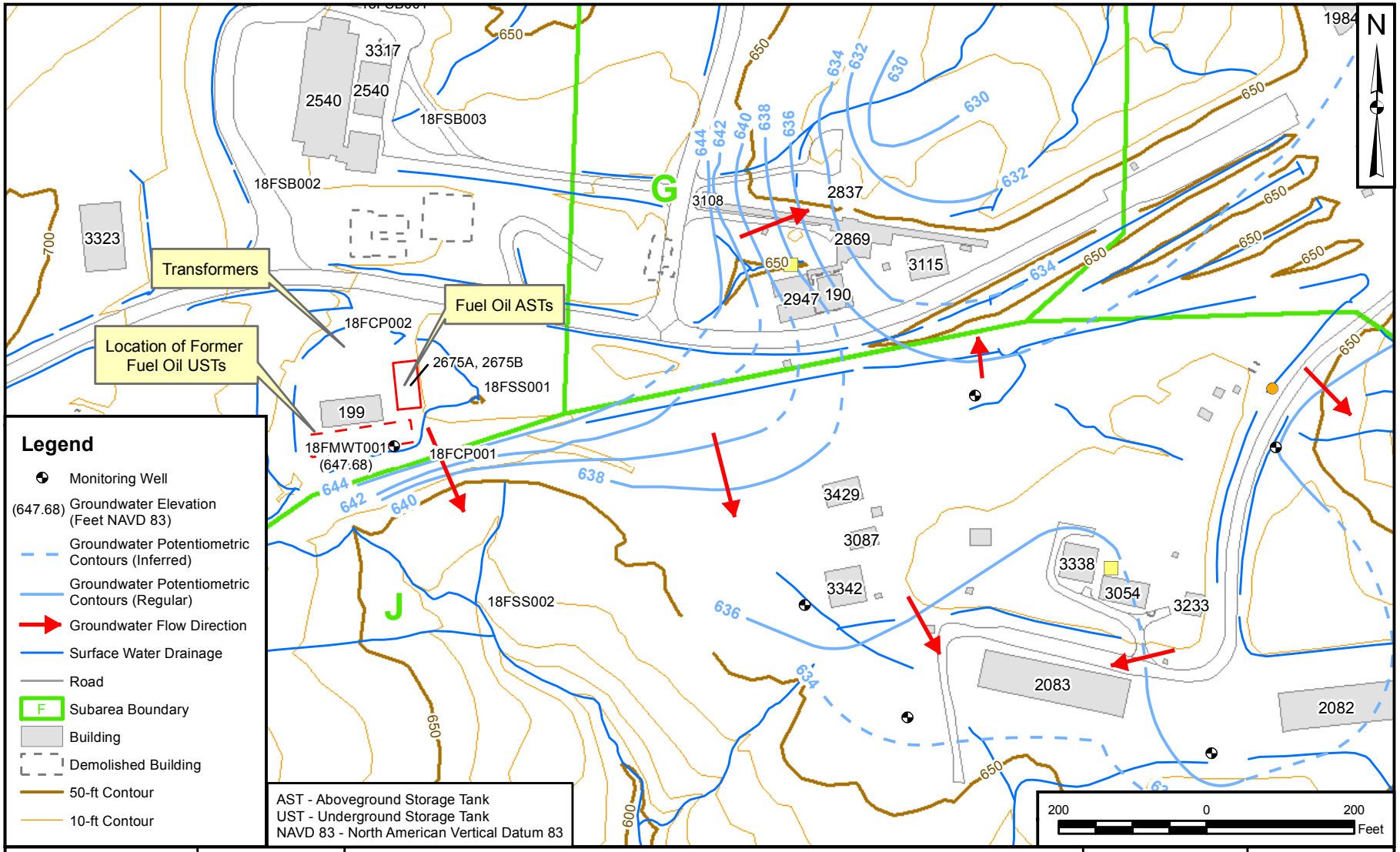

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C. TULLEY	03/06/12
CHECKED BY	DATE
C. RUMER	11/21/12
REVISED BY	DATE
J. NOVAK	11/21/12
SCALE	
AS NOTED	

NAVFAC

SUBAREA F- BUILDINGS 2084, 2085 AND 2540 AREA
GROUNDWATER POTENTIOMETRIC MAP - JANUARY 2012
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
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APPROVED BY	DATE
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APPROVED BY	DATE
—	—
FIGURE NO.	REV
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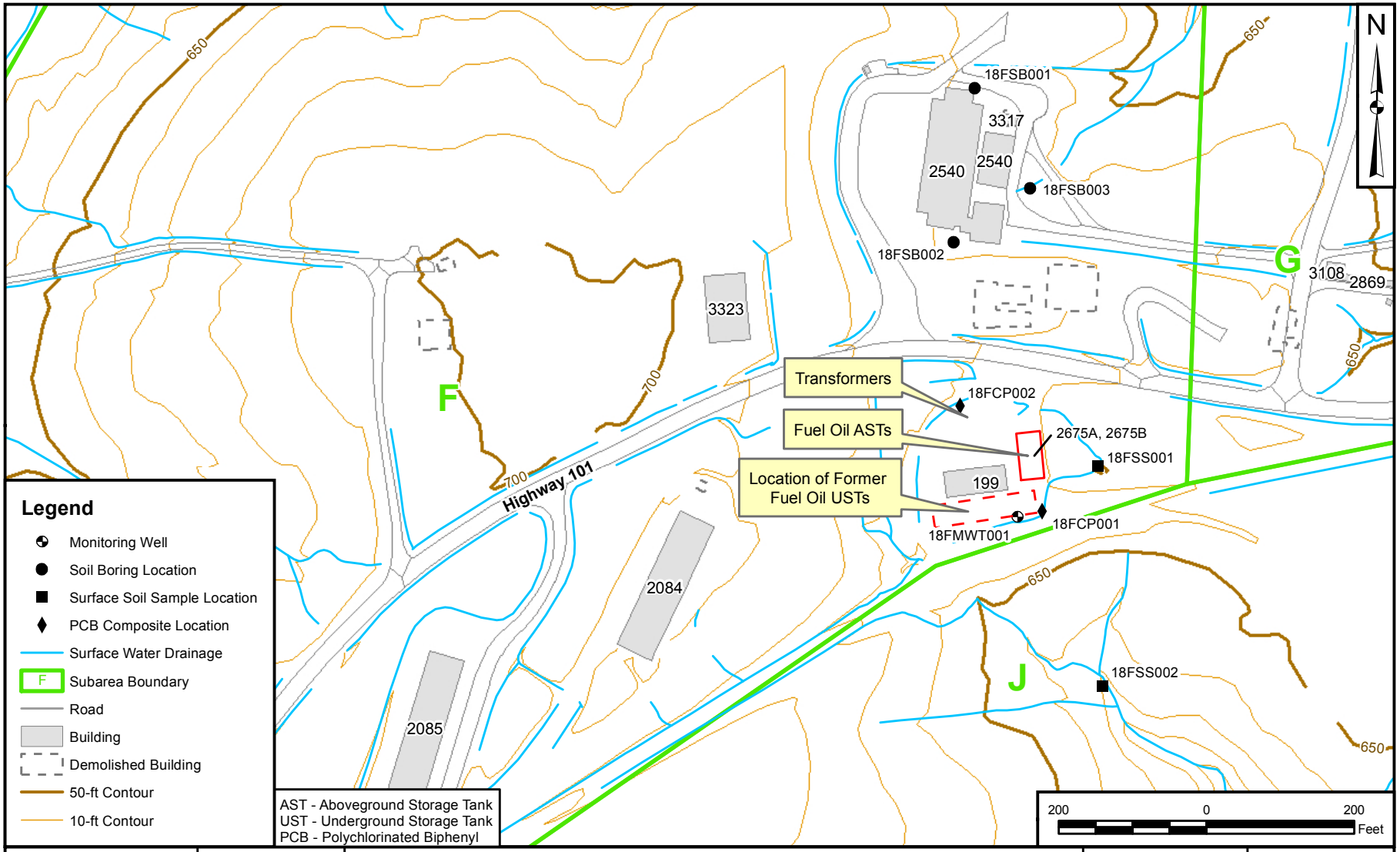

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CHECKED BY	DATE
C. RUMER	11/21/12
REVISED BY	DATE
J. NOVAK	11/21/12
SCALE	
AS NOTED	

NAVFAC

SUBAREA F- BUILDINGS 2084, 2085 AND 2540 AREA
SAMPLE LOCATIONS
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
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APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 8-5	0

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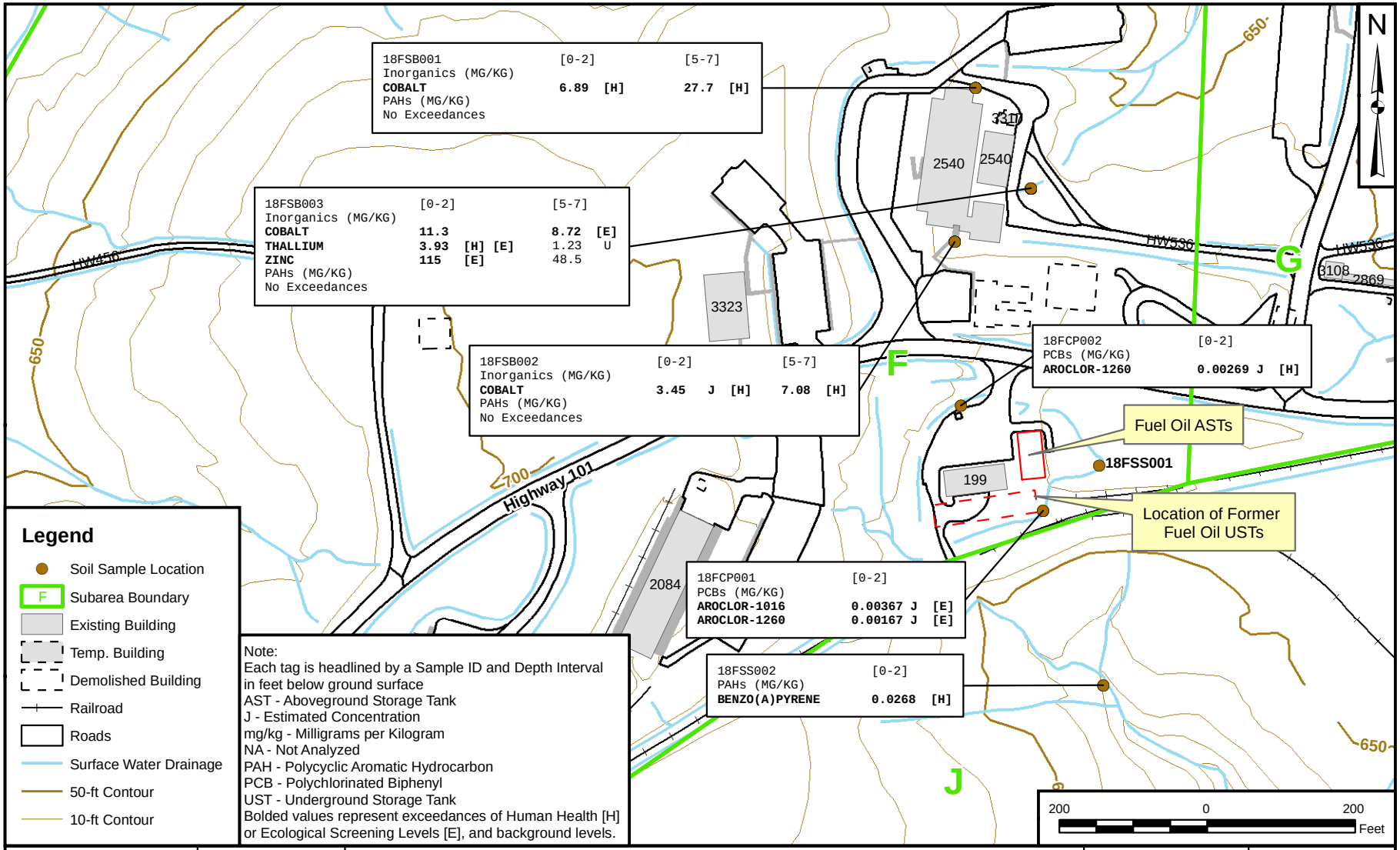


Legend

- Soil Sample Location
- Subarea Boundary
- Existing Building
- Temp. Building
- Demolished Building
- Railroad
- Roads
- Surface Water Drainage
- 50-ft Contour
- 10-ft Contour

Note:
Each tag is headlined by a Sample ID and Depth Interval in feet below ground surface
AST - Aboveground Storage Tank
J - Estimated Concentration
mg/kg - Milligrams per Kilogram
NA - Not Analyzed
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
UST - Underground Storage Tank
Bolded values represent exceedances of Human Health [H] or Ecological Screening Levels [E], and background levels.

DRAWN BY	DATE
J. ENGLISH	02/16/12
CHECKED BY	DATE
T. EVANS	10/09/13
REVISED BY	DATE
J. ENGLISH	10/09/13
SCALE	
AS NOTED	

NAVFAC

SUBAREA F- BUILDINGS 2084, 2085 AND 2540 AREA
EXCEEDANCES OF ANALYTES IN SOIL
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 8-6	0

FIGURE 8-7

CONTAMINANT EXPOSURE PATHWAY ANALYSIS

SWMU 18 SUBAREA F - BUILDINGS 2084, 2085 & 2540 AREA

NSA CRANE , INDIANA

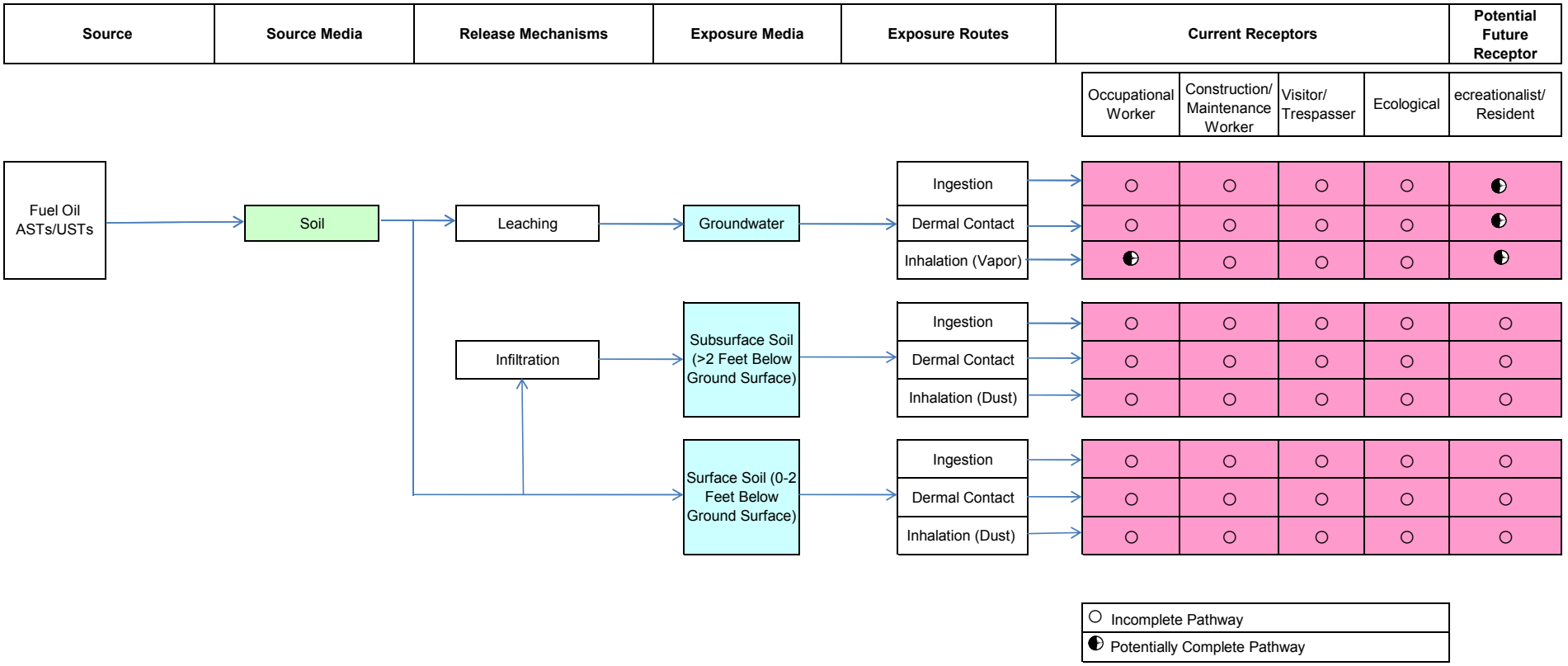


FIGURE 8-8a

SUMMARY OF CUMULATIVE HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE,
CRANE, INDIANA

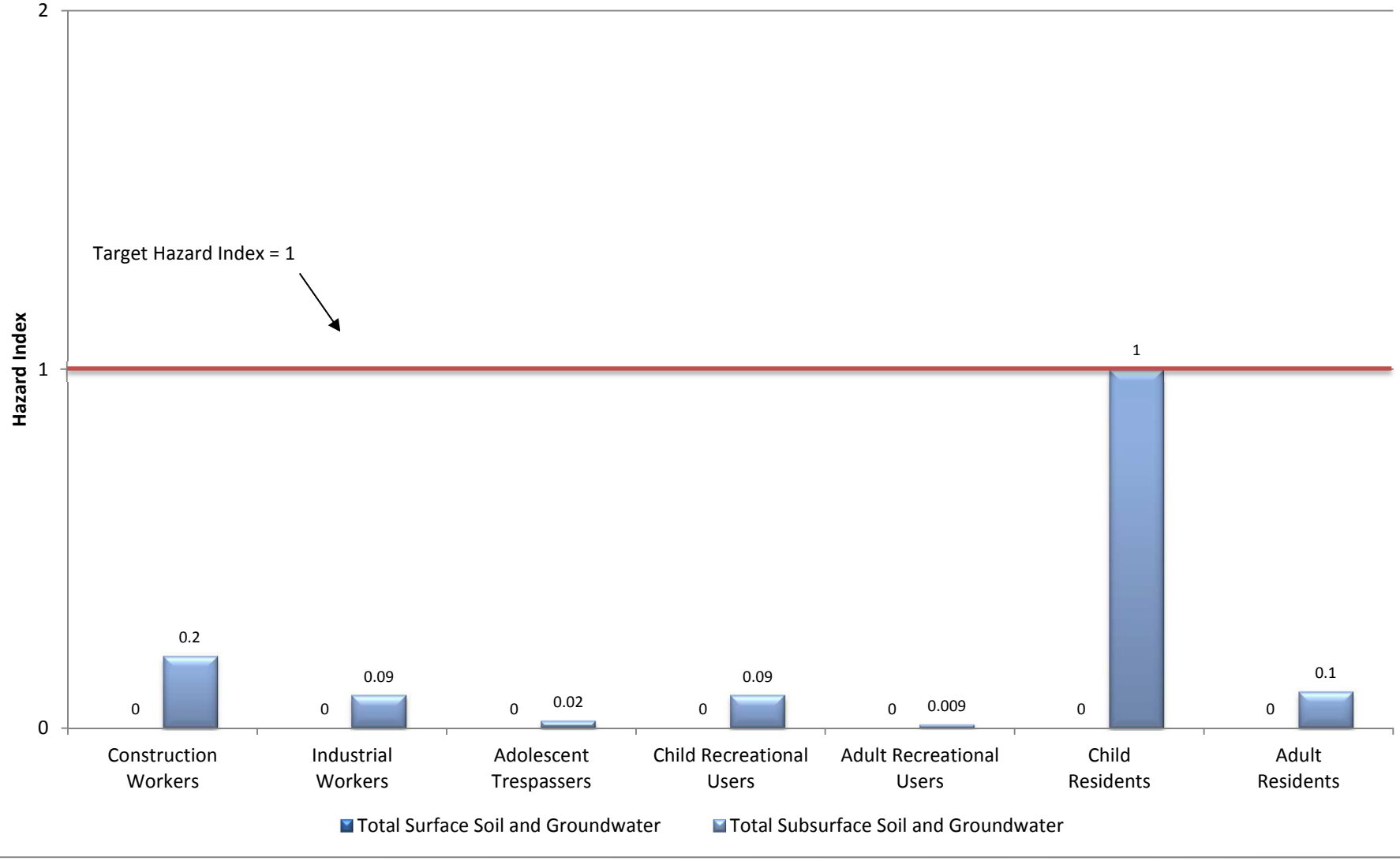


FIGURE 8-8b

SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

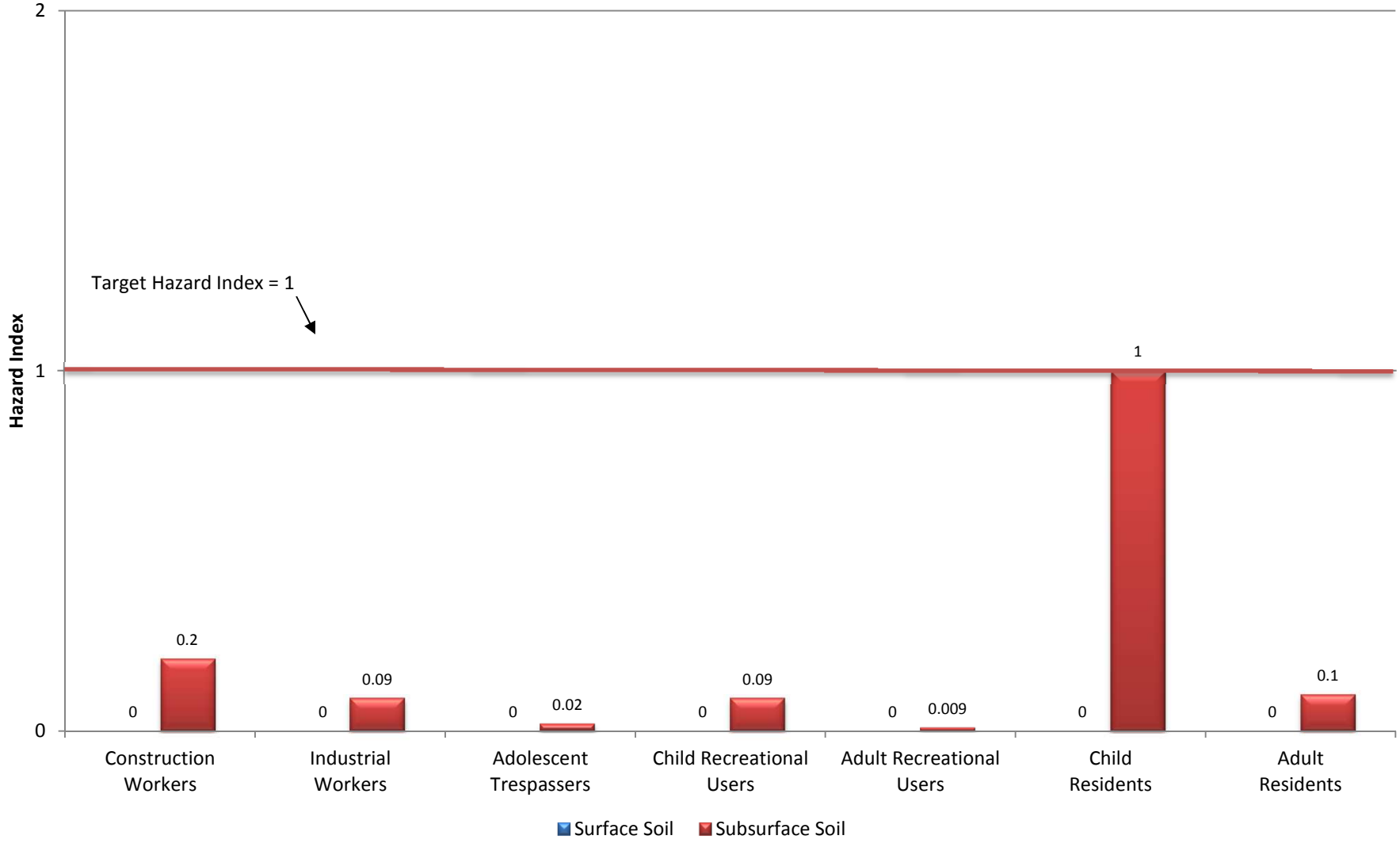


FIGURE 8-8c

SUMMARY OF CUMULATIVE HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

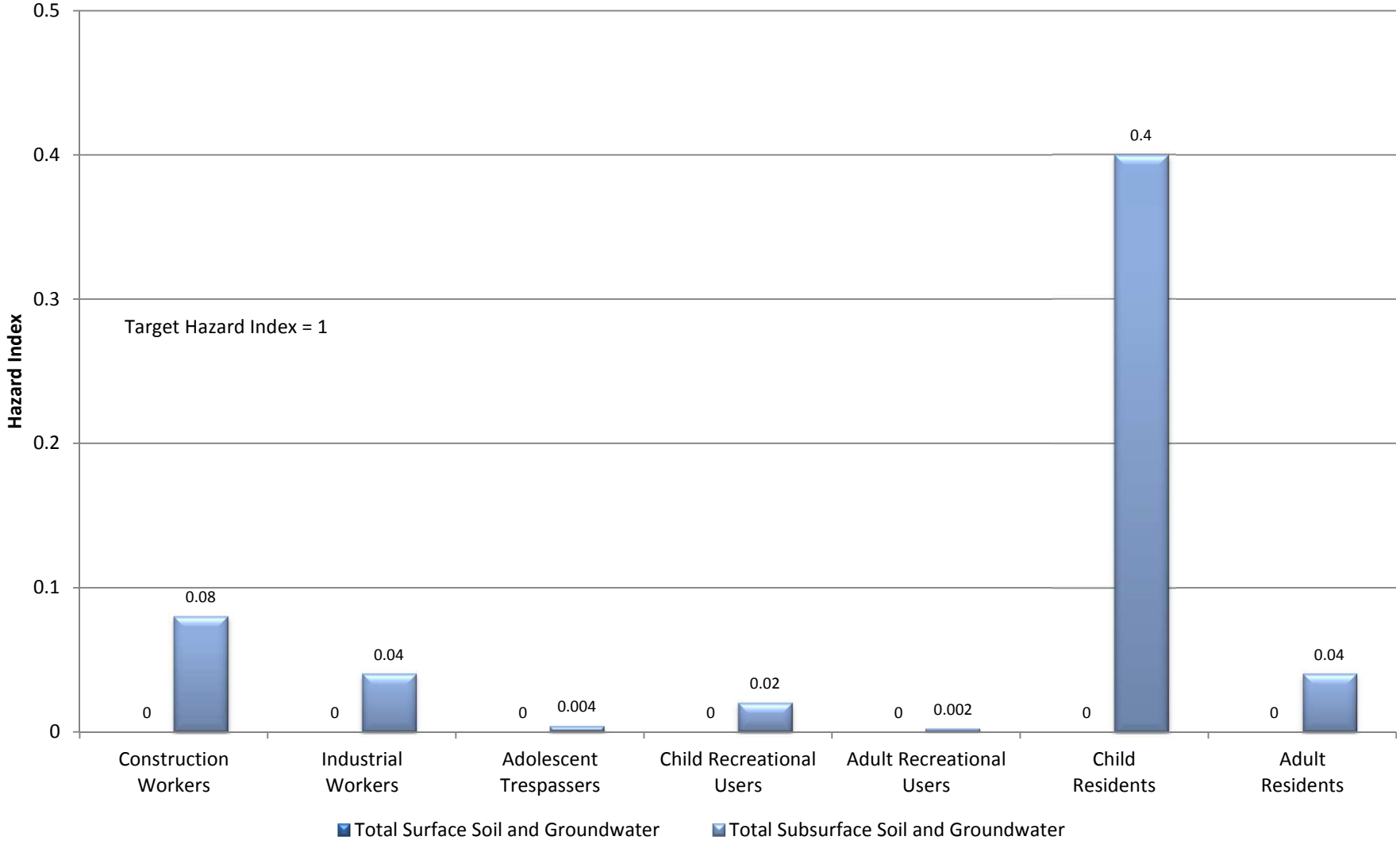


FIGURE 8-8d

SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

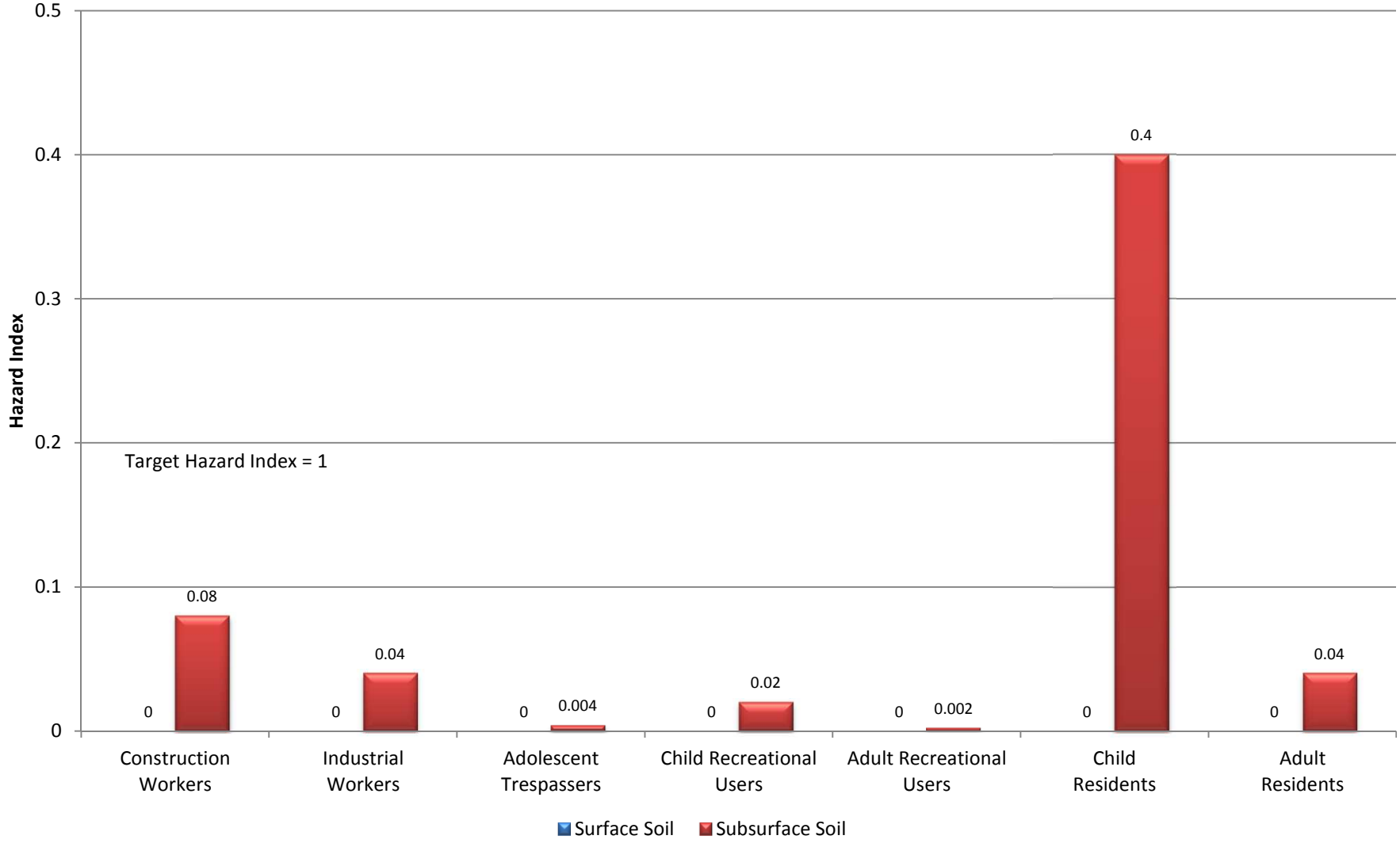


FIGURE 8-9a

SUMMARY OF CUMULATIVE CANCER RISKS - REASONABLE MAXIMUM EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

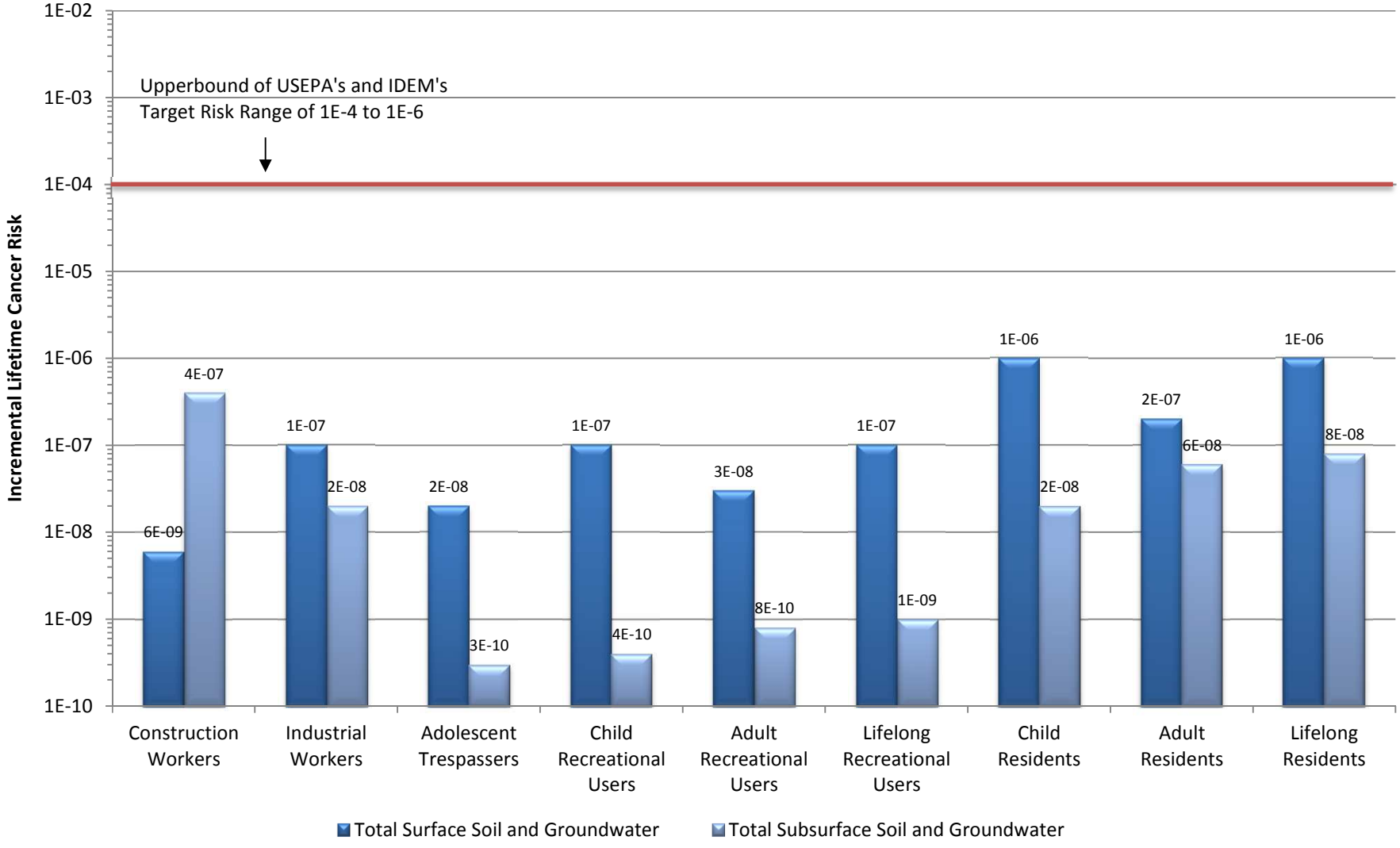


FIGURE 8-9b

SUMMARY OF MEDIA-SPECIFIC CANCER RISKS - REASONABLE MAXIMUM EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

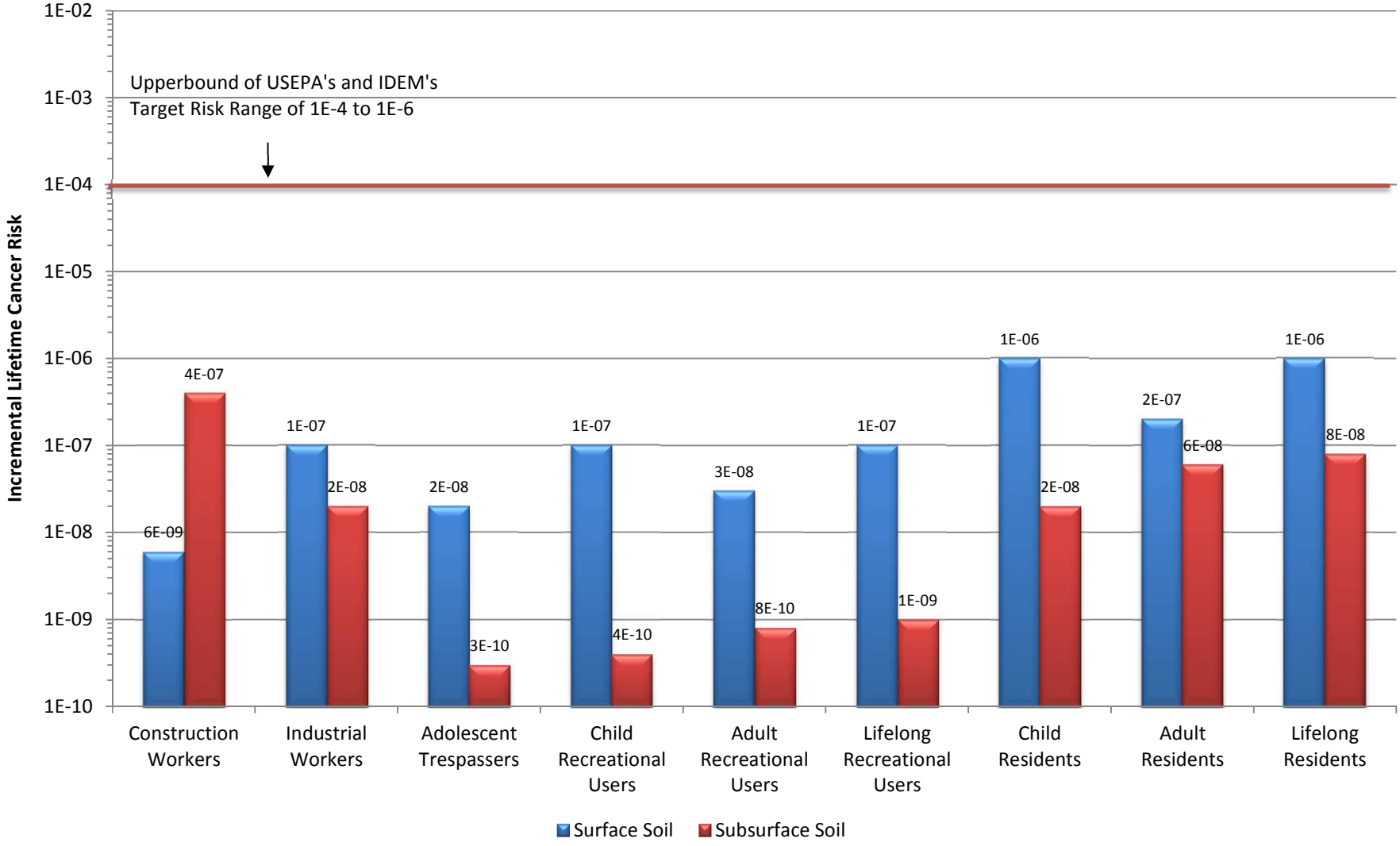


FIGURE 8-9c

SUMMARY OF CUMULATIVE CANCER RISKS - CENTRAL TENDENCY EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

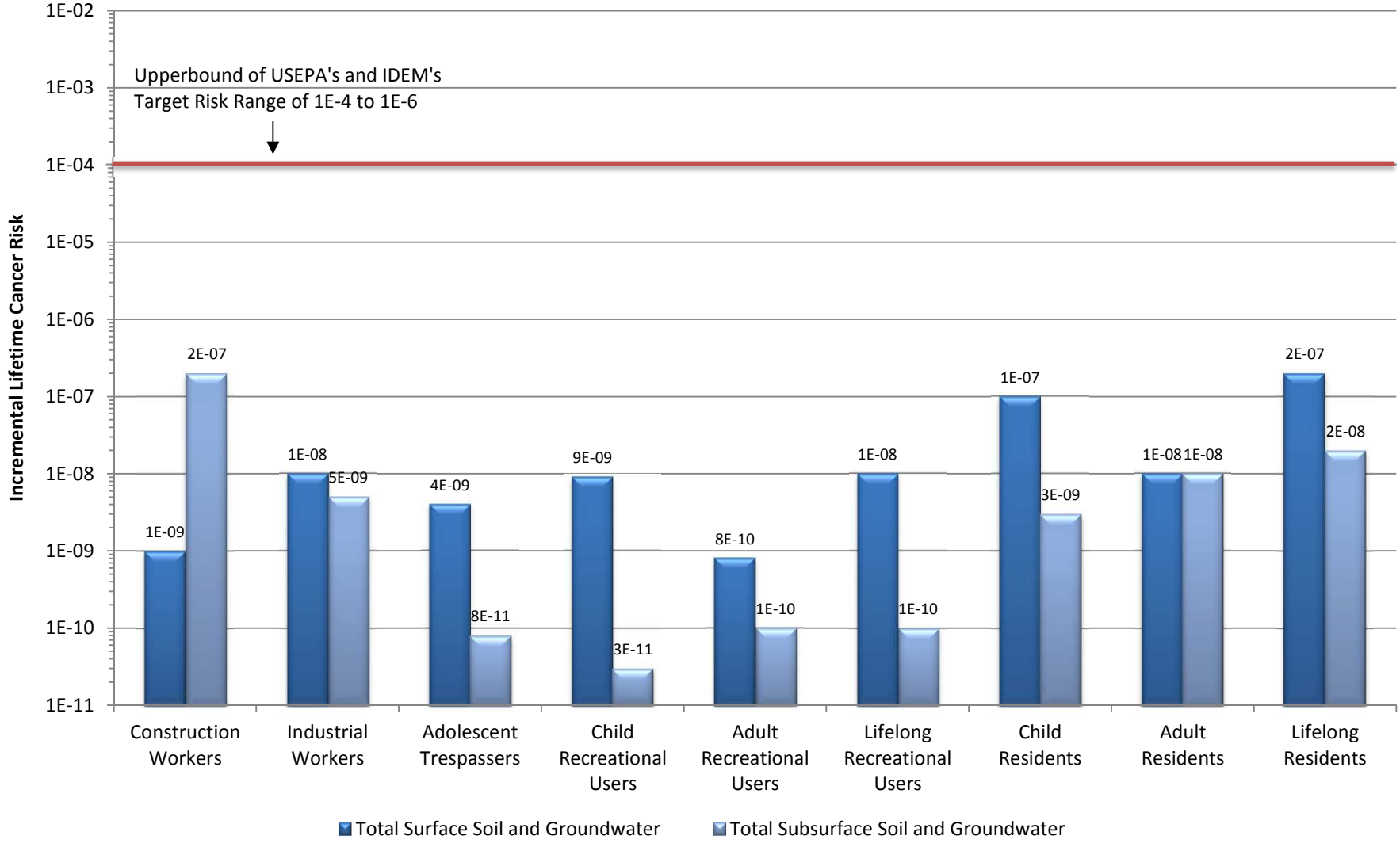
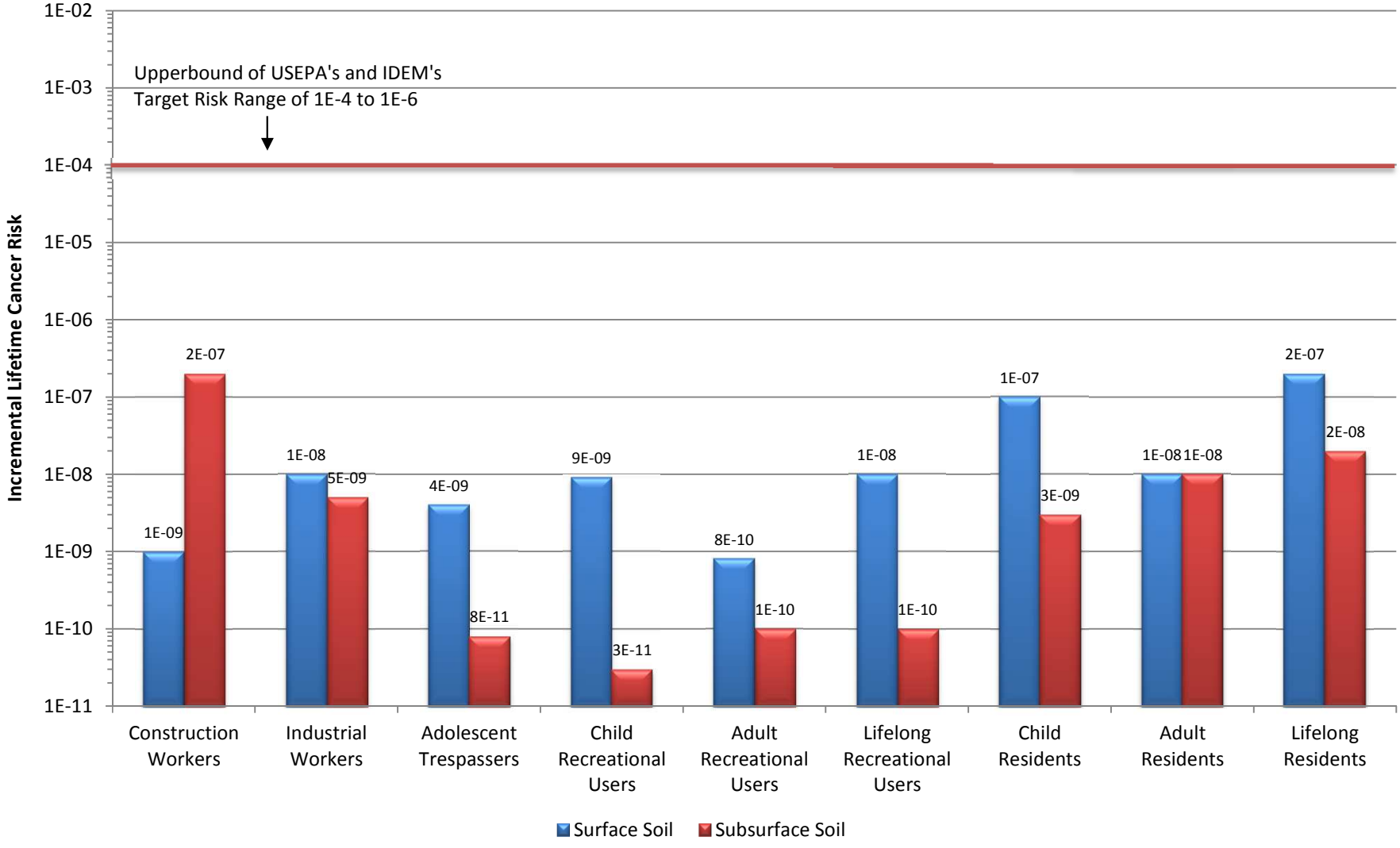


FIGURE 8-9d

SUMMARY OF MEDIA-SPECIFIC CANCER RISKS - CENTRAL TENDENCY EXPOSURES - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA



9.0 BOGGS CREEK

9.1 BOGGS CREEK DESCRIPTION

Boggs Creek is one of six major streams at NSA Crane (Figure 3-3). Boggs Creek is a third-order stream and lies within Drainage Basin IV at NSA Crane. Drainage Basin IV consists of Boggs and Turkey Creeks, which are the primary streams at NSA Crane and drain the majority of the installation.

SWMU 18 lies within Drainage Basin IV. Drainage swales and ditches convey surface water from developed areas of SWMU 18 to drainageways and then to three tributaries of Boggs Creek. The three tributaries are located east of Subareas A and B and north of Subarea E; along the boundary of Subareas C, D, E, F, G, and H; and, southeast of Subarea J. Two smaller drainages flow directly from Subarea E to Boggs Creek.

Boggs Creek also drains areas north and east of SWMU 18. The headwater of Boggs Creek lies just south of Highway 5, approximately 1.5 miles north of Subarea A of SWMU 18. Boggs Creek flows to a reservoir located near the southern boundary of NSA Crane, approximately 5.2 miles south of Subarea J of SWMU 18. From the reservoir, Boggs Creek ultimately flows into the East Fork White River approximately 5.6 miles south-southwest of the NSA Crane southern property boundary.

9.2 NATURE AND EXTENT OF CONTAMINATION

Five collocated surface water and sediment samples were collected along Boggs Creek during the RFI investigation (Figure 9-1). The surface water samples were analyzed for explosives (including NG), total and dissolved metals, perchlorate, and ammonia, and the sediment samples were analyzed for explosives (including NG) and TAL metals. The nature and extent of contaminants from SWMU 18 along Boggs Creek was evaluated based on the environmental samples collected. A summary of samples collected is provided in Table 2-1, and the locations of the samples are shown on Figure 9-1. Detection summary tables, by media, are provided in Tables 9-1 and 9-2, and the distribution of analytes in surface water and sediment in Boggs Creek are shown on Figures 9-2 and 9-3, respectively. Screening values are also provided in the summary tables for comparison of the results to regulatory criteria. Appendix G contains the full set of validated laboratory results. The following subsections discuss the nature and extent of contaminants detected in media along Boggs Creek.

9.2.1 Surface Water Results

Four explosives were detected in the surface water collected from Boggs Creek. Only RDX was detected at concentrations greater than the minimum human health screening level, however, the maximum RDX concentration was detected in the surface water sample from sample location 18SW004, located at the point east of Bridge 3357 on an unnamed tributary to Boggs Creek. This tributary flows from the area east of Boggs Creek. This sample was collected to identify potential contaminants to Boggs Creek not related to SWMU 18. RDX concentrations decrease in the locations downstream from this tributary, from 4.52 µg/L at 18SW003 to 1.49 µg/L at the farthest downstream location, 18SW001. No explosives were detected in the upstream surface water sample (18SW005) located farthest upstream in Boggs Creek.

Fourteen total TAL metals and twelve dissolved TAL metals were detected in one or more surface water sample collected from Boggs Creek. Four total TAL metals (aluminum, cadmium, chromium, and copper) and two dissolved TAL metals (chromium and copper) were detected at levels that exceeded the minimum human health and/or ecological screening levels. The maximum total aluminum, cadmium, and copper concentrations were detected in surface water sample 18SW003. The maximum total chromium concentration was detected in the downstream surface water sample 18SW001. The maximum dissolved chromium and copper concentrations were detected in surface water sample 18SW002. Dissolved copper was the only metal detected at concentrations exceeding screening levels in surface water sample 18SW005, the farthest upstream sample location along Boggs Creek.

Perchlorate was not detected in the surface water samples collected from Boggs Creek. Ammonia was detected in three surface water samples (18SW001 through 18SW003), but the concentrations did not exceed the minimum ecological screening level.

9.2.2 Sediment Results

One explosive, RDX, was detected in one sediment sample (18SD003) at a concentration (0.165 mg/kg), which exceeded the minimum ecological screening value (0.0.013 mg/kg). No other explosives were detected in the sediment samples collected from Boggs Creek.

Nineteen TAL metals were detected in the sediment samples collected from Boggs Creek. Eight TAL metals (arsenic, cadmium, chromium, cobalt, iron, manganese, nickel, and thallium) were detected at concentrations that exceeded the minimum human health and/or ecological screening levels. Arsenic, chromium, cobalt, iron, and manganese exceeded the minimum human health and/or ecological screening levels in all sediment samples. The maximum arsenic, iron, manganese, and thallium

concentrations were detected in sediment sample 18SD003. The maximum cadmium, chromium, and nickel concentrations were detected in sediment sample 18SD004, collected from the unnamed tributary at a point east of Bridge 3357. The maximum cobalt concentration was detected in sediment sample 18SD005, the farthest upstream sample location along Boggs Creek.

9.3 BASELINE HUMAN HEALTH RISK ASSESSMENT

This section presents the site-specific HHRA for exposure to surface water and sediment at Boggs Creek. The HHRA was prepared using the methodology presented in Appendix I. Section 9.3.1 contains a discussion of the selection of COPCs, Section 9.3.2 contains information on the potential receptors and potential exposure pathways, Section 9.3.3 contains the numerical results of the risk assessment, and Section 9.3.4 presents site-specific uncertainties associated with the risk assessment.

9.3.1 Data Evaluation

COPCs were identified for Boggs Creek using the screening levels presented and discussed in Section 2.2 of the HHRA methodology. A discussion of direct contact exposure COPCs (i.e., those chemicals detected at concentrations in excess of USEPA and IDEM direct contact exposure criteria) and COPCs selected using migration criteria are presented in the subsections that follow. COPCs selected using migration criteria are not quantitatively evaluated in the HHRA because they are not considered to be significant contributors to the direct contact exposure pathways identified for potential human receptors.

COPC selection information for each medium is presented in Tables 9-3 and 9-4. Table 9-5 presents a summary of the chemicals retained as COPCs for Boggs Creek. Samples used in the HHRA for Boggs Creek are listed in Appendix I. RAGS Part D tables for COPC selection are included in Appendix I.

9.3.1.1 Surface Water

Four explosives and 14 metals were detected in surface water samples collected at Boggs Creek. A comparison of maximum detected surface water concentrations to screening levels based on RSLs, IDEM screening levels for tap water, and USEPA maximum contaminant levels (MCL) is presented in Table 9-3. Maximum detected concentrations of the following chemicals exceeded COPC screening levels and were retained as COPCs for surface water at Boggs Creek:

- Explosives (RDX)
- Unfiltered metals (chromium)
- Filtered metals (chromium)

Concentrations of unfiltered and filtered chromium exceeded the screening levels based on the RSLs but were less than USEPA MCL and IDEM screening levels.

9.3.1.2 Sediment

One explosive and 19 metals were detected in sediment samples collected at Boggs Creek. A comparison of maximum detected sediment concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 9-4. The following chemicals were detected in sediment at maximum concentrations exceeding the direct contact risk-based COPC screening levels for residential land use and were retained as COPCs for sediment at Boggs Creek:

- Metals (arsenic, chromium, cobalt, iron, manganese, and thallium)

The maximum detected concentrations of cobalt and manganese exceeded the screening toxicity levels (set at a HQ of 0.1); however, they did not exceed the RSLs. Concentrations of cobalt and manganese exceeded the screening criteria based on the RSLs but were less than the IDEM screening levels.

9.3.1.3 Summary

Table 9-5 summarizes the chemicals retained as COPCs for surface water and sediment at Boggs Creek. RAGS Part D tables for COPC selection are included in Appendix I.

9.3.2 Exposure Assessment

This section presents the exposure assessment for Boggs Creek. The general exposure assessment approach and the exposure factors, which serve as the basis of the risk assessment, are provided in Section 3.0 of the HHRA methodology presented in Appendix I.1. The exposure assessment is designed to depict the physical setting of the site, identify potentially exposed populations and applicable exposure pathways, calculate EPCs, and estimate chemical intakes under the identified exposure scenarios.

Potential Receptors and Exposure Pathways

Receptors potentially exposed to site media at Boggs Creek included adolescent trespassers, recreational users, and hypothetical residents. The media of interest at Boggs Creek are surface water and sediment. Table 9-6 provides a site-specific summary of the potential receptors evaluated for Boggs

Creek. The following paragraphs briefly discuss relevant exposure pathways for each receptor evaluated in this HHRA.

Adolescent trespassers are plausible receptors under current or future land use scenarios. Although access to the base is controlled, once inside the base, access to the study areas is not limited by any physical constraints. This receptor may be exposed to potentially contaminated surface water (incidental ingestion; dermal contact) and sediments (incidental ingestion; dermal contact) in Boggs Creek. Potential exposures to surface water will be limited to wading because Boggs Creek is not deep enough for swimming.

Child and adult recreational users are plausible receptors under future land use scenarios. If NSA Crane were to close, the property could be converted to a park. A recreational user may be exposed to potentially contaminated surface water (incidental ingestion; dermal contact) and sediments (incidental ingestion; dermal contact). NSA Crane is not expected to close because principal base operations (demilitarization of munitions) are critical to the support of the United States Naval fleet.

Given the anticipated future land use for much of SWMU 18 (industrial), residents are very unlikely future receptors. However, the hypothetical future residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical resident may be exposed to surface water (ingestion; dermal contact) and sediment (incidental ingestion; dermal contact). It is also assumed that exposures to hypothetical residents would be similar to those for the child and adult recreational user.

Exposure Point Concentrations

EPCs for Boggs Creek are presented in Table 9-7. In general, the 95 percent UCL was used as the EPC for surface water and sediment. USEPA's ProUCL Version 4.1.00 was used to calculate the EPCs for exposures to surface water and sediment. Copies of the ProUCL printouts are included in Appendix I.

9.3.3 Risk Characterization

This section contains a summary of the results of the risk characterization for Boggs Creek. Quantitative risk estimates for potential human receptors are developed for those chemicals identified as COPCs. Uncertainties associated with the risk estimates are discussed in Section 9.3.4. The methodology used to calculate the risks presented in this section is provided in Section 2 of the HHRA methodology presented

in Appendix I.1. Potential cancer risks and HIs were calculated for adolescent trespassers, recreational users, and hypothetical residents under the RME and CTE scenarios and are summarized in Tables 9-8 and 9-9, respectively. Sample calculations are included in Appendix I.14 and the results of the risk assessment in RAGS Part D format are included in Appendix I.13.2.

9.3.3.1 Noncarcinogenic Risks

Tables 9-8 and 9-9 and Figures 9-4a through 9-4d present the HIs for the RME and CTE scenarios for Boggs Creek. Cumulative HIs for all receptors were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

9.3.3.2 Carcinogenic Risks

Tables 9-8 and 9-9 and Figures 9-5a through 9-5d present the ILCRs for the RME and CTE scenarios at Boggs Creek. Cumulative ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}.

9.3.4 Uncertainty Analysis

A detailed discussion of uncertainties associated with the various aspects of the HHRA, in general, was presented in Section 6 of the HHRA methodology. Site-specific uncertainties for Boggs Creek are presented below.

Thallium was retained as COPC in sediment at Boggs Creek. The toxicity criteria for thallium were developed for screening purposes only and are not appropriate for quantifying risks. Therefore, risks were not estimated for exposures to thallium in sediment. This results in an underestimation of risks for exposures to soil, although magnitude of the underestimation is not known.

9.3.5 Human Health Risk Assessment Summary

This section summarizes the results of the baseline HHRA for Boggs Creek at SWMU 18 which was performed to characterize the potential risks to likely human receptors under current and potential future land use scenarios. Potential receptors under the current land use scenario are trespassers. Potential receptors under future land use scenarios are child and adult recreational users, and hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future receptors were evaluated in the baseline HHRA, primarily for decision-making purposes.

The COPCs for direct contact to surface water are:

- RDX and chromium.

The COPCs for direct contact to sediment are :

- Arsenic, chromium, cobalt, iron, manganese, and thallium.

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. Cumulative HIs for all receptors under the RME and CTE scenarios were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. Cumulative ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}. Therefore, no COCs were identified for the surface waters and sediments of Boggs Creek.

9.4 ECOLOGICAL RISK ASSESSMENT

This section presents the subarea-specific ERA for exposures to surface water and sediment along Boggs Creek at SWMU 18. The ERA was prepared using the methodology presented in Appendix J. Section 9.4.1 contains a discussion of the environmental setting at Subarea A; Section 9.4.2 contains a discussion of the selection of COPCs; Section 9.4.3 contains a discussion on the refinement of COPCs; and, Section 9.4.4 provides a summary and conclusions of the ecological risk assessment.

9.4.1 Environmental Setting

Boggs Creek is located east of SWMU 18. Storm water from SWMU 18 flows into tributaries then to Boggs Creek. Potential sources of contamination include explosives and metals from SWMU 18 operations. Section 9.1 presents additional details on Boggs Creek.

9.4.2 Tier 1, Step 2: Selection of Contaminants of Potential Concern

Tables 9-10 and 9-11 provide the results of the COPC selection for sediment and surface water, respectively. Table 9-12 presents the results of the Tier 1 food chain model for sediment. Appendix J presents the food chain model calculation worksheets.

Sediment Invertebrates

One explosive and five metals were selected as COPCs because maximum detected concentrations resulted in an EEQ greater than 1.0. Two metals were selected as COPCs because screening levels were not available.

Aquatic Organisms

Three total metals and one dissolved metal were selected as COPCs because maximum detected concentrations resulted in an EEQ greater than 1.0.

Wildlife

The following summarizes the results of the food chain modeling for terrestrial receptors using maximum concentrations and Tier 1 input parameters:

- Piscivorous mammal: Four metals had EEQs greater than 1.0 in the food chain model.
- Piscivorous bird: Six metals had EEQs greater than 1.0 in the food chain model.

9.4.3 Tier 2, Step 3a: COPC Refinement

Summaries of the Step 3a evaluation for sediment invertebrates and aquatic organisms are presented in Tables 9-13 and 9-14. As part of the Step 3a evaluation for terrestrial wildlife, Table 9-15 presents the results of the food chain model for sediment using Step 3a exposure assumptions and chemical concentrations. A detailed discussion of the Step 3a evaluation is presented in the following sections.

Sediment Invertebrates

Beryllium and thallium were initially selected as COPCs for sediment invertebrates because screening levels were not available. Alternate benchmarks were not available for beryllium and thallium; therefore impacts cannot be quantified.

Arsenic, barium, cadmium, iron, manganese, and nickel were initially selected as COPCs for sediment invertebrates because detected concentrations exceeded their respective screening levels.

Arsenic was initially selected as a COPC because the maximum detected concentration (19.5 mg/kg) exceeded the screening level (9.79 mg/kg). The screening level is a TEC (MacDonald, et al., 2000). The

PEC for arsenic is 33 mg/kg and no samples had arsenic concentrations greater than the PEC; therefore, arsenic is eliminated as a COPC.

Barium was initially selected as a COPC because the maximum detected concentration (92.6 mg/kg) exceeded the screening level (48 mg/kg). Barium is not generally considered toxic and the concentrations detected in Boggs Creek samples are less than the maximum soil background concentration. Therefore, impacts to sediment invertebrates are expected to be minimal, and barium is not retained as a COPC for sediment invertebrates.

Cadmium was initially selected as a COPC because the maximum detected concentration (4.24 mg/kg) exceeded the TEC of 0.99 mg/kg; however, all concentrations detected in Boggs Creek samples are less than the PEC of 4.98 mg/kg. Therefore, impacts to sediment invertebrates are expected to be minimal, and cadmium is not retained as a COPC for sediment invertebrates.

Iron was initially selected as a COPC because the maximum concentration (119,000 mg/kg) exceeded the screening level of 20,000 mg/kg. This screening level is the lowest effects level (LEL). The severe effects level (SEL) is 40,000 mg/kg (Persaud, et al., 1993). Concentrations of iron at one location upstream of SWMU 18 and one location across from Subarea E were greater than the SEL. However, iron is typically not considered to be bioavailable. Iron concentrations in soil samples from the subareas at SWMU 18 were less than this value with a maximum iron soil concentration of 58,200 mg/kg at Subarea D. Therefore, impacts to sediment invertebrates are not expected to be site-related and iron is not retained as a COPC for sediment invertebrates.

The maximum concentration of manganese (1,460 mg/kg) exceeded its screening value (LEL) of 460 mg/kg. The maximum concentration of manganese only slightly exceeded the SEL of 1,100 mg/kg. Concentrations of manganese at locations upstream and downstream of this location were less than the SEL; therefore, impacts to sediment invertebrates are expected to be minimal and manganese is not retained as a COPC for sediment invertebrates.

The maximum concentration of nickel (27.8 mg/kg) slightly exceeded its screening value (TEC) of 22.7 mg/kg; however, all concentrations were less than the corresponding PEC of 48.6 mg/kg. Therefore impacts to sediment invertebrates are expected to be minimal, and nickel is not retained as a COPC for sediment invertebrates.

Aquatic Organisms

Total aluminum, total cadmium, and total and dissolved copper were selected as COPCs for aquatic organisms because detected concentrations exceeded their respective screening levels. Aluminum and cadmium were not detected in the filtered samples, and dissolved metals are typically considered to be the bioavailable fraction to aquatic organisms. Therefore, aluminum and cadmium are eliminated as COPCs in surface water for risks to aquatic organisms. Total copper and dissolved copper were detected at maximum concentrations (3.33 µg/L and 4.36 µg/L, respectively) exceeding the screening value of 1.58 µg/L. This value is based on the USEPA National Recommended Water Quality Criteria: 2002 using a hardness of 50 mg/L as CaCO3 (USEPA, 2002). The 2006 USEPA National Recommended Water Quality Criterion for copper is 9 µg/L using a hardness of 100 milligrams per liter (mg/L) as $CaCO_3$ (USEPA, 2006). The toxicity of several metals, including copper, to aquatic receptors in freshwater systems decreases with increasing water hardness. A water hardness value of 137 mg/L was calculated using the average calcium and magnesium concentrations detected in the surface water. Concentrations of dissolved copper were less than the 2006 screening value; therefore, copper is eliminated as a COPC.

Mammals and Birds

As presented in Section 9.4.2, the EEQs from the food chain modeling for sediment were greater than 1.0 for several metals using maximum chemical concentrations and Tier 1 exposure assumptions. Therefore, as part of the Step 3a refinement, risks were recalculated using average chemical concentrations and the Tier 2, Step 3a exposure parameters as presented in Appendix J. The food chain model calculation sheets are also provided in Appendix J.

The results of food chain modeling for terrestrial receptors using average concentrations and the Tier 2, Step 3a input parameters indicate that :

- Piscivorous receptors: No EEQs were greater than 1.0; therefore, impacts to piscivorous mammals and birds are not expected from chemicals detected in sediment and surface water from Boggs Creek.

9.4.4 Ecological Risk Summary and Conclusions

This ERA evaluated sediment and surface water from Boggs Creek. Based on the initial screening of the chemical data, several chemicals were initially selected as COPCs in sediment and surface water because they were detected at concentrations that exceeded conservative screening levels, they had

EEQs greater than 1.0 in the conservative food chain model, or because they did not have screening levels.

These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. The following presents the results of the ERA.

Sediment Invertebrates

No chemicals were retained as a COPC for potential risks to sediment invertebrates.

Aquatic Organisms

No chemicals were retained as a COPC for potential risks to aquatic organisms.

Mammals and Birds

No chemicals were retained as COPCs for mammals and birds.

9.5 SUMMARY AND RECOMMENDATIONS

Five collocated surface water and sediment samples were collected along Boggs Creek during the RFI investigation. The surface water samples were analyzed for explosives (including NG), total and dissolved metals, perchlorate, and ammonia, and the sediment samples were analyzed for explosives (including NG) and TAL metals.

Four explosives were detected in surface water samples collected from Boggs Creek. Only RDX was detected at concentrations greater than the minimum human health screening level, however, the maximum RDX concentration was detected in the surface water sample from sample location 18SW004, located at the point east of Bridge 3357 on an unnamed tributary to Boggs Creek. This tributary flows from the area east of Boggs Creek. This sample was collected to identify potential contaminants to Boggs Creek not related to SWMU 18. RDX concentrations decrease in the locations downstream from this tributary, from 4.52 µg/L at 18SW003 to 1.49 µg/L at the farthest downstream location, 18SW001. No explosives were detected in the upstream surface water sample (18SW005) located farthest upstream in Boggs Creek.

Fourteen total TAL metals and twelve dissolved TAL metals were detected in one or more surface water samples collected from Boggs Creek. Four total TAL metals (aluminum, cadmium, chromium, and

copper) and two dissolved TAL metals (chromium and copper) were detected at levels that exceeded the minimum human health and/or ecological screening levels.

Perchlorate was not detected in the surface water samples collected from Boggs Creek. Ammonia was detected in three surface water samples (18SW001 through 18SW003), but the concentrations did not exceed the minimum ecological screening level.

One explosive, RDX, was detected in one sediment sample 18SD003 at a concentration (0.165 mg/kg) that exceeded the minimum ecological screening value (0.0.013 mg/kg). No other explosives were detected in the sediment samples collected from Boggs Creek.

Nineteen TAL metals were detected in the sediment samples collected from Boggs Creek. Eight TAL metals (arsenic, cadmium, chromium, cobalt, iron, manganese, nickel, and thallium) were detected at concentrations that exceeded the minimum human health and/or ecological screening levels.

The baseline HHRA, performed to characterize the potential risks to likely human receptors for exposures to surface water and sediment at Boggs Creek, identified RDX and chromium as COPCs in surface water and arsenic, chromium, cobalt, iron, manganese, and thallium as COPCs in sediment. Cumulative ILCRs for all receptors under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of 10^{-4} to 10^{-6}. Furthermore, SWMU 18 is not contributing RDX to surface water in Boggs Creek. The maximum concentration of RDX detected was from the sample from the tributary that flows from the area east of Boggs Creek. This tributary flows past SWMU 13 (Mine Fill B). Characterization activities associated with SWMU 13 have determined that RDX-contaminated groundwater from SWMU 13 discharges to this unnamed tributary via seeps. The RDX in Boggs Creek is being addressed as part of remedial actions for SWMU 13. Therefore, no COCs were identified for the surface waters and sediments of Boggs Creek.

The ERA for Boggs Creek evaluated potential ecological risks from surface water and sediment. No chemicals were retained in the ERA as COPCs for potential ecological receptors.

Based on the results of the human health and ecological risk assessments, NFA is recommended for Boggs Creek.

TABLE 9-1

SUMMARY OF SURFACE WATER RESULTS - BOGGS CREEK
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE SAMPLE CODE MATRIX SAMPLE TYPE SUBMATRIX	ECO (1)	ECO REF	HH (2)	HH REF	18SW/SD001 18SW001 20111019 NORMAL SW NORMAL NA	18SW/SD002 18SW002 20111019 NORMAL SW NORMAL NA	18SW/SD003 18SW003 20111021 NORMAL SW NORMAL NA	18SW/SD004 18SW004 20111021 NORMAL SW NORMAL NA	18SW/SD005 18SW005 20111021 NORMAL SW NORMAL NA
DISSOLVED METALS (UG/L)									
ALUMINUM	87	AWQC	1600	USEPA RSL TAP	**27.3 J**	**31.4 J**	**40.2 J**	**28.3 J**	**25.9 J**
BARIUM	220	Region 5	290	USEPA RSL TAP	**39.8**	**47.8**	**45.6**	**49.7**	**34.3**
CALCIUM	116000	Region 3	NA	NA	**35700**	**42800**	**43200 J**	**53600 J**	**38700 J**
CHROMIUM	11	AWQC	0.031	USEPA RSL TAP	1 U	**0.849 J**	1 U	**0.581 J**	1 U
COPPER	1.58	Region 5	62	USEPA RSL TAP	**3.9**	**4.36**	**2.33 J**	**3.78 J**	**3.12 J**
IRON	10000	AWQC	1100	USEPA RSL TAP	**9.99 J**	**11.9 J**	**7.66 J**	**12.1 J**	**8.8 J**
MAGNESIUM	82000	Region 3	NA	NA	**6160**	**7360**	**7480**	**8680**	**6870**
MANGANESE	120	Region 3	32	USEPA RSL TAP	**9.33**	**5.13**	**2.18 J**	**1.82 J**	**3.01 J**
NICKEL	52	AWQC	30	USEPA RSL TAP	**2.2 J**	**3.32**	**1.36 J**	**2.49 J**	**2.62**
POTASSIUM	53000	Region 3	NA	NA	**3900**	**4130**	**3730 J**	**3790 J**	**1650 J**
SODIUM	680000	Region 3	NA	NA	**24800**	**31000**	**18600 J**	**29300 J**	**9180 J**
ZINC	65.7	Region 5	470	USEPA RSL TAP	**7.96**	**10.4**	**5.39**	**5.53**	**4.04 J**
EXPLOSIVES (UG/L)									
2-NITROTOLUENE	NA	NA	0.27	USEPA RSL TAP	**0.145 J**	0.16 U	0.157 U	0.16 U	0.16 U
4-AMINO-2,6-DINITROTOLUENE	NA	NA	3	USEPA RSL TAP	0.16 U	0.16 U	0.157 U	**0.247**	0.16 U
HMX	150	Region 3	78	USEPA RSL TAP	**0.375**	**0.346**	**1.24**	**2.21**	0.16 U
RDX	360	Region 3	0.61	USEPA RSL TAP	**1.49**	**1.56**	**4.52**	**10.8**	0.16 U
METALS (UG/L)									
ALUMINUM	87	AWQC	1600	USEPA RSL TAP	**50.6**	**97.5**	**294 J**	**49.5 J**	**47.6 J**
BARIUM	220	Region 5	290	USEPA RSL TAP	**41.7**	**48**	**42.3**	**51**	**34.5**
CADMIUM	0.25	AWQC	0.69	USEPA RSL TAP	0.5 U	**0.255 J**	**0.272 J**	0.5 U	0.5 U
CALCIUM	116000	Region 3	NA	NA	**37900 J**	**43900 J**	**40300 J**	**53600 J**	**39500 J**
CHROMIUM	11	AWQC	0.031	USEPA RSL TAP	**0.905 J**	**0.527 J**	**0.874 J**	1 U	1 U
COPPER	1.58	Region 5	62	USEPA RSL TAP	**2.59 J**	**2.75 J**	**3.33 J**	**1.71 J**	**1.31 J**
IRON	10000	AWQC	1100	USEPA RSL TAP	**43.2 J**	**123 J**	**223 J**	**42.1 J**	**48.7 J**
LEAD	2.5	AWQC	15	USEPA RSL TAP	0.75 UJ	0.75 UJ	**0.436 J**	0.75 UJ	0.75 UJ
MAGNESIUM	82000	Region 3	NA	NA	**6420**	**7450**	**6940**	**8820**	**6910**
MANGANESE	120	Region 3	32	USEPA RSL TAP	**11.1**	**10.9**	**27.7**	**1.17 J**	**2 J**
NICKEL	52	AWQC	30	USEPA RSL TAP	**1.88 J**	**1.08 J**	**1.38 J**	1.5 U	1.5 U
POTASSIUM	53000	Region 3	NA	NA	**4040**	**4180**	**3480 J**	**3830 J**	**1630 J**
SODIUM	680000	Region 3	NA	NA	**25700 J**	**31400 J**	**17900 J**	**29600 J**	**9160 J**
ZINC	65.7	Region 5	470	USEPA RSL TAP	**5.07**	**11.8**	**11.1 J**	**1.52 J**	2.5 UJ
MISCELLANEOUS PARAMETERS (MG/L)									
AMMONIA-N	19	Region 3	NA	NA	**0.774**	**0.79**	**0.124 J**	0.15 U	0.15 U

NOTES:
Only analytes with at least one detection are shown on this table.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

ACRONYMS:
Eco = Ecological
Eco Ref = Ecological Reference
HH = Human Health
HH Ref = Human Health Reference
mg/L = milligrams per liter
NA = Not available/analyzed
NSA = Naval Support Activity
SWMU = Solid Waste Management Unit
ug/L = Micrograms per liter
USEPA = United States Environmental Protection Agency

Light gray shading indicates detection.
Dark shading indicates exceedance of at least one criterion.

TABLE 9-2

SUMMARY OF SEDIMENT RESULTS - BOGGS CREEK
SWMU18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY CRANE, INDIANA

LOCATION SAMPLE ID SAMPLE DATE MATRIX SAMPLE TYPE SUBMATRIX	ECO (1)	ECO REF	HH (2)	HH REF	18SW/SD001 18SD0010006 10/19/2011 SD NORMAL SD	18SW/SD002 18SD0020006 10/19/2011 SD NORMAL SD	18SW/SD003 18SD0030006 10/21/2011 SD NORMAL SD	18SW/SD004 18SD0040006 10/21/2011 SD NORMAL SD	18SW/SD005 18SD0050006 10/21/2011 SD NORMAL SD
EXPLOSIVES (MG/KG)									
RDX	0.013	(4)	5.6	(6)	0.0392 U	0.04 U	**0.165**	0.0381 UJ	0.0367 U
METALS (MG/KG)									
ALUMINUM	NA	NA	7700	(6)	2490	4200	6350	4770	6320
ARSENIC	9.79	(3)	0.39	(6)	**5.87**	**4.53**	**19.5 J**	**9.93 J**	**9 J**
BARIUM	NA	NA	1500	(6)	30.7	45	92.6 J	54.7 J	66 J
BERYLLIUM	NA	NA	16	(6)	0.63 J	0.652 J	2.01	1.47	1.03 J
CADMIUM	0.99	(3)	7	(6)	0.681 J	0.671 U	0.691 J	**4.24 J**	0.627 UJ
CALCIUM	NA	NA	NA	NA	549 J	601 J	1240 J	1560	938 J
CHROMIUM	43.4	(3)	0.29	(6)	**14.2**	**11.1**	**31.3 J**	**38.3 J**	**20.8 J**
COBALT	50	(3)	2.3	(6)	**7.46**	**3.9 J**	**12.3 J**	**13.2 J**	**13.5 J**
COPPER	31.6	(3)	310	(6)	6.04	6.66	10.3 J	11.1 J	9.1 J
IRON	20000	(4)	5500	(6)	**19400**	**10800**	**119000**	**68400**	**28500**
LEAD	35.8	(3)	400	(6)	8.26	7.79	20.7 J	18.6 J	12.5 J
MAGNESIUM	NA	NA	NA	NA	939 U	449 J	767 J	1670 U	648 J
MANGANESE	460	(4)	180	(6)	**487**	**314**	**1460 J**	**765 J**	**1030 J**
MERCURY	0.174	(3)	2.3	(6)	0.0411 U	0.0443 U	0.0298 J	0.0212 J	0.0342 J
NICKEL	22.7	(3)	150	(6)	10.4	10.7	**25.2**	**27.8**	17
POTASSIUM	NA	NA	NA	NA	939 U	1010 U	383 J	309 J	410 J
THALLIUM	NA	NA	0.078	(6)	1.25 U	1.34 U	**2.28 J**	2.22 U	**1.41 J**
VANADIUM	NA	NA	39	(6)	14.1	12.9	35.2 J	33 J	23.6 J
ZINC	121	(3)	2300	(6)	32	21.8	52.3 J	72.8 J	32.1 J
MISCELLANEOUS PARAMETERS (MG/KG)									
TOTAL ORGANIC CARBON	NA	NA	NA	NA	7280	5670	10400	11100	4380

NOTES:
Only analytes with at least one detection are shown on this table.
(1) Minimum Ecological Risk Criteria
(2) Minimum Human Health Risk Criteria
(3) Region 5 (USEPA, 2003)
(4) Region 3, freshwater (USEPA, 2006)
(5) Sunahara (Sunahara, et al., 2009)
(6) Adjusted USEPA Regional Screening Level Direct Contact Residential
(7) Indiana Department of Environmental Management Soil - Direct

DATA QUALIFIERS:
U = Indicates that parameter was not detected at the numerical detection limit.
J = Indicates that result was detected but concentration is considered an estimate due to precision.
UJ = Indicates that the result was not detected but estimated.

Acronyms:
Eco - Ecological
Eco Ref - Ecological Reference
HH - Human Health
HH Ref - Human Health Reference
mg/kg - Milligrams per kilogram
NA - Not available/analyzed
NSA - Naval Support Activity
RDX - Cyclotrimethylenetrinitramine
SD - Sediment
SWMU - Solid Waste Management Unit

Light gray shading indicates detection.
Dark shading indicates exceedance of at least one criterion.

TABLE 9-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE WATER - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Range of Background Concentrations[3]	Adjusted USEPA RSL Tapwater[4]	USEPA MCL[5]	IDEM Groundwater Residential[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Explosives														
88-72-2	2-Nitrotoluene	0.145 J	0.145 J	ug/L	18SW001	1/5	0.157 - 0.16	0.145	NA	0.27 C	NA	2.7 C	No	BSL
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.247	0.247	ug/L	18SW004	1/5	0.157 - 0.16	0.247	NA	3 N	NA	30 N	No	BSL
2691-41-0	HMX	0.346	2.21	ug/L	18SW004	4/5	0.16 - 0.16	2.21	NA	78 N	NA	780 N	No	BSL
121-82-4	**RDX**	1.49	10.8	ug/L	18SW004	4/5	0.16 - 0.16	10.8	NA	**0.61 C**	NA	**6.1 C**	**Yes**	ASL
Metals (Total)														
7429-90-5	Aluminum	47.6 J	294 J	ug/L	18SW003	5/5	-	294	NA	1600 N	NA	16000 N	No	BSL
7440-39-3	Barium	34.5	51	ug/L	18SW004	5/5	-	51	NA	290 N	2000	2000 M	No	BSL
7440-43-9	Cadmium	0.255 J	0.272 J	ug/L	18SW003	2/5	0.5 - 0.5	0.272	NA	0.69 N	5	5 M	No	BSL
7440-70-2	Calcium	37900 J	53600 J	ug/L	18SW004	5/5	-	53600	NA	NA	NA	NA	No	NUT
7440-47-3	**Chromium**	0.527 J	0.905 J	ug/L	18SW001	3/5	1 - 1	0.905	NA	**0.031 C[8]**	100	**0.31 C[8]**	**Yes**	ASL
7440-50-8	Copper	1.31 J	3.33 J	ug/L	18SW003	5/5	-	3.33	NA	62 N	1300 [9]	1300 M	No	BSL
7439-89-6	Iron	42.1 J	223 J	ug/L	18SW003	5/5	-	223	NA	1100 N	NA	11000 N	No	BSL
7439-92-1	Lead	0.436 J	0.436 J	ug/L	18SW003	1/5	0.75 - 0.75	0.436	NA	15	15 [9]	15 M	No	BSL
7439-95-4	Magnesium	6420	8820	ug/L	18SW004	5/5	-	8820	NA	NA	NA	NA	No	NUT
7439-96-5	Manganese	1.17 J	27.7	ug/L	18SW003	5/5	-	27.7	NA	32 N	NA	320 N	No	BSL
7440-02-0	Nickel	1.08 J	1.88 J	ug/L	18SW001	3/5	1.5 - 1.5	1.88	NA	30 N	NA	300 N	No	BSL
7440-09-7	Potassium	1630 J	4180	ug/L	18SW002	5/5	-	4180	NA	NA	NA	NA	No	NUT
7440-23-5	Sodium	9160 J	31400 J	ug/L	18SW002	5/5	-	31400	NA	NA	NA	NA	No	NUT
7440-66-6	Zinc	1.52 J	11.8	ug/L	18SW002	4/5	2.5 - 2.5	11.8	NA	470 N	NA	4700 N	No	BSL
Metals (Filtered)														
7429-90-5	Aluminum	25.9 J	40.2 J	ug/L	18SW003	5/5	-	40.2	NA	1600 N	NA	16000 N	No	BSL
7440-39-3	Barium	34.3	49.7	ug/L	18SW004	5/5	-	49.7	NA	290 N	2000	2000 M	No	BSL
7440-70-2	Calcium	35700	53600 J	ug/L	18SW004	5/5	-	53600	NA	NA	NA	NA	No	NUT
7440-47-3	**Chromium**	0.581 J	0.849 J	ug/L	18SW002	2/5	1 - 1	0.849	NA	**0.031 C[8]**	100	100 M	**Yes**	ASL
7440-50-8	Copper	2.33 J	4.36	ug/L	18SW002	5/5	-	4.36	NA	62 N	1300 [9]	1300 M	No	BSL
7439-89-6	Iron	7.66 J	12.1 J	ug/L	18SW004	5/5	-	12.1	NA	1100 N	NA	11000 N	No	BSL
7439-95-4	Magnesium	6160	8680	ug/L	18SW004	5/5	-	8680	NA	NA	NA	NA	No	NUT
7439-96-5	Manganese	1.82 J	9.33	ug/L	18SW001	5/5	-	9.33	NA	32 N	NA	320 N	No	BSL
7440-02-0	Nickel	1.36 J	3.32	ug/L	18SW002	5/5	-	3.32	NA	30 N	NA	300 N	No	BSL
7440-09-7	Potassium	1650 J	4130	ug/L	18SW002	5/5	-	4130	NA	NA	NA	NA	No	NUT
7440-23-5	Sodium	9180 J	31000	ug/L	18SW002	5/5	-	31000	NA	NA	NA	NA	No	NUT
7440-66-6	Zinc	4.04 J	10.4	ug/L	18SW002	5/5	-	10.4	NA	470 N	NA	4700 N	No	BSL
Miscellaneous Parameters														
- -	Ammonia-N	0.124 J	0.79	mg/L	18SW002	3/5	0.15 - 0.15	0.79	NA	NA	NA	NA	No	NTX

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - No background data is available for surface water.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Values are for hexavalent chromium.
9 - The MCL for this parameter is actually a treatment technique. The SDWA action level (at the tap) has been presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18SW001
18SW002
18SW003
18SW004
18SW005

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirements To Be Considered
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical Of Potential Concern
IDEM = Indiana Department of Environmental Management
J = Estimated value
MCL = Maximum Contaminant Level
mg/L = Milligrams per liter
N = Noncarcinogen
NA = Not Applicable/Not Available
NSA = Naval Support Activity
RSL = Regional Screening Level
SDWA = Safe Drinking Water Act
SWMU = Solid Waste Management Unit
ug/L = Micrograms per liter
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level/ARAR/TBC

For elimination as a COPC:
BSL = Below COPC Screening Level
NTX = No toxicity criteria
NUT = Essential nutrient

TABLE 9-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SEDIMENT - BOGGS CREEK
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Explosives													
121-82-4	RDX	0.165	0.165	mg/kg	18SD0030006	1/5	0.0367 - 0.04	0.165	NA	5.6 C	78 C	No	BSL
Metals													
7429-90-5	Aluminum	2,490	6,350	mg/kg	18SD0030006	5/5	-	6,350	NA	7,700 N	100,000 L	No	BSL
7440-38-2	**Arsenic**	4.53	19.5 J	mg/kg	18SD0030006	5/5	-	19.5	NA	**0.39 C**	**5.5 C**	**Yes**	ASL
7440-39-3	Barium	30.7	92.6 J	mg/kg	18SD0030006	5/5	-	92.6	NA	1,500 N	21,000 N	No	BSL
7440-41-7	Beryllium	0.630 J	2.01	mg/kg	18SD0030006	5/5	-	2.01	NA	16 N	220 N	No	BSL
7440-43-9	Cadmium	0.681 J	4.24 J	mg/kg	18SD0040006	3/5	0.627 - 0.671	4.24	NA	7 N	98 N	No	BSL
7440-70-2	Calcium	549 J	1,560	mg/kg	18SD0040006	5/5	-	1,560	NA	NA	NA	No	NUT
7440-47-3	**Chromium**	11.1	38.3 J	mg/kg	18SD0040006	5/5	-	38.3	NA	**0.29 C[7]**	**4.1 C[7]**	**Yes**	ASL
7440-48-4	**Cobalt**	3.90 J	13.5 J	mg/kg	18SD0050006	5/5	-	13.5	NA	**2.3 N**	32 N	**Yes**	ASL
7440-50-8	Copper	6.04	11.1 J	mg/kg	18SD0040006	5/5	-	11.1	NA	310 N	4,300 N	No	BSL
7439-89-6	**Iron**	10,800	119,000	mg/kg	18SD0030006	5/5	-	119,000	NA	**5,500 N**	**77,000 N**	**Yes**	ASL
7439-92-1	Lead	7.79	20.7 J	mg/kg	18SD0030006	5/5	-	20.7	NA	400	400	No	BSL
7439-95-4	Magnesium	449 J	767 J	mg/kg	18SD0030006	3/5	939 - 1670	767	NA	NA	NA	No	NUT
7439-96-5	**Manganese**	314	1,460 J	mg/kg	18SD0030006	5/5	-	1,460	NA	**180 N**	2,500 N	**Yes**	ASL
7439-97-6	Mercury	0.021 J	0.034 J	mg/kg	18SD0050006	3/5	0.0411 - 0.0443	0.0342	NA	2.3 N[8]	3.1 S	No	BSL
7440-02-0	Nickel	10.4	27.8	mg/kg	18SD0040006	5/5	-	27.8	NA	150 N	2,100 N	No	BSL
7440-09-7	Potassium	309 J	410 J	mg/kg	18SD0050006	3/5	939 - 1010	410	NA	NA	NA	No	NUT
7440-28-0	**Thallium**	1.41 J	2.28 J	mg/kg	18SD0030006	2/5	1.25 - 2.22	2.28	NA	**0.078 N**	**1.1 N**	**Yes**	ASL
7440-62-2	Vanadium	12.9	35.2 J	mg/kg	18SD0030006	5/5	-	35.2	NA	39 N	NA	No	BSL
7440-66-6	Zinc	21.8	72.8 J	mg/kg	18SD0040006	5/5	-	72.8	NA	2,300 N	32,000 N	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - No background data is available for sediment.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
2 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - Value is for hexavalent chromium.
8 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18SD0010006
18SD0020006
18SD0030006
18SD0040006
18SD0050006

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg.
mg/kg = Milligrams per kilogram
N = Noncarcinogen
NA = Not Applicable/Not Available
NSA = Naval Support Activity
RDX = Cyclotrimethyenetrinitramine
RSL = Regional Screening Level
S = Soil saturation limit.
SWMU = Solid Waste Management Unit
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level

For elimination as a COPC:
BSL = Below COPC Screening Level
NUT = Essential nutrient

TABLE 9-5

CHEMICALS RETAINED AS COPCs - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Water	Sediment
RDX	E, I	
Metals		
Arsenic		E, I
Cadmium		
Chromium	E	E, I
Cobalt		E
Iron		E, I
Manganese		E
Thallium		E, I

Notes
E - Chemical exceeded USEPA screening criteria and was retained as a COPC.
I - Chemical exceeded IDEM screening criteria and was retained as a COPC.

Acronyms:
COPC - Chemical of Potential Concern
IDEM - Indiana Department of Environmental Management
NSA - Naval Support Activity
RDX - Cyclotrimethylenetrinitramine
USEPA - United States Environmental Protection Agency

TABLE 9-6

SELECTION OF EXPOSURE PATHWAYS - BOGGS CREEK
SWMU 18 – LOAD AND FILL AREA
NSA 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 Water	Surface Water	Boggs Creek	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not exposed to surface water.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not exposed to surface water.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Trespassers may be exposed to surface water while at the site.
	Sediment	Sediment	Boggs Creek	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not exposed to sediment.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not exposed to sediment.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Current trespassers may be exposed to sediment while at the site.
Future	Surface Water	Surface Water	Boggs Creek	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to surface water while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	
	Sediment	Sediment	Boggs Creek	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to sediment while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	

Notes:
Qual - Qualitative.
Quant - Quantitative.

TABLE 9-7

EXPOSURE POINT CONCENTRATIONS - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Water (ug/L)	Sediment (mg/kg)
Explosives		
RDX	7.94	NA
Inorganics		
Arsenic	NA	15.4
Chromium	0.905	34.1
Cobalt	NA	14.1
Iron	NA	91,940
Manganese	NA	1244
Thallium	NA	2.05

Notes:
The exposure point concentrations (EPCs) were calculated according to USEPA's ProUCL guidance. See the RAGS PART D Table 3s in Appendix J for details concerning the EPCs.

Acronyms:
COPC - Chemical of Potential Concern
mg/kg - Milligrams per kilogram
NA - Not applicable. Not a COPC for this media.
NSA - Naval Support Activity
RAGS - Risk Assessment Guidance for Superfund
RDX - Cyclotrimethylenetrinitramine
SWMU - Solid Waste Management Unit
ug/L - Micrograms per liter
USEPA - United States Environmental Protection Agency

TABLE 9-8

SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - BOGGS CREEK
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ Hazard Index > 1
Adolescent Trespassers	Surface Water	Incidental Ingestion	3E-08	--	--	--	0.0002	--
		Dermal Contact	4E-07	--	--	--	0.0007	--
		Total	4E-07	--	--	--	0.0009	--
	Sediment	Incidental Ingestion	5E-07	--	--	--	0.01	--
		Dermal Contact	7E-08	--	--	--	0.001	--
		Total	6E-07	--	--	--	0.02	--
		Total Surface Water and Sediment	1E-06				0.02	
Child Recreational Users/ Residents	Surface Water	Incidental Ingestion	1E-07	--	--	--	0.001	--
		Dermal Contact	2E-06	--	--	Chromium	0.003	--
		Total	2E-06	--	--	Chromium	0.004	--
	Sediment	Incidental Ingestion	9E-06	--	--	Arsenic, Chromium VI	0.3	--
		Dermal Contact	3E-07	--	--	--	0.008	--
		Total	1E-05	--	--	Arsenic, Chromium VI	0.3	--
		Total Surface Water and Sediment	1E-05				0.3	
Adult Recreational Users/ Residents	Surface Water	Incidental Ingestion	5E-08	--	--	--	0.0002	--
		Dermal Contact	1E-06	--	--	--	0.001	--
		Total	1E-06	--	--	--	0.001	--
	Sediment	Incidental Ingestion	2E-06	--	--	--	0.03	--
		Dermal Contact	2E-07	--	--	--	0.001	--
		Total	2E-06	--	--	--	0.03	--
		Total Surface Water and Sediment	3E-06				0.03	
Lifelong Recreational Users/ Residents	Surface Water	Incidental Ingestion	2E-07	--	--	--	NA	--
		Dermal Contact	3E-06	--	--	Chromium	NA	--
		Total	3E-06	--	--	Chromium	NA	--
	Sediment	Incidental Ingestion	1E-05	--	--	Arsenic, Chromium	NA	--
		Dermal Contact	5E-07	--	--	--	NA	--
		Total	1E-05	--	--	Arsenic, Chromium	NA	--
		Total Surface Water and Sediment	1E-05				NA	

TABLE 9-9

SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - BOGGS CREEK
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ Hazard Index > 1
Adolescent Trespassers	Surface Water	Incidental Ingestion	6E-09	--	--	--	0.00006	--
		Dermal Contact	1E-07	--	--	--	0.0002	--
		Total	1E-07	--	--	--	0.0002	--
	Sediment	Incidental Ingestion	1E-07	--	--	--	0.004	--
		Dermal Contact	1E-08	--	--	--	0.0002	--
		Total	1E-07	--	--	--	0.004	--
		Total Surface Water and Sediment	3E-07				0.004	
Child Recreational Users/ Residents	Surface Water	Incidental Ingestion	1E-08	--	--	--	0.0003	--
		Dermal Contact	2E-07	--	--	--	0.0007	--
		Total	2E-07	--	--	--	0.001	--
	Sediment	Incidental Ingestion	9E-07	--	--	--	0.07	--
		Dermal Contact	1E-08	--	--	--	0.0008	--
		Total	9E-07	--	--	--	0.07	--
		Total Surface Water and Sediment	1E-06				0.07	
Adult Recreational Users/ Residents	Surface Water	Incidental Ingestion	3E-09	--	--	--	0.00006	--
		Dermal Contact	7E-08	--	--	--	0.0003	--
		Total	7E-08	--	--	--	0.0004	--
	Sediment	Incidental Ingestion	1E-07	--	--	--	0.007	--
		Dermal Contact	4E-09	--	--	--	0.00009	--
		Total	1E-07	--	--	--	0.008	--
		Total Surface Water and Sediment	2E-07				0.008	
Lifelong Recreational Users/ Residents	Surface Water	Incidental Ingestion	1E-08	--	--	--	NA	--
		Dermal Contact	2E-07	--	--	--	NA	--
		Total	3E-07	--	--	--	NA	--
	Sediment	Incidental Ingestion	1E-06	--	--	--	NA	--
		Dermal Contact	1E-08	--	--	--	NA	--
		Total	1E-06	--	--	--	NA	--
		Total Surface Water and Sediment	1E-06				NA	

TABLE 9-10

SEDIMENT COPC SELECTION - BOGGS CREEK
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Detection	Maximum Detection	Sample of Maximum Detection	Average of Detections[1]	Average of All Results[2]	Ecological Screening Level[3]		EEQ[4]	Deletion or Selection of COPCs for Sediment Invertebrates		Further Evaluated in Terrestrial Food Chain Modeling[5]	
							Value	Source		COPC (yes/no)?	Rationale	Evaluated (yes/no)?	Rationale
EXPLOSIVES (MG/KG)													
RDX	1/5	0.165	0.165	18SD0030006	0.165	0.048	102	Sunahara	0.0016	NO	BSL	**YES**	BIO
METALS (MG/KG)													
ALUMINUM	5/5	2490	6350	18SD0030006	4826	4826	25500	NOAA	0.25	NO	BSL	NO	NONBIO
ARSENIC	5/5	4.53	19.5 J	18SD0030006	9.77	9.77	9.79	Region 5	**2.0**	**YES**	ASL	**YES**	BIO
BARIUM	5/5	30.7	92.6 J	18SD0030006	57.8	57.8	48	NOAA	**1.9**	**YES**	ASL	NO	NONBIO
BERYLLIUM	5/5	0.63 J	2.01	18SD0030006	1.16	1.16	NA	NA	**NA**	**YES**	NSL	NO	NONBIO
CADMIUM	3/5	0.681 J	4.24 J	18SD0040006	1.87	1.25	0.99	Region 5	**4.3**	**YES**	ASL	**YES**	BIO
CALCIUM	5/5	549 J	1560	18SD0040006	978	978	NA	NA	NA	NO	NUT	NO	NUT
CHROMIUM	5/5	11.1	38.3 J	18SD0040006	23.1	23.1	43.4	Region 5	0.88	NO	BSL	**YES**	BIO
COBALT	5/5	3.9 J	13.5 J	18SD0050006	10.1	10.1	50	Region 5	0.27	NO	BSL	NO	NONBIO
COPPER	5/5	6.04	11.1 J	18SD0040006	8.64	8.64	31.6	Region 5	0.35	NO	BSL	**YES**	BIO
IRON	5/5	10800	119000	18SD0030006	49220	49220	20000	Region 3	**6.0**	**YES**	ASL	NO	NONBIO
LEAD	5/5	7.79	20.7 J	18SD0030006	13.6	13.6	35.8	Region 5	0.58	NO	BSL	**YES**	BIO
MAGNESIUM	3/5	449 J	767 J	18SD0030006	621	634	NA	NA	NA	NO	NUT	NO	NUT
MANGANESE	5/5	314	1460 J	18SD0030006	811	811	460	Region 3	**3.2**	**YES**	ASL	NO	NONBIO
MERCURY	3/5	0.0212 J	0.0342 J	18SD0050006	0.028	0.026	0.174	Region 5	0.20	NO	BSL	**YES**	BIO
NICKEL	5/5	10.4	27.8	18SD0040006	18.2	18.2	22.7	Region 5	**1.2**	**YES**	ASL	**YES**	BIO
POTASSIUM	3/5	309 J	410 J	18SD0050006	367	415	NA	NA	NA	NO	NUT	NO	NUT
THALLIUM	2/5	1.41 J	2.28 J	18SD0030006	1.85	1.22	NA	NA	**NA**	**YES**	NSL	NO	NONBIO
VANADIUM	5/5	12.9	35.2 J	18SD0030006	23.8	23.8	57	NOAA	0.62	NO	BSL	NO	NONBIO
ZINC	5/5	21.8	72.8 J	18SD0040006	42.2	42.2	121	Region 5	0.60	NO	BSL	**YES**	BIO
MISCELLANEOUS PARAMETERS (MG/KG)													
TOTAL ORGANIC CARBON	5/5	4380	11100	18SD0040006	7766	7766	NA	NA	NA	NA	NA	NA	NA

Ecological effects quotients (EEQs) are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available. Other cells are shaded if the chemical is retained as a COPC for sediment invertebrates or if the chemical is retained for food chain modeling.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - In order of preference: USEPA Region 5 Ecological Sediment Screening Levels (USEPA, 2003), followed by USEPA Region 3 BTAG Freshwater Sediment Screening Levels (USEPA, 2006) and NOAA freshwater or marine sediment screening value (Buchman, 2008) for all chemicals except explosives. Value for explosives are from the Ecotoxicology of Explosives (Sunahara et al, 2009).
4 - EEQs were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
5 - All biaccumulative chemicals are retained for food chain modeling.

COPC Selection Rationale:
ASL = Above Screening Level
BIO = Bioaccumulative chemical
BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level
NUT = Essential nutrient

Acronyms:
BTAG - Biological Technical Assistance Group
COPC - Chemical of Potential Concern
EEQ - Ecological Effect Quotient
J - Estimated concentration
mg/kg - Milligrams per kilogram
NA - Not applicable/not available
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit
RDX - Cyclotrimethylenetrinitramine
USEPA - United States Environmental Protection Agency

TABLE 9-11

SURFACE WATER COPC SELECTION - BOGGS CREEK
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Detection	Maximum Detection	Sample of Maximum Detection	Average of Detections[1]	Average of All Results[2]	Ecological Screening Level[3]		EEQ[4]	Deletion or Selection of COPCs for Aquatic Organisms		Further Evaluated in Terrestrial Food Chain Modeling[5]	
							Value	Source		COPC (yes/no)?	Rationale	Evaluated (yes/no)?	Rationale
METALS (UG/L)													
ALUMINUM	5/5	47.6 J	294 J	18SW003	108	108	87	AWQC	**3.4**	**YES**	ASL	NO	NONBIO
BARIUM	5/5	34.5	51	18SW004	43.5	43.5	220	Region 5	0.23	NO	BSL	NO	NONBIO
CADMIUM	2/5	0.255 J	0.272 J	18SW003	0.264	0.255	0.25	AWQC	**1.1**	**YES**	ASL	**YES**	BIO
CALCIUM	5/5	37900 J	53600 J	18SW004	43040	43040	116000	Region 3	0.46	NO	BSL	NO	NUT
CHROMIUM	3/5	0.527 J	0.905 J	18SW001	0.769	0.661	11	AWQC	0.082	NO	BSL	**YES**	BIO
COPPER	5/5	1.31 J	3.33 J	18SW003	2.34	2.34	1.58	Region 5	**2.1**	**YES**	ASL	**YES**	BIO
IRON	5/5	42.1 J	223 J	18SW003	96.0	96.0	10000	AWQC	0.022	NO	BSL	NO	NONBIO
LEAD	1/5	0.436 J	0.436 J	18SW003	0.436	0.387	2.5	AWQC	0.17	NO	BSL	**YES**	BIO
MAGNESIUM	5/5	6420	8820	18SW004	7308	7308	82000	Region 3	0.11	NO	BSL	NO	NUT
MANGANESE	5/5	1.17 J	27.7	18SW003	10.6	10.6	120	Region 3	0.23	NO	BSL	NO	NONBIO
NICKEL	3/5	1.08 J	1.88 J	18SW001	1.45	1.17	52	AWQC	0.036	NO	BSL	**YES**	BIO
POTASSIUM	5/5	1630 J	4180	18SW002	3432	3432	53000	Region 3	0.079	NO	BSL	NO	NUT
SODIUM	5/5	9160 J	31400 J	18SW002	22752	22752	680000	Region 3	0.046	NO	BSL	NO	NUT
ZINC	4/5	1.52 J	11.8	18SW002	7.37	6.15	65.7	Region 5	0.18	NO	BSL	**YES**	BIO
DISSOLVED METALS (UG/L)													
ALUMINUM	5/5	25.9 J	40.2 J	18SW003	30.6	30.6	87	AWQC	0.46	NO	BSL	NA	NA
BARIUM	5/5	34.3	49.7	18SW004	43.4	43.4	220	Region 5	0.23	NO	BSL	NA	NA
CALCIUM	5/5	35700	53600 J	18SW004	42800	42800	116000	Region 3	0.46	NO	BSL	NA	NA
CHROMIUM	2/5	0.581 J	0.849 J	18SW002	0.715	0.586	11	AWQC	0.077	NO	BSL	NA	NA
COPPER	5/5	2.33 J	4.36	18SW002	3.50	3.50	1.58	Region 5	**2.8**	**YES**	ASL	NA	NA
IRON	5/5	7.66 J	12.1 J	18SW004	10.1	10.1	10000	AWQC	0.0012	NO	BSL	NA	NA
MAGNESIUM	5/5	6160	8680	18SW004	7310	7310	82000	Region 3	0.11	NO	BSL	NA	NA
MANGANESE	5/5	1.82 J	9.33	18SW001	4.29	4.29	120	Region 3	0.078	NO	BSL	NA	NA
NICKEL	5/5	1.36 J	3.32	18SW002	2.40	2.40	52	AWQC	0.064	NO	BSL	NA	NA
POTASSIUM	5/5	1650 J	4130	18SW002	3440	3440	53000	Region 3	0.078	NO	BSL	NA	NA
SODIUM	5/5	9180 J	31000	18SW002	22576	22576	680000	Region 3	0.046	NO	BSL	NA	NA
ZINC	5/5	4.04 J	10.4	18SW002	6.66	6.66	65.7	Region 5	0.16	NO	BSL	NA	NA
EXPLOSIVES (UG/L)													
2-NITROTOLUENE	1/5	0.145 J	0.145 J	18SW001	0.145	0.093	750	Region 3[6]	0.00019	NO	BSL	NO	Not Present in Sediment
4-AMINO-2,6-DINITROTOLUENE	1/5	0.247	0.247	18SW004	0.247	0.113	1480	Region 3[7]	0.00017	NO	BSL	NO	Not Present in Sediment
HMX	4/5	0.346	2.21	18SW004	1.04	0.850	150	Region 3	0.015	NO	BSL	NO	Not Present in Sediment
RDX	4/5	1.49	10.8	18SW004	4.59	3.69	360	Region 3	0.030	NO	BSL	**YES**	BIO
MISCELLANEOUS PARAMETERS (MG/L)													
AMMONIA-N	3/5	0.124 J	0.79	18SW002	0.563	0.368	19	Region 3	0.042	NO	BSL	NO	Not Present in Sediment

Ecological effects quotients (EEQs) are shaded if the maximum detected concentration exceeds a screening level or a screening level is not available. Other cells are shaded if the chemical is retained as a COPC for aquatic organisms.

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - In order of preference: AWQC (USEPA, 2009), followed by USEPA Region 5 Ecological Screening Levels (USEPA, 2003) and USEPA Region 3 BTAG Freshwater Screening Levels (USEPA, 2006).
4 - EEQs were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
5 - Chemicals are retained for food chain modeling if they were present in sediment and bioaccumulative. Only total metals were evaluated in the food chain model.
6 - Value for 3-nitrotoluene.
7 - Value for 2-amino-4,6-dinitrotoluene.

COPC Selection Rationale:
ASL = Above Screening Level
BIO = Bioaccumulative chemical
BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level
NUT = Essential nutrient

AWQC - Ambient Water Quality Criteria
BTAG - Biological Technical Assistant Group
COPC - Chemical of Potential Concern
EEQ - Ecological Effect Quotient
J - Estimated concentration
mg/L - Milligrams per liter
NA - Not applicable/not available
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit
ug/L - Micrograms per liter
USEPA - United States Environmental Protection Agency

TABLE 9-12

TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO, BOGGS CREEK
PISCIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Receptor EEQs			
	Belted Kingfisher		Mink	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
EXPLOSIVES				
RDX	1.1E-02	5.6E-03	2.5E-03	7.8E-04
METALS				
ARSENIC	8.8E-01	4.4E-01	1.5E+00	3.4E-01
CADMIUM	3.2E+00	7.5E-01	4.5E+00	5.1E-01
CHROMIUM	1.0E+00	1.7E-01	9.1E-01	3.8E-02
COPPER	2.0E+00	2.3E-01	1.1E+00	7.3E-02
LEAD	1.1E+00	1.9E-01	3.1E-01	4.9E-02
MERCURY	2.2E+00	2.2E-01	3.2E-01	6.5E-02
NICKEL	1.4E+00	4.9E-01	4.0E+00	4.6E-01
ZINC	1.2E+00	4.5E-01	7.5E-01	1.9E-01

Cells are shaded if the value is greater than 1.0

EEQ - Ecological Effects Quotient
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level

TABLE 9-13

STEP 3A EVALUATION FOR RISKS TO SEDIMENT INVERTEBRATES
SEDIMENT COPCs - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]	Maximum EEQ[2]	Step 3a Evaluation			Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?
					Higher Effects Benchmarks		Step 3a Factors Considered in Evaluation[3]		
					Value	Source			
METALS (MG/KG)									
ARSENIC	5/5	19.5	9.79	2.0	33	PEC	Less than higher effects benchmark.	Acceptable	No
BARIUM	5/5	92.6	48	1.9	NA	NA	Generally not considered toxic. Less than soil background concentrations.	Acceptable	No
BERYLLIUM	5/5	2.01	NA	NA	NA	NA	No screening value or alternate benchmark available. Impacts cannot be quantified.	Not able to be determined	No
CADMIUM	3/5	4.24	0.99	4.3	4.98	PEC	Less than higher effects benchmark.	Acceptable	No
IRON	5/5	119000	20000	6.0	40000	SEL	Not likely site-related because soil iron concentrations were lower and high sediment iron concentration upstream. Typically not considered bioavailable.	Acceptable	No
MANGANESE	5/5	1460	460	3.2	1100	SEL	Less than higher effects benchmark in adjacent upstream and downstream samples.	Acceptable	No
NICKEL	5/5	27.8	22.7	1.2	48.6	PEC	Less than higher effects benchmark.	Acceptable	No
THALLIUM	2/5	2.28	NA	NA	NA	NA	No screening value or alternate benchmark available. Impacts cannot be quantified.	Not able to be determined	No

Footnotes:
1 Sources of ecological screening level presented in Table J.2
2 Maximum detection divided by the screening level.
3 See Section 9.6.3 for a more detailed Step 3a evaluation.

Acronyms:
COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quotient
PEC = Probable Effects Concentration (MacDonald, et al., 2000)
SEL = Severe Effects Level (Persaud, et al., 1993)
mg/kg = Milligrams per kilogram
NA = Not available
NSA = Naval Support Activity
SWMU = Solid Waste Management Unit

TABLE 9-14

STEP 3A EVALUATION FOR RISKS TO AQUATIC ORGANISMS
SURFACE WATER COPCs - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern (COPC)	Frequency of Detection	Maximum Detected Concentration	Screening Level[1]	Maximum EEQ[2]	Step 3a Factors Considered in Evaluation[3]	Risk Determination (Acceptable/ Unacceptable)	Retained as a COPC?
DISSOLVED METALS (UG/L)							
COPPER	5/5	4.36	1.58	2.8	Less than 2006 USEPA water quality criteria screening level.	Acceptable	No
METALS (UG/L)							
ALUMINUM	5/5	294	87	3.4	Dissolved metals considered bioavailable and not detected in filtered samples.	Acceptable	No
CADMIUM	2/5	0.272	0.25	1.1		Acceptable	No
COPPER	5/5	3.33	1.58	2.1	Dissolved copper less than 2006 USEPA water quality criteria screening level.	Acceptable	No

Footnotes:
1 Sources of ecological screening level presented in Table J.2.
2 Maximum detection divided by the screening level.
3 See Section 9.6.3 for a more detailed Step 3a evaluation.

Acronyms:
COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quotient
NA = Not available
NSA = Naval Support Activity
SWMU = Solid Waste Management Unit
ug/L = Micrograms per liter

TABLE 9-15

TERRESTRIAL FOOD CHAIN MODEL - TIER 2, STEP 3A SCENARIO, BOGGS CREEK
PISCIVOROUS RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Receptor EEQs			
	Belted Kingfisher		Mink	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
METALS				
ARSENIC	8.7E-02	4.3E-02	8.8E-02	2.0E-02
CADMIUM	6.1E-02	1.4E-02	4.4E-02	5.0E-03
CHROMIUM	1.3E-01	2.2E-02	7.4E-02	3.0E-03
COPPER	3.8E-01	4.5E-02	1.0E-01	6.8E-03
LEAD	9.8E-02	1.6E-02	1.9E-02	2.9E-03
MERCURY	5.3E-01	5.3E-02	3.9E-02	7.7E-03
NICKEL	1.6E-01	5.8E-02	2.4E-01	2.8E-02
ZINC	1.4E-01	5.5E-02	4.5E-02	1.1E-02

EEQ - Ecological Effects Quotient
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level
NSA - Naval Support Activity
SWMU - Solid Waste Management Unit

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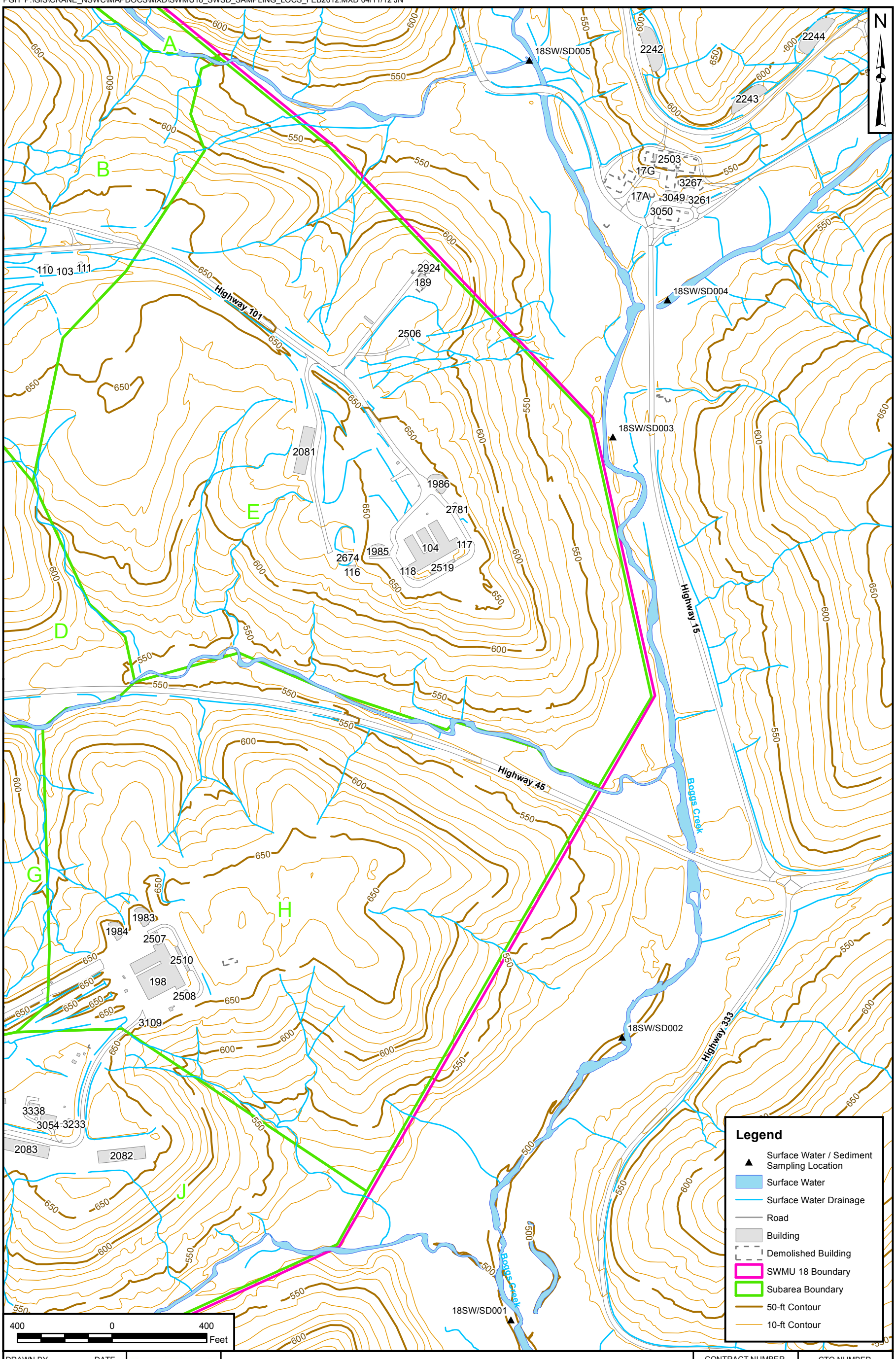


DRAWN BY	DATE
J. ENGLISH	02/16/12
CHECKED BY	DATE
C. RUMER	04/11/12
REVISED BY	DATE
J. NOVAK	04/11/12
SCALE	
AS NOTED	

NAVFAC

BOGGS CREEK SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS SWMU 18 - LOAD & FILL AREA NSA CRANE CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 9-1	0

DRAWN BY J. NOVAK	DATE 09/20/12
CHECKED BY C. RUMER	DATE 11/28/12
REVISED BY J. NOVAK	DATE 11/28/12
SCALE AS NOTED	

BOGGS CREEK
EXCEEDANCES OF ANALYTES IN SURFACE WATER
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER 1851	CTO NUMBER F201
APPROVED BY —	DATE —
APPROVED BY —	DATE —
FIGURE NO. FIGURE 9-2	REV 0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU18_BOGGS CREEK_SD_TAGS.MXD 11/21/12 JN

18SW/SD005	[0-0.5]
METALS (MG/KG)	
ARSENIC	**9 J**
CHROMIUM	**20.8 J**
COBALT	**13.5 J**
IRON	**28500**
MANGANESE	**1030 J**
NICKEL	17
THALLIUM	**1.41 J**

18SW/SD004	[0-0.5]
METALS (MG/KG)	
ARSENIC	**9.93 J**
CADMIUM	**4.24 J**
CHROMIUM	**38.3 J**
COBALT	**13.2 J**
IRON	**68400**
MANGANESE	**765 J**
NICKEL	**27.8**

18SW/SD003	[0-0.5]
EXPLOSIVES (MG/KG)	
RDX	**0.165**
METALS (MG/KG)	
ARSENIC	**19.5 J**
CADMIUM	0.691 J
CHROMIUM	**31.3 J**
COBALT	**12.3 J**
IRON	**119000**
MANGANESE	**1460 J**
NICKEL	**25.2**
THALLIUM	**2.28 J**

18SW/SD002	[0-0.5]
METALS (MG/KG)	
ARSENIC	**4.53**
CHROMIUM	**11.1**
COBALT	**3.9 J**
IRON	**10800**
MANGANESE	**314**
NICKEL	10.7

18SW/SD001	[0-0.5]
METALS (MG/KG)	
ARSENIC	**5.87**
CADMIUM	0.681 J
CHROMIUM	**14.2**
COBALT	**7.46**
IRON	**19400**
MANGANESE	**487**
NICKEL	10.4

Legend

- Sediment Sample Location
- Subarea Boundary
- AOC 01 Site Boundary
- Existing Building
- Temp. Building
- Demolished Building
- Railroad
- Roads
- Surface Water Drainage
- 50-ft Contour
- 10-ft Contour

Note:
Each tag is headlined by a Sample ID and a Depth Interval at which sediment was collected in feet below ground surface.
J - Estimated Concentration
mg/kg - Milligrams per Kilogram
Bolded values represent exceedances of Human Health or Ecological Screening Levels.

500 0 500 Feet

DRAWN BY	DATE
J. NOVAK	09/20/12
CHECKED BY	DATE
C. RUMER	11/21/12
REVISED BY	DATE
J.NOVAK	11/21/12
SCALE	
AS NOTED	

NAVFAC

BOGGS CREEK
EXCEEDANCES OF ANALYES IN SEDIMENT
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 9-3	0

FIGURE 9-4a

SUMMARY OF CUMULATIVE HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

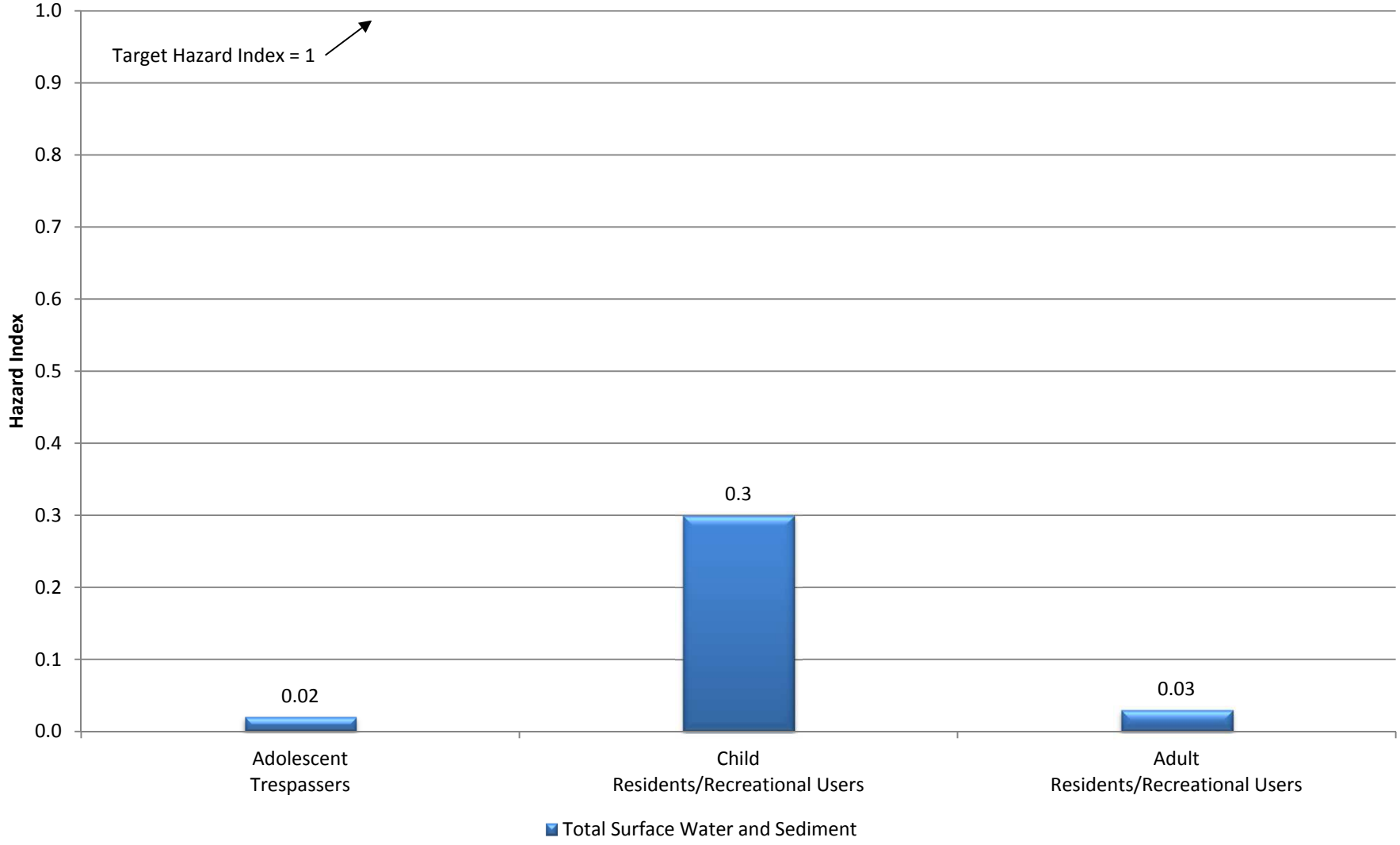


FIGURE 9-4b

SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

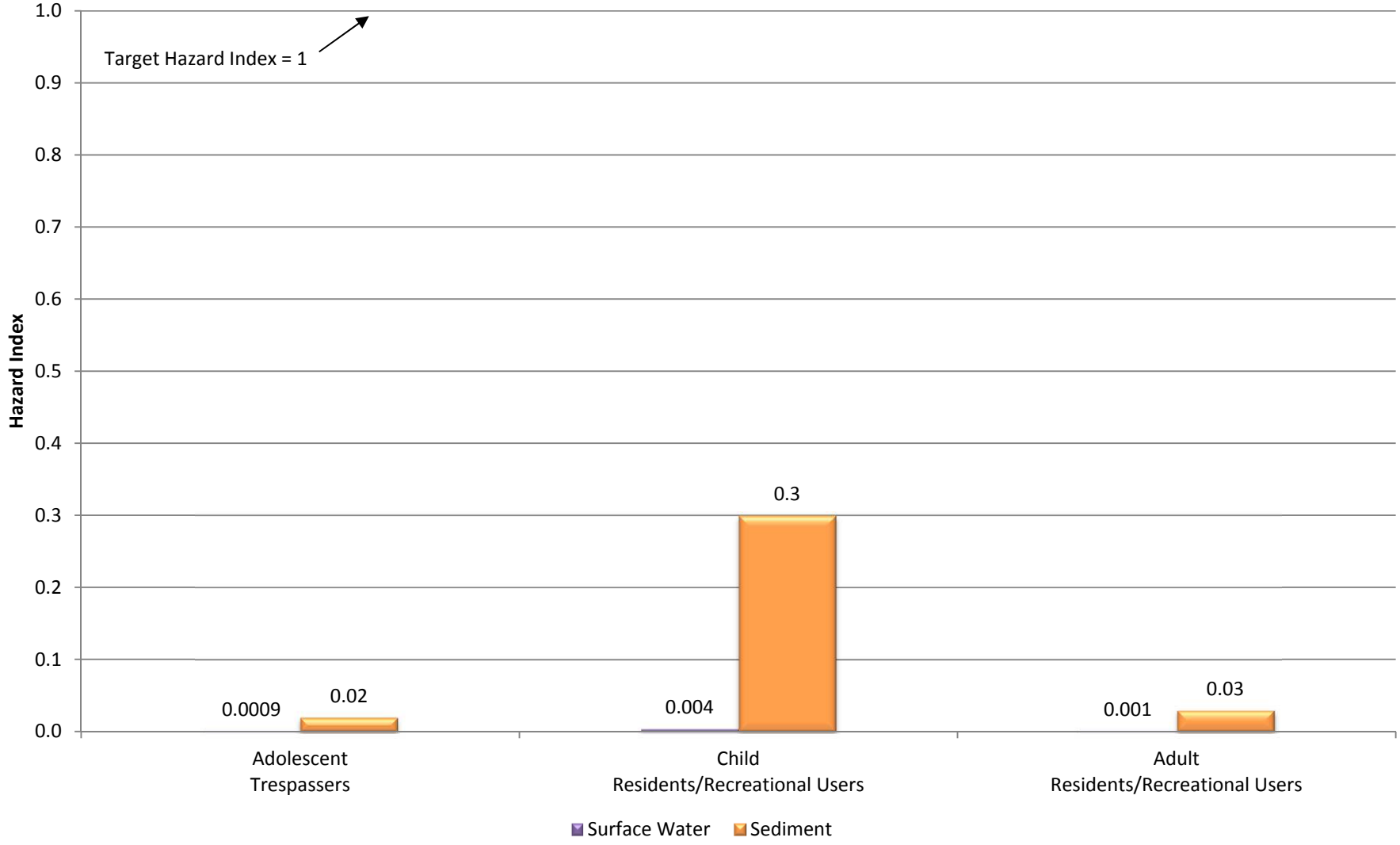


FIGURE 9-4c

SUMMARY OF CUMULATIVE HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

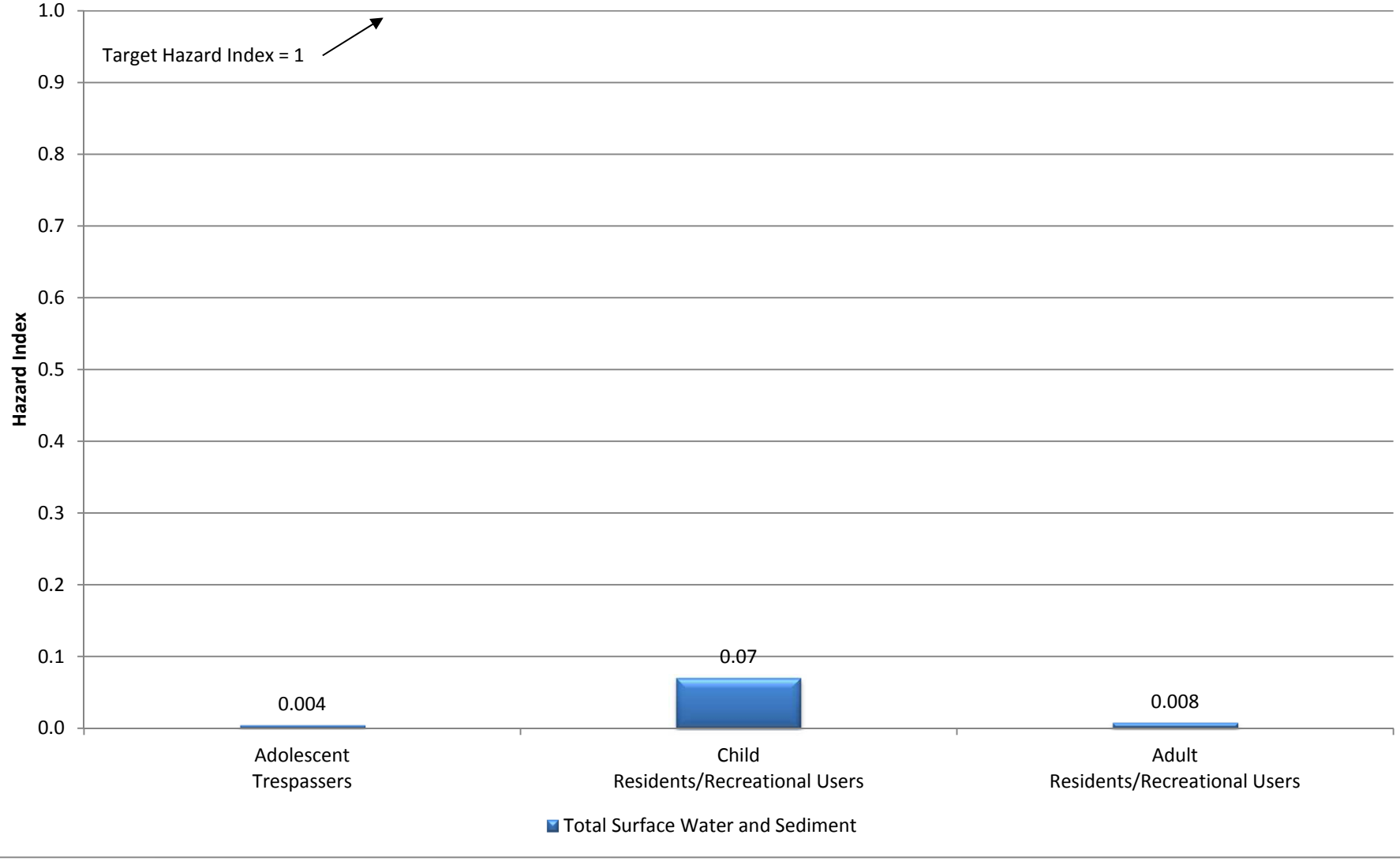


FIGURE 9-4d

SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

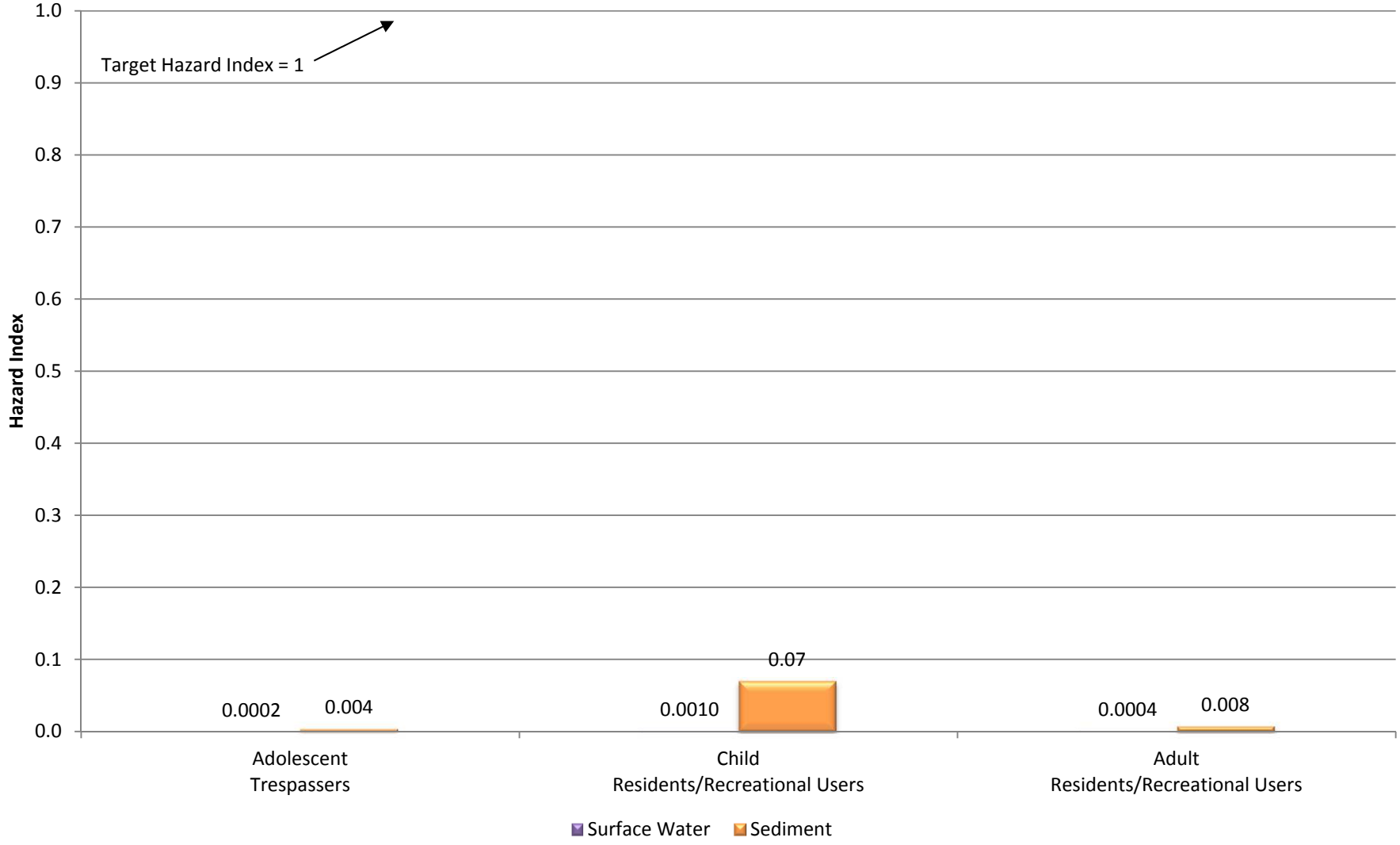


FIGURE 9-5a

SUMMARY OF CUMULATIVE CANCER RISKS - REASONABLE MAXIMUM EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

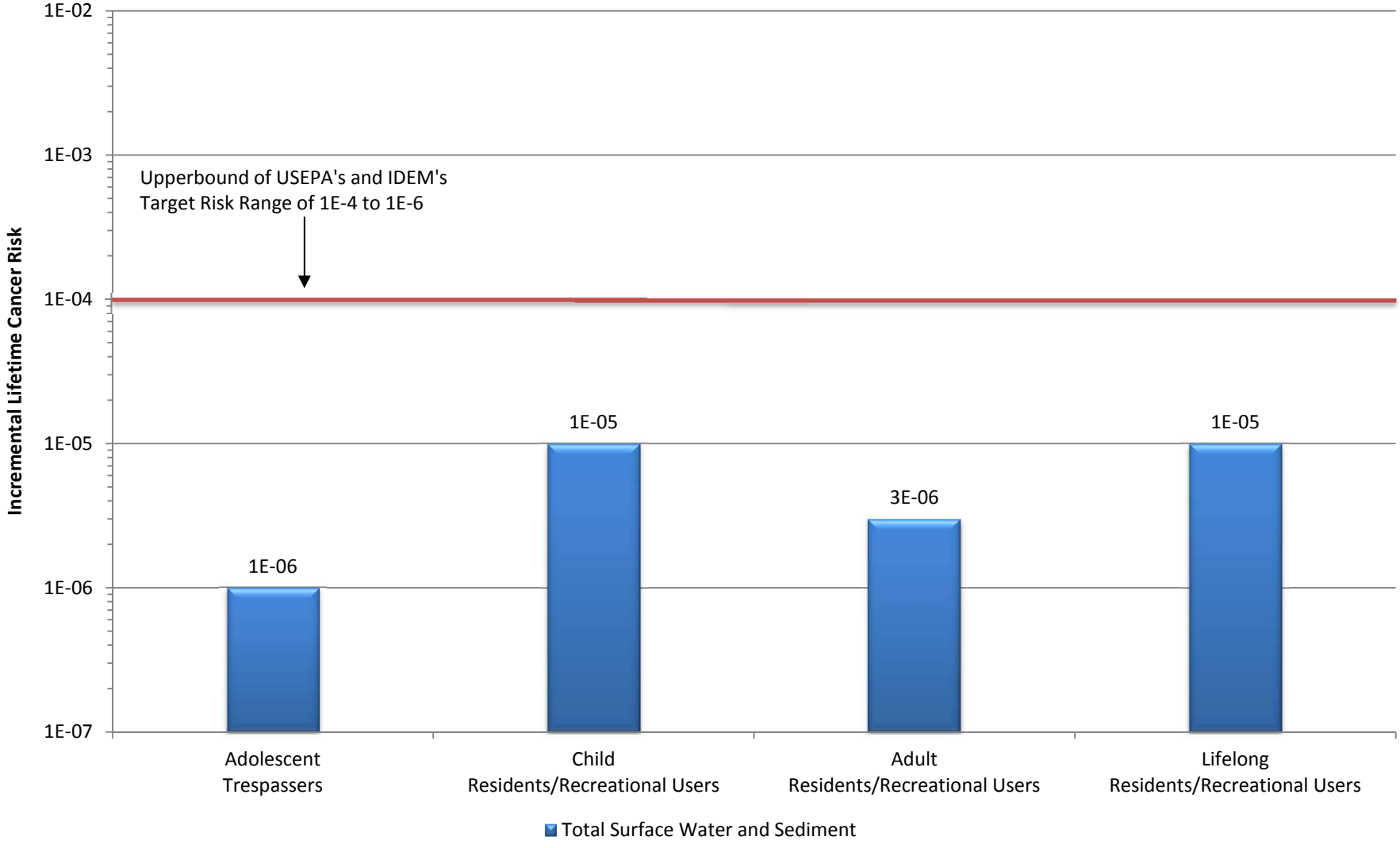


FIGURE 9-5b

SUMMARY OF MEDIA-SPECIFIC CANCER RISKS - REASONABLE MAXIMUM EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

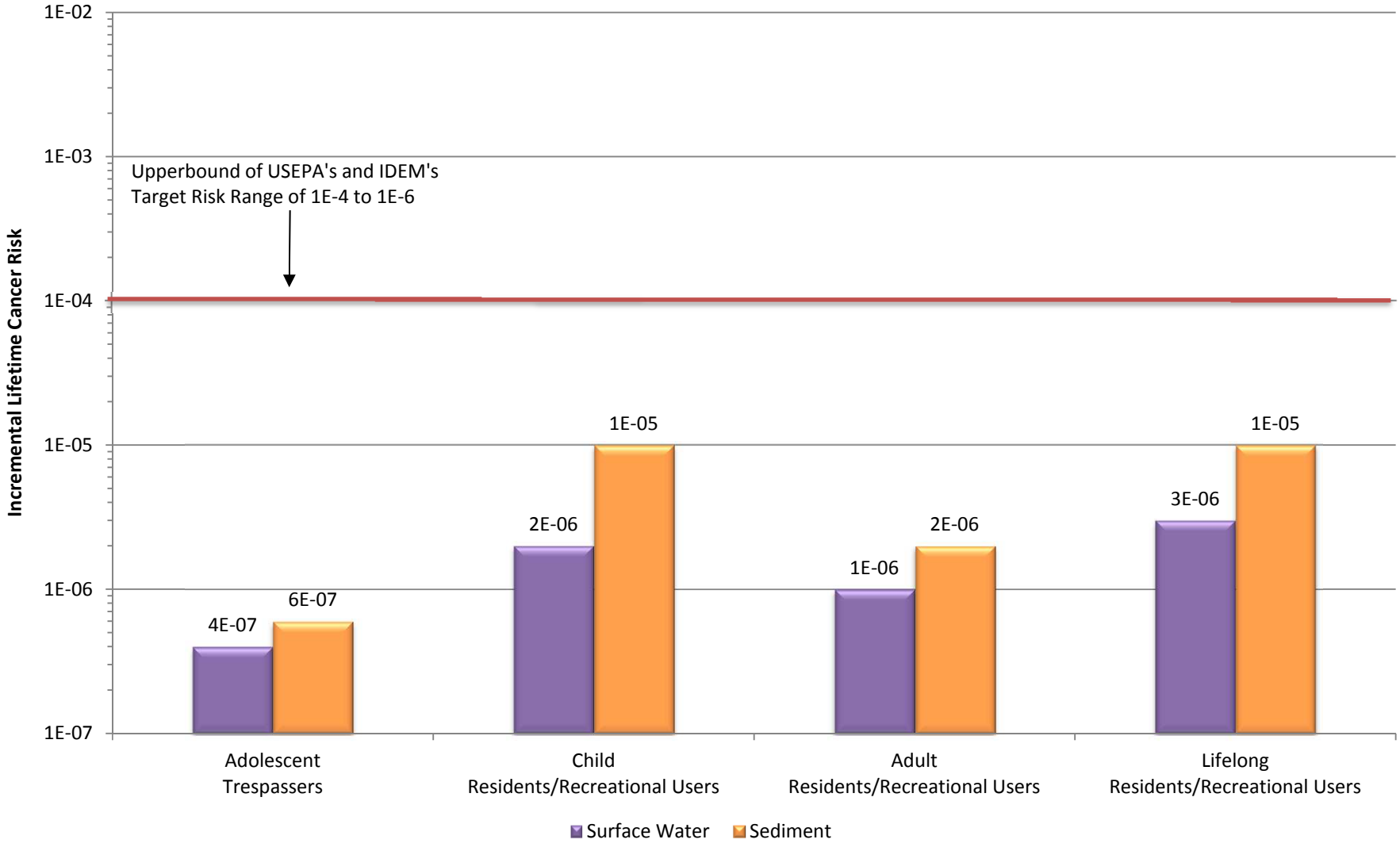


FIGURE 9-5c

SUMMARY OF CUMULATIVE CANCER RISKS - CENTRAL TENDENCY EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

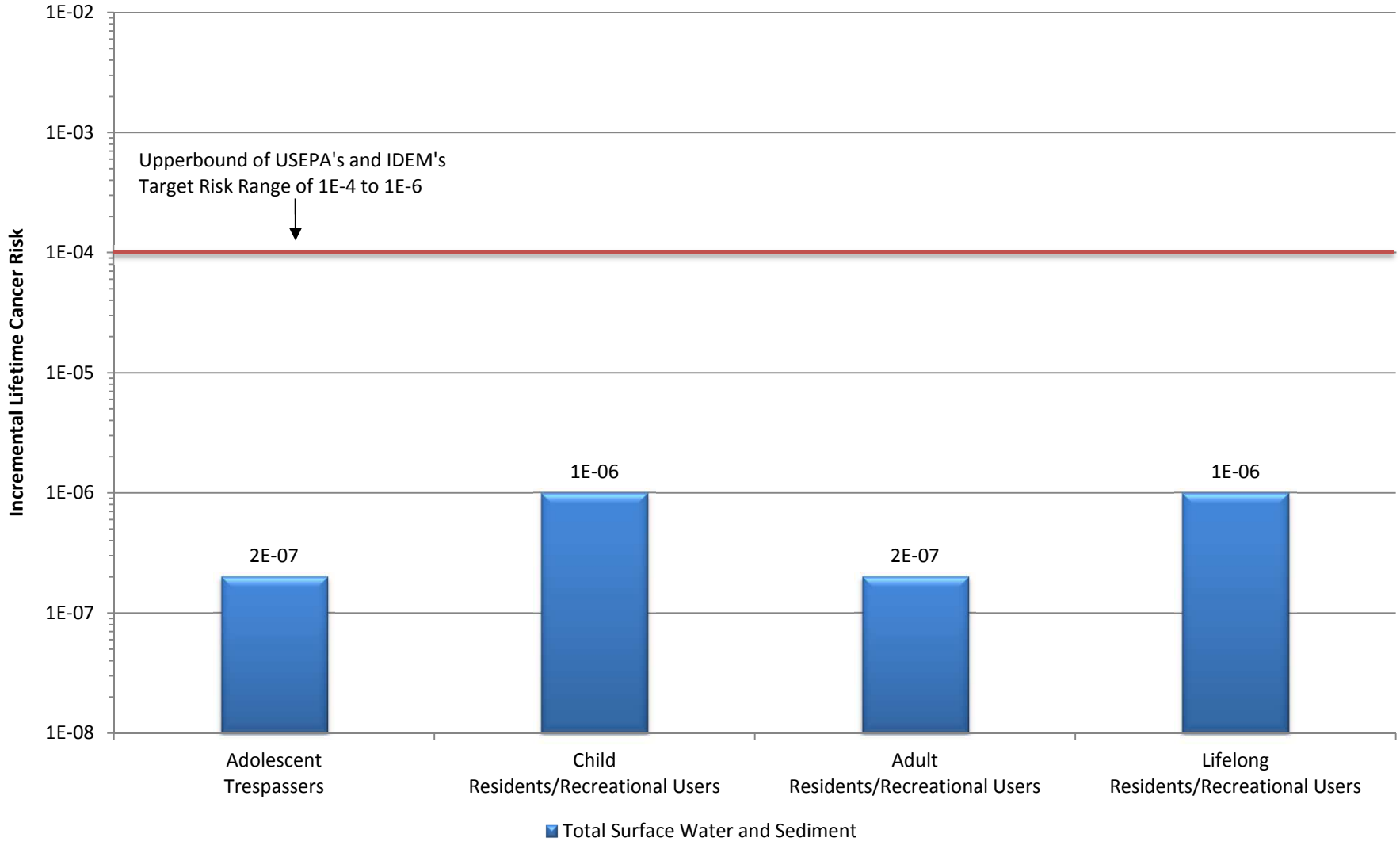
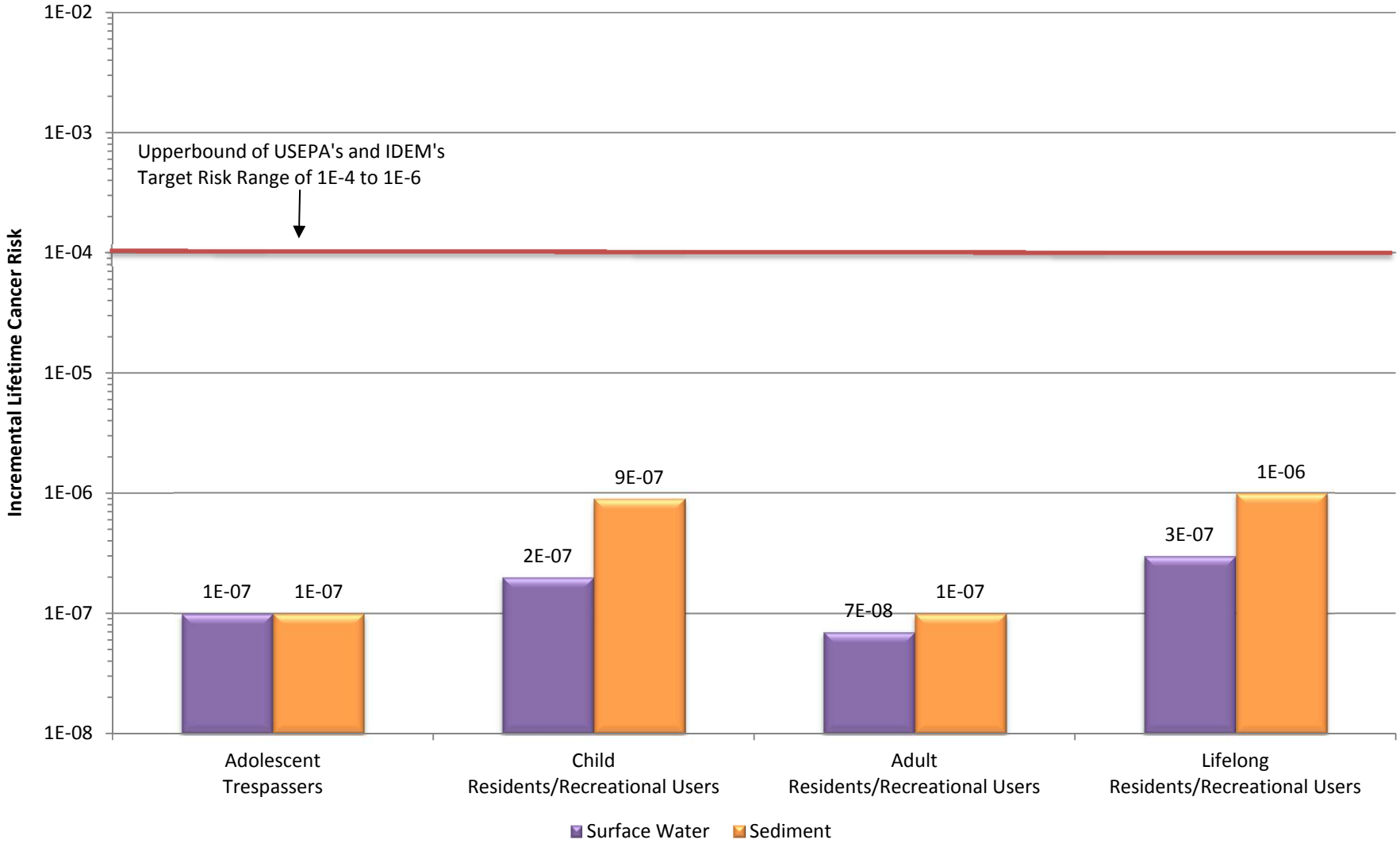


FIGURE 9-5d

SUMMARY OF MEDIA-SPECIFIC CANCER RISKS - CENTRAL TENDENCY EXPOSURES - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA



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APPENDIX A

MISCELLANEOUS FIELD DOCUMENTATION (COCS, FIELD CALIBRATION LOGS, WORK PERMITS, GROUNDWATER MESAUREMENT SHEETS, SURVEY DATA, FIELD TASK MODIFICATION REQUEST FORMS)

CHAIN OF CUSTODY SHEETS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER No 027998 | PAGE 1 OF 4

PROJECT NO: 112601851	FACILITY: NSA CRANE	PROJECT MANAGER: TIM EVANS	PHONE NUMBER: 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARDS
SAMPLERS (SIGNATURE): KS		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS:
		CARRIER/WAYBILL NUMBER: FEDEX 877063934802		CITY, STATE: NASHVILLE TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: VOC	TAL METALS	TPH - DRO/GRO, PAH	BTEX	TAL METALS + PH	RCRA METALS	VOC	COMMENTS
			SWMU 18							G	HCL								
			1110194							G	4°C								
01	10/18	0800	TB 101811-01	TB	—	—	QC	G	2	G	4°C	2	—	—	—	—	—	—	
02		1330	18JSB002 0406	J	4	6	SO	G	5	G	MEOH/NaHSO4	—	1	1	3	—	—	—	
03		1320	18JSB002 0002	J	0	2		G	1	G	4°C	—	—	—	—	1	—	—	
04		1355	18JSB001 0002	J	0	2		G	1	G	4°C	—	1	—	—	—	—	—	
05		1405	18JSB001 0608	J	6	8		G	5	G	MEOH/NaHSO4	—	1	1	3	—	—	—	
06		1445	18CSB009 0002	C	0	2		G	1			—	—	—	—	—	1	—	
07		1450	18CSB009 0204	C	2	4		G	4			—	—	—	—	—	1	3	
08		1510	18CSB008 0002	C	0	2		G	4			—	—	—	—	—	1	3	
09		1515	18CSB008 0305	C	3	5	↓	G	4			—	—	—	—	—	1	3	
10		1045	18JSD001 0006	J	0	6"	SD	G	5			—	1	1	3	—	—	—	
11		1115	18JSD002 0006	J	0	6"	↓	G	1			—	1	—	—	—	—	—	
12		1245	18JSS004 0002	J	0	2	SS	G	1			—	1	—	—	—	—	—	
13	↓	1305	18JSS003 0002	J	0	2	↓	G	1			—	1	—	—	—	—	—	

1. RELINQUISHED BY: KS	DATE: 10-19-11	TIME: 1840	1. RECEIVED BY: FEDEX	DATE: 10.19.11	TIME: 1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: Reginald Talley	DATE: 10.20.11	TIME: 0820

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 027999 | PAGE 2 OF 4

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, BRIAN RICHARDS

SAMPLERS (SIGNATURE)	FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
[signature]	KEITH SIMPSON	412 352 2264	

CARRIER/WAYBILL NUMBER	CITY, STATE
FEDEX 8770 6393 4802	NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G, G, G, G, G, G, G, G

PRESERVATIVE USED: 4°C, 4°C, 4°C, METH. NaHSO4, 4°C, 4°C, MeOH NaHSO4, 4°C

TYPE OF ANALYSIS: TAL METALS, TAL METALS + PH, RCRA METALS, VOC, RCRA METALS + PH, TPH-DRO/ERO, PAH, ~~FUEL OIL PARAMETERS~~, BTEX, EXPLOSIVES + NG

SWMU 18

1110194

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TAL METALS	TAL METALS + PH	RCRA METALS	VOC	RCRA METALS + PH	TPH-DRO/ERO, PAH	BTEX	EXPLOSIVES + NG	COMMENTS
10/14	~~1330~~	1330	18JSS0020002	J	0	2	SS	G	1	1	—	—	—	—	—	—	—	
-15	10/18	1345	18JSS001 0002	J	0	2	↓	G	1	—	1	—	—	—	—	—	—	
-16	↓	0000	FD101811-01	FD	0	6"	SD	G	4	—	—	1	3	—	—	—	—	
-17	↓	1440	18CSD0030006	C	0	6"	SD	G	12	—	—	3	9	—	—	—	—	RUN ALSO MS/MSD
-18	10/19	0900	18CSB006 0002	C	0	2	SB	↓	4	—	—	—	3	1	—	—	—	
-19	↓	0910	18CSB 006 0203	C	2	3	SB	↓	4	—	—	1	3	—	—	—	—	
-20	↓	1000	18CSB 005 0002	C	0	2	SB	↓	4	—	—	1	3	—	—	—	—	
-21	↓	0000	FD101911-02	C	0	2	SB	↓	4	—	—	1	3	—	—	—	—	
-22	↓	1040	18CSB003 0002	C	0	2	SB	↓	4	—	—	1	3	—	—	—	—	
-23	↓	1120	18CSB001 0002	C	0	2	SB	↓	4	—	—	—	—	* KS	1	3	—	
-24	↓	1130	18CSB001 0204	C	2	4	SB	↓	12	—	—	—	—	—	3	9	—	RUN ALSO MS/MSD
-25	↓	1310	18BSB002 0002	B	0	2	SB	↓	1	—	—	—	—	—	—	—	1	
26	↓	0000	FD 101911-05	B	—	—	SB	↓	1	—	—	—	—	—	—	—	1	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY [signature]	10.19.11	1840	1. RECEIVED BY FEDEX	10.19.11	1840
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY Reginald Lilly	10.20.11	0820

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

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FORM NO. TINUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0326 | PAGE 3 OF 4

PROJECT NO: 112G0185I	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARDS
SAMPLERS (SIGNATURE) KHS Simpson		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 302 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4802		CITY, STATE NASHVILLE TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: EXPLOSIVES+NG	PCBs	VOCs	RCRA METALS + PH	TPH-DRO/GRO, PAH, FIELD OIL PARAMETERS	BTEX	TAL METALS + TOC	COMMENTS
			SWMU 18							G	4°C								
			11/10/95							G	4°C								
										G	MeOH + NaHSO4								
										G	4°C								
										G	4°C								
										G	MeOH + NaHSO4								
-01	10/19	1315	18BSB002 0507	B	5	7	SB	G	1			1							
02		1340	18BSB001 0002	B	0	2	SB		1			1							
03		1350	18BSB001 0608	B	6	8	SB		3			3							RUN ALSO MS/MSD
04		1450	18BSB005 0002	B	0	2	SB		1			1							
05		1500	18BSB004 0002	B	0	2	SB		1			1							18BSB004 0002
06		0900	18CSP001 0002	C	0	2	SP	C	1			—	1						
07		0940	18CSS001 0002	C	0	2	SS	G	4			—	—	3	1	—	—		
-08		0000	FD 101911-01	—	0	2	—	G	4			—	—	3	1	—	—		
09		0000	FD 101911-04	—	—	—	—	G	4			—	—	—	—	1	3	—	
-10		1205	18CSD001 0006	C	0	6"	SD	G	4			—	—	—	—	1	3	—	
11		1235	18CSD002 0006	C	0	6"	SD	G	4			—	—	—	—	1	3	—	
12		1520	18SD001 0006	BC	0	6"	SD	G	2			1	—	—	—	—	—	1	
13	↓	1600	18SD002 0006	BC	0	6"	SD	G	2			1	—	—	—	—	—	1	

1. RELINQUISHED BY KHS Simpson	DATE 10.19.11	TIME 1840	1. RECEIVED BY FEDEX	DATE 10.19.11	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Raymond Talley	DATE 10.20.11	TIME 0800

COMMENTS

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FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER No 126000 | PAGE 4 OF 4

PROJECT NO: 11260185I	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN NICHOLS
SAMPLERS (SIGNATURE) KEITH SIMPSON		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4802		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	G	G	G	G	P	P	P	P	
			SWMU 18							PRESERVATIVE USED	HCl	4°C	HCl	4°C	4°C	HNO3	HNO3	H2SO4	COMMENTS
			111095							TYPE OF ANALYSIS: TPH - DRO/ERO	PAH	BTEX + NAPH. (VOAs)	EXPLOSIVES + NG	PERCHLORATE	TOTAL TAL METALS	DISS TAL METALS	AMMONIA		
14	10/19	1200	18C SW 001	C	—	—	SW	G	7	2	2	3	—	—	—	—	—		
15		0000	FD 101911-03	—	—	—	SW	G	7	2	2	3	—	—	—	—	—		
16		1230	18C SW 002	C	—	—	SW	G	21	6	6	9	—	—	—	—	—		RUN ALSO MS/MSD
17		1525	18 SW 001	BC	—	—	SW	G	6	—	—	—	2	1	1	1	1		
18	↓	1605	18 SW 002	BC	—	—	SW	G	6	—	—	—	2	1	1	1	1		
19	↑																		
20																			

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY KEITH SIMPSON	10.19.11	1840	1. RECEIVED BY FEDEX	10.19.11	1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reginald Lollis	DATE 10.20.11	TIME 0820

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1110227

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** Nº 0328 | **PAGE** 1 **OF** 6

PROJECT NO: 112G01851	**FACILITY:** NSA CRANE	**PROJECT MANAGER** TIM EVANS	**PHONE NUMBER** 412 921 7281	**LABORATORY NAME AND CONTACT:** EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER** KEITH SIMPSON	**PHONE NUMBER** 412 352 2264	**ADDRESS**
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4890		**CITY, STATE** NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

SWMU 18

DATE / YEAR	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: VOC (WATER)	VOC (SOIL)	RCRA METALS	TPH-DRO/GRO, PAH & MCOFF PARAMETERS	BTEX	EXPLOSIVES + NG	EXPLOSIVES	COMMENTS
									G	HCl	G	G	G	G	G	G	G	
										MeOH + NaHSO4				4°C MeOH + NaHSO4		4°C	4°C	
10/20/2011	0730	TB 102011-01	TB	—	—	QC	G	2	2		—	—	—	—	—	—	—	01 TRIP BLANK
	1015	18CSB002 0002	C	0	2	SB		4	—		3	1	—	—	—	—	—	02
	1020	18CSB002 0507	C	5	7	SB		4	—		3	1	—	—	—	—	—	03
	1100	18CSB004 0002	C	0	2	SB		4	—		—	—	1	3	—	—	—	04
	1110	18CSB004 0507	C	5	7	SB		4	—		—	—	1	3	—	—	—	05
	1245	18CSB007 0002	C	0	2	SB		4	—		—	—	1	3	—	—	—	06
	1255	18CSB007 0406	C	4	6	SB		4	—		—	—	1	3	—	—	—	07 STRONG FUEL ODOR
	1435	18BSB003 0002	B	0	2	SB		1	—		—	—	—	—	1	—	—	08
	1445	18BSB003 0203	B	2	3	SB		1	—		—	—	—	—	1	—	—	09
	1520	18BSB006 0002	B	0	2	SB		1	—		—	—	—	—	1	—	—	10
	1610	18ISB001 0002	I	0	2	SB		5	—		—	—	1	3	—	1	—	11
	1620	18ISB001 0305	I	3	5	SB		5	—		—	—	1	3	—	1	—	12
↓	1635	18ISB002 0002	I	0	2	SB	↓	1	—		—	—	—	—	—	1	—	13

1. RELINQUISHED BY	DATE 10.21.11	TIME 1840	1. RECEIVED BY FEDEX	DATE 10.21.11	TIME 1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 10/22/11	TIME 0815

COMMENTS

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FORM NO. TtNUS-001

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1110227

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0329 | PAGE 2 OF 6

PROJECT NO: 112G0185	FACILITY: NSA CRANE	PROJECT MANAGER: TIM EVANS	PHONE NUMBER: 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE): [signature]		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS:
		CARRIER/WAYBILL NUMBER: FEDEX 8770 6393 4890		CITY, STATE: NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G

PRESERVATIVE USED: 4°C 4°C 4°C 4°C

TYPE OF ANALYSIS: EXPLOSIVES | PCBs | EXPLOSIVES NG | TAL METALS

DATE (YEAR 2011)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	EXPLOSIVES	PCBs	EXPLOSIVES NG	TAL METALS		COMMENTS
		SWMU 18												
10/20	1640	18ISB002 0406	I	4	6	SB	G	1	1	—	—	14		
	0900	18B CP 003 0002	B	0	2	CP		3	—	3	—	15		RUN ALSO MS/MSD
	0000	FD 102011-01	B	—	—	—		1	—	—	1	16		
	0930	18B SS 003 0002	B	0	2	SS		1	—	—	1	17		
	0950	18B SS 002 0002	B	0	2	SS		3	—	—	3	18		RUN ALSO MS/MSD
	1010	18 B SS 004 0002	B	0	2	SS		1	—	—	1	19		
	1030	18 B CP 002 0002	B	0	2	CP	C	1	—	1	—	20		
	0000	FD 102011-02	B	—	—	—	G	1	—	1	—	21		
	1045	18 B SS 001 0002	B	0	2	SS	G	1	—	—	1	22		
	1100	18 B CP 001 0002	B	0	2	CP	C	1	—	1	—	23		
	1300	18D SS 003 0002	D	0	2	SS	G	2	—	—	1	24		
	1330	18D CP 001 0002	D	0	2	CP	C	1	—	1	—	25		
	1350	18D CP 002 0002	D	0	2	CP	C	1	—	1	—	26		

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: [signature]	10.21.11	1840	1. RECEIVED BY: FEDEX	10.21.11	1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: [signature]	DATE 10/22/11	TIME 0815

COMMENTS

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1110229

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER Nº 0327 | PAGE 3 OF 5

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER: FEDEX 8770 6393 4890		CITY, STATE: NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: EXPLOSIVES + NG	TAL METALS + PH	TAL METALS	EXPLOSIVES	EXPLOSIVES + PH		COMMENTS
		SWMU 18							G	4°C							
10/20	1425	18DSS0010002	D	0	2	SS	G	2			1	1	—	—	—	—	01
	1450	18DSS0020002	D	0	2	SS	G	2			1	—	1	—	—	—	02
	1520	18GSS0020002	G	0	2	SS	G	1			—	—	1	—	—	—	03
	1535	18GSS0010002	G	0	2	SS	G	1			—	1	—	—	—	—	04
10/21	0820	18ISB0030002	I	0	2	SB	G	3			—	—	—	3	—	—	05 RUN ALSO MS/MSD
	0000	FD102111-01	—	—	—	SB	G	1			—	—	—	1	—	—	06
	0835	18ISB0030911	I	9	11	SB	G	1			—	—	—	1	—	—	07
	0900	18ISB0040002	I	0	2	SB	G	1			—	—	—	1	—	—	08
	0950	18ISB0040204	I	2	4	SB	G	3			—	—	—	3	—	—	09 RUN ALSO MS/MSD
	0000	FD102111-02	—	—	—	SB	G	1			—	—	—	1	—	—	10
	0915	18ISB0050002	I	0	2	SB	G	1			—	—	—	1	—	—	11
	0925	18ISB0050204	I	2	4	SB	G	1			—	—	—	1	—	—	12
	1020	18ASB0040002	A	0	2	SB	G	4			—	—	3	—	1	—	13 MS/MSD ON METALS ONLY

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	10.21.11	1840	1. RECEIVED BY FEDEX	10.21.11	1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 10/22/11	TIME 0805

COMMENTS

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1110229

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER Nº 0332 | PAGE 4 OF 5

PROJECT NO: 112G01851	FACILITY: KSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE) KTS		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4890		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G

PRESERVATIVE USED: 4°C | 4°C | MeOH & H2O | 4°C

TYPE OF ANALYSIS: TAL METALS | EXPLOSIVES | VOCs | TAL METALS + PH

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TAL METALS	EXPLOSIVES	VOCs	TAL METALS + PH	COMMENTS
		SWMU ~~IF~~ KS 18											
10/21	0000	FD102111-05	FD	—	—	SB	G	1	1	—	—	—	14
	1030	18A SB001 0002	A	0	2	SB	G	2	1	1	—	—	15
	1045	18A SB001 0204	A	2	4	SB	G	4	3	1	—	—	16 MS/MSD OK METALS ONLY
	1110	18A SB005 0002	A	0	2	SB	G	2	1	1	—	—	17
	1120	18A SB005 0608	A	6	8	SB	G	2	1	1	—	—	18
	1220	18A SB003 0002	A	0	2	SB	G	2	1	1	—	—	19
	1230	18A SB003 0406	A	4	6	SB	G	2	1	1	—	—	20
	1320	18E SB005 0002	E	0	2	SB	G	5	1	1	3	—	21
	1335	18E SB005 0608	E	6	8	SB	G	2	1	1	—	—	22
	1350	18E SB003 0002	E	0	2	SB	G	5	—	1	3	1	23
	1355	18E SB003 0203	E	2	3	SB	G	2	1	1	—	—	24
	1420	18E SB006 0002	E	0	2	SB	G	5	1	1	3	—	25
↓	1430	18E SB006 0810	E	8	10	SB	G	2	1	1	—	—	26

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY KTS	10.21.11	1840	1. RECEIVED BY FEDEX	10.21.11	1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 10/22/11	TIME 0805

COMMENTS

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1110230

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** Nº 0330 | PAGE 4 5 KS OF 6

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER**	**PHONE NUMBER**	**ADDRESS**
KS		KEITH SIMPSON	412 352 2264	
		CARRIER/WAYBILL NUMBER		**CITY, STATE**
		FED EX 8770 6393 4890		NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	G	G	G	G	G	P	P	P	P	
		SWMU 18							PRESERVATIVE USED	HCl	4°C	HCl	4°C	4°C	HNO_3	HNO_3	H_2SO_4	4°C	
									TYPE OF ANALYSIS	VOC + BTEX	PAH	TPH DRO/GRO	PCBs	EXPLOSIVES+NG	RCRA/TAL METALS	TAL METALS DISS.	TAL METALS AMMONIA	PERCHLORATE	COMMENTS
10/20	1715	RB 102011-01	RB	—	—	QC	G	12		3	2	2	2	2	1				HAND AUGER -01
10/20	1720	RB 102011-02	RB	—	—	QC	G	12		3	2	2	2	2	1				STAINLESS PITCHER -02
10/21	1400	RB 102111-01	RB	—	—	QC	G	12		3	2	2	2	2	1				PLASTIC DPT SLEEVE -03
10/21	1430	RB 102111-02	RB	—	—	QC	G	12		3	2	2	2	2	1				PLASTIC TROWEL -04
	0845	18SW003	BC	—	—	SW	G	18		—	—	—	—	6	—	3	3	3	-05/-06
	0930	18SW004	BC	—	—	SW	G	6		—	—	—	—	2	—	1	1	1	07/08 -04-07
	0000	FD 102111-03	FD	—	—	SW	G	6		—	—	—	—	2	—	1	1	1	02-10-07-08
	1020	18SW005	BC	—	—	SW	G	6		—	—	—	—	2	—	1	1	1	11/12-08-09
	1230	18ESW001	E	—	—	SW	G	5		—	—	—	—	2	—	1	1	1	*13/14-09-10
↓	1250	18ESW002	E	—	—	SW	G	5		—	—	—	—	2	—	1	1	1	*15/16/10

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY KS	10.21.11	1840	1. RECEIVED BY FEDEX	10.21.11	1840
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 10/22/11	TIME 845

COMMENTS → * DO NOT RUN NG ←

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1110230

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER № 0333 PAGE 6 OF 6

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, BRIAN RICHARD

SAMPLERS (SIGNATURE)	FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
[signature]	KEITH SIMPSON	412 352 2264	

CARRIER/WAYBILL NUMBER	CITY, STATE
FEDEX 8770 6393 4890	NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G, G, G, G, G, G, G

PRESERVATIVE USED: 4°C, MeOH, NaHSO4, 4°C, 4°C, 4°C, 4°C, MeOH, NaHSO4

SWMU 18

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: TPH-DRO/ERO, PAH, FUEL OIL PARAMETERS		BTEX		EXPLOSIVES + NG	TAL METALS + TOC	EXPLOSIVES	TAL METALS	VOCs	# wkd	COMMENTS
10/21	1505	18ESB001 0002	E	0	2	SB	G	4	1	3	—	—	—	—	—	—	11	17	
	1515	18ESB001 0608	E	6	8	SB	G	4	1	3	—	—	—	—	—	—	12	18	STRONG FUEL ODOR
	1530	18ESB001 1415	E	14	15	SB	G	4	1	3	—	—	—	—	—	—	13	19	"
	0845	18SD003 0006	BC	0	6"	SD	G	2	1	1	1	1	—	—	—	—	14	20	*
	0930	18SD004 0006	BC	0	6"	SD	G	6	—	—	3	3	—	—	—	—	15	21	RUN ALSO MS/MSD
	1020	18SD005 0006	BC	0	6"	SD	G	2	—	—	1	1	—	—	—	—	16	22	
	0000	FD102111-04	—	0	6"	SD	G	2	—	—	1	1	—	—	—	—	17	23	
	1230	18ESD001 0006	E	0	6"	SD	G	5	—	—	—	1	1	—	3		18	24	
	1250	18ESD002 0006	E	0	6"	SD	G	5	—	—	—	1	1	—	3		19	25	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY [signature]	10.21.11	1840	1. RECEIVED BY FEDEX	10.21.11	1840
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY [signature]	10/22/11	815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER № 0364 | PAGE 1 OF 8

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412921 7281	EMPIRICAL LABs, BRIAN RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER: FEDEX ~~8770 6393~~ 8770 6393-4824		CITY, STATE: NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

SWMU 18

1110258

CONTAINER TYPE PLASTIC (P) or GLASS (G): G, G, G, G, G, G, G, G

PRESERVATIVE USED: HCL, 4°C, MeOH, NaHSO4, 4°C, 4°C, MeOH, NaHSO4, 4°C, 4°C

TYPE OF ANALYSIS: VOC (WATER), TPH-DRO/ERO, PAH, ~~FUEL OIL PARAMETERS~~, BTEX, TAL METALS + PH, EXPLOSIVES, VOCs, TAL METALS, EXPLOSIVES + NG

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOC (WATER)	TPH-DRO/ERO, PAH	~~FUEL OIL PARAMETERS~~	BTEX	TAL METALS + PH	EXPLOSIVES	VOCs	TAL METALS	EXPLOSIVES + NG	COMMENTS
-01	10/22	0800	TB 102211-01	TB	—	—	QC	G	2	2	—	—	—	—	—	—	—	—	
-02		0820	18ESB002 0002	E	0	2	SB	G	4	—	1	3	—	—	—	—	—	—	
-03		0830	18ESB002 0406	E	4	6	SB	G	4	—	1	3	—	—	—	—	—	—	
-04		0900	18HSB001 0002	H	0	2	SB	G	5	—	—	—	1	1	3	—	—	—	
-05		0910	18HSB001 0204	H	2	4	SB	G	5	—	—	—	—	1	3	1	—	—	
-06		0915	18HSB002 0002	H	0	2	SB	G	5	—	—	—	—	1	3	1	—	—	
-07		0930	18HSB002 0305	H	3	5	SB	G	13	—	—	—	—	1	9	3	—	—	RUN MS/MSD ON VOC, METALS
-08		0000	FD 102211-02	—	—	—	SB	G	4	—	—	—	—	—	3	1	—	—	
-09		1000	18HSB004 0002	H	0	2	SB	G	5	—	—	—	—	1	3	1	—	—	
-10		1010	18HSB004 0305	H	3	5	SB	G	5	—	—	—	—	1	3	1	—	—	
-11		1020	18HSB003 0002	H	0	2	SB	G	5	—	—	—	—	1	3	1	—	—	
-12		1030	18HSB003 0203	H	2	3	SB	G	5	—	—	—	—	1	3	1	—	—	
-13		1115	18FSB001 0002	F	0	2	SB	G	2	—	—	—	—	—	—	1	1	—	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: [signature]	10.24.11	1830	1. RECEIVED BY: FEDEX	10.24.11	1830
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY: [signature]	10.25.11	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0334 | PAGE 2 OF 8

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112601851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER**	**PHONE NUMBER**	**ADDRESS**
K E. Simpson		KEITH SIMPSON	412 352 2269	
		CARRIER/WAYBILL NUMBER		**CITY, STATE**
		FEDEX 8770 6393 4824		NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G

PRESERVATIVE USED: 4°C 4°C 4°C Meoh/NaHSO4

TYPE OF ANALYSIS: EXPLOSIVES + NG | TAL METALS | TAL METALS + PH | VOC

	DATE (MM/DD) YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	EXPLOSIVES + NG	TAL METALS	TAL METALS + PH	VOC	COMMENTS
			SWMU 18											
			1110258											
14	10/22	1125	18FSB001 0507	F	5	7	SB	G	2	1	1	—	—	
15		1130	18FSB003 0002	F	0	2	SB	G	2	1	—	1	—	
16		1140	18FSB003 0507	F	5	7	SB	G	2	1	1	—	—	
17		1200	18FSB002 0002	F	0	2	SB	G	2	1	1	—	—	
18		1210	18FSB002 0507	F	5	7	SB	G	2	1	1	—	—	
19		1350	18GSB002 0002	G	0	2	SB	G	1	—	1	—	—	
20		1400	18GSB002 0305	G	3	5	SB	G	4	—	1	—	3	
21		1410	18GSB001 0002	G	0	2	SB	G	1	—	1	—	—	
22		1420	18GSB001 0810	G	8	10	SB	G	4	—	1	—	3	
23		1445	18GSB004 0002	G	0	2	SB	G	1	—	—	1	—	
24		1455	18GSB004 0608	G	6	8	SB	G	4	—	1	—	3	
25		1510	18GSB003 0002	G	0	2	SB	G	1	—	1	—	—	
26	↓	1520	18GSB003 0709	G	7	9	SB	G	4	—	1	—	3	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: K E Simpson	10/24/11	1830	1. RECEIVED BY: FEDEX	10/24/11	1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: Reynolds Talley	10.25.11	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0335 | PAGE 3 OF 8

PROJECT NO: 112601851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD	
SAMPLERS (SIGNATURE) Keith S. Simpson		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS	
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4824		CITY, STATE NASHVILLE, TN	

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

	DATE YEAR	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: PCB	TPH-DRO/ERO, PAH, FUELS OIL PARAMETERS	BTEX	EXPLOSIVES	TAL METALS	VOCs	TAL METALS + PH	COMMENTS
			SWMU 18							G	4°C		MeOH, NaHSO4			MeOH, NaHSO4			
			1110258							G	4°C		4°C			4°C			
27	10/22	0830	18FCP002 0002	F	0	2	CP	C	1	G	4°C	1							
28		0845	18FCP001 0002	F	0	2	CP	C	1	G	4°C	1							
29		0920	18FSS002 0002	F	0	2	SS	G	12	G	4°C		3	9					RUN ALSO MS/MSD
30		0940	18FSS001 0002	F	0	2	SS	G	4	G	4°C		1	3					
31		0000	FD102211-01	—	0	2	SS	G	4	G	4°C		1	3					
32		1110	18HSS003 0002	H	0	2	SS	G	2	G	MeOH, NaHSO4				1	1			
33		1115	18HSD001 0006	H	0	6"	SD	G	5	G	4°C				1	1	3	—	
34		1140	18HCP002 0002	H	0	2	CP	C	1	G	4°C	1							
35		1200	18HCP003 0002	H	0	2	CP	C	1	G	4°C	1							
36		1210	18HSD002 0006	H	0	6"	SD	G	5	G	MeOH, NaHSO4				1	1	3	—	
37		1225	18HSS002 0002	H	0	2	SS	G	2	G	4°C				1	1			
38		0000	FD102211-04	—	—	—	SS	G	2	G	MeOH, NaHSO4				1			1	
39		1240	18HSS001 0002	H	0	2	SS	G	2	G	4°C				1			1	

1. RELINQUISHED BY Keith Simpson	DATE 10/24/11	TIME 1830	1. RECEIVED BY FEDEX	DATE 10/24/11	TIME 1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reginald Jolly	DATE 10.25.11	TIME 0815

COMMENTS NOTE: NO FD102211-03

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER № 0336 | PAGE 4 OF 8

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G-01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABs, BRIAN RICHARD

SAMPLERS (SIGNATURE): [signature]

FIELD OPERATIONS LEADER: KEITH SIMPSON — PHONE NUMBER: 412 352 2264 — ADDRESS:

CARRIER/WAYBILL NUMBER: FEDEX 8770 6393 4824 — CITY, STATE: NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G, G, G, G

PRESERVATIVE USED: 4°C, 4°C, 4°C, 4°C

TYPE OF ANALYSIS: PCB, EXPLOSIVES, TAL METALS, TAL METALS + PH

SWMU 18

1110266

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	PCB	EXPLOSIVES	TAL METALS	TAL METALS + PH					COMMENTS
-01	10/22	1255	18HCP001 0002	H	0	2	CP	C	1	1	—	—	—					
-02	↓	1433	18ESS017 0002	E	0	2	SS	G	2	—	1	1	—					
-03	↓	1455	18ESS013 0002	E	0	2	SS	G	6	—	3	3	—					RUN ALSO MS/MSD
-04	↓	1520	18ESS012 0002	E	0	2	SS	G	6	—	3	3	—					RUN ALSO MS/MSD
-05	10/23	0855	18ESS015 0002	E	0	2	SS	G	2	—	1	1	—					
-06	↓	0910	18ESS014 0002	E	0	2	SS	G	2	—	1	1	—					
-07	↓	0925	18ESS016 0002	E	0	2	SS	G	2	—	1	1	—					
-08	↓	1000	18ESS010 0002	E	0	2	SS	G	2	—	1	1	—					
-09	↓	0000	FD102311-01	—	0	2	SS	G	2	—	1	1	—					
-10	↓	1010	18ESS011 0002	E	0	2	SS	G	2	—	1	—	1					
-11	↓	1305	18ESS009 0002	E	0	2	SS	G	2	—	1	—	1					
-12	↓	1320	18ESS001 0002	E	0	2	SS	G	2	—	1	1	—					
-13	↓	1420	18ESS004 0002	E	0	2	SS	G	2	—	1	1	—					

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY [signature]	10/24/11	1830	1. RECEIVED BY FEDEX	10/24/11	1830
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY [signature]	10.25.11	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0337 | PAGE 5 OF 8

PROJECT NO: 1126-01851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281
SAMPLERS (SIGNATURE) Keith S. Simpson		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2269
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4824	

LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD

ADDRESS

CITY, STATE NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

SWMU 18

1110266

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)									
										G	G	G							
										PRESERVATIVE USED			4°C	4°C	4°C				
										TYPE OF ANALYSIS	EXPLOSIVES	TAL METALS	EXPLOSIVES + NG						COMMENTS
14	10/23	1435	18ESS006 0002	E	0	2	SS	G	2	1	1	—							
15	↓	1510	18ESS005 0002	E	0	2	SS	G	2	1	1	—							
16	10/24	1030	18DSB005 0002	D	0	2	SB	G	2	—	1	1							
17		1040	18DSB005 0305	D	3	5			2	—	1	1							
18		~~0000~~	~~FD102411-01~~	D	—	—			3	—	2	1							DUP KS
19		0000	FD102411-01	D	—	—			1	—	1	—							
20		1045	18DSB006 0002	D	0	2			2	—	1	1							
21		1050	18DSB006 0406	D	4	6			4	—	3	1							MS/MSD OK METALS ONLY
22		1115	18DSB018 0002	D	0	2			2	—	1	1							
23		1120	18DSB018 0810	D	8	10			2	—	1	1							
24		0000	FD102411-02	—	—	—			1	—	1	—							
25		1140	18DSB007 0002	D	0	2			2	—	1	1							
26	↓	1150	18DSB007 0507	D	5	7	↓	↓	2	—	1	1							

1. RELINQUISHED BY Keith S. Simpson	DATE 10.24.11	TIME 1830	1. RECEIVED BY FEDEX	DATE 10.24.11	TIME 1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reginald Jolley	DATE 10.25.11	TIME 0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0338 | PAGE 6 OF 8

PROJECT NO: 112G01851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281
SAMPLERS (SIGNATURE) KEITH S. Simpson		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4824	

LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD

ADDRESS

CITY, STATE NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)									COMMENTS
			SWMU 18 1110266							G	G	G	G						
										PRESERVATIVE USED		4°C	4°C	MeOH NaHSO4	4°C				
										TYPE OF ANALYSIS		EXPLOSIVES +NG	TAL METALS	VOC	SVOCs				
17	10/24	1200	18DSB008 0002	D	0	2	SB	G	2	1	1	—	—						
18		1208	18DSB008 0507	D	5	7			2	1	1	—	—						
9		1220	18DSB010 0002	D	0	2			2	1	1	—	—						
30		1225	18DSB010 1113	D	11	13			2	1	1	—	—						
31		1335	18DSB009 0002	D	0	2			2	1	1	—	—						
32		1340	18DSB009 0709	D	7	9			2	1	1	—	—						
33		1400	18DSB016 0002	D	0	2			2	1	1	—	—						
34		1410	18DSB016 0203	D	2	3			2	1	1	—	—						
35		1420	18DSB011 0002	D	0	2			2	1	1	—	—						
36		1425	18DSB011 0406	D	4	6			2	1	1	—	—						
37		1440	18DSB017 0002	D	0	2			11	1	1	9	—						MS/MSD ON VOCs ONLY
38		1450	18DSB017 0305	D	3	5			5	1	1	3	—						
39	↓	1510	18DSB014 0002	D	0	2	↓	↓	12	1	1	9	1						MS/MSD ON VOCs ONLY

1. RELINQUISHED BY KEITH S. Simpson	DATE 10.24.11	TIME 1830	1. RECEIVED BY FEDEX	DATE 10.24.11	TIME 1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reginald Jolley	DATE 10.25.11	TIME 0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0365 | PAGE 7 OF 8

PROJECT NO: 112G01851	FACILITY: NSA CRANE	PROJECT MANAGER: TIM EVANS	PHONE NUMBER: 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE): [signature]		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS:
		CARRIER/WAYBILL NUMBER: 8770 6393 4824		CITY, STATE: NASHVILLE, TN

STANDARD TAT [X]
RUSH TAT [ ] 24 hr. [ ] 48 hr. [ ] 72 hr. [ ] 7 day [ ] 14 day

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: EXPLOSIVES+NG	TAL METALS	VOCs	SVOCs	PCBs	EXPLOSIVES	EXPLOSIVES+PH	COMMENTS
			SWMU 18							G	4°C								
			1110271							G	4°C								
										G	MeOH/NaHSO4								
										G	4°C								
										G	4°C								
										G	4°C								
										G	4°C								
01	10/24	1520	18DSB014 0406	D	4	6	SB	G	14			1	1	9	3	—	—	—	MS/MSD ON VOC + SVOC
02		0000	FD 102411-05	—	—	—	SB		1			—	1	—	—	—	—	—	
03		1610	18DSB012 0002	D	0	2	SB		6			1	1	3	1	—	—	—	
04		1615	18DSB012 0305	D	3	5	SB		6			1	1	3	1	—	—	—	
05		1550	18DSB013 0002	D	0	2	SB	↓	6			1	1	3	1	—	—	—	
06		1350	18ACP001 0002	A	0	2	CP	C	1			—	—	—	—	1	—	—	
07		1400	18ASS002 0002	A	0	2	SS	G	2			—	1	—	—	—	1	—	
08		1410	18ASS004 0002	A	0	2	SS	G	4 2 KS			—	3	—	—	—	1	—	MS/MSD ON METALS ONLY
09		1445	18ASS001 0002	A	0	2	SS	G	2			—	1	—	—	—	—	1	
10		1500	18ASS003 0002	A	0	2	SS	G	2			—	1	—	—	—	1	—	
11	↓	0000	FD 102411-03	—	—	—	SS	G	1			—	1	—	—	—	—	—	

1. RELINQUISHED BY: [signature]	DATE: 10.24.11	TIME: 1830	1. RECEIVED BY: FEDEX	DATE: 10.24.11	TIME: 1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: [signature]	DATE: 10.25.11	TIME: 0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0366 | PAGE 8 OF 8

PROJECT NO.	FACILITY	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT
1126-01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS BRIAN RICHARD
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER**	**PHONE NUMBER**	**ADDRESS**
KT SL		KEITH SIMPSOIX	412 352 2264	
		CARRIER/WAYBILL NUMBER		**CITY, STATE**
		FEDEX 8770 6393 4824		NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

	DATE 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)				PRESERVATIVE USED				TYPE OF ANALYSIS: EXPLOSIVES	TAL METALS	VOCs	PCBs	COMMENTS
			SWMU 18							G	G	G	G	4°C	4°C	MeOH/NaHSO4	4°C					
			111027I																			
12	10/24	0845	18E SD 003 0006	E	0	6"	SD	G	5	1	1	3	—									
13		0850	18E CP 002 0002	G	0	2	CP	C	1	—	—	—	1									
14		0910	18E SS 002 0002	E	0	2	SS	G	2	1	1	—	—									
15		0955	18E SD 004 0006	G	0	6"	SD	G	2	1	1	1	—									VOC, METALS + EXP
16		0930	18E CP001 0002	E	0	2	CP	C	1	—	—	—	1									
17		1000	18E SS 008 0002	E	0	2	SS	G	2	1	1	—	—									
18		1030	18E SS 003 0002	E	0	2	SS	G	2	1	1	—	—									
19		1035	18E SD 005 0006	E	0	6"	SD	G	5	1	1	3	—									
20		1045	18E CP 003 0002	E	0	2	CP	C	1	—	—	—	1									
21		1055	18E SS 007 0002	E	0	2	SS	G	2	1	1	—	—									
12		1130	18E SD 006 0006	E	0	6"	SD	G	2	1	1	—	—									
13		1330	18A CP 002 0002	A	0	2	CP	C	1	—	—	—	1									
24	↓	1345	18A SD 001 0006	A	0	6"	SD	G	2	1	1	—	—									

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY KT SL	10.24.11	1830	1. RECEIVED BY FEDEX	10.24.11	1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY [signature]	10.25.11	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

1110275

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** Nº 0367 | **PAGE** 1 **OF** 2

PROJECT NO: 112G-01851	**FACILITY:** NSA CRANE	**PROJECT MANAGER** TIM EVANS	**PHONE NUMBER** 412 921 7281	**LABORATORY NAME AND CONTACT:** EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER** KEITH SIMPSON	**PHONE NUMBER** 412 302 2264	**ADDRESS**
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4813		**CITY, STATE** NASHVILLE TN

STANDARD TAT ☒ **RUSH TAT** ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	TYPE OF ANALYSIS: VOC (WATER)	EXP. + NG	TAL METALS	SVOCs	VOCs	PCBs		COMMENTS
									G	G	G	G	G	G			
									PRESERVATIVE USED	HCL	4°C	4°C	4°C	MeOH NaHSO4	4°C		
10/25	0800	TB102511-01	TB	—	—	QC	G	2	2	—	—	—	—	—			-01
	0825	18DSB003 0002	D	0	2	SB		2	—	1	1	—	—	—			-02
	0840	18DSB003 0305	D	3	5			2	—	1	1	—	—	—			-03
	0905	18DSB001 0002	D	0	2			2	—	1	1	—	—	—			-04
	0915	18DSB001 0204	D	2	4			2	—	1	1	—	—	—			-05
	0925	18DSB004 0002	D	0	2			2	—	1	1	—	—	—			-06
	0930	18DSB004 0709	D	7	9			2	—	1	1	—	—	—			-07
	0950	18DSB015 0002	D	0	2			6	—	1	1	1	3	—			-08
	0955	18DSB015 0305	D	3	5			6	—	1	1	1	3	—			-09
	1020	18DSB002 0002	D	0	2			2	—	1	1	—	—	—			-10
	1025	18DSB002 0305	D	3	5			2	—	1	1	—	—	—			-11
	1330	18CSB009 0002	C	0	2			3	—	—	—	—	3	—	-12		RESAMPLE FOR MISSING VOC FNUM 10.18.11
	1000	18ICP003 0002	I	0	2	CP	C	1	—	—	—	—	—	1	-13		-12

1. RELINQUISHED BY		DATE 10.25.11	TIME 1600	1. RECEIVED BY FEDEX		DATE 10.25.11	TIME 1600
2. RELINQUISHED BY		DATE	TIME	2. RECEIVED BY		DATE	TIME
3. RELINQUISHED BY		DATE	TIME	3. RECEIVED BY		DATE 10/26/11	TIME 0820

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

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1110275

1110275

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER Nº 0368 | PAGE 2 OF 2

PROJECT NO: 112G-01851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHLAND
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4813		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)									PRESERVATIVE USED							TYPE OF ANALYSIS: EXPLOSIVES	TAL METALS	TPH-DRO/ERO, PAH, FUEL OIL PARAMETERS	BTEX	PCBs	VOCs	TAL METALS + PH	COMMENTS
		SWMU 18							G	G	G	G	G	G	G			4°C	4°C	4°C	MeOH NaHSO4	4°C	MeOH NaHSO4	4°C							
10/25	0930	18ISS003 0002	I	0	2	SS	G	6	1	1		1	3												1	1	1	3	—	—	—	-14
	1020	18ICP002 0002	I	0	2	CP	C	1																	—				1	—	—	-15
	1025	18ICP001 0002	I	0	2	CP	C	1																	—				1	—	—	-16
	0925	18ISD001 0006	I	0	6"	SD	G	9	1	1		1	3												—	1	1	3	—	3	—	-17
	1055	18ISS001 0002	I	0	2	SS	G	4	1																—						3	-18 MS/MSD ON METALS ONLY
	1110	18ISS002 0002	I	0	2	SS	G	2	1	1															—							-19
	1120	18ISS005 0002	I	0	2	SS	G	6	1	1		1	3												—	1	1	3	—	—	—	20
↓	1135	18ISS004 0002	I	0	2	SS	G	6	1	1		1	3												—	1	1	3	—	—	—	21

1. RELINQUISHED BY	DATE 10.25.11	TIME 1600	1. RECEIVED BY FEDEX	DATE 10-25-11	TIME 1600
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 10/26/11	TIME 0820

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

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1110275

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER | PAGE 1 OF 1

PROJECT NO: 112601851	SITE NAME: NSA CRANE	PROJECT MANAGER AND PHONE NUMBER: TIM EVANS 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, BRIAN RICHARD
SAMPLERS (SIGNATURE): [signature]		FIELD OPERATIONS LEADER AND PHONE NUMBER: KEITH SIMPSON 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER: FEDEX 8770 6393 4824	CITY, STATE: NASHVILLE, TN

STANDARD TAT [X]
RUSH TAT [ ] 24 hr. [ ] 48 hr. [ ] 72 hr. [ ] 7 day [ ] 14 day

	DATE YEAR 2011	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: TAL METALS	EXPLOSIVES	TAL METALS + TPH	VOCs				COMMENTS
			SWMU 18 1110291				G	4°C	G	4°C	G	4°C	G	4°C; MeOH; MeOH		
-01	10/23	0910	18ESB008 0002	SB	G	2			1	1	—	—				
-02		0915	18ESB008 0911			2			1	1	—	—				
-03		0925	18ESB009 0002			2			—	1	1	—				
-04		1010	18ESB009 1113			2			1	1	—	—				
-05		1035	18ESB010 0002			2			1	1	—	—				
-06		1050	18ESB010 1113			2			1	1	—	—				
-07		1255	18ESB007 0002			2			1	1	—	—				
-08		1305	18ESB007 1214			2			1	1	—	—				
-09		1405	18ESB012 0002			2			1	1	—	—				
-10		1430	18ESB012 0507			2			1	1	—	—				
-11		1450	18ESB011 0002			2			1	1	—	—				
-12		1500	18ESB011 0305			2			1	1	—	—				
-13		1515	18ESB004 0002			5			1	1	—	3				
-14		1530	18ESB004 0203			3			1	1	—	—				

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: [signature]	10-24-11	1830	1. RECEIVED BY: FEDEX	10-24-11	1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY: [signature]	10-25-11	0815

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

3/99 FORM NO. TtNUS-001

1110291 Summ Package 10

TETRA TECH NUS, INC. 1111066 CHAIN OF CUSTODY | NUMBER № 0369 | PAGE 1 OF 1

PROJECT NO: 112G01851	FACILITY:	PROJECT MANAGER: TIM EVANS	PHONE NUMBER: 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LAB B. RICHARD
SAMPLERS (SIGNATURE): [signature]		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS:
		CARRIER/WAYBILL NUMBER: FEDEX 8770 6393 5029		CITY, STATE: NASHVILLE TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G
PRESERVATIVE USED: NaOH + NaSO4 4° HCl

TYPE OF ANALYSIS: VOCs, RCRA METALS, VOC

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOCs	RCRA METALS	VOC						COMMENTS
		SWMU 18															
11/2	1020	18C MWT0030204	C	2	4	SB	G	4	3	1	—		—	Q1			
11/2	0800	TB110211-01	TB	—	—	QC	G	2	—	—	2		—	Q2			

1. RELINQUISHED BY: [signature]	DATE: 3 NOV 11	TIME: 1810	1. RECEIVED BY: FEDEX	DATE: 3 NOV 11	TIME: 1810
2. RELINQUISHED BY:	DATE:	TIME:	2. RECEIVED BY:	DATE:	TIME:
3. RELINQUISHED BY:	DATE:	TIME:	3. RECEIVED BY: [signature]	DATE: 11/4/11	TIME: 0830

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0371 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112601851	NSA CRANE	TIM EVANS	412 921	EMPIRICAL LAB, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: KEITH SIMPSON	PHONE NUMBER: 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER: FEDEX 8770 6393 4868		CITY, STATE: NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G
PRESERVATIVE USED: KU KU

	DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: EXPLOSIVES	TAL METALS	COMMENTS
01	11/21	1615	SWMU 18 1111206 18ASB002 0002	A	0	2	SB	G	2	1	1	
02	11/21	1640	18ASB002 0405	A	4	5	SB	G	2	1	1	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	11.21.11	1810	1. RECEIVED BY FEDEX	11.21.11	1810
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 11.23.11	TIME 0810

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER № 0388 | PAGE 1 OF 1

PROJECT NO: 112G01851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 4857		CITY, STATE NASHVILLE TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G

PRESERVATIVE USED: HCL | 4°C | 4°C | 4°C

TYPE OF ANALYSIS: TCL VOC; METALS | EXP TAL METALS, TPH-DRO/ERO, PAH | BTEX - TCL VOCs | EXP TAL METALS | TCL VOC

	DATE (YEAR 2011)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS								COMMENTS
01	11/18	1200	TB 111811-01	TB	—	—	QC	G	2	2	—	—	—				TRIP BLANK
02	11/18	1610	18A MWT004 0002	A	0	2	SB	|	4	—	1	3	—				*
03	11/18	1620	18A MWT004 0204	A	2	4	SB	|	4	—	1	3	—				*
04	11/20	1052	18H MWT003 0204	H	2	4	SB	|	4	—	—	—	1	3			
05	11/20	1102	18H MWT003 0608	H	6	8	SB	↓	4	—	—	—	1	3			

SWMU 18

111210

	DATE	TIME
1. RELINQUISHED BY	22 NOV 11	1805
2. RELINQUISHED BY		
3. RELINQUISHED BY		

	DATE	TIME
1. RECEIVED BY FEDEX	22 NOV 11	1805
2. RECEIVED BY		
3. RECEIVED BY Reynold Talley	11.23.11	0815

COMMENTS * LOW VOL (1.4 oz JAR) → RUN FUEL OIL PARAMETERS 1ST THEN METALS, EXP

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1112143

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0391 | PAGE 1 OF 1

PROJECT NO: 112G01851	FACILITY: NSA CRANE SWMU 18/OU F201	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412-921-7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS
SAMPLERS (SIGNATURE) Kindra Snuff		FIELD OPERATIONS LEADER Tim Evans	PHONE NUMBER 412-921-7281	ADDRESS 621 MAINSTREAMS DR. STE 270
		CARRIER/WAYBILL NUMBER FedEx 8731 7167 0477		CITY, STATE NASHVILLE, TN 37228

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2011	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: TCL VOCs	RCRA METALS	RCRA METALS (DISS)	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED: HCL	HNO3	HNO3	COMMENTS
													G	P	P	
12/12	0000	TB-121211-01	—	—	—	—	—	2	X							TRIP BLANK
12/10	1055	18CGWT003	003	—	—	GW	G	5	X	X	X				01	
12/16	1625	18CGWT002	002	—	—	GW	G	4	X	X					02/03	
12/17	1205	18CGWT001	001	—	—	GW	G	5	X	X	X				04	
12/17	0000	18FD-121711-01	—	—	—	QC	G	5	X	X	X				05/06	FIELD DUP
															07/08	

1. RELINQUISHED BY Kindra Snuff	DATE 12/19/11	TIME 1830	1. RECEIVED BY FedEx	DATE 12/19/11	TIME 1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 12/20/11	TIME 0830

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1112143

1201047

TETRA TECH NUS, INC. | **CHAIN OF CUSTODY** | **NUMBER** Nº 0392 | **PAGE** 1 OF 1

PROJECT NO: 112G01851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921	LABORATORY NAME AND CONTACT: EMPIRICAL, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2269	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 5636		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

SUMM 18
GW SAMPLING

CONTAINER TYPE PLASTIC (P) or GLASS (G): G | P | P | G | G | G
PRESERVATIVE USED: HCl | HNO3 | HNO3 | HCl | 4°C | HCl

DATE YEAR	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: VOCs	RCRA METALS (TOTAL)	RCRA METALS (DIS.)	TPH-DRO/GRO FUEL OIL PARM	PAHs	BTEX & NAPHTHALENE	COMMENTS
1/10 2012	1000	TB011012-01	TB	—	—	QC	G	2	2	—	—	—	—	—	D
↓	1450	08GWT012	08	—	—	GW	G	4	3	1	—	—	—	—	02/03 1/13/12
1/11	1150	08GWT008	08	—	—	↓	↓	5	3	1	1	—	—	—	03/04
↓	1600	18FGWT001	18/01	—	—	↓	↓	21	—	—	—	6	6	9	05
↓	0000	FD011112-01	DUP	—	—	↓	↓	7	—	—	—	2	2	3	06

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	12 JAN 12	1701	1. RECEIVED BY FEDEX	12 JAN 12	1701
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 1/13/12	TIME 0820

COMMENTS: NOTE - DISSOLVED METALS ID ENDS IN F & ARE FIELD FILTERED

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

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1201047 Summ Package

TETRA TECH NUS, INC. 1201110 CHAIN OF CUSTODY | NUMBER Nº 0394 | PAGE 1 OF 1

PROJECT NO: 112G01851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7291	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, B. RICHARD
SAMPLERS (SIGNATURE) TLT SL		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 5599		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒ RUSH TAT ☐ ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)						PRESERVATIVE USED					COMMENTS
		SWMU 18 GW SAMPLING							G	G	P	P			HCl		4°C	HNO_3	HNO_3	
									TYPE OF ANALYSIS	VOC	EXPLOSIVES+NG	TAL METALS (TOTAL)	DISS. TAL METALS							
1/17	0930	TB 011712-01	TB	—		QC	G	2	2							01				
↓	1340	18DGWT001	D	—		GW	G	21	9	6	3	3				02	03			RUN ALSO MS/MSD
	1500	18DGWT004	D	—		↓	↓	6	3	2	1	—				04				
	0000	FD 011712-01	FD	—				7	3	2	1	1				05	06			
↓	1540	18DGWT005	D	—				6	3	2	1	—				07				
1/18	1120	18DGWT~~002~~003	D	—				6	3	2	1	—				08				18DGWT003
↓	1200	18DGWT002	D	—		↓	↓	6	3	2	1	—				09				

1. RELINQUISHED BY TLT SL	DATE 18 JAN 12	TIME 1810	1. RECEIVED BY FEDEX	DATE 18 JAN 12	TIME 1810
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 1/19/12	TIME 0830

COMMENTS NOTE - DISSOLVED METALS ID ENDS IN F & ARE FIELD FILTERED

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R FORM NO. TtNUS-001

1201110 Simm Package

1201111

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0395 | PAGE 1 OF 1

PROJECT NO: 112601851	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LABS, B. RICHARD
SAMPLERS (SIGNATURE) K Simpson		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 4123522264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 5599		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID (summ 18)	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)									COMMENTS
									PRESERVATIVE USED									
									TYPE OF ANALYSIS	EXPLOSIVES	TAL METALS							
17 JAN	1020	SUBAREA I SUMP 18I SD002 0006	I	—	—	SD	G	2	G	G								0.1

1. RELINQUISHED BY K Simpson	DATE 18 JAN 12	TIME 1810	1. RECEIVED BY FEDEX	DATE 18 JAN 12	TIME 1810
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1201111 Summ Package

10

1201129

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0396 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
126018S1	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LAB, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		KEITH SIMPSON	4123522264	
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FEDEX 8770 6393 5603		NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)								COMMENTS
		SUMM 18 GROUNDWATER							G	G	P	P	P	P			
									PRESERVATIVE USED		HCl	4°C	HNO3	HNO3	H2SO4	4°C	
									TYPE OF ANALYSIS		VOC	EXPLOSIVES	T. TAL METALS	DISS. TAL METALS	AMMONIA	PERCHLORATE	
1/18	1630	TB011812-01	TB	—	—	QC	G	2	2		—	—	—	—	—	01	
1/18	1721	18EGWT001	E	—	—	GW	G	8	3	2	1	1	1	—	02	03	
1/19	0940	18EGWT007	E	—	—			6	—	2	1	1	1	1	04	05	
	1000	18EGWT005	E	—	—			6	—	2	1	1	1	1	06	07	
	1240	18EGWT006	E	—	—			18	—	6	3	3	3	3	08	09	RUN ALSO MS/MSD
	0000	FD011912-01	FD	—	—			6	—	2	1	1	1	1	10	11	
	0000	FD011912-02	FD	—	—			2	—	—	—	—	1	1	12		
	1450	18GGWT001	G	—	—			7	3	—	1	1	1	1	13	14	
	1740	18GGWT004	G	—	—			7	3	—	1	1	1	1	15	16	SAMPLED @ 1740
1/20	1145	18AGWT003	A	—	—			4	—	2	1	—	1	—	17		
	1240	18AGWT002	A	—	—			5	—	2	1	1	1	—	18	19	
	1250	18AGWT004	A	—	—	↓	↓	5	—	2	1	1	1	—	20	21	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	20 JAN 12	1831	1. RECEIVED BY FEDEX	20 JAN 12	1831
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	1/21/12	0820

COMMENTS NOTE - DISSOLVED METALS ID ENDS IN F & ARE FIELD FILTERED

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

11

1201129 Summ Package

1 CO 1138

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0397 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		KEITH SIMPSON	412 352 2264	^
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED EX 8770 6393 5614		NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	G	G	P	P	P	P	G	
									PRESERVATIVE USED	HCL	4°C	H2SO4	HNO3	HNO3	4°C	4°C	
		SWMU 18							TYPE OF ANALYSIS	VOCs	EXPLOSIVES	AMMONIA	TAL METALS	DISS. TAL METALS	PERCHLORATE	EXPLOSIVES+NG	COMMENTS
1/20/2012	0900	TB012012-01	TB	—	—	QC	G	2		2	—	—	—	—	—	—	01
	1620	18AGWT001	A	—	—	GW	G	4		—	2	1	1	—	—	—	02
	1815	18JGWT004	J	—	—			3		—	—	—	1	1	1	—	03/04
1/19	0900	18DGWT006	D	—	—			6		3	—	—	1	1	—	1	05/06 LOW VOL.
1/21	1045	18HGWT003 -	H	—	—			10		3	2	1	1	—	3	—	07 MS/MSD ON PERCHLORATE ONLY
	1130	18HGWT002 -	H	—	—			8		3	2	1	1	—	1	—	08
	1245	18HGWT001 -	H	—	—			9		3	2	1	1	+	1	—	09/10
	1410	18JGWT001	J	—	—			2		—	—	—	1	—	1	—	11/12
	1640	18JGWT003	J	—	—			3		—	—	—	1	1	1	—	13/14 12/13
1/22	1220	18JGWT005 KS	J	—	—			3		—	—	—	1	1	1	—	15 (18JGWT005) 16/15
	1305	18EGWT003	E	—	—			18		3	2	1	1	+	—	—	17 MS/MSD ON VOCs 18/17
	1320	18EGWT004	E	—	—			8		3	2	1	1	1	—	—	19 18/19 20
	0000	FD012212-01	FD	—	—			3		3	—	—	—	—	—	—	21 20 22

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	1-23-12	1800	1. RECEIVED BY FED EX	1-23-12	1800
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	1/24/11	0845

COMMENTS NOTE - Dissolved Metals ID ENDS IN "F" E ARE FIELD FILTERED

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

11

1201138 Sumn Package

124150

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0398 | PAGE 2 OF ____

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G01851	NSA CRANE	TIM EVANS	412 921 7281	EMPIRICAL LABS, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		KEITH SIMPSON	412 352 2264	
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FEDEX 8770 6393 5614		NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)										COMMENTS
		SWMU 18 GROUNDWATER SAMPLING							PRESERVATIVE USED	HCl	4°C	H_2SO_4	HNO_3	HNO_3	HCl	4°C	HCl		
									TYPE OF ANALYSIS	VOC	EXPLOSIVES	AMMONIA	TAL METALS	DISS. TAL METALS	TPH - DRO/GRO FUEL OIL RANGE	PAH	BTEX + TNRPH.	PERCHLORATE	
1/22	1440	18EGWT002	E	—	—	GW	G	15		3	2	1	1	1	2	2	3		22/23 21/22
↓	1720	18JGWT002	J	—	—	GW	G	3		—	—	—	1	1	—	—	1		24/25 23/24
1/23	1210	18IGWT005 -	I	—	—	GW	G	6		—	2	1	1	1	—	—	1		26/27 25/26
	1210	18IGWT003 -	I	—	—	GW	G	6		—	2	1	1	1	—	—	1		28/29 27/28
↓	1230	18IGWT004 -	I	—	—	GW	G	6		—	2	1	1	1	—	—	1		30/31 29/3
																			BD 1/24/12

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	1-23-12	1800	1. RECEIVED BY FEDEX	1-23-12	1800
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE 1/24/12	TIME 0845

COMMENTS: NOTE - DISSOLVED METALS ID ENDS IN "F" & ARE FIELD FILTERED

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

1201138 Summ Package 12

120 1141

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER Nº 0399 | PAGE 1 OF 1

PROJECT NO: 1126018	FACILITY: NSA CRANE	PROJECT MANAGER TIM EVANS	PHONE NUMBER 412 921 7281	LABORATORY NAME AND CONTACT: EMPIRICAL LAB, B. RICHARD
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER KEITH SIMPSON	PHONE NUMBER 412 352 2264	ADDRESS
		CARRIER/WAYBILL NUMBER FEDEX 8770 6393 5625		CITY, STATE NASHVILLE, TN

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2012	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS: VOC	PERCHLORATE	AMMONIA	TAL METALS	EXPLOSIVES	DISS. TAL METALS		COMMENTS
		SWMU 18 GROUNDWATER										HCl	4°C	H_2SO_4	HNO_3	4°C	HNO_3	
1/23	0800	TB012312-01	TB	—	—	QC	G	2	2		—	—	—	—	—	—		01
↓	1515	18G GWT 003	G	—	—	GW	↓	6	3		1	1	1	—	—			02
↓	1720	18I GWT 001	I	—	—	↓	↓	6	—		1	1	1	2	1			03/04
1/24	1310	18G GWT 002	G	—	—	↓	↓	7	3		1	1	1	—	1			05/06

1. RELINQUISHED BY		DATE 24 JAN 12	TIME 1500	1. RECEIVED BY FEDEX		DATE 24 JAN 12	TIME 1500
2. RELINQUISHED BY		DATE	TIME	2. RECEIVED BY		DATE	TIME
3. RELINQUISHED BY		DATE	TIME	3. RECEIVED BY		DATE 1/25/12	TIME 0800

COMMENTS: NOTE - DISSOLVED METALS ID ENDS IN "F" & ARE FIELD FILTERED

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

10

1201141 Summ Package

FIELD EQUIPMENT CALIBRATION LOGS

#1

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME/MODEL : MiniRae 3000

INSTRUMENT SERIAL # : 592-901943

MANUFACTURER : Mini Rae

PROJECT NAME : NSA Crane SWMU 18

PROJECT NUMBER : 112G01851

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS
10/18/11	0.1/132.2	Auto Cal	100 PPM Span	None	0.0/97.3	Chuck Kay	Lot # LTF211-TM-CM
10/19/11	0.0/110.7	"	"	"	0.0/99.2	Chuck Kay	
10/20/11	0.1/89.6				0.0/101.1	Chuck Kay	
10/21/11	0.0/88.5				0.0/101.5	Chuck Kay	
10/22/11	0.0/90.6	"	"	"	0.0/99.9	[illegible]	
10/23/11	0.0/98.6				0.0/101.3	Chuck Kay	
10/24/11	0.0/78.6				0.0/98.7	Chuck Kay	
10/25/11	1.3/418.4				0.0/99.5	Chuck Kay	

Instrument Rented From: _____

EQUIPMENT CALIBRATION LOG

#2

INSTRUMENT NAME/MODEL : Mini Rae 3000 PROJECT NAME : NSA Crane SWMU 18

INSTRUMENT SERIAL # : 592-902390 PROJECT NUMBER : 112G01851

MANUFACTURER : Mini Rae

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS
10/18/11	0.0/164.3	100 ppm	Auto cal	None	0.0/100.1	Chuck Ivy	Isobut LTF211-TM-cm
10/19/11	0.0/111.6	100 ppm	Auto Cal	None	0.0/99.6	Chuck Ivy	
10/20/11	0.0/88.6	"	"	"	0.0/99.4	Chuck Ivy	
10/21/11	0.0/97.6	"	"	"	0.0/101.6	JK-S	
10/22/11	0.0/97.1	"	"	"	0.0/99.7	JK-S	
10/23/11	0.0/99.4				0.0/100.0	Chuck Ivy	
10/24/11	0.0/128.4				0.0/100.1	Chuck Ivy	
10/25/11	0.1/106.0				0.0/100.0	Chuck Ivy	
11/02/11	0.0/99.9	"	"	"	0.0/100.0	JK-S	
11/03/11	0.0/100.0	"	"	"	0.0/100.0	JK-S	
11/04/11	0.0/100.0	"	"	"	0.0/100.0	JK-S	
11/05/11	0.1/100.0	"	"	"	0.0/100.1	JK-S	
11/8/11	0.1/100.0	"	"	"	0.0/100.0	KEL	LOT GAK 248 100 12 EXP 6-2014
11.14.11	0.1/100.0	"	"	"	0.0/100.0	KEL	
11.16.11	0.1/100.0	"	"	"	0.0/100.0	KEL	
11-17-11	0.0/130.6	"	"	"	0.0/100.2	KEL	
11.18.11	0.0/99.3	"	"	"	0.0/100.0	KEL	
11-19-11	0.2/99.9	"	"	"	0.0/100.0	KEL	
11.20.11	0.1/98.1	"	"	"	0.0/100.0	KEL	
11.21.11	0.2/99.2	"	"	"	0.0/100.0	KEL	
11-22-11	0.0/108.5	"	"	"	0.0/100.1	KEL	
11-29-11	0.0/107.6	"	"	"	0.0/100.2	KEL	
11-30-11	0.0/100.5	"	"	"	0.0/100.0	C. WARD	
12-1-11	0.0/101.2	"	"	"	0.0/100.0	C. WARD	
12-2-11	0.0/103.5	"	"	"	0.0/100.0	C. WARD	
12-3-11	0.0/100.5	"	"	"	0.0/100.0	K. Losekamp	
12-4-11	0.0/99.9	"	"	"	0.0/100.0	K. Losekamp	
12-5-11	0.0/98.6	"	"	"	0.0/100.8	K. Losekamp	
12-6-11	0.0/100.1	"	"	"	0.0/100.1	K. Losekamp	

Instrument Rented From: Eagle Instruments

#3

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME/MODEL : MiniRae 3000

PROJECT NAME : NSA Crane SWMU 18

INSTRUMENT SERIAL # : 592-902390

PROJECT NUMBER : 112G01851

MANUFACTURER : Mini Rae

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS
12-13-11	0.0 / 95.0	Air / 100 ppm	Autocal	Internal	0.0 / 100.2	[signature]	Isobutylene lot GAK-248-100-12
12-14-11	0.0 / 100.2	"	"	"	0.0 / 100.0	[signature]	
12-15-11	0.2 / 113.9	"	"	"	0.2 / 100.2		
12-16-11	0.0 / 96.5	"	"	"	0.0 / 100.3	[signature]	
12-17-11	0.0 / 118.6	"	"	"	0.0 / 100.0	[signature]	
12-18-11	0.0 / 108.3	"	"	"	0.0 / 100.1	[signature]	
12-19-11	0.1 / 194.2	"	"	"	0.1 / 98.5		
12-20-11	0.0 / 366	"	"	"	0.0 / 43.5	[signature]	
12-20-11	0.0 / 43.5	"	"	"	0.0 / 99.9	[signature]	Recal Lot# M-4159

Instrument Rented From: _____

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME/MODEL : Mini Rae 3000

PROJECT NAME : NSA Crane SWMU 18

INSTRUMENT SERIAL # : 110-013302

PROJECT NUMBER : 112G01851

MANUFACTURER : Mini Rae

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS
1/03/12	0.0 / 100.0	Air / 100ppm	Autocal	Autocal	0.0 / 100.0		Isobutylene Lot # 11-4159
1/5/12	0.0 / 100.0	Air / 100ppm	"	"	0.1 / 100.0		
1/6/12	0.0 / 100.0	"	"	"	0.0 / 99.8		
1/7/12	0.0 / 101.1	"	"	"	0.0 / 100.1		

Instrument Rented From: _____

04-01122

Eagle Instruments, Inc.
610/494-8390

Calibration Data Sheet

Date: 10/14/11
Customer: TetraTech NUS
Model: MiniRae 3000
Serial Number: 592-902390

Span Setting: 100ppm
Battery Voltage: 100%
Response Factor: 1.0
Hydrogen Fuel: N-A

Gas Calibration Check
(performed at room temperature)

Calibration Gas	Lot Number	Actual Reading
100ppm Isobutylene	LTB030-MOEM	100ppm

This instrument has been calibrated to meet or exceed factory specifications.

James R Baker
Technician

Eagle Instruments, Inc.
610/494-8390

04-011122

Calibration Data Sheet

Date: 10/14/11
Customer: Tetra Tech NUS
Model: MiniRae 3000
Serial Number: 592-901943

Span Setting: 100ppm
Battery Voltage 100%
Response Factor: 1.0
Hydrogen Fuel: N/A

Gas Calibration Check
(performed at room temperature)

Calibration Gas	Lot Number	Actual Reading
100ppm Isobutylene	LTB030-MA-CM	100ppm

This instrument has been calibrated to meet or exceed factory specifications.

James R Bardt
Technician

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME/MODEL : HORIBA U52

PROJECT NAME : NSA Crane SWMU 18

INSTRUMENT SERIAL # : SONDE Y8MGFG2L

PROJECT NUMBER : 112G01851

MANUFACTURER : HORIBA

CALIBRATION DATE	INITIAL PH SETTINGS SC	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL PH SETTINGS SC	SIGNATURE	COMMENTS
4 JAN 12	3.77 4.41	AUTO CAL →	AS PER MANUF	AUTO CAL	4.00 4.49		AUTO CAL SOLUTION
5 JAN 12	3.96 4.45	"	"	"	4.00 4.49		~~PH 4~~ IKS
7 JAN 12	3.93 4.46	"	"	"	4.00 4.49		~~100 4~~
8 JAN 12	3.96 4.43	"	"	"	4.00 4.49		LOT # 1AL454
9 JAN 12	3.95 4.41	"	"	"	4.00 4.49		EXP 12-12
10 JAN 12	3.92 4.42	"	"	"	4.00 4.49		
11 JAN 12	3.94 4.41	"	"	"	4.00 4.49		PH 4.00
17 JAN 12	3.43 4.51	"	"	"	4.00 4.50		SC 4.49 MS/CM
18 JAN 12	4.12 4.93	"	"	"	4.00 4.49		
19 JAN 12	4.21 4.11	"	"	"	4.00 4.49		
20 JAN 12	3.82 4.91	"	"	"	4.00 4.49		Lot L148273
21 JAN 12	4.03 4.52	"	"	"	4.00 4.45		EXP # 112012
22 JAN 12	4.01 4.41	"	"	"	4.00 4.45		
23 JAN 12	4.03 4.44	"	"	"	4.00 4.48		

Instrument Rented From: US ENV.

EQUIPMENT CALIBRATION LOG

METER 1

INSTRUMENT NAME/MODEL : HORIBA U52

PROJECT NAME : NSA Crane SWMU 18

INSTRUMENT SERIAL # : SONDE W2UFX5FB

PROJECT NUMBER : 112G01851

MANUFACTURER : HORIBA

CALIBRATION DATE	INITIAL pH SETTINGS	SC	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL pH SETTINGS	SC	SIGNATURE	COMMENTS
10 JAN 12	3.96	4.50	SEE COMM.	AS PER MANU.	AUTO	4.00	4.49		HORIBA AUTO CAL
11 JAN 12	3.95	4.51	"	"	"				PH 4.00
17 JAN 12	4.10	4.44	"	"	"	4.00	4.49		SC 4.49
18 JAN 12	4.05	4.53	"	"	"	3.99	4.50		NTU 0
19 JAN 12	4.7	4.69	"	"	"	4.00	4.49		LOT 1AL454
20 JAN 12	3.96	4.44	"	"	"	4.00	4.49		EXP 12/12
21 JAN 12	4.05	4.53	"	"	"	3.99	4.45		
22 JAN 12	3.98	4.57	"	"	"	4.00	4.46		17 JAN LOT IS SAME
23 JAN 12	3.92	4.41	"	"	"	3.99	4.50		
24 JAN 12	3.95	4.44	"	"	"	4.00	4.49		Lot C145273
									EXP 11 2012

Instrument Rented From: US ENV

EQUIPMENT CALIBRATION LOG

METER 2

INSTRUMENT NAME/MODEL : HORIBA U52

PROJECT NAME : NSA Crane SWMU 18

INSTRUMENT SERIAL # : SONDE HLANS6C8

PROJECT NUMBER : 112G01851

MANUFACTURER : HORIBA

CALIBRATION DATE	INITIAL PH SETTINGS SC	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL PH SETTINGS SC	SIGNATURE	COMMENTS
17 JAN 12	4.21 4.55	SEE COMMENTS	AS PER MANU.	AUTO	4.00 4.50		HORIBA AUTO CAL
18 Jan 12	4.14 4.54	"	"	"	4.00 4.51		PH 4.00
19 Jan 12	4.27 4.68	"	"	"	4.00 4.49		SC 4.49
20 Jan 12	4.03 4.55	"	"	"	4.00 4.49		NTU 0
21 Jan 12	4.05 4.61	"	"	"	4.00 4.49		LOT 1AL454
22 Jan 12	4.03 4.51	"	"	"	4.00 4.50		EXP 12/2012
23 Jan 12							
							Cat C148273
							eEP 11 2012

Instrument Rented From: US ENGR

U.S. Environmental Rental Corporation

166 Riverview Ave. Waltham MA 02453 781-899-1560
91 Prestige Park Circle East Hartford, CT 06108 860-289-8700
5C South Gold Drive, Hamilton, NJ 08691 609-570-8555
1202 Tech Blvd. Suite 108 Tampa, FL 33619 813-628-4200
www.usenvironmental.com

RR Number	36615
Technician	RM
Date	01/04/12
U-22 SN#	6023005
Display SN#	T910022

Company	Tetra Tech NUS
Contact	Keith Simpson
Ph#	812-854-6160

Horiba U-22

Packing List

Manual	X
Auto-Cal Solution	X
Extra Batteries	X
Flow Cell	X
Barb Kit	X
Cal Cup	X
Sensor Guard	X
Display Boot	X

US Environmental provides equipment in first class working order
If equipment is damaged or is not working up to standards please contact US Environmental immediately at 888-550-8100.
In most cases our technicians can troubleshoot problems over the phone.

Customer Comments _____

U.S. Environmental
Rental Corporation

Calibration Report

Calibrated With Horiba Auto-Cal Solution

Lot Number 9015

Parameter	Conductivity 4.49 ms/cm	PH 4.01
Reading Before	4.62	4.49
Reading After	4.49	4.00

Parameter	Turbidity 0 NTU	D.O. mg/L
Reading Before	0.00	8.77
Reading After	0.00	10.42

Serial #	6023005
Tech Initials	RM
Date	1/4/12

U.S. Environmental Rental Corporation

Horiba Version					
U-22 XD		166 Riverview Ave. Waltham MA 02453	781-899-1560	RR Number	37211
U-22 TG		91 Prestige Park Circle, unit 5 East Hartford, CT 06108	860-289-8700	Technician	KC
U-10		127 Route 206 Suite 12 Hamilton, NJ 0861	609-585-6090		
U-50	X	1202 Tech Blvd., Suite 108 Tampa, FL 33619	813-628-4200	Date	12/09/11

Company	NAVFAC PWD Crane	Sonde SN#	XGEOP8RP
Contact	Tom	Display SN#	HLAN56C8
Ph#			

Calibration Information

Autocal	pH (4.00)	Conductivity (4.49)	DO mg/L	Turb. (0ntu)
Before	4.21	4.79	10.1	0
After	4	4.49	9.58	0

Packing List

Cable Length (ft.)	2M	Extra Batteries	X	
Flow Cell	X	Sensor Guard	X	
Barb Kit	X	Manual	X	
Storage/Cal Cup	X	250ML Autocal Sol.	X	X2
Turb. Cal cup	X			

Extra Calibration Kit	
**Only if customer orders	
Autocal	

If unit has any problems customer must notify U.S. Environmental with in 24 Hours of recipt of unit.

Please call our YSI technical support department at 813) 628-4200 ** many problems can be solved in the field

Customer Comments _____

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME/MODEL : Horiba U-52

INSTRUMENT SERIAL # : RWYXYM4O

MANUFACTURER : Horiba

PROJECT NAME : NSA Crane SWMU 18

PROJECT NUMBER : 112G01851

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS
10/19/11							
pH	3.92	/	Autocal	/	3.99	CK	Cal Sol lot No 9015
Temp	12.89						Exp 06/09/12
ORP	303						
Turb	2.5				0.0		
DO	9.24				10.09		
Cond	4.55				4.51		
10.21.11							
PH	4.02		AUTO CAL	AUTO CAL	4.00	RL ✓	
COND	4.66				4.50		
TURB	0.2				0		
DO	4.01				9.93		
15 NOV 11 PH	4.12				3.99		
COND	4.53				4.53	RL ✓	
DO	8.12				8.52		
TEMP	19.5				19.5		
20 NOV 11 PH	4.03		AUTO CAL	AUTO CAL	4.00	RL ✓	
COND	4.50				4.49		
TEMP	18.9				18.9		

Instrument Rented From: _____

SAFETY & BUILDING AVAILABILITY

(Explosive Safety)

and

FLAME TOOL/HOT WORK PERMITS

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)
0591 8020/11 (Rev 5/08)

FROM	**ESO-KT**	**AUTHORIZING CODE**	**JXRRL**
ISSUED TO	**Tetra Tech - Keith Simpson**	**DATE**	**10/24/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples for BLDG 142 Complex which includes BLDGs 109, 143, and 2707 and all associated PRMs.

TOOLS

General hand tools and GeoProbe Direct Push Technology (DPT) rig - runs on hydraulics and uses the weight of the machine to push down a jackhammer with a 2.5" diameter probe.

EXPIRED DPT

LOCATION	LOCATION	DATES	
AREA 142 Complex	**BUILDING** 142	**FROM** 10/24/2011	**THROUGH** 11/4/2011

APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Check in with BLDGs 142 and 143 EVERY morning.
- Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building.
- Ensure all grounding girdles have been identified (by Bob Lloyd 854-8303).
- Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Kevin Stalder, JXRRL**	
Issuing Safety Specialist's Name *(Printed)* **Katelin Tharp, BXTN**	Katelin Tharp
Person Performing Work Name *(Printed)* **Keith Simpson, Tetra Tech**	Keith E. Simpson

DISTRIBUTION: ORIGINAL TO BUILDING SUPERVISOR, COPY TO EXPLOSIVES SAFETY OFFICE

SUBAREA D

SAFETY & BUILDING AVAILABILITY PERMIT

(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)

0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**JXRRL**
ISSUED TO	**Tetra Tech - Keith Simpson**	**DATE**	**11/1/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples for BLDG 142 Complex which includes BLDGs 109, 143, and 2707 and all associated PRMs.

TOOLS

General hand tools and Central Mining Equipment(CME) 550, , runs on Diesel Fuel, Gus Pech 100, and a compressor to drill through the earth.

LOCATION	LOCATION	DATES
AREA **142 Complex**	BUILDING **142**	FROM **11/1/2011** THROUGH **12/1/2011**

APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Check in with BLDGs 142 and 143 EVERY morning for Hazard Control Briefing.
- Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building.
- Grounding girdles have been identified (by Bob Lloyd 854-8303), and relocated as applicable.
- Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Kevin Stalder, JXRRL**	
Issuing Safety Specialist's Name *(Printed)* **Denny Gordon, BXTN-DG**	
Person Performing Work Name *(Printed)* **Keith Simpson, Tetra Tech**	

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AREAS G, J, H

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)
0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**WXRL**
ISSUED TO	**Tetra Tech - Keith Simpson**	**DATE**	**11/1/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples within proximity to Code WXRL facilities to include BLDG's 198, 2510, 2507, 3109, 2509, 2947, 2869, 3040(Baghouse), 3342.

TOOLS

General hand tools, General hand tools and Central Mining Equipment(CME) 550, runs on Diesel Fuel, Gus Pech 100, and a compressor to drill through the earth and install well.

LOCATION	LOCATION	DATES
AREA **See above**	BUILDING **See above**	FROM **11/1/2011** THROUGH **12/1/2011**

APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Coordinate with Facility Process Supervisor for testing schedule and availability, and to sign Hazard Control Briefing. - Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building. - Grounding girdle locations have been reviewed (by Bob Lloyd 854-8303), and identified several locations that require re-location. - Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.
- This area is a no transmitting area, cell phone use is only authorized by Bldg 3323.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Todd Deaton, WXRP**	
Issuing Safety Specialist's Name *(Printed)* **Denny Gordon, BXTN-DG**	
Person Performing Work Name *(Printed)* **Keith Simpson, Tetra Tech**	

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Subarea D

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)
0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**JXRRL**
ISSUED TO	**Charles Warnino Tetra Tech**	**DATE**	**11/30/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples for BLDG 142 Complex which includes BLDGs 109, 143, and 2707 and all associated PRMs.

TOOLS

General hand tools and Central Mining Equipment(CME) 550, runs on Diesel Fuel, and a compressor to drill through the earth.

LOCATION	LOCATION	DATES		
AREA **142 Complex**	BUILDING **142**	FROM **11/30/2011**	THROUGH	**12/7/2011**

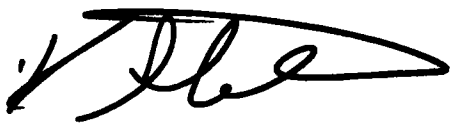
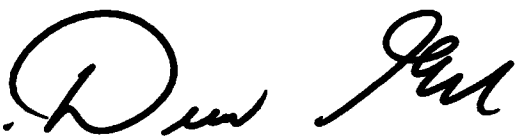
APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Check in with BLDGs 142 and 143 EVERY morning for Hazard Control Briefing.
- Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building.
- Grounding girdles have been identified (by Bob Lloyd 854-8303), and relocated as applicable.
- Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Kevin Stalder, JXRRL**	
Issuing Safety Specialist's Name *(Printed)* **Denny Gordon, BXTN-DG**	
Person Performing Work Name *(Printed)* **Charles Warino, Tetra Tech**	

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Subareas G, J, H

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)
0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**WXRP**
ISSUED TO	**Charles Warnino Tetra Tech**	**DATE**	**11/30/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples within proximity to Code WXRP facilities to include BLDG's 198, 2510, 2507, 3109, 2509, 2947, 2869, 3040(Baghouse), 3342.

TOOLS

General hand tools, General hand tools and Central Mining Equipment(CME) 550, runs on Diesel Fuel, and a compressor to drill through the earth and install well.

LOCATION AREA	LOCATION BUILDING	DATES FROM	THROUGH
See above	See above	11/30/2011	12/7/2011

APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Coordinate with Facility Process Supervisor for testing schedule and availability, and to sign Hazard Control Briefing. - Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building. - Grounding girdle locations have been reviewed (by Bob Lloyd 854-8303), and identified several locations that require re-location. - Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.
- This area is a no transmitting area, cell phone use is only authorized by Bldg 3323.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Terry Chastain, WXRP**	Terry Chastain X6460
Issuing Safety Specialist's Name *(Printed)* **Denny Gordon, BXTN-DG**	Denny Gordon
Person Performing Work Name *(Printed)* **Charles Warino, Tetra Tech**	Charles Warino

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Schaeffer Exhibit D

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)
0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**JXRRL**
ISSUED TO	**Tim Evans -Tetra Tech**	**DATE**	**11/30/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples for BLDG 142 Complex which includes BLDGs 109, 143, and 2707 and all associated PRMs.

TOOLS

General hand tools and Central Mining Equipment(CME) 550, , runs on Diesel Fuel, and a compressor to drill through the earth.

LOCATION	LOCATION	DATES
AREA **142 Complex**	BUILDING **142**	FROM **12/12/2011** THROUGH **12/30/2011**

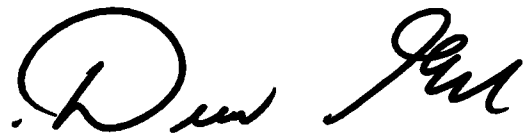
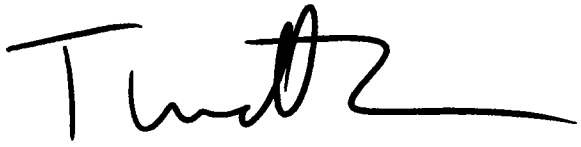
APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Check in with BLDGs 142 and 143 EVERY morning for Hazard Control Briefing.
- Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building.
- Grounding girdles have been identified (by Bob Lloyd 854-8303), and relocated as applicable.
- Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)*	
Kevin Stalder, JXRRL	
Issuing Safety Specialist's Name *(Printed)*	
Denny Gordon, BXTN-DG	
Person Performing Work Name *(Printed)*	
Tim Evans - Tetra Tech	

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Sharea G, H, J

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)
0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**WXRP**
ISSUED TO	**Tim Evans - Tetra Tech**	**DATE**	**11/30/2011**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling for environmental core samples within proximity to Code WXRP facilities to include BLDG's 198, 2510, 2507, 3109, 2509, 2947, 2869, 3040(Baghouse), 3342.

TOOLS

General hand tools, General hand tools and Central Mining Equipment(CME) 550, runs on Diesel Fuel, and a compressor to drill through the earth and install well.

LOCATION AREA	LOCATION BUILDING	DATES FROM	THROUGH
See above	See above	12/12/2011	12/30/2011

APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Coordinate with Facility Process Supervisor for testing schedule and availability, and to sign Hazard Control Briefing. - Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building. - Grounding girdle locations have been reviewed (by Bob Lloyd 854-8303), and identified several locations that require re-location. - Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.
- This area is a no transmitting area, cell phone use is only authorized by Bldg 3323.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Terry Chastain, WXRP**	Terry Chastain
Issuing Safety Specialist's Name *(Printed)* **Denny Gordon, BXTN-DG**	Denny Gordon
Person Performing Work Name *(Printed)* **Tim Evans, Tetra Tech**	Tim Evans

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SWMU 11 & AREA C

ESO

SAFETY & BUILDING AVAILABILITY PERMIT
NON-ROUTINE REPAIR OR MAINTENANCE
9ND-NWSCC 10470/1 (REV. 12-78)

FROM	TO
SAFETY SPECIALIST	Tetra Tech
ISSUED TO: Keith Simpson	DATE: 11/2/11

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling test wells IVO B-119 & 227.

Tools: Drilling rigs (2), various hand tools and Battery operated power tools, & torches.

LOCATION	DATES
AREA: B & B BUILDING: (old 225) 119 & 227	FROM: 11/2/11 THROUGH: 11/12/11

APPLICABLE SAFETY PRECAUTIONS

☒ General Safety Instructions on the reverse side deemed adequate.

☐ In addition to the General Safety Precautions on the reverse side, comply with the following:

Milvan movements, trucks, RTCHs competing for space.
Refueling @ Decon site above 101, when possible.
FEIs on site, both Drill site & Decon site.
Hi Vis Vests, IAW SF plan.

BUILDING AVAILABLE AND WORK APPROVED

SIGNATURE *(Supervisor)* K. E. Simpson 412 352 2254

SIGNATURE *(Issuing Safety Specialist)* [signature] 854-8498

BLD 200 AREA I

SAFETY & BUILDING AVAILABILITY PERMIT
NON-ROUTINE REPAIR OR MAINTENANCE
9ND-NWSCC 10470/1 (REV. 12-78)

FROM	TO
SAFETY SPECIALIST Tim Evans	Tetra Tech
ISSUED TO Keith Simpson / CHARLES WARING	DATE 11/21/11

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Dr. // test Wells, build concrete forms, dig for Ballards IVO B200

Tools: Drilling Rig (2) various hand tools, Batt op Tools,

LOCATION	DATES
AREA ____ BUILDING 200	FROM 11/21/11 THROUGH 12/21/11 (21)

APPLICABLE SAFETY PRECAUTIONS

☐ General Safety Instructions on the reverse side deemed adequate.

☒ In addition to the General Safety Precautions on the reverse side, comply with the following:

1/13/12 1/4/12

Coordinate w/ Davis & Assoc, and Wattle Bros, management.

BUILDING AVAILABLE AND WORK APPROVED

SIGNATURE *(Supervisor)* x

SIGNATURE *(Issuing Safety Specialist)* x 8498 or x 3404

AREA A

COREY

SAFETY & BUILDING AVAILABILITY PERMIT
NON-ROUTINE REPAIR OR MAINTENANCE
9ND-NWSCC 10470/1 (REV. 12-78)

GOOD FOR 2 DAYS ONLY

FROM SAFETY SPECIALIST	TO Tetra tech
ISSUED TO Keith Simpson	DATE 11/21/11

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Digging forms & Footings

Tools: Hand digging tools only.

EXPIRED

LOCATION AREA _____ BUILDING 105	DATES FROM 11/21/11 THROUGH 11/22/11

APPLICABLE SAFETY PRECAUTIONS

☒ General Safety Instructions on the reverse side deemed adequate.

☐ In addition to the General Safety Precautions on the reverse side, comply with the following:

① take additional directions from Cory Hudson.

Keith S. Simpson TETRA TECH

BUILDING AVAILABLE AND WORK APPROVED

SIGNATURE *(Supervisor)* [signature]

SIGNATURE *(Issuing Safety Specialist)* [signature] x8498 or x3404

AREA E

SAFETY & BUILDING AVAILABILITY PERMIT
NON-ROUTINE REPAIR OR MAINTENANCE
9ND-NWSCC 10470/1 (REV. 12-78) 12/13

FROM	TO
SAFETY SPECIALIST Tim Evans Charlie Marino	TTL
ISSUED TO Keith Simpson	DATE 11/16/11

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drill test well IVO B104, 189 & 267

Tools: Drilling Rig (2 poss), various hand tools & Batt. op power tools.

B-189 & B-267

LOCATION	DATES
AREA _____ BUILDING B104	FROM 11/16/11 THROUGH 12/16/11

APPLICABLE SAFETY PRECAUTIONS

21 12/13

☐ General Safety Instructions on the reverse side deemed adequate.

☒ In addition to the General Safety Precautions on the reverse side, comply with the following:

1/13/12 11/14/12

✓ All cutting, & torch work to be done at Decon Pad above B101.

✓ All refueling ops @ Decon pad as well.

BUILDING AVAILABLE AND WORK APPROVED

SIGNATURE *(Supervisor)* Dan M. Stella

SIGNATURE *(Issuing Safety Specialist)* x 8498

AREA H & J & G

SAFETY & BUILDING AVAILABILITY PERMIT
(FOR NON-ROUTINE REPAIR OR MAINTENANCE IN OR NEAR EXPLOSIVES OPERATIONS)

0591 8020/11 (Rev 5/08)

FROM	**ESO-DG**	**AUTHORIZING CODE**	**WXRP**
ISSUED TO	**Keith Simpson, TETRA TECH**	**DATE**	**1/19/2012**

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Drilling and pouring concrete wells for environmental core samples within proximity to Code WXRP facilities to include BLDG's 198, 2510, 2507, 3109, 2509, 2947, 2869, 3040(Baghouse), 3342.

TOOLS

General hand tools, General hand tools and Central Mining Equipment(CME) 550, runs on Diesel Fuel, and a compressor to drill through the earth and install well.

LOCATION AREA	LOCATION BUILDING	DATES FROM	THROUGH
See above	See above	1/19/2012	2/17/2012

APPLICABLE SAFETY PRECAUTIONS

☐ **General Safety Instruction (on the reverse side) deemed adequate.**

☑ **In addition to the General Safety Instruction (on the reverse side), comply with the following:**

- Coordinate with Facility Process Supervisor for testing schedule and availability, and to sign Hazard Control Briefing. - Smoking is only authorized in designated locations.
- If any generators are used, refueling is to be done at a minimum 100 feet away from any operating building. - Grounding girdle locations have been reviewed (by Bob Lloyd 854-8303), and identified several locations that were re-located. - Be observant of all ordnance placarded vehicles.
- Do not block any roads to allow access for emergency vehicles.
- This area is a no transmitting area, cell phone use is only authorized by Bldg 3323.

BUILDING AVAILABLE AND WORK APPROVED

Supervisor's Name *(Printed)* **Brent Noonan, WXRP**	R Brent Noonan
Issuing Safety Specialist's Name *(Printed)* **Denny Gordon, BXTN-DG**	Denny Gordon
Person Performing Work Name *(Printed)* **Keith Simpson, Tetra Tech**	Keith E. Simpson

SUBAREA A - BLD 105

SAFETY & BUILDING AVAILABILITY PERMIT
NON-ROUTINE REPAIR OR MAINTENANCE
9ND-NWSCC 10470/1 (REV. 12-78)

FROM	TO
SAFETY SPECIALIST	Tetra-Tech
ISSUED TO Keith Simpson	DATE 1/19/12

PERMIT TO PERFORM THE FOLLOWING WORK

DESCRIPTION OF WORK

Sub contractor to pour concrete IVO Bldg 105. Gradiant Sup aware. Dispatch to provide key for access.

TOOLS: Truck & general Hand tools.

LOCATION	DATES
AREA 200 BUILDING 105	FROM 1/20/12 THROUGH 1/21/12

APPLICABLE SAFETY PRECAUTIONS

☒ General Safety Instructions on the reverse side deemed adequate.

☐ In addition to the General Safety Precautions on the reverse side, comply with the following:

BUILDING AVAILABLE AND WORK APPROVED

SIGNATURE *(Supervisor)* [signature]

SIGNATURE *(Issuing Safety Specialist)* [signature] X 3404

FLAME TOOL/HOT WORK PERMIT SWMU 11 & AREA C FIRE

NSA CRANE 11320 (REV. 12-10)

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES	11-2-11	11-12-11	NAVFAC	CAAA	NSWC	OTHER
	TIME	0900	1600	NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]				TETRA - TECH			

TYPE OF EQUIPMENT TO BE USED (Cutting Torch, Arc, Welder, etc.) Diesel Drill Rig, [redacted], Hammers/Wrenches

PURPOSE OF USE installing test wells Post Hole digger, GENERATOR

WHERE USED (Building/Structure/Other Location) B-119 Area + Behind 224 INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1 [X] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 [X] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.

3 [X] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 [ ] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

5 [ ] PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.

6 [X] THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

NSA X-1476 , CAAA X-3404 , NSWC X6569 or 1625 , PWD 854-3427

UPDATED 11-15-11 TO 12-23-11 TW

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X-		X

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
ABC	[ ] WATER [X] DRY CHEMICAL [ ] CO 2	10#	

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X- [illegible]	[illegible]	X	[illegible]

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X- [illegible]	[illegible]	X	[illegible]

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

SIGNATURE (Fire Department/Representative)		DATE
X- [illegible]	x 1235	11-2-11

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

- Refueling may take place on site
- Smoking in designated areas only
- Seperate permit for torch work
- Fire ext. on site on Decon site.

Decon site @ Gravel Pad @ 101
Tools: Steam Jenny

FLAME TOOL/HOT WORK PERMIT
NSA CRANE 11320 (REV. 12-10)

SWMU 11 & Area C

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES			NAVFAC	CAAA	NSWC	OTHER
	TIME			NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]							

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

PURPOSE OF USE

WHERE USED (Building/Structure/Other Location) | INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1 ☐ READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 ☐ REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.

3 ☐ FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 ☐ REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

5 ☐ PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.

6 ☐ THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

NSA X-1476 , CAAA X-3404 , NSWC X6569 or 1625 , PWD 854-3427

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X- [illegible]	KEITH SIMPSON	X [illegible]

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
ABC	☐ WATER ☐ DRY CHEMICAL ☐ CO 2	10 ft	

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X- [illegible]	KEITH SIMPSON	X 912 352 2764	11.4.11

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X- [illegible]	[illegible]	X	11-4-11

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

SIGNATURE (Fire Department/Representative)		DATE
X- [illegible]	x 1235	11/04/11

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

FLAME TOOL/HOT WORK PERMIT
NSA CRANE 11320 (REV. 12-10)

AREA D

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES	11-07-11	12-30-11	NAVFAC	CAAA	NSWC	OTHER
	TIME	0845	1900	NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]				Jerry Tech			

TYPE OF EQUIPMENT TO BE USED (Cutting Torch, Arc, Welder, etc.) Hand Tools, Drill Rig POST HOLE DIGGER / GENERATOR

PURPOSE OF USE Post Holes

WHERE USED (Building/Structure/Other Location) B-142 AREA D — INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1 [✓] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 [✓] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA. SW

3 [✓] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 [✓] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

5 [✓] PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.

6 [✓] THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

NSA X-1476 • CAAA X-3404 • NSWC X6569 or 1625 • PWD 854-3427

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X- Witnessed by Jerry Tech	[redacted]	X [redacted]

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
ABC	[ ] WATER [✓] DRY CHEMICAL [ ] CO 2	10#	

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X [redacted]	[redacted]	X	11-07-11

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X- [redacted]	[redacted]	X 5530	11-07-11

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

SIGNATURE (Fire Department/Representative)		DATE
X- [redacted]	x 1235	11-07-11

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

FLAME TOOL/HOT WORK PERMIT

NSA CRANE 11320 (REV.11-05)

AREA A

	ITEM	FROM	TO	ISSUED TO			
ESAMS CONTROL NUMBER	DATES			NAVFAC	CAAA	NSWC	OTHER
	TIME			NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			

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

PURPOSE OF USE

WHERE USED (Building/Structure/Other Location)	INSIDE	OUTSIDE

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT

1 ☐ READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON REVERSE SIDE, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 ☐ REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.

3 ☐ FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 ☐ REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE(NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.

REQUIRED FIRE EXTIGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
☐	WATER		
☐	DRY CHEMICAL		
☐	CO 2		

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

SIGNATURE (Permit Holder)	PRINT NAME/EXT	DATE

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME/EXT	DATE

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

SIGNATURE (Fire Department/Representative)	x3343	DATE

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

FLAME TOOL/HOT WORK PERMIT

NSA CRANE 11320 (REV.11-05)

Subarea G - 12/15/11 ONLY

	ITEM	FROM	TO	ISSUED TO			
ESAMS CONTROL NUMBER	DATES			NAVFAC	CAAA	NSWC	OTHER
	TIME			NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			

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

PURPOSE OF USE

WHERE USED (Building/Structure/Other Location)	INSIDE	OUTSIDE

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT

1 [ ] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON REVERSE SIDE, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 [ ] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.

3 [ ] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 [ ] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE(NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.

REQUIRED FIRE EXTIGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
[ ]	WATER		
[ ]	DRY CHEMICAL		
[ ]	CO 2		

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

SIGNATURE (Permit Holder)	PRINT NAME/EXT	DATE

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME/EXT	DATE

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

SIGNATURE (Fire Department/Representative)	x3343	DATE

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

FLAME TOOL/HOT WORK PERMIT

Subareas G & J

NSA CRANE 11320 (REV. 12-10)

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES	12/6/11	12/30/11	NAVFAC	CAAA	NSWC	OTHER
	TIME	0730	1900	NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]				Tri Tech			

TYPE OF EQUIPMENT TO BE USED (Cutting Torch, Arc, Welder, etc.) Hand Tools and Hand Tools Grinding

PURPOSE OF USE Tank work

WHERE USED (Building/Structure/Other Location) 2949 & 2052 - 3040 & 198 | INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1 [ ] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 [X] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA. updated 01/19/12 to 01/31/12

3 [X] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 [X] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

5 [X] PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.

6 [X] THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

NSA X-1476 • CAAA X-3404 • NSWC X6569 or 1625 • PWD 854-3427

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X- [redacted]	Tri Tech Tank Tech	X

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
ABC	[ ] WATER [X] DRY CHEMICAL [ ] CO 2	10 lb	

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X- [redacted]	[redacted]	X	

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X-		X	

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

SIGNATURE (Fire Department/Representative)		DATE
X- [redacted]	x 1235	12/6/11

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

FLAME TOOL/HOT WORK PERMIT

NSA CRANE 11320 (REV. 12-10)

AREA E

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES	11-16-11	12-16-11	NAVFAC	CAAA	NSWC	OTHER
	TIME	1530	1600	NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]				TETRA - TECH			

TYPE OF EQUIPMENT TO BE USED (Cutting Torch, Arc, Welder, etc.) Drill Rig

PURPOSE OF USE Drilling test wells

WHERE USED (Building/Structure/Other Location) B-104 AREA — INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1 [X] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 [ ] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.

3 [ ] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 [ ] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

5 [ ] PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.

6 [X] THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

NSA X-1476 • CAAA X-3404 • NSWC X6569 or 1625 • PWD 854-3427

updated 01/04/12 to 01/18/12 final

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X-		X

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
	[ ] WATER		
	[ ] DRY CHEMICAL		
	[ ] CO 2		

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X-	[illegible]	X	[illegible]

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X-	Dave Fletcher	X 3040	11-16-2011

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

SIGNATURE (Fire Department/Representative)		DATE
X-	x 1235	11-16-11

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

Follow B-EVAC PLAN.
EVACUATE if FIRE Alarm Sounds
COORDINATE w/ Bldg. Supv. daily

FLAME TOOL/HOT WORK PERMIT
NSA CRANE 11320 (REV. 12-10)

DECON PAD

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES	11-16-11	12-16-11	NAVFAC	CAAA	NSWC	OTHER
	TIME	1500	1600	NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]				TETRA TECH			

TYPE OF EQUIPMENT TO BE USED (Cutting Torch, Arc, Welder, etc.) torch, grinder, saw, Hand tools

PURPOSE OF USE cutting Pipe, Pressure Washing, Refueling

WHERE USED (Building/Structure/Other Location) DECON Site NEAR 101 — INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1 [X] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.

2 [ ] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.

3 [ ] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.

4 [ ] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.

5 [ ] PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.

6 [ ] THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

NSA X-1476 • CAAA X-3404 • NSWC X6569 or 1625 • PWD 854-3427

UP DATE 12-13-11 To 12-31-11
Robert
updated 01/04/12 to 02/04/12
D. Ned

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X-		X

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
	[ ] WATER		
	[ ] DRY CHEMICAL		
	[ ] CO 2		

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X-		X	

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X-	Kelly Simpson	X	

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

SIGNATURE (Fire Department/Representative)		DATE
X-	x 1235	11-16-11

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

FLAME TOOL/HOT WORK PERMIT BLD 200 Subarea I

NSA CRANE 11320 (REV. 12-10)

	ITEM	FROM	TO	ISSUED TO (CIRCLE ONE)			
ESAMS CONTROL NUMBER	DATES			NAVFAC	CAAA	NSWC	OTHER
	TIME			NAME OF TRADE/CONTRACTOR/TENANT ACTIVITY			
[redacted]							

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

PURPOSE OF USE

WHERE USED (Building/Structure/Other Location) | INSIDE/OUTSIDE (CIRCLE ONE)

INSTRUCTIONS OF THE FIRE SUPPRESSION/PREVENTION BRANCH, FIRE DEPARTMENT **(ALL CHECKED BOXES APPLY TO PERMIT)**

1. [X] READ AND BE FAMILIAR WITH THE GENERAL FIRE PREVENTION INSTRUCTION ON **[REVERSE SIDE]**, YOU SHALL ALSO COMPLY WITH THE FOLLOWING.
2. [ ] REMOVE ALL COMBUSTABLES 35 FEET, ALL FLAMMABLE MATERIAL 50 FEET, AND ALL EXPLOSIVES 100 FEET (UNLESS DISTANCE IS WAIVED BY CAAA OR NAVY SAFETY AND FIRE PREVENTION PERSONNEL, OR EXPLOSIVES ARE NOT PRESENT), FROM THE HOT WORK AREA.
3. [X] FIRE WATCH, WITH APPROVED EXTINGUISHER AND/OR STAND-BY FIRE FIGHTING EQUIPMENT, SHALL BE PRESENT DURING AND AT LEAST 30 MINUTES AFTER WORK IS COMPLETE.
4. [X] REFRASIL TYPE CLOTH SHALL BE USED TO PROTECT ANY EXPOSURE (NOTED IN NUMBER 2 ABOVE) THAT CAN NOT BE REMOVED THE PRESCRIBED DISTANCE.
5. [X] PRIOR TO WORK BEING PERFORMED, PERMIT HOLDER SHALL ENSURE ALL LOCKOUT/TAGOUT PROCEDURES ARE IN PLACE.
6. [X] THE FOLLOWING SAFETY OFFICE SHALL BE CONTACTED PRIOR TO WORK BEING PERFORMED (CIRCLE ONE):

   NSA X-1476 • CAAA X-3404 • NSWC X6569 or 1625 • PWD 854-3427

updated 01/04/12 to 01/18/12 D. Neal

SIGNATURE OF PERSON DESIGNATED AS FIRE WATCH	PRINT NAME	EXT.
X-		X

REQUIRED FIRE EXTINGUISHER AT WORK SITE			OTHER FIRE PROTECTION STANDBY REQUIREMENT(S)
TYPE		SIZE	
ABC	[ ] WATER [X] DRY CHEMICAL [ ] CO 2	40	

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

SIGNATURE (Permit Holder)	PRINT NAME	EXT.	DATE
X-		X	

HAZARDOUS AREAS ONLY

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

SIGNATURE (Building Supervisor/Foreman/Representative)	PRINT NAME	EXT.	DATE
X-		X	

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

SIGNATURE (Fire Department/Representative)		DATE
X-	x 1235	

DISTRIBUTION: Original (Fire Prevention File)
Copy (Work Site)

ADDITIONAL PERMIT INSTRUCTIONS:

GROUNDWATER LEVEL MEASURMENT SHEETS

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: NSA Crane
Project No.: 112G01851
Location: SWMU 18
Personnel: Simpson, Losekamp, Rojahn
Weather Conditions: 40° F, no rain
Measuring Device: Solinst
Tidally Influenced: Yes ___ No _X_
Remarks:

Well Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Groundwater Elevation (feet)*	Comments
18AMWT001	21-Jan-12	1655		26.00	10.68		
18AMWT002	21-Jan-12	1707		27.45	17.11		
18AMWT003	21-Jan-12	1704		28.00	13.66		
18AMWT004	21-Jan-12	1700		28.55	10.39		
18CMWT001	21-Jan-12	1545		37.45	6.52		
18CMWT002	21-Jan-12	1505		36.45	14.10		
18CMWT003	21-Jan-12	1553		32.25	15.68		
08MWT008	21-Jan-12	1600		32.70	9.40		
08MWT012	21-Jan-12	1555		76.00	53.35		
18DMWT001	21-Jan-12	1603		21.05	8.93		
18DMWT002	21-Jan-12	1605		29.35	22.01		
18DMWT003	21-Jan-12	1607		27.05	16.18		
18DMWT004	21-Jan-12	1610		26.05	10.48		
18DMWT005	21-Jan-12	1614		23.87	16.02		
18DMWT006	21-Jan-12	1616		36.60	31.61		Draw down from sampling,poor producer
18EMWT001	21-Jan-12	1630		21.10	8.96		
18EMWT002	21-Jan-12	1647		38.61	30.08		
18EMWT003	22-Jan-12	0900		33.05	17.55		
18EMWT004	22-Jan-12	0905		24.05	9.61		
18EMWT005	21-Jan-12	1641		52.62	48.22		
18EMWT006	21-Jan-12	1639		22.00	10.96		
18EMWT007	21-Jan-12	1643		32.65	29.85		

All measurments are to the nearest 0.01 foot from the top of riser

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: NSA Crane
Project No.: 112G01851
Location: SWMU 18
Personnel: Simpson, Losekamp, Rojahn
Weather Conditions: 40° F, no rain
Measuring Device: Solinst
Tidally Influenced: Yes ___ No _X_
Remarks:

Well Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Groundwater Elevation (feet)*	Comments
18FMWT001	21-Jan-12	1520		27.40	16.42		
18GMWT001	21-Jan-12	1512		27.95	14.92		
18GMWT002	21-Jan-12	1511		24.75	7.04		
18GMWT003	21-Jan-12	1505		34.25	20.72		
18GMWT004	21-Jan-12	1508		30.25	10.96		
18HMWT001	21-Jan-12	1416		27.55	14.11		
18HMWT002	21-Jan-12	1420		23.00	12.18		
18HMWT003	21-Jan-12	1422		36.31	16.78		
18IMWT001	21-Jan-12	1524		33.50	19.66		
18IMWT002	Not Installed						
18IMWT003	21-Jan-12	1540		25.00	14.32		
18IMWT004	21-Jan-12	1533		37.67	27.33		
18IMWT005	21-Jan-12	1530		61.81	44.85		
18JMWT001	21-Jan-12	1430		31.82	16.55		
18JMWT002	21-Jan-12	1450		36.65	21.31		
18JMWT003	21-Jan-12	1433		31.15	20.95		
18JMWT004	21-Jan-12	1441		33.75	21.92		
18JMWT005	21-Jan-12	1436		30.56	23.80		

All measurments are to the nearest 0.01 foot from the top of riser

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name:	NSA Crane	**Project No.:**	112G01851
Location:	SWMU ~~18~~ 11	**Personnel:**	Simpson, Losekamp, Rojahn
Weather Conditions:	40° F, no rain	**Measuring Device:**	Solinst
Tidally Influenced:	Yes __ No _X_	**Remarks:**	

Well Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Groundwater Elevation (feet)*	Comments
11MWT001	21-Jan-12	1714			8.73		
11MWT002	21-Jan-12	1719			5.29		
11MWT003	21-Jan-12	1722			9.26		
11MWT004	21-Jan-12	1729			32.78		

* All measurements to the nearest 0.01 foot from the top of riser

SWMU 11, OLD STORAGE BUILDING 225 CTO F27E
SWMU 18, LOAD AND FILL AREA CTO F201
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

SAMPLE LOCATION SURVEY DATA

HORIZONTAL DATUM: North American Datum 1983 (NAD83), INDIANA WEST ZONE, U.S. Survey Feet
VERTICAL DATUM: North American Vertical Datum 1988 (NAVD88)

Pt	N	E	Elev	Loc	Sample Loc
336	1306320.18	3014842.22	683.42	GRD	
337	1306319.31	3014842.41	686.39	TC	
338	1306319.50	3014842.22	685.89	TP	08MWT012
339	1306740.04	3014736.95	695.62	GRD	
340	1306740.09	3014737.53	698.12	TC	
341	1306740.16	3014737.46	697.63	TP	08MWT008
36	1307499.48	3014474.52	687.84	GRD	
37	1307499.56	3014474.25	691.25	TC	
38	1307499.75	3014474.06	690.94	TP	11MWT001
33	1307226.18	3014337.27	685.00	GRD	
34	1307226.10	3014337.86	685.00	TC	
35	1307226.17	3014337.75	684.73	TP	11MWT002
43	1307021.21	3014185.32	683.23	GRD	
44	1307020.71	3014185.55	686.29	TC	
45	1307020.87	3014185.51	685.99	TP	11MWT003
46	1307368.18	3014175.57	685.95	GRD	
47	1307367.94	3014175.83	688.79	TC	
48	1307367.99	3014175.86	688.51	TP	11MWT004
176	1309870.07	3015628.28	670.60		18ACP001
170	1309774.65	3015838.39	680.34		18ACP002
173	1309530.56	3015644.96	678.63		18ASB001
169	1309677.36	3015709.32	680.04		18ASB002
171	1309784.24	3015882.61	678.73		18ASB003
172	1309616.46	3015801.97	678.75		18ASB004
175	1309762.08	3015597.09	677.83		18ASB005
174	1309732.22	3015595.74	678.24	BASIN	18ASD001
182	1310012.58	3015882.39	645.75		18ASS001 *(revised label)*
179	1310027.94	3015626.25	654.79		18ASS002
revised	1309970.36	3015871.64	656.03		18ASS003
178	1309933.56	3015589.50	664.05		18ASS004
254	1309582.30	3015573.54	684.49	GRD	
255	1309582.01	3015573.89	687.35	TC	
256	1309581.89	3015573.81	687.08	TP	18AMWT001
251	1309548.29	3015885.81	686.16	GRD	
252	1309549.74	3015887.16	689.02	TC	
253	1309549.98	3015887.19	688.69	TP	18AMWT002
248	1309778.26	3015927.17	681.31	GRD	

249	1309776.66	3015928.28	683.81	TC	
250	1309776.75	3015928.17	683.49	TP	18AMWT003
245	1309760.61	3015730.03	680.68	GRD	
246	1309760.62	3015729.87	683.48	TC	
247	1309760.34	3015729.68	683.12	TP	18AMWT004
60	1308314.27	3015416.44	687.05		18BCP001
revised	1308069.50	3015316.58	677.66		18BCP002
49	1308445.43	3016852.96	678.67		18BCP003
50	1308417.48	3016590.64	687.12		18BSB001
51	1308441.07	3016418.44	688.98		18BSB002
54	1308365.20	3016466.58	685.52		18BSB003
55	1308360.62	3015424.36	686.78		18BSB004
57	1308362.77	3015299.98	687.20		18BSB005
56	1308287.77	3015337.43	686.32		18BSB006
61	1308260.91	3015463.06	683.73		18BSS001
71	1308270.75	3016358.99	682.20		18BSS002
59	1308576.17	3017045.78	661.36		18BSS003
65	1307852.56	3015280.55	661.08		18BSS004
20	1307033.78	3014695.87	693.83		18CCP001
3	1306824.25	3014434.45	683.61	GRD	
4	1306823.84	3014434.44	686.55	TC	
5	1306823.75	3014434.32	686.25	TP	18CMWT001
6	1306547.71	3014482.99	684.68	GRD	
7	1306547.56	3014483.30	687.68	TC	
8	1306547.60	3014483.20	687.34	TP	18CMWT002
9	1306268.84	3014631.58	684.61	GRD	
10	1306268.59	3014631.74	687.48	TC	
11	1306268.64	3014631.86	687.17	TP	18CMWT003
18	1307428.58	3014820.29	691.39		18CSB001
16	1307408.76	3014570.91	688.19		18CSB002
15	1307250.88	3014578.42	690.94		18CSB003
17	1307276.43	3014656.94	695.34		18CSB004
14	1306988.49	3014637.50	687.98		18CSB005
13	1306893.09	3014628.17	687.46		18CSB006
184	1306890.30	3014709.26	691.57		18CSB007
12	1306582.61	3014689.25	689.77		18CSB008
26	1306378.29	3014738.17	687.63		18CSB009
19	1306988.63	3014643.21	690.10	BASIN	18CSD003
23	1306565.95	3014284.43	655.76		18CSS001
32	1306648.79	3015999.77	583.97		18CSW/SD01
28	1307599.98	3015256.70	650.55		18CSW/SD02
143	1307411.31	3015971.35	676.02		18DCP001
147	1307283.78	3015931.99	670.41		18DCP002
135	1307839.63	3016102.01	681.01	GRD	
136	1307839.75	3016101.98	684.11	TC	
137	1307840.00	3016101.97	683.78	TP	18DMWT001
140	1307460.12	3015770.64	675.86	GRD	

141	1307459.88	3015770.34	678.79	TC	
142	1307459.76	3015770.43	678.47	TP	18DMWT002
148	1307252.17	3016070.98	670.20	GRD	
149	1307252.11	3016071.58	673.08	TC	
150	1307252.20	3016071.34	672.81	TP	18DMWT003
260	1307046.76	3016102.05	659.76	GRD	
261	1307046.67	3016101.66	662.71	TC	
262	1307046.81	3016101.67	662.38	TP	18DMWT004
257	1307113.75	3016388.12	657.90	GRD	
258	1307113.62	3016387.90	660.73	TC	
259	1307113.32	3016387.47	660.30	TP	18DMWT005
156	1307416.56	3016639.65	661.23	GRD	
157	1307417.01	3016639.94	663.99	TC	
158	1307416.96	3016639.92	663.72	TP	18DMWT006
138	1307697.59	3015820.23	678.52		18DSB001
134	1307744.76	3016008.36	680.02		18DSB002
133	1307627.90	3015930.19	680.78		18DSB003
139	1307500.76	3015787.82	678.28		18DSB004
154	1307695.42	3016281.76	673.11		18DSB005
153	1307614.83	3016191.13	673.21		18DSB006
160	1307393.64	3016384.54	663.73		18DSB007
159	1307317.49	3016406.63	662.41		18DSB008
165	1307102.37	3016156.35	665.66		18DSB009
166	1307134.26	3016326.23	663.07		18DSB010
161	1307267.22	3016234.40	665.31		18DSB011
152	1307441.22	3016235.33	668.81		18DSB012
151	1307359.30	3016178.89	672.53		18DSB013
145	1307358.93	3016064.26	678.92		18DSB014
144	1307455.81	3016070.10	675.85		18DSB015
162	1307156.51	3016091.73	665.92		18DSB016
146	1307336.27	3016024.67	674.84		18DSB017
155	1307695.57	3016662.72	666.84		18DSB018
163	1307102.77	3016042.36	657.94		18DSS001
164	1306881.75	3015877.44	602.20		18DSS002
29	1306650.48	3016778.36	563.93		18DSS003
89	1307150.01	3018576.49	656.71		18ECP001
76	1307309.09	3018844.44	656.45		18ECP002
77	1307072.10	3018728.22	649.22		18ECP003
82	1307507.89	3018601.97	655.89	GRD	
83	1307508.25	3018602.25	659.37	TC	
84	1307508.29	3018602.10	659.10	TP	18EMWT001
308	1307166.08	3018248.01	627.11	GRD	
309	1307165.58	3018247.86	630.09	TC	
310	1307165.63	3018247.93	629.53	TP	18EMWT002
302	1307234.13	3018898.76	653.50	GRD	
303	1307233.71	3018899.08	656.66	TC	
304	1307233.68	3018899.18	656.31	TP	18EMWT003

305	1307059.92	3018632.22	649.95	GRD	
306	1307059.39	3018632.24	653.25	TC	
307	1307059.13	3018632.19	652.92	TP	18EMWT004
296	1308411.26	3018715.56	633.92	GRD	
297	1308410.30	3018717.71	637.08	TC	
298	1308410.07	3018717.66	636.76	TP	18EMWT005
299	1308270.19	3018552.72	638.33	GRD	
300	1308269.68	3018553.04	641.06	TC	
301	1308269.75	3018552.93	640.81	TP	18EMWT006
293	1308451.91	3018616.55	633.78	GRD	
294	1308452.14	3018616.20	636.43	TC	
295	1308452.26	3018616.05	636.31	TP	18EMWT007
81	1307271.71	3018321.32	641.73		18ESB001
80	1307140.04	3018304.06	625.78		18ESB002
87	1307340.41	3018608.95	656.68		18ESB003
79	1307052.85	3018612.63	649.77		18ESB004
74	1307314.90	3018859.48	653.52		18ESB005
88	1307159.93	3018554.67	656.65		18ESB006
117	1308430.66	3018691.10	633.59		18ESB007
118	1308381.45	3018606.06	634.52		18ESB008
123	1308333.36	3018613.33	634.10		18ESB009
114	1308371.18	3018675.19	634.03		18ESB010
124	1307754.38	3018041.14	637.79		18ESB011
125	1307616.23	3018002.65	633.05		18ESB012
73	1307319.75	3018854.89	654.19	BASIN	18ESD003
92	1307133.09	3018470.68	640.65	BASIN	18ESD004
78	1307054.00	3018624.00	649.18		18ESD005
115	1308419.16	3018725.99	634.44	BASIN	18ESD006
96	1307071.69	3018244.02	608.83		18ESS001
102	1307351.91	3018914.37	631.40		18ESS002
100	1307025.33	3018633.34	636.44		18ESS003
99	1306922.71	3018583.25	597.74		18ESS004
94	1307008.58	3018368.49	602.57		18ESS005
95	1306861.36	3018380.92	575.78		18ESS006
91	1307112.50	3018533.89	651.13		18ESS007
93	1307089.38	3018422.15	623.71		18ESS008
97	1307182.31	3018150.71	626.14		18ESS009
116	1308411.39	3018741.96	628.01		18ESS010
113	1308297.64	3018654.32	630.71		18ESS011
128	1308680.59	3017598.71	650.84		18ESS012
revised	1308651.61	3017683.28	644.81		18ESS013
131	1308127.72	3017426.71	648.81		18ESS014
130	1308116.81	3017492.47	641.66		18ESS015
132	1307990.27	3017358.17	645.60		18ESS016
106	1306669.22	3018330.74	536.21		18ESS017
108	1306512.61	3018675.04	526.60		18ESW/SD001
105	1306654.52	3018217.97	533.07		18ESW/SD002

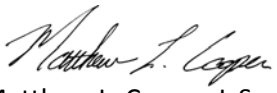
190	1305045.33	3016108.70	660.17		18FCP001
185	1305187.83	3015997.68	663.82		18FCP002
263	1305037.62	3016074.61	661.76	GRD	
264	1305037.93	3016075.28	664.33	TC	
265	1305037.79	3016074.95	664.10	TP	18FMWT001
195	1305618.02	3016017.43	666.42		18FSB001
191	1305409.44	3015989.29	665.56		18FSB002
194	1305482.12	3016092.60	659.98		18FSB003
186	1305106.01	3016184.85	648.20		18FSS001
187	1304808.75	3016190.07	626.64		18FSS002
266	1305390.47	3016830.53	643.91	GRD	
267	1305390.93	3016831.34	646.98	TC	
268	1305390.90	3016831.07	646.67	TP	18GMWT001
269	1305479.89	3016728.16	633.61	GRD	
270	1305481.64	3016728.47	637.03	TC	
271	1305481.83	3016728.60	636.78	TP	18GMWT002
275	1305261.02	3016738.43	651.61	GRD	
276	1305261.74	3016738.69	654.44	TC	
277	1305261.54	3016738.70	654.21	TP	18GMWT003
272	1305244.61	3016493.30	654.09	GRD	
273	1305244.02	3016493.67	657.02	TC	
274	1305244.05	3016493.37	656.72	TP	18GMWT004
218	1305391.17	3016831.15	643.56		18GSB001
216	1305481.85	3016727.24	633.74		18GSB002
213	1305284.33	3016592.32	648.79		18GSB003
214	1305217.84	3016706.77	651.38		18GSB004
revised	1305510.96	3016758.09	630.60		18GSS001
215	1305452.45	3016684.93	637.62		18GSS002
231	1305727.58	3017502.57	648.69		18HCP001
224	1305349.11	3017652.87	650.65		18HCP002
228	1305631.91	3017514.01	651.10		18HCP003
311	1305649.24	3017498.40	651.26	GRD	
312	1305649.67	3017500.13	654.47	TC	
313	1305649.90	3017500.47	654.15	TP	18HMWT001
314	1305338.38	3017747.63	649.71	GRD	
315	1305336.23	3017748.11	652.66	TC	
316	1305336.29	3017748.16	652.43	TP	18HMWT002
317	1305247.20	3017515.32	650.60	GRD	
318	1305244.98	3017515.07	653.33	TC	
319	1305245.07	3017515.11	653.00	TP	18HMWT003
233	1305542.00	3017471.34	651.27		18HSB001
222	1305405.29	3017429.61	651.55		18HSB002
227	1305524.95	3017660.65	651.27		18HSB003
223	1305354.31	3017559.02	651.22		18HSB004
225	1305329.61	3017686.45	650.81	BASIN	18HSD001
229	1305661.81	3017504.79	650.79	BASIN	18HSD002
232	1305777.18	3017293.64	624.85		18HSS001

230	1305682.63	3017517.14	646.42		18HSS002
226	1305246.62	3017709.31	628.82		18HSS003
199	1304125.92	3015013.79	685.97		18ICP001
200	1304118.03	3015171.52	685.35		18ICP002
205	1304062.60	3015136.53	685.91		18ICP003
320	1304198.16	3015030.58	695.63	GRD	
321	1304198.25	3015031.11	698.39	TC	
322	1304198.16	3015031.33	698.06	TP	18IMWT001
				GRD	
				TC	
				TP	18IMWT002
329	1303904.12	3015317.55	690.09	GRD	
330	1303904.17	3015318.29	692.87	TC	
331	1303904.03	3015318.20	692.60	TP	18IMWT003
326	1303799.12	3015094.58	687.70	GRD	
327	1303799.51	3015094.87	690.37	TC	
328	1303799.41	3015094.74	689.98	TP	18IMWT004
323	1303931.87	3014923.25	686.14	GRD	
324	1303932.59	3014925.24	689.26	TC	
325	1303932.69	3014925.26	688.90	TP	18IMWT005
198	1304109.49	3014949.53	685.83		18ISB001
204	1303972.70	3014899.21	684.01		18ISB002
203	1303941.15	3015080.08	685.64		18ISB003
201	1303991.85	3015262.05	689.37		18ISB004
202	1303994.95	3015298.80	688.50		18ISB005
196	1303903.16	3014857.42	674.29	BASIN	18ISD001
332	1304210.89	3015302.91	681.81		18ISD002
208	1304231.53	3015301.70	677.25		18ISS001
210	1303861.42	3015225.09	683.50		18ISS002
197	1303847.85	3014813.56	662.69		18ISS003
211	1303793.11	3015010.97	685.01		18ISS004
212	1303801.11	3015128.69	684.02		18ISS005
290	1305104.41	3016860.88	650.24	GRD	
291	1305106.14	3016861.58	653.42	TC	
292	1305106.31	3016861.36	653.13	TP	18JMWT001
278	1305037.02	3017268.79	655.03	GRD	
279	1305036.47	3017268.42	657.72	TC	
280	1305036.55	3017268.51	657.31	TP	18JMWT002
287	1304822.55	3016630.76	655.51	GRD	
288	1304823.25	3016631.22	658.69	TC	
289	1304822.84	3016630.93	658.35	TP	18JMWT003
284	1304671.00	3016771.76	653.95	GRD	
285	1304671.31	3016769.70	656.94	TC	
286	1304671.09	3016769.78	656.65	TP	18JMWT004
281	1304622.38	3017182.08	657.96	GRD	
282	1304622.26	3017181.60	660.39	TC	
283	1304622.49	3017181.42	660.09	TP	18JMWT005

236	1304877.30	3017068.55	664.11		18JSB001
234	1304830.29	3016988.63	662.42		18JSB002
235	1304873.08	3017045.95	664.00	BASIN	18JSD001
237	1304790.90	3017142.11	664.25	SUMP	18JSD002
243	1305136.09	3017276.61	651.76		18JSS001
239	1304798.45	3016746.61	654.81		18JSS002
240	1304670.82	3016575.98	641.76		18JSS003
238	1304539.12	3016912.77	638.63		18JSS004

This survey was executed according to survey statement of work and technical specifications. I hereby certify that this survey was performed either by me or under my direct supervision and control and that all the information shown is true and correct to the best of my knowledge and belief.

Certified this 9th day of February 2012.



Matthew L. Cooper L.S.
Indiana L.S. #20200079
Bledsoe Riggert & Guerrettaz, Inc

PREPARED BY:

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TETRA TECH
FIELD TASK MODIFICATION REQUEST FORM

NSA Crane Project/Installation Name	**CTO F201 112G01851** CTO & Project Number	**18 October 2011-01** Task Mod. Number
September 2011 UFP-SAP Modification To (e.g. Work Plan)	**SWMU 18** Site/Sample Location	**18 October 2011** Date

Activity Description:
Deletion of sediment sample 18CSD004 from sampling program.

Reason for Change:
Settling basin has been removed by NSA Crane.

Recommended Disposition:
Approve deletion of sample and advance boring 18CSB009 in location of former settling basin instead of adjacent to it.

Field Operations Leader (Signature) — Date: 10/18/11

Approved Disposition: Modification Accepted

Project/Task Order Manager (Signature) — Date: 10/18/11

Distribution:

Program/Project File –CTO F201
Project/Task Order Manager – Timothy Evans
Field Operations Leader – Keith Simpson

Other: _____

APPENDIX B

SUBAREA B - BORING LOGS AND SAMPLE LOG SHEETS

SUBAREA

B

BORING LOGS

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: GeoProbe 5410

BORING No.: 18135B001
DATE: 10/19/11
GEOLOGIST: Kevin Loseke
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							Gravel						
S-1	0		2/4	1'	Stiff	Brn/	gravelly Silty Clay	CL	moist	0	0	0	0
1340				2'	Loose	white	Gravel Some Clay	GC	moist				
					Stiff	grey	Silty Sandy Clay	CL	moist brown				
	4			4'					mottle				
			4/4		Stiff	brown	silty clay	CL	moist				
S-2													
1345				7'									
	8				Stiff	grey	Silty Clay	CL	moist				
					refusal at 8'								

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Sample at 0-2 & 6-8 MS/MSD
refusal at 8'

Drilling Area Background (ppm): 0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18BSB002
DATE: 10/19/11
GEOLOGIST: Kevin Loeckamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		4/4	1'	Stiff	grey	silty clay tr gravel	CL	moist / brown mottle	0	0	0	0
1310					Stiff	BRN	silty clay wl	CL	moist				
							grey mottle						
	4.0												
			2.5/3										
S-2				6'									
1315	6'9"				Stiff	Gray	Silty sand fine grain	SM	moist w/tan mottle				
					refusal	at	6' 9"						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Sample cut 0-2 + S-1 + FD10 1911-05 (S-1)
refusal at 6'9".

Drilling Area Background (ppm): 0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Hand Auger

BORING No.: 18B53003
DATE: 10/20/11
GEOLOGIST: Kevin Lockamy
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							Railroad tracks						
S-1				1'	loose	wh. to	Gravel	GW	wet	0	0	0	0
1435				2'	stiff	Brn	Silty Clay	CL	moist	↓	↓	↓	↓
S-2				3'	Stiff	tan/ orange	Clayey Sand some	SW	moist	↓	↓	↓	↓
1445							Sandstone fragments						
					Auger		refusal @ 3'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample @ 0-2 + 2-3. Auger refusal due to Sandstone frags at 3.0'. No utilities b/c of railroad tracks

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18BSB004
DATE: 10/17/11
GEOLOGIST: Kevin Liebkamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		1'2'3"	1'	Stiff	Gray	Silty clay	CL	moist	0	0	0	0
1500	2.0			2'3"	Very Stiff	Brn	Sandy Silty clay	CL	moist	↓	↓	↓	↓
					very hard		refusal @ 2'3"						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample at 0-2'. No subsurface sample refusal at 2'3" on two attempts.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18SB3005
DATE: 10/19/11
GEOLOGIST: Kevin Coseknump
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		1/2	1'	Loose	black	Asphalt			0	0	0	0
1450	2			2'	very stiff	tan	Sandy Clay	CL	moist	0	0	0	0
							refusal @ 2'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample at 0-2. Refusal @ 2' two attempts with same refusal

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Hand Auger

BORING No.: 18BSB3006
DATE: 10/20/11
GEOLOGIST: Kevin Wiesekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							Railroad tracks						
S-1				1'	Loose	white BRN	Gravel some clay	GW	~~wet~~ wet at 1'	0	0	0	0
S-2				2'	Stiff	BRN	Silty Clay	CL	water at 1.5'	0	0	0	0
					Auger refusal at 2'								

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample 0-2. No subsurface sample due to refusal at 2'. water at 1.5'. No rig access due to railroad tracks.

Converted to Well: Yes _____ No X Well I.D. #: _____

SOIL SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSB001 0002
Sample Location: 18BSB001
Sampled By: RS-RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1340	0-2	BRN	MOIST, CLAY W SILT & GRAVEL
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA~~ Metals	~~1- 4 oz w/m glass~~, 4°C	
~~TPH-DRO/ERO~~, PAH	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~ > Fuel Oil Parameters	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~VOCs~~	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSB00106 08
Sample Location: 18BSB01
Sampled By: RS-RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silty, Clay, Moisture, etc.)
Time: 1350	6-8	BRN	MOIST, SILTY CLAY
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass,~~ 4°C	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~TPH-DRO/ERO~~, PAH	~~1- 4 oz w/m glass~~, 4°C	
BTEX	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
~~VOCs~~	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals	3X VOL FOR MS MSD	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
YES	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSB002 0002
Sample Location: 18BSB002
Sampled By: RS - RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-19-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1310	0-2	BRN/GRAY	SILT TR F SAND
Method: DPT			MOIST TR CLAY
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1-4 oz w/m glass, 4°C~~	
Explosives + NG	~~1-4 oz w/m glass~~, 4°C ✓	1-4 oz GLASS 4°C
~~TAL Metals~~	~~1-4 oz w/m glass~~, 4°C	RS
~~RCRA Metals~~	1-~~4 oz w/m glass~~, 4°C	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1-4 oz w/m glass~~, 4°C	
~~BTEX~~ → Fuel Oil Parameters	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~VOCs~~	1 Terracore Kit, ~~$NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1-4 oz w/m glass~~, 4°C	
~~SVOCs~~	1-4 oz w/m glass, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18BSB00205 07
Sample Location: 18BSB002
Sampled By: 12S - 12C
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1315	5-7	BRN/ GRAY	MOIST, SILTY CLAY TOP & SANDY SILT BTM
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	1- ~~4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	1- ~~4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	1- ~~4 oz w/m glass,~~ 4°C	
~~TPH-DRO/ERO~~, PAH → Fuel Oil Parameters	~~1- 4 oz w/m glass,~~ 4°C	
~~BTEX~~ → Fuel Oil Parameters	1 ~~Terracore Kit, NaHSO$_4$~~ & CH_3OH	
~~VOCs~~	1 ~~Terracore Kit, NaHSO$_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass,~~ 4°C	
~~SVOCs~~	1- 4 oz ~~w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		2X VOC FOR DUP

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD 101911-05

FD 101911-05 12S

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

NO ACCESS
HAND AUGER

Sample ID No.: 18BSB0030002
Sample Location: 18BSB003
Sampled By: RS - RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-20-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1435	0-2'	BRN	MOIST, CLAY W SILT SOME GRAVEL ≤ 1"
Method: HAND AUGER			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

ON R.R. TRACKS
REMOVED TOP 1' GRAVEL THEN HAND AUGER

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSB0030203
Sample Location: 18BSB003
Sampled By: KS-RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.20.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1445	2-3'	LT BRN	MOIST, FINE SAND W SILT TR CLAY
Method: HAND AUGER			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
RCRA Metals	~~1- 4 oz w/m glass~~, 4°C	
~~TPH-DRO/ERO~~, PAH > Fuel Oil Parameters	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~	~~1 Terracore Kit, NaHSO4~~ & CH_3OH	
~~VOCs~~	~~1 Terracore Kit, NaHSO4~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	1- 4 oz w/m glass, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

TD - 3' BGS REFUSAL

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18BSB004 0002
Sample Location: 18BSB004
Sampled By: KS-KC
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11 / Time: 1500 / Method: DPT / Monitor Reading (ppm):	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-2	BRN	MOIST, CLAY SOME SILT TR F GRAVEL

COMPOSITE SAMPLE DATA:

Date: / Method: / Monitor Readings (Range in ppm):	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO~~, PAH	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ > ~~Fuel Oil Parameters~~	1 ~~Terracore~~ Kit, $NaHSO_4$ & CH_3OH	
~~VOCs~~	1 ~~Terracore~~ Kit, $NaHSO_4$ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

REFUSAL @ 2.2' BGS
2 ATTEMPTS

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] ~~Subsurface Soil~~
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSB005 0002
Sample Location: 18BSB005
Sampled By: RS-RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1450	0-2'	BRN TO GRAY	MOIST, SANDY CLAY
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~TPH DRO/ERO~~, PAH → Fuel Oil Parameters	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~ → Fuel Oil Parameters	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

~~REFUSAL~~ @
REFUSAL @ 2' IN RR TRAVS WITH ASPHALT

NO 2ND SAMPLE

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSB006 0002
Sample Location: 18B SB006
Sampled By: RS - RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10 20 11 / Time: 1520 / Method: HAND AUGER / Monitor Reading (ppm):	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-2'	BRN	MOIST TO WET TOP 1" GRAVEL 1-2' SILTY CLAY SOME GRAVEL

COMPOSITE SAMPLE DATA:

Date: / Method: / Monitor Readings (Range in ppm):	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~TPH-DRO/ERO~~, PAH → ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~ → ~~Fuel Oil Parameters~~	~~1 Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~VOCs~~	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

ON RR TRACKS
NO ODOR

REFUSAL @ 2' BGS

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RS RC

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18BS5001000Z
Sample Location: 18BS5001
Sampled By: CK / CR
C.O.C. No.:

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/20/11	Depth	Color	Description (Sand, Silty, Clay, Moisture, etc.)
Time: 1045	0 - 1'	Brown	Silty Clay w/ Rocks Moist & Free water
Method: HA			
Monitor Reading (ppm): 0.1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silty, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

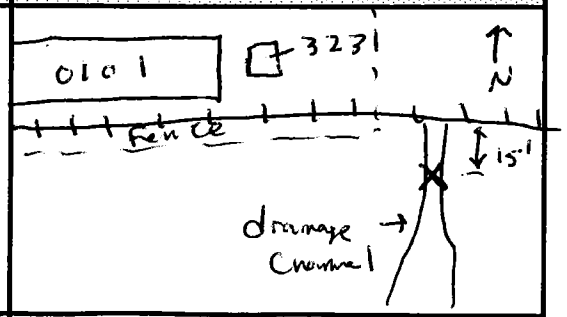
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

- Sample flag located, ~15's of railroad tracks in drainage channel center
- Refusal @ 1' bgs
- Some standing water in channel

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chuck Ry

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18B55002C0002
Sample Location: 18B55002
Sampled By: C K C R
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/20/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0950	0-2'	Light Brown (0-1')	Moist Clay
Method: HA		Light Brown/Gray (1'-2')	
Monitor Reading (ppm): 0.1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

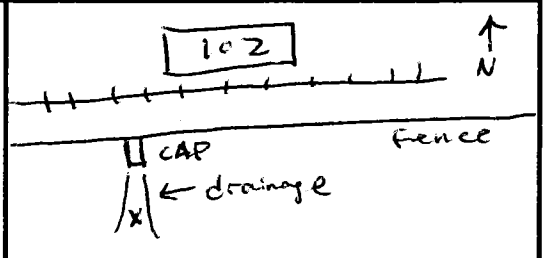
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~	1- 4 oz w/m glass, 4°C	
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

- Sample Pin Flag missing, Pink tape on fence near sample location
- Collected from drainage way 20's of CAP culvert, 30' S of fence, center of drainage
- Location Flagged & taped, verified by Figure

MAP:



Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Chuck Kay

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BSS003CCC2
Sample Location: 18BSS03
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/20/11	Depth	Color	Description (Sand, Silty Clay, Moisture, etc.)
Time: 0930	0-2'	Brown	Silty Clay, very wet & moist
Method: HA			
Monitor Reading (ppm): 0.1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

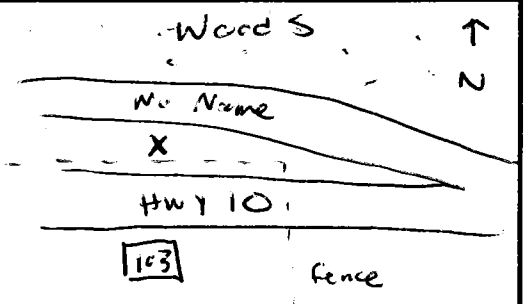
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH DRO/ERO, PAH~~	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

- Sample collected from drainage channel @ flag ~20' N of Highway 10 & 20's of a main Road (Not labled)
- Pink flagging added

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD102011-01

Signature(s):

Chuck Ky

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18B55004SS02
Sample Location: 18B55004
Sampled By:
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/20/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1010	0-1.5'	0-1' Brown	Clayey Silt
Method: HA		1'-1.5' Light Brown	Silt Clay w/ Mottles & Oxidized RC
Monitor Reading (ppm): 0.1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

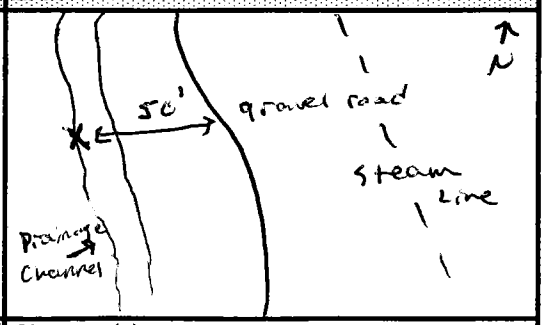
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA~~ Metals	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	1 Terracore Kit, ~~$NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

- Refusal @ 1.5'
- Both layers (0-1, & 1-1.5) very moist
- sample pin flag located @ drainage channel, sample collected @ flag (right bank of channel)

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Chuck Ky

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[X] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BCP001ee02
Sample Location: 18BCP001
Sampled By: CK / CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date: 10/20/11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time 1100	1055	0-1'	Light Brown	Sandy Clay w/ gravel
Method:	1056	↓	↓	↓
	1057			
Monitor Readings	1059			
(Range in ppm):				

SAMPLE COLLECTION INFORMATION:

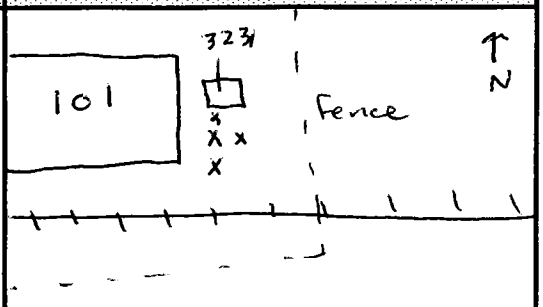
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	1 Terracore Kit, $NaHSO_4$ & ~~CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
PCB	1- 4 oz w/m glass, 4°C	✓
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

- 4 comp locations, 1 on pin Flag, 3 - N, S, E due to utility lines
- Refusal @ 1' due to #57 stone
- Sample Collected @ 1100

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chuck Ray

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BCP002 0002
Sample Location: 18BCP002
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date: 10/20/11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
1030	1025	0-1'	Light Brown	sandy clay w/ gravel
Method: HA	1026	0-1'	↓	↓
	1027	0-1'		
Monitor Readings (Range in ppm): 0.1	1029	0-1'		

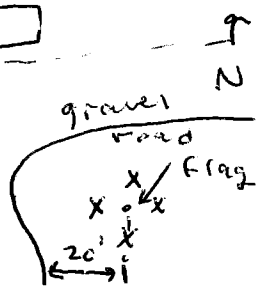
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ → Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~ → Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
PCB	1- 4 oz w/m glass, 4°C	✓
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

- Refusal @ 1' bgs @ all locations
- 4 Comp sample locations, NSEW around pin flag, 2' in each directions.
- Location ~ 20' E of gravel road
- Large gravel (#57 stone) @ 1' bgs

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD102011-02

Signature(s):

Chuck Ky

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[X] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18BCP003D002
Sample Location: 18BCP003
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date: 10/20/11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0900	0855	0-2'	Medium/Light	Silty Clay
Method: HA	0856	0-2'	Brown	↓
	0858	0-2'	↓	
Monitor Readings	0900	0-2'		
(Range in ppm):				
0.1 ↓ 0.1				

SAMPLE COLLECTION INFORMATION:

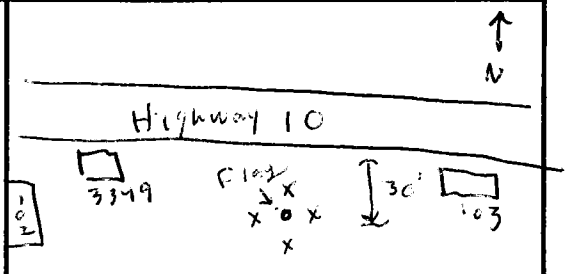
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
PCB	1- 4 oz w/m glass, 4°C	✓
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

- 4 comp samples from 2' N-S-E-W of Pin Flag, 30'S of Highway 10
- No distressed Vegetation
- Could Not Locate Bldg 114 on Figure, but Pin Flag Found

MAP:



Circle if Applicable: MS/MSD ✓

Duplicate ID No.:

Signature(s): Chuck Ivy

APPENDIX C

SUBAREA C - BORING LOGS, WELL CONSTRUCTION DIAGRAMS, AND SAMPLE LOG SHEETS

SUBAREA

C

BORING LOGS

and

WELL CONSTRUCTION LOGS

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: Gus Pech 100

BORING No.: 18CMWT001
DATE: 11/3/11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	0												
S-1		5/9	1.4/2.0			Gray	Gravel & Silty Clay Damp	GC	1330 Fill	0	–	0	0
		14/15					Sand & Gravel	GW					
S-2		7/7	1.9/2.0			Brn to	Silt tr Clay grading Gray	MH	1335	0	–	0	0
		7/7				Lt Brn	Clay	CH					
S-3	5	3/7	1.0/2.0			Lt Brn	Silty Clay Mottled		1342	0	–	0	0
		10/27		11/4 5/9			Silty Sand	SM	Damp				
S-4		29/50/.2	0.4/0.7	11=111			Same as above (weath Sandstone)		1345	0	–	0	0
						Tan Brn	Silty F Sandstone Dry	–					
S-5		50/.2	0.2/0.2			Tan Brn	Dry-Damp	–	1357	–	–	–	0
	10					& Gray							
						Tan	Silty F Sandstone						
						&							
						Gray							
	15												
						Gray	Sandstone Dry			–	–	–	0
									1432 @ 19'				
	20												
										–	–	–	0
						Gray	Silty VF Sandstone		1437				
	25									–	–	–	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 4¼" ID HSA 2" SPT 0 - 8.2
5½" Air Rotary 2.2 - 35.0

Drilling Area Background (ppm): Ø

Converted to Well: Yes ✓ No ____ Well I.D. #: 18CMWT001

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: GeoProbe 7822

BORING No.: 18C MW TB01
DATE: 11/3/11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	25					Gry	Silty F Sandstone						
							Hard @ 26'						
						BLK	Coal 28.5-28.5		1445				
	30						Hard @ 29'						
						Dk Gry	Shale / Siltstone			-	-	-	0
							Hard @ 33.5-34		1457				
	35					Gry	Sandstone			-	-	0	0
				35.0					1500 - 1510 Allow to sit				
									1540 Blow air				
									water in borehole				
									16th WL: 30.8'				
	40								11/4 @ 0815				
									WL = 5.7'				
							Set well		0900				
							2" PVC screen (20-35')		24.3 - 34.3				
							#2 Sand		20.3 - 34.5				
							Bentonite		14.5 - 20.3				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: _____

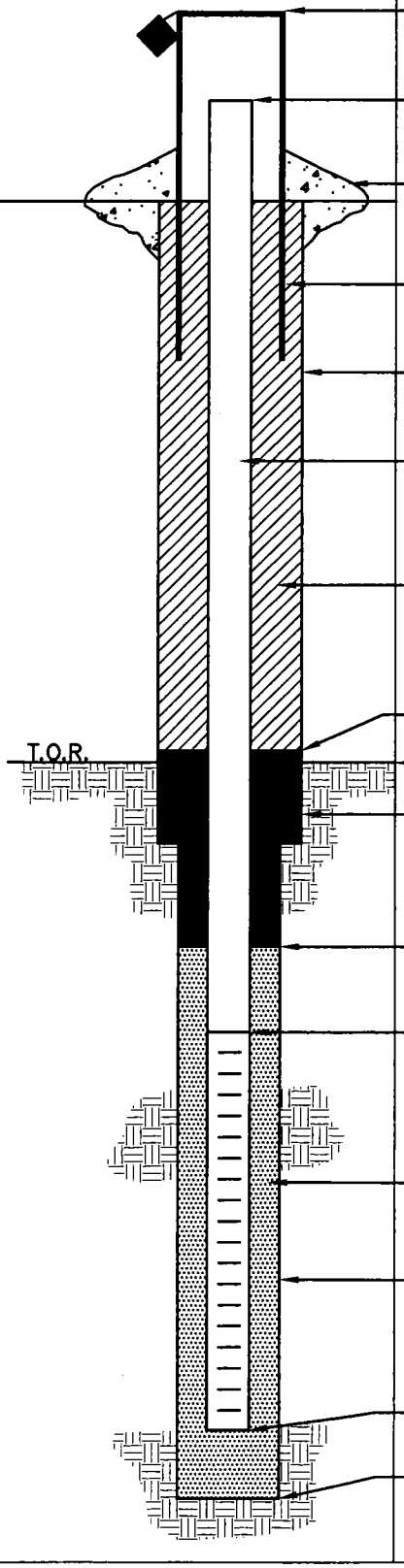
Converted to Well: Yes ✓ No _____ Well I.D. #: 18C MW TB01

WELL NO.: 18CMW1001

Tetra Tech NUS, Inc.

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT: NSA Crane - SWMU 18	LOCATION: Subarea C	DRILLER: Micah Group / Ben Borth IN # 2359 WD	
PROJECT NO.: 112G01851	BORING: 18CMW1001	DRILLING METHOD: HSA / Air Rotary	
DATE BEGUN: 11-3-11	DATE COMPLETED: 11-4-11		
FIELD GEOLOGIST: T. Evans		DEVELOPMENT METHOD: SURGE/Pump	
GROUND ELEVATION: 683.61	DATUM: NAVD 88		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 686.55 / 2.9

ELEVATION/HEIGHT TOP OF RISER: 686.25 / 2.6

TYPE OF SURFACE SEAL: Concrete Pad (4' x 4' x 6") w/ 4" Bollards

I.D. OF SURFACE CASING: 6"

DIAMETER OF HOLE: 8"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

TYPE OF BACKFILL: Cement - Bentonite Grout

ELEVATION/DEPTH TOP OF SEAL: 669.3 / 14.3

ELEVATION/DEPTH TOP OF BEDROCK: 676.9 / 6.7

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 663.3 / 20.3

ELEVATION/DEPTH TOP OF SCREEN: 659.3 / 24.3

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE x LENGTH: 0.020" x 10'

I.D. SCREEN: 2"

TYPE OF SAND PACK: #2 Sand (US Sieve 10-20)

DIAMETER OF HOLE IN BEDROCK: 5.5"

CORE/REAM: N/A

ELEVATION/DEPTH BOTTOM SCREEN: 649.3 / 34.3

ELEVATION/DEPTH BOTTOM OF SAND: 649.1 / 34.5

ELEVATION/DEPTH BOTTOM OF HOLE: 648.6 / 35.0

BACKFILL MATERIAL BELOW SAND: Natural

ACAD: FORM_MWINBR.dwg 07/20/99 INL

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: Gus Pech 100

BORING No.: 18CMW T002
DATE: 11/3/11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	0								Time				
S-1		3/3	1.1/		Stiff	Brn	Topsoil (2-3")	OL	0845	0	-	0	0
		4/6	/2.0				Clay Some silt Tr Gravel	CL					
S-2		2/5	1.6/		V Stiff	Brn	Silt Some to Tr Clay	ML	0846	0	-	0	0
		9/13	/2.0				mottled 1.8 to 2.0	CH					
S-3	5	8/10	2.0/		Hard	Brn	Clay Some Silt	CL	0900	0	-	0	0
		11/20	/2.0			Gray+Brn	Silt mottled	ML					
S-4		50/.9	/0.9		Hard		- No Recovery -		0910				
S-5		7/9	0.8/		V Stiff	Tan	Silt V Dry	ML	0921				
	10	11/13	/2.0										
S-6		17/24	1.4/		Hard		↓		0932	-	-	-	0
		23/21	/2.0		Hard	Brn	Silty Clay	CL					
S-7		16/50/.3	0.6/	12.8		Tan White	Silt (mottled)	ML	1015				
			/0.8	III≡III					6" ø AR from				
	15					Gray	Siltstone		12.8; log Cuttings				
						Gray	F Sandstone			-	-	-	0
									1020 @ 18'	-	-	0	0
	20												
				11/4 ⊻									
						Dk Gray	Shale		1035				
	25								Rod chatter @ 23' Cuttings Dump				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 4 1/4" ID HSA 2" SPT 0-12.8'
5 1/2" ø Air Rotary 12.8 - 33.8

Drilling Area Background (ppm): ø

Converted to Well: Yes ✓ No ____ Well I.D. #: 18CMW T002

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: Gus Pech 100

BORING No.: 18CMW702
DATE: 11/3/11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	25									–	–	–	0
						DK Gray	Shale						
	30			11/3 ▽ 35									
										–	–	–	0
						DK Gray	Silty Sandstone						
									1045	–	–	0	0
	35			37.8									
									1635 WL = 30.72				
									11/4/11 @ 0815 WL = 20.3				
							Instl 11 well		11/4/11 @ 0935				
							2" PVC Screen (20 slot)		23.7 - 33.7				
	40						#2 Sand		20.5 - 33.8				
							Bentonite		14.3 - 20.5				
	45												
	50												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: _____

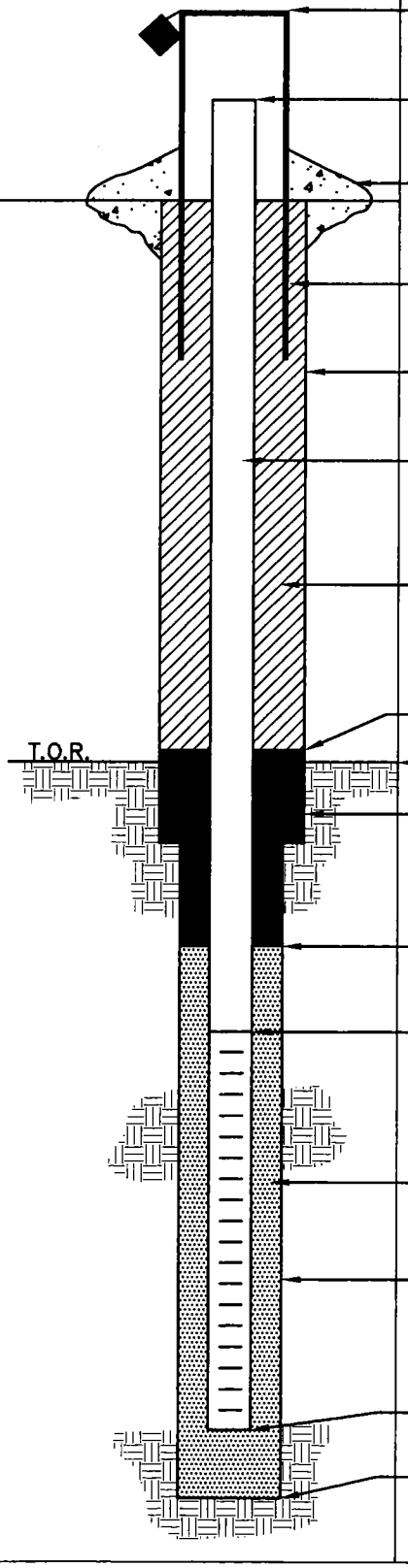
Converted to Well: Yes ✓ No _____ Well I.D. #: 18CMW702

WELL NO.: 18CMWT002

Tetra Tech NUS, Inc.

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT	NSA Crane - SWMU 18	LOCATION	Subarea C	DRILLER	Micah Group / Ben Borth IN # 2359 WD
PROJECT NO.	112G01851	BORING	18CMWT002	DRILLING METHOD	HSA / Air Rotary
DATE BEGUN	11-3-11	DATE COMPLETED	11-4-11	DEVELOPMENT METHOD	Surge / Pump
FIELD GEOLOGIST	J. Evans				
GROUND ELEVATION	675.9	DATUM	NAVD 88		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 678.9 / 2.9

ELEVATION/HEIGHT TOP OF RISER: 678.5 / 2.5

TYPE OF SURFACE SEAL: Concrete Pad (4' x 4' x 6") w/ 4 Bollards

I.D. OF SURFACE CASING: 6"

DIAMETER OF HOLE: 8"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

TYPE OF BACKFILL: Cement Bentonite Grout

ELEVATION/DEPTH TOP OF SEAL: 663.7 / 14.3

ELEVATION/DEPTH TOP OF BEDROCK: 663.1 / 12.8

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 655.4 / 20.5

ELEVATION/DEPTH TOP OF SCREEN: 655.6 / 23.3

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE x LENGTH: 0.020" x 10'

I.D. SCREEN: 2"

TYPE OF SAND PACK: #2 Sand (US Sieve 10-20)

DIAMETER OF HOLE IN BEDROCK: 5.5"

CORE/REAM: N/A

ELEVATION/DEPTH BOTTOM SCREEN: 645.6 / 33.3

ELEVATION/DEPTH BOTTOM OF SAND: 645.4 / 33.5

ELEVATION/DEPTH BOTTOM OF HOLE: 645.4 / 33.5

BACKFILL MATERIAL BELOW SAND: N/A

ACAD:FORM_MWINBR.dwg 07/20/99 INL

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: CME 55 ATV / Gus Pech 100 Track

BORING No.: 18 CMW T003
DATE: 11-2-11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Headspace	Borehole**	BZ**
	0								Time				
S-1		2/4	1.2/		M Stiff	Brn	Topsoil		1023	0	-	-	-
		3/3	2.0			Brn	Silt some Clay Dry + Damp	ML					
S-2		2/5	1.7/		V Stiff		↓	ML	1026	2.2	-	0	0
		8/11	/2.0			Tan Brn	Silt mottled Dry	ML	sl. odor	4.3	1.5		*
S-3	5	4/6	1.7/		Hard		↓	↓	1035	0	-	0	0
		12/20	2.0			Tan	Silt Some F Sand Dry	SM					
S-4		22/24	2.0/		V Dense	Tan			1040	1.6	-	0	0
	8.0	42/26	2.0			Tan-Brn	Weath Sandstone Dry	-	sl odor →	3			
S-5		6/20	1.5/				↓	-	1057	0	-	0	0
	10	31/50/.3	/1.8	9.8 ft = 11 ft		↓	↓ Dry						
						Gray Tan	Sandstone	VBr	1257 - 1305	-	-	0	0
6		0/3.0	2.6/3.0			Blk &	Coal / Sandstone		10-13'				
		0%				Gray Tan	Interbedded laminae	↓	Iron staining @ 11' & 12.4				
						Gray	Sandstone	VBr	1320 - 1326	-	-	0	0
	15			14.8		& Tan		↓	wet @ ~ 14.8-16'				
2		1.5/5.0	3.85/5.0					Br					
		80%											
										-	-	0	0
						Gray		VBr					
3	20	30/4.5	4.5/			W/blk	laminae	↓	1333 - 1337				
		60%/0	4.5	11/4				Br					
				11/3					Mud Aff. @ 21.8 & 22.3'				
							↓	↓	1515 WL = 21.8'	-	-	0	0
				23.0					1530 - Ream hole 1555 to 5½" 10-23'				
	25								11/2" @ 1645 WL: 20.8'				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: 4¼" HSA + 2" SPT 0-10' } CME 55
NX core 10-22.5'
Ream hole to 5½" 10-30' Gus Pech 100

Converted to Well: Yes ✓ No _____ Well I.D. #: 18CMW T003

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: CME 55 / Geoprobe

BORING No.: 18CMWT2003
DATE: 11/4/11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	25								11/4/11 @ 1025	-	-	-	0
						Gray	F Sandstone		Continue 23'-29'				
						DK Gray	Shale (Dry)		1030 @ 28'				
							Coal seam @ ~28.5-28.7		1040 @ 29.8'	-			
	30			29.8						-	-	0	0
							Install well		1105				
							2" PVC screen (.20-slot)		19.3-29.3				
	35						#2 Sand		17.0-29.8				
							Bentonite		14.0-17.0				
	40												
	45												
	50												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: _____

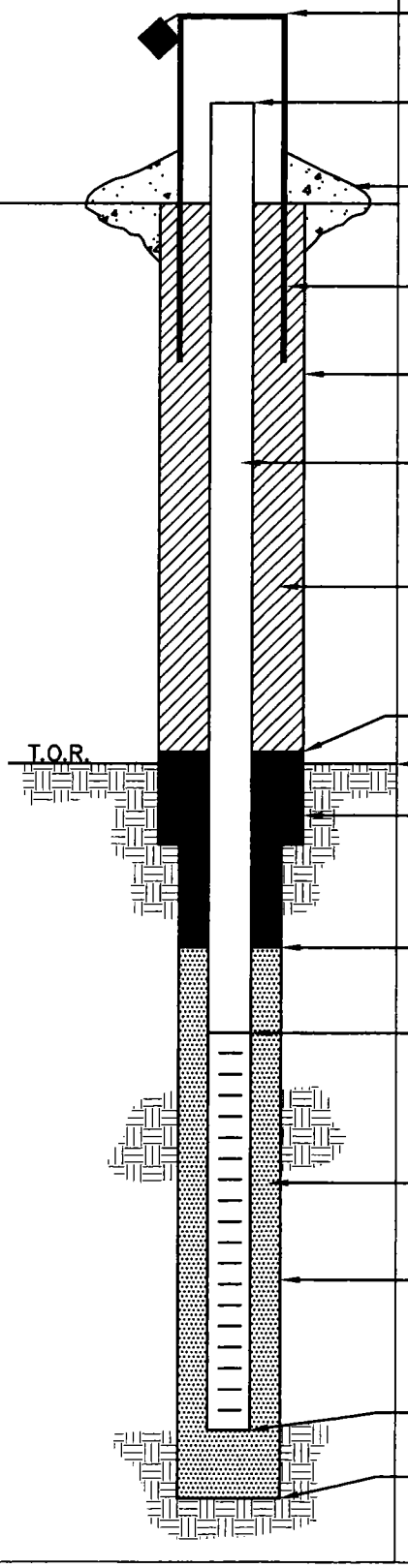
Converted to Well: Yes ✓ No _____ Well I.D. #: 18CMWT2003

WELL NO.: 18CMW7003

Tetra Tech NUS, Inc.

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT	NSA Crane - SWMU 18	LOCATION	Subarea C	DRILLER	Micah Group / Ben Borth IN # 2359 WD
PROJECT NO.	112G01851	BORING	18CMW7003	DRILLING METHOD	HSA / Air Rotary
DATE BEGUN	11-2-11	DATE COMPLETED	11-3-11	DEVELOPMENT METHOD	SURGE/PUMP
FIELD GEOLOGIST	T. Evans				
GROUND ELEVATION	677.61	DATUM	NAD 83		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 679.91

ELEVATION/HEIGHT TOP OF RISER: 679.61

TYPE OF SURFACE SEAL: Concrete Pad (4' x 4' x 6") w/4 Bollards

I.D. OF SURFACE CASING: 6"

DIAMETER OF HOLE: 8" (0 to 10')

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

TYPE OF BACKFILL: Cement Bentonite Grout

ELEVATION/DEPTH TOP OF SEAL: 670.6 / 14.0

ELEVATION/DEPTH TOP OF BEDROCK: [illegible] / 9.8

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 667.6 / 17.0

ELEVATION/DEPTH TOP OF SCREEN: 665.3 / 19.3

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE x LENGTH: 0.020" x 10'

I.D. SCREEN: 2"

TYPE OF SAND PACK: #2 Sand (US Sieve 10-20)

DIAMETER OF HOLE IN BEDROCK: 5.5"

CORE/REAM: NX Core 10 - 22.5
Ream 10 - 30.0

ELEVATION/DEPTH BOTTOM SCREEN: 655.3 / 29.3

ELEVATION/DEPTH BOTTOM OF SAND: 654.6 / 30.0

ELEVATION/DEPTH BOTTOM OF HOLE: 654.6 / 30.0

BACKFILL MATERIAL BELOW SAND: N/A

ACAD: FORM_MWINBR.dwg 07/20/99 INL

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: CME Prowler 5410

BORING No.: 18CSB001
DATE: 10/19/11
GEOLOGIST: Kevin Loxekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		3/4		stiff	Tan/Brown	silty clay some	CL	Moist	0	0	115	0
1120				2'			gravel			34.0	0		0
					stiff	Gray	silty clay some sand	CL	Strong petroleum odor moist	21.0	0		0
S-2	4.0									6	0		0
1130			2/36	5'	Loose	Orange/Brown	silty sand	SW	Slight petroleum	6	0		0
				6'	stiff	Grey	silty clay some sand		moist	0	0		0
	7.5					Orange	Sand tr rocks	SW	moist	0	0		0
				7'5"						0	0		0
							refusal at 7'5"						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample at 0-2 + 2-4 MS/MSD, Sampled at 2-4 interval b/c of strong petroleum odor and PID hit to refusal at 7'5"

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geo Probe 5410

BORING No.: 18CSB002
DATE: 10/20/11
GEOLOGIST: Kevin Loscamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		4/4	1'	Soft	BRN	silty sandy Clay	CL	wet	0	0	0	0
1015							↓		↓				
				3'			↓		↓				
	4				Soft	Tan	silty Sandy Clay	CL	moist				
			3/4				tr red Sandstone frags						
S-2													
1020	7			6.5'	Stiff	Tan	silty Sand	SM	moist	↓	↓	↓	↓
					refusal		at 7.0'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample @ 0-2 + 5-7. Refusal at 7.0'.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18CSB003
DATE: 10/19/11
GEOLOGIST: Kevin Losekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							Gravel						
S-1	0		1'/3'		Loose	tan/white	silty sandy Gravel	GW	Dry	0	0	0	0
1040				2'									
	3.0			3'	Stiff	tan	silty fine sand	SM	moist				
							refusal @ 3.0'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample at 0-2. Insufficient recovery for subsurface sample. Pushed twice refusal at 3.0'.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18CSB004
DATE: 10/20/11
GEOLOGIST: Kevin Losekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		2/4		Soft	BRN	Silty Clay tr	CL	moist	0	0	0	0
1100							Limestone gravel						
	4												
S-2			3/4										
1110	4			6'									
	7'			7'	Stiff	Tan	Sandy Clay	CL	Moist				
					Stiff/ Hard	Orange	silty Sand	SC	Dry				
					Refusal at 7' 2"								

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Sample @ 0-2 + 5-7. Location in former UST Area. 0-6' most likely fill.

Drilling Area Background (ppm): 0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 186S13005
DATE: 10/19/11
GEOLOGIST: Kevin Loseke
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		6"/1'	1'	Loose	tan	Sandy silty gravel	GW	moist	0	0	0	0
1000	1'						refusal at 1'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: FD at 0-1 10191-02. Sample at 0-1. ND Subsurface Sample. Refusal at 1' on 2 pushes

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18CSB006
DATE: 10/19/11
GEOLOGIST: Kevin Loeckner
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		2/3							0	0	0	0
900				2'	Loose	tan brown	Sandy gravel	SW	moist				
S-2 900	3'			3'	Stiff	tan brown	Silty clay fr gravel	CL	moist				
					refusal @ 3' drilled twice								

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample 0-2 & 2-3 Drilled hole moved over and refused at same depth.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Hand Auger

BORING No.: 18CSB007
DATE: 10/20/11
GEOLOGIST: Kevin Loveland
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1					Soft	Brn	Silty clay	CL	Moist	0	0	0	0
1245				2'						0			
					Soft		Sandy clay with	CL	very wet	3			
				4'			gravel			3			
S-2					Soft	Blk	Silty clay with	CL	very wet	59			
1255				6'			black staining (+odor)		water at 4'	59			
							Silty clay some	CL					
							Sand and gravel						
					refusal	at	6' 5"						
					Hand		Auger						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample 0-2 & 4-6 Very Strong Petroleum Odor from 4' to 6'. water at 4', No Sign of UST except fill cap was still in place. No sig access through Sliding metal doors.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18CSB008
DATE: 10/18/11
GEOLOGIST: Kevin Wiekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							Gravel						
S-1	0.0		3/4	1'	Stiff	brN	Clayey tr gravel	GC	Moist	0	0	0	0
1510													
				3'	Stiff	brN	Silty clay	CL	moist				
S-2	4.0			4'	Soft	gray	Silty clay tr gravel	CL	wet				
1515	4'8"		5"/4	4'8"	Stiff	brown	Sandstone	SW	moist hard				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Sample 0-2 & 3-5 Refusal at 4'8" Two attempts

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 5410

BORING No.: 18CSB009
DATE: 10/18/11
GEOLOGIST: Kurt Loesemann
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							Grass/former basin						
S-1	0.0		3/4		Stiff	Grey	silty clay	CL	Moist	0	0	0	0
1445				2'									
				3'	Soft	Grey	Sandy gravel	GW	Wet				
S-2	4'			4'2"	Stiff	BRN	silty clay	CL	moist				
1450	2"		2 3/4"		Refusal @ 4'2"								

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample 0-2 & 2-4
two attempts. UST removed. Most likely fill material

Converted to Well: Yes ____ No X Well I.D. #: ____

WELL DEVELOPMENT RECORDS

MONITORING WELL DEVELOPMENT RECORD

Well: 18CMWT001
Site: SUBAREA C
Date Installed: 5 NOV 11
Date Developed: 8 NOV 11
Dev. Method: SURGE + PUMP
Pump Type: 12 V SUB.
SURGE 1ST 5 MIN/PUMP

Depth to Bottom (ft.): 37.45
Static Water Level Before (ft.): 5.26
Static Water Level After (ft.): ____
Screen Length (ft.): 10'
Specific Capacity: ____
Casing ID (in.): 2" PVC

Responsible Personnel: K. SIMPSON
Drilling Co.: MICAH
Project Name: NSA CRANE - SWMU 18
Project Number: 112G-01851

PUMP RATE = 2 GPM

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor,color,etc.)
1433	0	0	5.26					DARK GRAY, NO ODOR
1435		4		17.45	6.01	1.14	>999	
1449		32	32.00	16.80	5.94	1.23	>999	
1451		34	34.20					DRY TO PUMP INLET
1502		34	30.10					RESTART
1503	↓	36	36.62	16.83	6.07	1.27	500	

MONITORING WELL DEVELOPMENT RECORD

Well: 18C MWTOW2
Site: SUBAREA C
Date Installed: 5 NOV 11
Date Developed: 8 NOV 11
Dev. Method: SURGE - PUMP
Pump Type: 12V SUB SURGE & PUMP

Depth to Bottom (ft.): 36.45
Static Water Level Before (ft.): 15.42
Static Water Level After (ft.): ~~15.42~~
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2" PVC

Responsible Personnel: K. SIMPSON
Drilling Co.: MICAH
Project Name: NSA CRANE - SWMU 18
Project Number: 112G-01851

PUMP RATE = 2 GPM

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor,color,etc.)
1359	0	0	15.42					GRAY, NO ODOR
1401	↓	4	30.71	15.8	6.48	0.781	>999	
1404	↓	10	36.00					DRY TO PUMP INLET
1425	↓	10	33.00					RESTART
1426	↓	11	36.00	16.0	6.13	0.845	>999	DRY
			← MONDAY 21 NOV 11 → BAILER					
			14.90					
1123	0	11	29.02	15.8	6.11	0.830	325	LT GRAY NO ODOR
1135	↓	14	33.10	15.9	6.12	0.827	675	
1140	↓	16						

MONITORING WELL DEVELOPMENT RECORD

Well: 18CMWT003
Site: SUBAREA C
Date Installed: 5 & NOV 11
Date Developed: 9 NOV 11
Dev. Method: SURGE - PUMP
Pump Type: 12 V SUB. SURGED & PUMP

Depth to Bottom (ft.): 32.25
Static Water Level Before (ft.): 22.65
Static Water Level After (ft.): _____
Screen Length (ft.): 10
Specific Capacity: _____
Casing ID (in.): 2" PVC

Responsible Personnel: K. SIMPSON
Drilling Co.: MICAH
Project Name: NSA CRANE - SWMU 18
Project Number: 112G-01851

2 GPM PUMP RATE

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor,color,etc.)
1311	0	0	22.65	16.0	6.62	1.36	>900	DARK GRAY, NO ODOR
1314	0	6	30.00	—	—	—	—	DRY TO PUMP INLET
1329	0	6	29.00	15.8	6.38	1.40	>900	PUMPED DRY ~ 1/2 GAL
—	—	—	MONDAY	21 NOV 11	—	—	—	BAILER
								CLEAR, THEN GRAY NO ODOR
1050	0	6	19.09					
1105	0	11	29.00	15.5	6.43	1.44	575	REMOVED 5 GAL
1117	0	11	29.10	—	—	—	—	
								POOR PRODUCER

1318 - 29.55'

GROUNDWATER SAMPLING LOG SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSA Crane-SWMU 18
Project No.: ~~112G02635~~ 112G01851

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 18CMW1001
Sample Location: 18CMW1001
Sampled By: K. SMITH
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 12/7/11 KS Time: ~~1155~~ 1205	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other ORP
Method: BLADDER	CLEAR	5.72	0.004	12.41	334	9.92	0.0	82

PURGE DATA:

Date: 12/7/11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: BLADDER								
Monitor Reading (ppm): 0.0								
Well Casing Diameter & Material Type: PVC 2" SCH			SEE LOW FLOW PURGE					
Total Well Depth (TD): 37.41	KS							
Static Water Level (WL): ~~8.71~~	5.96			DATA	SHEET			
One Casing Volume (gal/L): 5.1								
Start Purge (hrs): 1030								
End Purge (hrs): 1155								
Total Purge Time (min): 85								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3-40 mL VIALS	✓
METALS	HNO3	1-250 mL POLY	✓
DISSOLVED METALS	HNO3	1-250 mL POLY	✓
		2X VOL FOR DUP + SAMPLE	

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	18FD-120711-01

Signature(s): Kendra Smith

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSA-CRANE-SWMU 18 WELL ID.: 18MW1001
PROJECT NUMBER: 112G01851 DATE: 12/17/2011

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1030	8.71'				WATER	LEVEL				CLOUDY
1040	11.60'	170	6.15	0.007	333	12.49	12.98	123	0.0	
1050	12.32'	170	6.02	0.005	331	11.67	13.59	113	0.0	
1100	12.51'	170	5.94	0.005	335	12.70	12.28	91	0.0	
1110	12.64	170	5.86	0.004	334	12.48	12.07	69	0.0	
1120	12.80	170	5.80	0.005	337	11.99	11.86	77	0.0	
1130	12.93	170	5.99	0.005	333	11.21	12.07	78	0.0	
1140	13.11	170	5.70	0.005	330	10.00	12.20	80	0.0	
1145	13.15	170	5.70	0.003	331	10.11	12.47	82	0.0	
1150	13.19	170	5.69	0.003	329	9.89	12.30	81	0.0	
1155	13.21	170	5.72	0.004	334	9.92	12.41	82	0.0	
			SAMPLES COLLECTED @ 1205							
	TD=37.41 WL=5.96									

SIGNATURE(S): Kindra Arnold

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSA Crane-SWMU ~~1~~ 18
Project No.: ~~112G02635~~ 112G01851

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 18CGWT002
Sample Location: 18CGWT002
Sampled By: K SMITH
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 12/16/2011	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1625	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	PPT (%)	ORP
Method: BLADDER	clear	5.90	1.21	13.23	0.0	1.24	0.6	106

PURGE DATA:

Date: 12/16/2011	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: BLADDER								
Monitor Reading (ppm): 0.0								
Well Casing Diameter & Material			SEE LOW FLOW PURGE					
Type: PVC 2" SCH								
Total Well Depth (TD): 36.39'								
Static Water Level (WL): 34.85	14.40		DATA SHEET					
One Casing Volume (gal/L): 3.6								
Start Purge (hrs): 1325								
End Purge (hrs): 1555								
Total Purge Time (min): 150								
Total Vol. Purged (gal/L): 4.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3-40 mL VIALS	✓
METALS	HNO3	250 mL POLY	✓
DISSOLVED METALS	HNO3	250 mL POLY	

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

KS

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSA-CRANE-SWMU 18 WELL ID.: 18CGWTC02
PROJECT NUMBER: 112G01851 DATE: 12/16/2011

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or (ppt)	Comments
1325	13.25'			INITIAL WATER LEVEL						
1340	16.34'	180	5.74	1.18	215	0.81	13.54	90	0.6	CLOUDY
1350	20.40'	120	5.71	1.16	136	0.66	13.51	93	0.6	
1400	22.60'	120	5.70	1.16	84.3	0.95	13.63	109	0.6	
1410	24.55	120	5.70	1.15	60.0	0.95	13.58	123	0.6	
1420	26.60	120	5.73	1.15	31.4	1.17	13.48	137	0.6	
1430	27.41	120	5.78	1.15	21.1	1.64	13.52	146	0.6	
1440	28.30	120	5.80	1.15	10.3	1.74	13.48	153	0.6	
1450	29.28	120	5.81	1.15	12.4	1.95	13.45	118	0.6	
1500	30.10	120	5.80	1.16	8.2	1.91	13.51	120	0.6	
1510	30.89	120	5.77	1.17	1.8	1.79	13.36	104	0.6	
1520	31.92	120	5.760	1.18	0.0	1.59	13.33	111	0.6	
1530	32.94	120	5.76	1.19	0.0	1.60	13.34	110	0.6	
1540	33.74	120	5.77	1.18	0.0	1.36	13.28	110	0.6	
1545	34.41	120	5.82	1.19	0.0	1.30	13.26	102	0.6	
1550	34.85	120	5.86	1.20	0.0	1.28	13.25	102	0.6	
1555		120	5.90	1.21	0.0	1.27	13.23	106	0.6	
	1555 RECHARGE WELL, WELL WENT DRY									
	SAMPLE COLLECTED @ 1625									
	TD=36.39'									
	WL=14.40'									

SIGNATURE(S): Kendra

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSA Crane-SWMU ~~#~~ 18
Project No.: ~~412G02635~~ 112G01651

Sample ID No.: 18CGWT003
Sample Location: 18CGWT003
Sampled By: K. SMITH
C.O.C. No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 12/16/2011	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1055	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	ORP
Method: BLADDER	cloudy	5.87	1.47	11.76	101	2.12	0.7	153

PURGE DATA:

Date: 12/16/2011	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: BLADDER								
Monitor Reading (ppm): 0.0								
Well Casing Diameter & Material				SEE	LOW FLOW		PURGE	
Type: PVC 2" SCH								
Total Well Depth (TD): 32.14'				DATA	SHEET			
Static Water Level (WL): 29.49	17.00							
One Casing Volume (gal): 2.5								
Start Purge (hrs): 0835								
End Purge (hrs): 1045								
Total Purge Time (min): 130								
Total Vol. Purged (gal): 3.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL	3-40 mL VIALS	✓
R METALS	HNO3	250 mL POLY	✓
DISSOLVED METALS	HNO3	250 mL POLY	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Kendra Smith

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSA CRANE - Seneca 18
PROJECT NUMBER: 112G01851
WELL ID.: 18CGWT003
DATE: 12/16/2011

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0835	16.22'	—	INITIAL WATER LEVEL							
0850	18.67	170	5.87	1.55	234.1	1.67	12.19	100	0.6	CLOUDY
0900	21.27	170	5.89	1.47	226	2.18	12.90	133	0.7	
0910	22.36	110	5.91	1.43	145	2.84	12.13	142	0.7	
0920	23.10	110	5.94	1.40	120	2.38	12.24	144	0.7	
0930	24.02	110	5.99	1.38	99.7	2.78	12.20	146	0.7	
0940	24.67	110	5.99	1.39	73.5	2.99	12.05	147	0.7	
0950	25.33	110	5.99	1.39	65.9	2.67	12.06	148	0.7	
1000	26.11	110	5.97	1.41	73.6	2.57	11.93	150	0.7	
1010	26.90	110	5.94	1.44	81.0	2.34	12.01	154	0.7	
1020	27.61	110	5.92	1.42	111.0	2.20	11.90	157	0.7	
1030	28.45	110	5.91	1.43	110.0	2.12	11.80	157	0.7	
1035	28.76	110	5.90	1.44	109.0	2.10	11.81	156	0.7	
1040	29.15	110	5.90	1.45	108.0	2.09	11.80	155	0.7	
1045	29.49	110	5.87	1.47	101.6	2.12	11.76	153	0.7	
			SAMPLES COLLECTED @ 1055							
	TD=	32.14'								
	WL=	17.00								

SIGNATURE(S): Kendra Privett

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

SWMU 08 EXISTING MW

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: 08GWT008
Sample Location: 08GWT008
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Date: 11 JAN 12								
Time: 1150								
Method: BLADDER PUMP	CLEAR	6.45	0.280	12.17	56	2.76	167	0

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Other
Date: 11 JAN 12								
Method: BLADDER PUMP								
Monitor Reading (ppm): 0	SEE LOW FLOW PURGE DATA SHEET, Page 2							
Well Casing Diameter & Material								
Type: 2" PVC SCH								
Total Well Depth (TD): 32.70								
Static Water Level (WL): 9.45								
One Casing Volume (gal): 3.8								
Start Purge (hrs): 0750								
End Purge (hrs): 1150								
Total Purge Time (min): 240								
Total Vol. Purged (gal): 7.6								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL, 4°C	3- 40ml glass vials	✓
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~Explosives plus~~ NG	~~4°C~~	~~2 - 1 liter amber glass~~	
~~Perchlorate~~	~~4°C~~	~~1 - 250 mL PE~~	
~~Ammonia~~	~~H2SO4 - 4°C~~	~~1 - 250 mL PE~~	
~~Total TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE~~	
~~Dissolved TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field filtered~~	
Total RCRA Metals	HNO3 - 4°C	1 - 250mL PE	✓
Dissolved RCRA Metals	HNO3 - 4°C	1 - 250mL PE, field filtered	✓
~~TPH-DRO/ERO~~	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ ~~Fuel Oil Parameters~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~BTEX + Naph.~~	~~HCL - 4°C~~	~~3- 40mL vials~~	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

SCREEN 15 TO 30' (15' SCREEN)

PUMP SET 7' OFF BTM (~~BTOR~~) KS

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

K Simpson

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112GO1851, CTO F201

WELL ID.: 08GWT008
DATE: 11 JAN 12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP +/- mV		Comments
0750	9.45	210								
0800	10.00	200	6.62	0.297	180	2.25	14.09	136		LT CLOUDY
0810	10.80	120	6.60	0.294	154	1.57	14.02	137		NO ODOR
0820	10.77		6.47	0.291	127	2.80	13.88	146		
0830	10.75		6.36	0.289	116	3.12	13.26	154		
0840	10.75		6.47	0.286	111	2.65	13.14	160		
0950	10.76		6.59	0.295	107	2.29	13.09	167		
0900			6.51	0.283	86	1.80	12.86	162		
0910			6.49	0.295	78	1.21	12.78	159		
0920			6.52	0.278	69	2.52	12.72	175		
0930			6.55	0.279	71	1.96	12.73	165		
0940			6.56	0.281	59	2.10	12.60	172		
0950			6.57	0.297	55	2.22	12.53	177		
1000			6.57	0.285	54	1.68	12.55	172		
1010			6.57	0.291	53	1.21	12.55	169		
1020			6.58	0.281	54	2.20	12.56	167		
1030			6.52	0.283	52	2.51	12.52	165		
1040			6.48	0.285	50	2.71	12.49	164		
1050			6.46	0.293	51	2.76	12.22	162		
1100			6.40	0.291	52	2.80	12.15	161		
1110			6.41	0.280	53	2.76	12.16	163		
1120			6.41	0.279	55	2.75	12.18	165		
1130			6.41	0279	55	2.80	12.18	166		
1140			6.44	0.280	54	2.74	12.17	167		
1150			6.45	0.280	56	2.76	12.17	167		4 HRS - 5 AMPLE

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

SWMU 08 EXISTING MW

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: 08GWT012
Sample Location: 18GWT012
Sampled By: K. Simpson
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 10 JAN 12	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 1450	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: BLADDER PUMP	CLEAR	4.57	1.20	13.50	9.2	1.40	191	0

PURGE DATA:

Date: 10 JAN 12	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Other
Method: BLADDER PUMP								
Monitor Reading (ppm): 0	SEE LOW FLOW PURGE DATA SHEET, Page 2							
Well Casing Diameter & Material								
Type: 2" PVC SCH								
Total Well Depth (TD): 76.0								
Static Water Level (WL): 53.36								
One Casing Volume (gal): 3.7								
Start Purge (hrs): 1130								
End Purge (hrs): 1450								
Total Purge Time (min): 200								
Total Vol. Purged (gal): 6.6								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCL, 4°C	3- 40ml glass vials	✓
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~Explosives plus~~ NG	~~4°C~~	~~2 - 1 liter amber glass~~	
~~Perchlorate~~	~~4°C~~	~~1 - 250 mL PE~~	
~~Ammonia~~	~~H2SO4 - 4°C~~	~~1 - 250 mL PE~~	
~~Total TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE~~	
~~Dissolved TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field filtered~~	
Total RCRA Metals	HNO3 - 4°C	1 - 250mL PE	✓
~~Dissolved RCRA Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field filtered~~	
~~TPH-DRO/ERO~~	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ > ~~Fuel Oil Parameters~~	~~4°C~~	2 - 1 liter amber glass	
~~BTEX + Naph.~~	~~HCL - 4°C~~	~~3 - 40mL vials~~	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

20' SCREEN

PUMP SET ~ 8' OFF BTM 58' BTOR

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):
~	~	

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112GO1851, CTO F201

WELL ID.: 08 GWT 012
DATE: 10 JAN 12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP +/- mV		Comments
										START PURGE
1130	53.36	250								
1140	53.75	125	4.61	1.28	540	6.42	12.70	162		CLEAR, NO ODOR
1150	53.62		4.53	1.22	491	6.50	12.60	182		
1200	53.57		4.50	1.19	467	6.86	12.61	198		
1210	53.57		4.49	1.18	398	3.25	12.90	210		
1220	53.56		4.48	1.18	344	2.27	13.20	231		
1230	53.54		4.52	1.20	180	3.56	13.25	223		
1240	53.52		4.57	1.21	113	4.36	13.30	218		
1250			4.59	1.22	75	4.49	13.37	210		
1300			4.61	1.22	62	4.65	13.42	203		
1310			4.61	1.23	51	4.68	13.26	200		
1320	53.50		4.61	1.23	42	4.70	13.18	199		
1330	53.50		4.58	1.23	39	3.90	13.37	197		
1340			4.59	1.22	30	3.01	13.51	196		
1350			4.58	1.20	24	2.20	13.64	195		
1400			4.56	1.20	20	1.82	13.63	194		
1410			4.56	1.20	18	1.05	13.63	194		
1420			4.57	1.20	13	1.40	13.65	195		
1430			4.55	1.20	10	1.38	13.52	191		✓
1435			4.57	1.20	9.5	1.39	13.50	191		
1440			4.57	1.20	9.2	1.40	13.50	191		

SIGNATURE(S): [signature]

SOIL SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB001 0002
Sample Location: 18CSB001
Sampled By: RS-RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1120	0-2'	BRN	MOIST SILT CLAY W GRAVEL
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
TPH-DRO/ERO, PAH (Fuel Oil Parameters)	1- 4 oz w/m glass, 4°C	✓
BTEX (Fuel Oil Parameters)	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		~~3X VOL FOR QA~~ RS

OBSERVATIONS / NOTES:

FUEL ODOR @ 2'

NO QA

MAP:

Circle if Applicable:

MS/MSD ~~YES~~ NO

Duplicate ID No.:

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB001 0204
Sample Location: 18CSB001
Sampled By: RS-RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1130	2-4'	GRAY BRN	GLAY W TR SAND MOIST
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
TPH-DRO/ERO, PAH > Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	✓
BTEX > Fuel Oil Parameters	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	1 ~~Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

3X VOL FOR MS/MSD

OBSERVATIONS / NOTES:

FUEL ODOR @ 2' BGS

MAP:

Circle if Applicable:

MS/MSD YES

Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB002-0002
Sample Location: 18CSB002
Sampled By: RS-RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.20.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1015	0-2'	BRN	MOIST, SILT, F SAND, CLAY
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	1- ~~4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	1- ~~4 oz w/m glass~~, 4°C	
~~TAL Metals~~	1- ~~4 oz w/m glass~~, 4°C	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO~~, PAH → ~~Fuel Oil Parameters~~	1- ~~4 oz w/m glass~~, 4°C	
~~BTEX~~ → ~~Fuel Oil Parameters~~	1 ~~Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	1- ~~4 oz w/m glass~~, 4°C	
~~SVOCs~~	1- ~~4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSB0020507
Sample Location: 18CSB002
Sampled By: RS-RC
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.20.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1020	5-7'	BRN	MOIST, SILT, F. SAND, SILT
Method: DPT			GRAY SAND STONE FRAGS (TR)
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

~~Date:~~	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, ~~etc.~~)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass,~~ 4°C	
Explosives + NG	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	1~~- 4 oz~~ w/m glass, 4°C	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~ → Fuel Oil Parameters	1 ~~Terracore Kit, NaHSO$_4$~~ & CH_3OH	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass,~~ 4°C	
SVOCs	1- 4 oz w/m glass, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
~~MS/MSD~~	~~Duplicate ID No.:~~

Signature(s):

RS RC

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB003 0002
Sample Location: 18CSB003
Sampled By: RS - RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1040	0-2'	BRN/GRAY	MOIST, SILT ~~CLAY~~ K F SAND GRAVEL TO .5'
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date: / Method: / Monitor Readings (Range in ppm):	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
RCRA Metals	1- 4 oz w/m glass, 4°C ✓	
~~TPH-DRO/ERO, PAH~~ > ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH ✓	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

REFUSAL @ 3.5' BGS
< 1 FOOT RECOVERY
INSUFFICIANT VOL. FOR 2ND SAMPLE
~ 10" GRAVEL IN SLEVE THEN 3"
SILT F SAND

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RS RC

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSB004-0002
Sample Location: 18CSB004
Sampled By: RS-RC
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-20-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1100	0-2'	BRN	MOIST, CLAY/SILT w LIMESTONE GRAVEL <1"
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
TPH-DRO/ERO, PAH → Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	✓
BTEX → Fuel Oil Parameters	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

RS RC

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB004-0507
Sample Location: 18CSB004
Sampled By: RS-KL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/20/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1110	5-7'	BRN	MOIST, CLAY/SILT W/ TR LIMESTONE GRAVEL
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz~~ w/m glass, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass~~, 4°C	
TPH-DRO/ERO, PAH → Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	✓
BTEX	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SB 18C005 0002
Sample Location: 18CSB005
Sampled By: RS - RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA: REFUSAL

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1000	~~0-2~~	BRN	MOIST SLT, F SAND
Method: DPT	0-1		GRAVEL
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass,~~ 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO~~, PAH → ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass,~~ 4°C	
~~BTEX~~ → ~~Fuel Oil Parameters~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass,~~ 4°C	
~~SVOCs~~	1- ~~4 oz w/m glass,~~ 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		2X VOL FOR DUP

OBSERVATIONS / NOTES:

MAP:

NO 2ND SAMPLE
REFUSAL @ 1' BGS

Circle if Applicable:

MS/MSD —

Duplicate ID No.: FD 101911-02

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSB006 0002
Sample Location: 18CSB006
Sampled By: RS - KL
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0900	0 - 2'	BRN	SILTY CLAY MOIST
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives~~ + NG	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
RCRA Metals + pH	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO~~, PAH → Fuel Oil Parameters	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~ → Fuel Oil Parameters	~~1 Terracore Kit~~, $NaHSO_4$ & CH_3OH	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RS KL

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB006023
Sample Location: 18CSB006
Sampled By: RS-RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.19.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0910	2-3'	BRN	MOIST, SILTY CLAY
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m~~ glass, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m~~ glass, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m~~ glass, 4°C	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO~~, PAH > ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

HAND AUGER
NO ACCESS

Sample ID No.: 18CSB007 0002
Sample Location: 18CSB007
Sampled By: RS-KC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.20.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1245	0-2'	BRN	WET SILTY CLAY TR ROCK FRAGS.
Method: HAND AUGER			
Monitor Reading (ppm): 3			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TPH-DRO/ERO, PAH > Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	✓
BTEX	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	1- 4 oz w/m glass, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

SEE 2ND PG
04-06'

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSB007040 6
Sample Location: 18CSB007
Sampled By: RS-RL
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10 20 11 / Time: 1255 / Method: HAND AUGER / Monitor Reading (ppm): 59	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	4-6	BLACK	WET - SILTY CLAY WITH BLACK STAINING

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TPH-DRO/ERO, PAH (Fuel Oil Parameters)	1- 4 oz w/m glass, 4°C	✓
BTEX (Fuel Oil Parameters)	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

STRONG FUEL ODOR
TANK FILL CAP STILL IN PLACE
NO SIGN OF TANK (UST) BEING REMOVED, MAY STILL BE IN PLACE

TD ~ 6.5' - STARTING TO CLEAN UP AT BTM

MAP:

PID = 59 PPM

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

RL

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSB008 0102
Sample Location: 18CSB008
Sampled By: KS - KL
C.O.C. No.:

[ ] Surface Soil
(X) Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-18-07	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1510	0-2	BRN	MOIST, SILT CLAY TR GRAVEL
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	1- ~~4 oz w/m glass, 4~~°C	
~~TAL Metals~~	1- ~~4 oz w/m glass, 4~~°C	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
TPH-DRO/ERO, PAH ~~BTEX~~ → Fuel Oil Parameters	1- ~~4 oz w/m glass,~~ 4°C	
	1 ~~Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	1- 4 oz w/m glass, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

KL KS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB008 0305
Sample Location: 18CSB008
Sampled By: RS-RL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-19-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1515	3-5	GRAY	WET, SILTY CLAY TR GRAVEL
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
RCRA Metals	1- 4 oz w/m glass, 4°C ✓	
~~TPH-DRO/ERO, PAH~~ → ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass~~, 4°C	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ &~~ CH_3OH	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
S~~VOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB009 0002
Sample Location: 18CSB009
Sampled By: RS-KC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/8/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1442	0-2'	GRAY	MOIST SILTY/CLAY + SANDY GRAVEL
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass~~, 4°C	
~~Explosives + NG~~	~~1- 4 oz w/m glass~~, 4°C	
~~TAL Metals~~	~~1- 4 oz w/m glass~~, 4°C	
RCRA Metals ✓	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO~~, PAH > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	~~✓~~
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	~~✓~~
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

IN FORMER CATCH BASIN
(SETTLING BASIN CSD004)

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

TH SL

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSB009020904
Sample Location: 18CSB009
Sampled By:
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-19-11 / Time: 1450 / Method: DPT / Monitor Reading (ppm):	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	2-4	GRAY	MOIST SILTY/CLAY + SAND & GRAVEL

COMPOSITE SAMPLE DATA:

Date: / Method: / Monitor Readings (Range in ppm):	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO~~, PAH (Fuel Oil Parameters)	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ (Fuel Oil Parameters)	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	1- 4 oz w/m glass, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSB009002
Sample Location: 18CSB009
Sampled By: RS-RL
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.25.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1330	0 - 2	LT GRAY	MOIST, F SAND TR SILT
Method: PICK/SHOVEL			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO~~, PAH	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ > ~~Fuel Oil Parameters~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

RESAMPLE - FIRST SAMPLE 10/13/11 FOR MISSING VOC VIALS

18" EAST OF ORIGINAL LOCATION

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RS RL

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[4] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSSa1 0002
Sample Location: 18CSS001
Sampled By: C Kelly / C Rumer
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/19/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0940	0-2' bgs	Medium Brown	Silty clay w/ some Fine gravel Particles
Method: HA			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
RCRA Metals + PH	1- 4 oz w/m glass, 4°C	✓
~~TPH DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	X 2
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~ > Fuel Oil Parameters	~~1 Terracore~~ Kit, $NaHSO_4$ & CH_3OH	✓
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

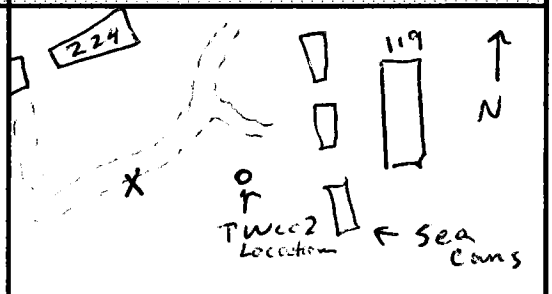
Strike thru Parameters that are not required - Add pH, if required to Metals

Set Collected

OBSERVATIONS / NOTES:

- collected VOCs from 0.5'-2'
- sample taken from side of Drainage stream bed (left side)
- Location not laid out, marked w/ pin Flag + Flagging Tape (pink)

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD101911-001

Signature(s):

Chuck Rumer

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CCP001 0002
Sample Location: 18CCP001
Sampled By: Chuck Kelly / C Rumer
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:	—	—	—
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
10/19/11	0854	0-2'	Brown / Medium Brown / Gray	Silty Sand / Clay
Method: HA	0856	0-2'		"
	0858	0-2'		"
Monitor Readings (Range in ppm): 0.0 ↓ 0.0	0859	0-2'		"

SAMPLE COLLECTION INFORMATION:

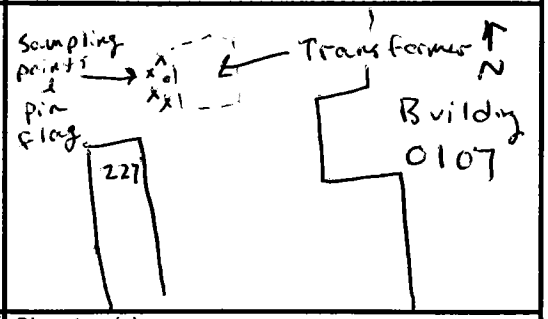
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
PCB	1- 4 oz w/m glass, 4°C	✓
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

- SAMPLE COLLECTED 0900
- 4 Locations in semicircle around pin Flag
- Soil 0-6" Brown w/ gravel, 6"-2' medium brown and gray clay
- No Distressed Vegetation

MAP:



Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Chuck Kelly

SEDIMENT SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSD001 0006
Sample Location: 18CSD001
Sampled By: C Kelly C Romer
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/19/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1205	0-6"	Medium Brown	Sandy / Gravely Sediment
Method: Trowel			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

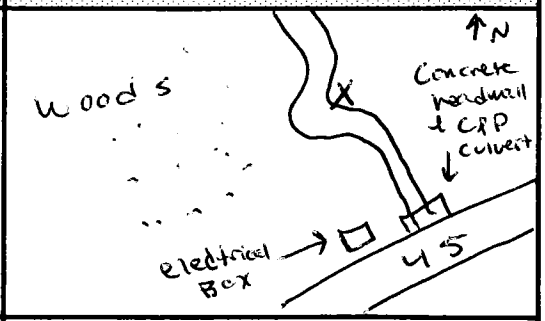
Analysis	Container Requirements	Collected
Explosives	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
TAL Metals	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals & TOC~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TPH-DRO/ERO, PAH > Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	✓
BTEX	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓ x 2
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

- Sediment collected from left side of stream bed approx 150' NW of Highway 45
- No Location Marked
- Location marked after sample collected w/ Pin flag & Pink Tape

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD101911-01

Signature(s):

Chuck Ky

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSD002000
Sample Location: 18CSD002
Sampled By: C Kelly / C Runner
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/19/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1235	0 - 6"	Medium Brown/gray	Sandy / Silty Clay Sediment
Method: Trowel			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

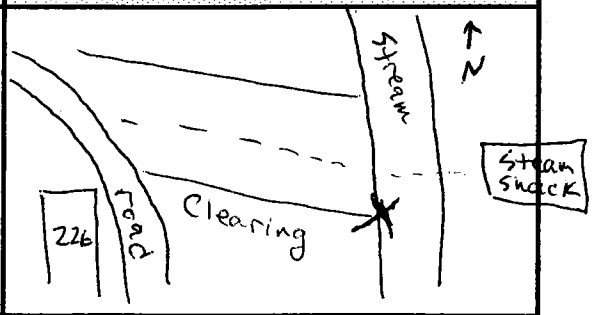
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals & TOC~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TPH-DRO/ERO, PAH > Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	✓ X3
BTEX	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

- No location Premarked
- Sample collected from right side of streambed, SE side of Steam line clearing
- Location Marked w/ Pin Flag & Pink Tape

MAP:



Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Chuck Ky

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSD0030006
Sample Location: 18CSD03
Sampled By: CR/CK
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1440	0-6"	Dark Gray/ Black	Watery Silt with granular particles
Method: Grab			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

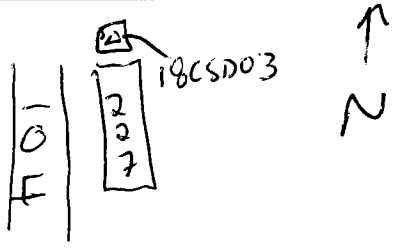
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1-4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1-4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1-4 oz w/m glass, 4°C~~	
~~TAL Metals & TOC~~	~~1-4 oz w/m glass, 4°C~~	
RCRA Metals	1- 4 oz w/m glass, 4°C	✓
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1-4 oz w/m glass, 4°C~~	
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
Strike thru Parameters that are not required		

OBSERVATIONS / NOTES:

- Dimensions - 5'x7' (concrete block)
  3' of free board
  5' depth
- Large Chunks at bottom
- Strong Fuel Odor

MAP:



Circle if Applicable:
MS/MSD

Duplicate ID No.:
FD 18II-001

Signature(s):
C. Ker

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18CSD004 0006
Sample Location: 18CSD001
Sampled By:
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings				
(Range in ppm):				

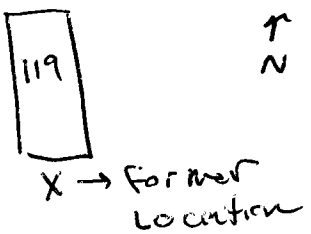
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
Explosives	1- 4 oz w/m glass, 4°C	
Explosives + NG	1- 4 oz w/m glass, 4°C	
TAL Metals	1- 4 oz w/m glass, 4°C	
TAL Metals & TOC	1- 4 oz w/m glass, 4°C	
RCRA Metals	1- 4 oz w/m glass, 4°C	
TPH-DRO/ERO, PAH > Fuel Oil Parameters	1- 4 oz w/m glass, 4°C	
BTEX > Fuel Oil Parameters	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
VOCs	1 Terracore Kit, $NaHSO_4$ & CH_3OH	
Strike thru Parameters that are not required		

OBSERVATIONS / NOTES:

NO SAMPLE
Settling Basin Removed

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chuck Mg

SURFACE WATER SAMPLING LOG SHEETS

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSW001
Sample Location: 18CSW001
Sampled By: C Kelly / C Rimer
C.O.C. No.:

[✓] Stream
[ ] Spring
[ ] Pond
[ ] Lake
[ ] Other:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 10/19/11	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1200	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	
Depth: Surface	Slight Brown tint	7.07	0.4	11.4	7.0	11.5	186	
Method: DE								

SAMPLE COLLECTION INFORMATION:

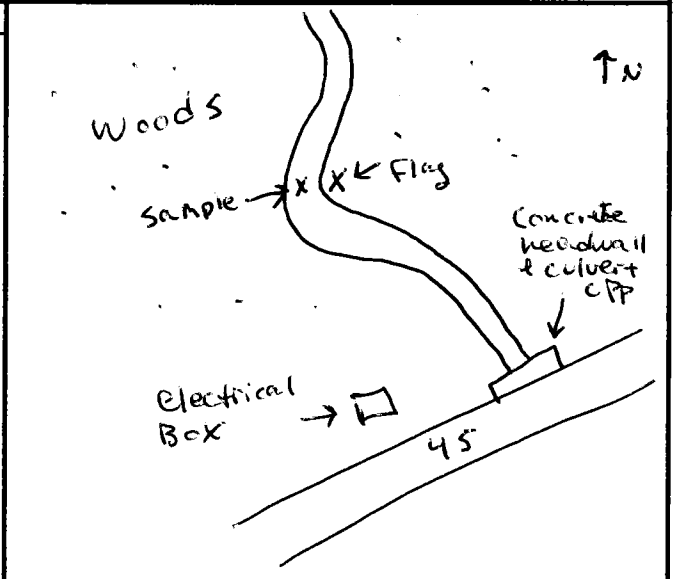
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	4°C	2 - 1 liter amber glass	
Explosives plus NG	~~4°C~~	~~2 - 1 liter amber glass~~	
Perchlorate	~~4°C~~	~~1 - 250 mL PE~~	
~~Total TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE~~	
~~Dissolved TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field filtered~~	
TPH-DRO/ERO	HCL - 4°C	2 - 1 liter amber glass	✓
PAH (Fuel Oil Parameters)	4°C	2 - 1 liter amber glass X 2	✓
BTEX + Naph.	HCL - 4°C	3- 40mL vials	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate 20 GPM 8" deep in center

- No location Marked
- Sample collected approx 150' NW of Highway 45 @ S bend in stream
- Location Marked w/ Pin Flag & Pink Tape After Sample collected
- Path From roadway also marked
- Bottles Filled Midstream

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD101911-03

Signature(s):

Chuck Rimer

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18CSW002
Sample Location: 18CSW002
Sampled By: C Kelly / C Bauer
C.O.C. No.:

[X] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 10/19/11	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1230	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	
Depth: Surface	slight brown tint	6.31	0.4	14.5	26	13.09	222	
Method: DF								

SAMPLE COLLECTION INFORMATION:

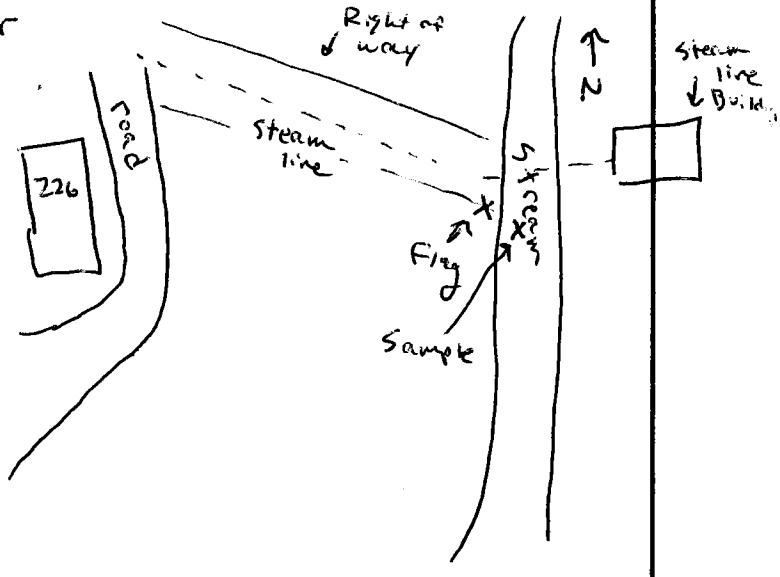
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~Explosives plus NG~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~Perchlorate~~	4°C	~~1 - 250 mL PE~~	
~~Total TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE~~	
~~Dissolved TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field filtered~~	
TPH-DRO/ERO (Fuel Oil Parameters)	HCL - 4°C	2 - 1 liter amber glass X3	✓
PAH (Fuel Oil Parameters)	4°C	2 - 1 liter amber glass	✓
BTEX + Naph. (Fuel Oil Parameters)	HCL - 4°C	3- 40mL vials	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate 20 GPM 6" deep in center

- No location Premarked
- Sample collected @ stream, ~~NE~~ SE side of steam line right of way clearing
- Samples collected midstream
- Location marked w/ Pin Flag & Pink Tape

MAP:



Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Chuck Kelly

APPENDIX D

SUBAREA F - BORING LOGS, WELL CONSTRUCTION DIAGRAMS, AND SAMPLE LOG SHEETS

SUBAREA

F

BORING LOGS

and

WELL CONSTRUCTION LOGS

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: CME 55 / GtuSPech 100

BORING No.: 18F MW T001
DATE: 11-21-11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	0								Time				
S-1		2/4	1.8/		M Stiff	DK Brn	topsoil Moist	OL	1015	0	-	0	0
		6/2	2.0			Brn to Tan Brn	Clay and Silt	CL	Dry to Damp				
S-2		4/9	2.0/		V Stiff	tan Brn	Silty F Sand	SM	1018	0	-	0	0
		11/12	2.0				Tr C Sand Same as above some Clay	SC					
S-3	5	3/3	0.9/		Stiff	Tan Brn	Same as above	↓	1025				
		6/5	2.0			↓	to Silty F Sand Tr F Gravel	SM		0	-	0	0
S-4		4/6	2.0/		Stiff	↓	Silty F Sand some F Gravel	SW	1028 Dry to Damp				
		5/5	2.0			Brn	Clay Tr Some Silt & F Sand	CH					
S-5		2/2	1.6/		M Stiff	Olive	Silt Tr Clay	MH	1042	0	-	0	0
	10	2/5	2.0			Gray	vs soft		Damp				
S-6		2/2	2.0/		Stiff	↓	↓		1045	0	-	0	0
		3/6	2.0			↓	↓		Damp to Moist				
S-7		2/2	0.7/		Loose	Red Brn	Silty Sand & Sandstone Frags	GM	1049	0	-	0	0
		3/7	2.0		↓	Lt Brn	(weath sandstone) Clayey silt in tip	MH	Damp				
S-8	15	4/5	1.7/		V Stiff ↓	Gray, Red Brn Lt Brn	Weath Mudstone/ Shale	MH	1100 Damp	0	-	0	0
		11/15	2.0			↓	↓						
S-9		12/50/.3	0.5/0.8		Hard	↓	↓	ML	1105 Dry	0	-	0	0
					VBR ↓	Lt Brn Gray	Shale w/ blk partings		Rust on partings				
1.9/5.0	①	38%	4.6/5.0		BR	Gray	Siltstone highly laminated		① Start 12:40				
	20						- Horiz frac @ 19 (1 [illegible]) - Mud on frac @ 21.5		End 12:50				
					VBR		Siltstone laminated		② Start 12:55				
0.0/5.0	②	0%	3.0/5.0				Increasing F Sand		End 1310				
	25						w/ depth						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" SPT 4 1/4" ID HSA 0 - 16.8
NX core 16.8 - 30.0
5.5" Air rotary 16.8 - 30.0

Drilling Area Background (ppm): Ø

Converted to Well: Yes ✓ No ____ Well I.D. #: 18G MW T001

TETRA TECH

BORING LOG

PROJECT NAME: NSA Crane - SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: Micah Group
DRILLING RIG: CME 55 / GusPech 100

BORING No.: 18FMWT001
DATE: 11-21-11
GEOLOGIST: T. Evans
DRILLER: Ben Borth / IN # 2359 WD

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Headspace	Borehole**	BZ**
	25												
					VBR	Blk	Coal						
					VBR	Gray	F Sandstone						
3.0/3.0	(3)	100%	3.0/3.0		BL	Gray	F Sandstone		(3) Start 1315				
							w/ Blk clasts/laminae (irregularly oriented)		End 1323				
							Horiz/Subhoriz fracs		Water in BH @ start of (3)	–	–	Ø	Ø
							@ 27.6, 28, 29'						
									1345 water @ 18'				
									1520				
									Plug borehole				
									to 24.5' to seal coal seam				
									1525				
									Install well				
							2" PVC Screen (20-slot)		14.0-24.0				
							#2 Sand		13.0-24.5				
							Bentonite		11.0 - 13.0				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): Ø

Converted to Well: Yes ✓ No ____ Well I.D. #: 18GMWT001

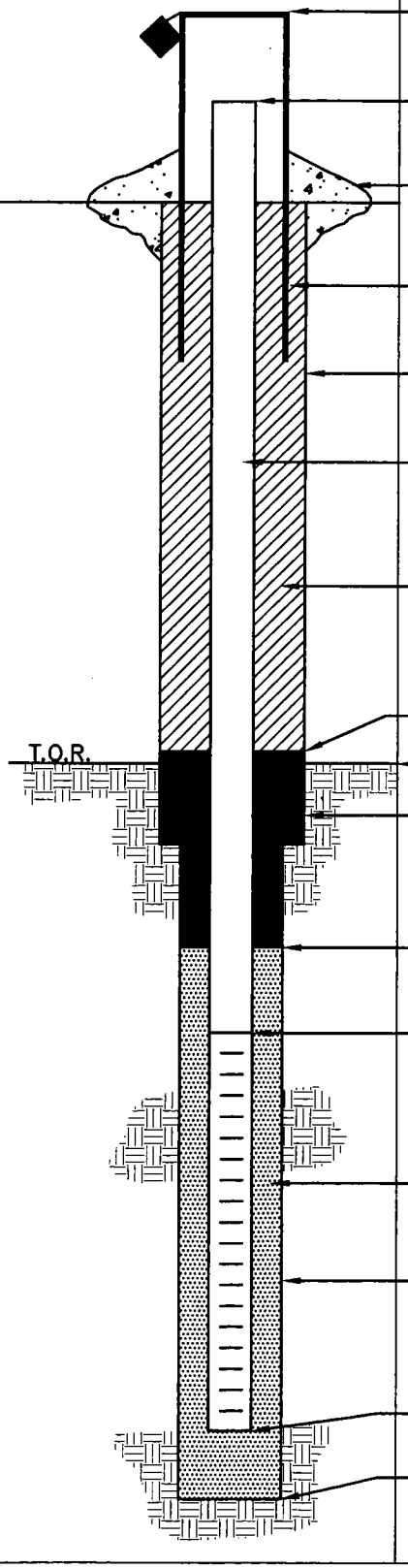
WELL NO.: 18FMW1001

Tetra Tech NUS, Inc.

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT: NSA Crane - SWMU 18	LOCATION: Subarea F	DRILLER: Micah Group /	
PROJECT NO.: 112G01851	BORING: 18FMW1001	DRILLING METHOD: Ben Borth IN # 2359 WD HSA / Air Rotary	
DATE BEGUN: 11-21-11	DATE COMPLETED: 11-21-11		
FIELD GEOLOGIST: T. Evans		DEVELOPMENT METHOD: surge / pump	
GROUND ELEVATION: 661.76	DATUM: NAVD 88		

ACAD: FORM_MWINBR.dwg 07/20/99 INL



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 664.3/2.5

ELEVATION/HEIGHT TOP OF RISER: 664.1/2.3

TYPE OF SURFACE SEAL: Concrete Pad (4' x 4' x 6") w/ 4 Bollards

I.D. OF SURFACE CASING: 6"

DIAMETER OF HOLE: 8"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

TYPE OF BACKFILL: Cement-Bentonite Grout

ELEVATION/DEPTH TOP OF SEAL: 650.8/11.0

ELEVATION/DEPTH TOP OF BEDROCK: 645.0/16.8

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 648.8/13.0

ELEVATION/DEPTH TOP OF SCREEN: (647.8) → 648.8/14.0

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE x LENGTH: 0.020" x 10'

I.D. SCREEN: 2"

TYPE OF SAND PACK: #2 Sand (US Sieve 10-20)

DIAMETER OF HOLE IN BEDROCK: 5.5"

CORE/REAM: NX Core 16.8-30.0
Ream 16.8-30.0

ELEVATION/DEPTH BOTTOM SCREEN: (637.8) → 638.8/24.0

ELEVATION/DEPTH BOTTOM OF SAND: 637.3/24.5

ELEVATION/DEPTH BOTTOM OF HOLE: 637.3/30.0

BACKFILL MATERIAL BELOW SAND: Bentonite (24.5 - 30.0')

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 583

BORING No.: 18FSB001
DATE: 10/22/11
GEOLOGIST: Kevin Losekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		4/4	1.5'	loose	white	Gravel	GW	Dry	0	0	0	0
1115													
					stiff	Orange	Clayey Sand	SC	Dry				
	4												
S-2			3/3										
1125				6'									
	7'2"				Hard	tan/gray	[redacted] KL	[redacted]	Dry				
							silty fine Sand	SC					
					Refusal	at 7'2"							

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Sample @ 0-2 + 5-7 Refusal on [redacted] Hard silty Sand at 7'2" moved location 5' N to avoid utilities.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 583

BORING No.: 18FSB002
DATE: 10/22/11
GEOLOGIST: Kevin Losekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		2/4	1'	~~BRN~~ Soft	BRN	Top soil	OH	wet	0	0	0	0
1200							silty clay some sand	CL	moist				
	4												
S-2			3/3	3'									
1210					Hard	Lt BRN	silty Sand	SC	Dry				
	7					some clay			very wet *				
					Refusal at 7'								
						*	IN LOW SPOT WITH						
							STANDING WATER						
							NO TW INSTALLED						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Sample @ 0-2 + 5-7. Refusal at 7'.

Drilling Area Background (ppm): 0

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112G01851
DRILLING COMPANY: TTL
DRILLING RIG: Geoprobe 583

BORING No.: 18FSB003
DATE: 10/22/11
GEOLOGIST: Kevin Losekamp
DRILLER: Chris White

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		2/4	1'	Soft	DK BRN	top soil	OH	wet	0	0	0	0
1130					soft	BRN	Silty clay	CL	wet				
					↓	↓	↓	↓	↓				
	4												
S-2			3/3	5'	↓	↓	↓	↓	↓				
1140					very stiff	gray BRN	Silty clayey Sand	SC	moist				
	7'2"												
					Refusal	at 7' 2"							

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Sample @ 0-2 + 5-7. Refusal at 7'2".

Drilling Area Background (ppm): 0

Converted to Well: Yes _____ No X Well I.D. #: _____

WELL DEVELOPMENT RECORDS

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

Well: 18FMWT001
Site: SWMU 18
Date Installed: 21 NOV 11
Date Developed: 30 NOV 11
Dev. Method: Bailer / pump
Pump Type: 12v sub
Surge for 5 min 75

Depth to Bottom (ft.): 27.40
Static Water Level Before (ft.): 16.35
After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: K. Losekamp
Driller: Micah Group / Ben Borth
Project Name: NSA Crane - SWMU 18
Project Number: 112G01851
PID/FID (ppm): Wellhead: 0
Breathing Zone: 0

Time	Estimated Sediment Thickness (feet)	Cumulative Water Volume (gal ~~or L~~)	Water Level Readings (feet below TOC)	Temperature (degrees C)	pH	Specific Conductance (units mS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1045	0	0	16.35	13.89	6.			
1055	0	2.5	24.2	13.89	6.62	1.08	755	Lt tan No odor
1540	0	2.5	16.55					
1545	0	3	21.9	16.64	6.15	1.11	396	Slightly cloudy
1600	0	6.5	23.2	16.65	5.59	1.05	7999	Tan
			16 - Dec - 11					
1524	.5	6.5	16.23					
1535	.5	7.0	19.10	11.72	5.77	1.10	7999	
1539	.1	11.5	24.6					Dry to pump inlet
1624	.1	11.5	16.55					Restart
1626	.0	12.5	19.61	14.72	5.59	1.07	7999	Cloudy
1630	.0	15.5						Dry to pump

GROUNDWATER SAMPLING LOG SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: 18FGWT001
Sample Location: 18FMWT001
Sampled By: K SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 11 JAN 12	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 1600	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: BLADDER PUMP	LT CLOUDY	5.52	0.931	13.11	43	2.91	134	0

PURGE DATA:

Date: 11 JAN 12	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Other
Method: BLADDER PUMP								
Monitor Reading (ppm): 0	SEE LOW FLOW PURGE DATA SHEET, Page 2							
Well Casing Diameter & Material Type: 2" PVC SCH								
Total Well Depth (TD): 27.40								
Static Water Level (WL): 15.93								
One Casing Volume (gal/L): 1.9								
Start Purge (hrs): 1200								
End Purge (hrs): 1600								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 6.3								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	~~HCL, 4°C~~	~~3~~ 40ml glass vials	
~~Explosives~~	4°C	~~2 - 1 liter amber~~ glass	
~~Explosives plus NG~~	4°C	~~2 - 1 liter amber~~ glass	
~~Perchlorate~~	4°C	~~1 - 250 mL PE~~	
~~Ammonia~~	~~H2SO4 - 4°C~~	~~1 - 250 mL PE~~	
~~Total TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE~~	
~~Dissolved TAL Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field~~ filtered	
~~Total RCRA Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE~~	
~~Dissolved RCRA Metals~~	~~HNO3 - 4°C~~	~~1 - 250mL PE, field filtered~~	
TPH-DRO/ERO	HCL - 4°C	8 2 - 1 liter amber glass	✓
PAH (Fuel Oil Parameters)	4°C	8 2 - 1 liter amber glass	✓
BTEX + Naph.	HCL - 4°C	12 3 - 40mL vials	✓
Strike thru Parameters that are not required		SAMPLE DUP, MS, MSD	

OBSERVATIONS / NOTES:

4X VOC FOR QA

PUMP SET 4' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
YES	FD 011112-01

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSA Crane SWMU 18
PROJECT NUMBER: 112GO1851, CTO F201

WELL ID.: 18F MW G001
DATE: 11 JAN 12

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP +/- mV		Comments
1200	15.93	150								
1210	17.00	100	5.50	0.980	>999	1.42	13.25	141		CLOUDY, NO ODOR
1220	17.05		5.41	0.930	905	2.01	13.32	142		
1230	17.10		5.36	0.909	874	2.43	13.40	143		
1240	17.05		5.36	0.970	520	2.44	13.00	146		
1250	17.00		5.37	0.980	260	2.45	12.85	149		
1300	17.00		5.37	0.982	200	1.95	13.04	141		TURB = 200
1310	17.02		5.38	0.979	127	1.64	13.40	138		
1320			5.38	0.975	120	2.10	13.31	138		
1330			5.37	0.973	112	2.76	13.28	138		
1340			5.37	0.970	109	3.10	13.24	138		
1350			5.37	0.963	87	2.91	13.22	136		
1400			5.37	0.958	72	2.85	13.21	134		
1410			5.39	0.959	86	2.71	13.00	135		
1420			5.41	0.959	102	2.66	12.79	136		
1430			5.41	0.949	83	2.88	12.91	135		
1440			5.42	0.946	74	3.10	13.10	134		
1450			5.43	0.944	66	3.12	13.09	132		
1500			5.44	0.942	61	3.14	13.09	132		
1510			5.43	0.939	61	3.03	13.10	133		
1520			5.43	0.937	61	2.98	13.10	133		
1530			5.48	0.935	54	2.98	13.10	133		
1540			5.51	0.932	50	2.95	13.10	133		
1550			5.52	0.932	42	2.96	13.10	133		
1600			5.52	0.931	43	2.91	13.11	134		4 HAS - END PURGE

SIGNATURE(S): [signature]

SOIL SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18FSB001 0002
Sample Location: 18FSB001
Sampled By: RS-RC
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.22.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1115	0-2	BRN	DRY, SILT TR CLAY, F. SAND, GRAVEL
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
TAL Metals	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass,~~ 4°C	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	1- ~~4 oz w/m glass,~~ 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MOVED 5' N TO CLEAR PHONE LINE,
TOP ~10" GRAVEL ROAD

MAP:

NO TW INSTALLED
NOT WET

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

RA EC

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18FSB0010507
Sample Location: 18FSB001
Sampled By: KS-KL
C.O.C. No.:

[ ] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-22-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1125	5-7	BRN	MOIST ~~CLAY & SILT w/ F SAND~~ SEE BELOW
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
TAL Metals	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → ~~Fuel Oil Parameters~~	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ → ~~Fuel Oil Parameters~~	1 ~~Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$~~ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	1- ~~4 oz w/m glass~~, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

TD 7'2" BGS

MAP:

F SAND
TR SILT, TR CLAY

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

KL

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18FSB002 002
Sample Location: 18FSB002
Sampled By: RS-RL
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10-22-11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1200	0-2	BRN	MOIST, SILTY FINE SAND
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
TAL Metals	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MAP:

NO TW INSTALLED
NOT WET

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RL RS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18FSB0020507
Sample Location: 18FSB002
Sampled By: RS-RC
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.22.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1210	5-7'	BRN	MOIST, SILTY F. SAND
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
TAL Metals	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO~~, PAH > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass~~, 4°C	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

RC EC

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18FSB003002
Sample Location: 18FSB003
Sampled By: KS-KL
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.22.11 / Time: 1130 / Method: DPT / Monitor Reading (ppm):	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-2	BRN	MOIST, SILT (TOP SOIL)

COMPOSITE SAMPLE DATA:

Date: / Method: / Monitor Readings (Range in ppm):	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
TAL Metals + PH	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	1 ~~Terracore Kit~~, $NaHSO_4$ & CH_3OH	
~~VOCs~~	1 ~~Terracore Kit~~, $NaHSO_4$ & CH_3OH	
~~PCB~~	1- ~~4 oz w/m glass~~, 4°C	
SVOCs	1- ~~4 oz w/m~~ glass, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MAP:

NO TW INSTALLED
NOT WET

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

KS KL

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18FSB003 05T07
Sample Location: 18FSB003
Sampled By: KS - KL
C.O.C. No.:

[ ] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10.22.11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1140	5-7	BRN	MOIST F SAND w/ SILT & TR CLAY
Method: DPT			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
TAL Metals	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO~~, PAH	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ → Fuel Oil Parameters	1 ~~Terracore Kit~~, $NaHSO_4$ & CH_3OH	
~~VOCs~~	1 ~~Terracore Kit~~, $NaHSO_4$ & CH_3OH	
~~PCB~~	~~1- 4 oz w/m glass~~, 4°C	
~~SVOCs~~	1- 4 ~~oz~~ w/m glass, 4°C	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD | **Duplicate ID No.:**

Signature(s): KL KS

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[X] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18FSS0010002
Sample Location: 18FSS001
Sampled By: CR/CK
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/22/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0940	0 - 2'	Gray/Medium Brown	Clay
Method: HA			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

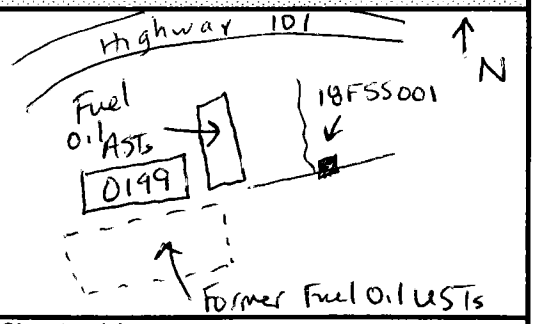
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TPH-DRO/ERO, PAH	1- 4 oz w/m glass, 4°C	✓ x2
BTEX (Fuel Oil Parameters)	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

- Fuel Odor

MAP:



Circle if Applicable:

MS/MSD

Duplicate ID No.: FD102211-01

Signature(s):

C. Rea

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18FSS0020002
Sample Location: 18FSS002
Sampled By: CA/CK
C.O.C. No.:

[X] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/22/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0920	0 - 8"	Brown	Sandy Silt
Method: HA			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

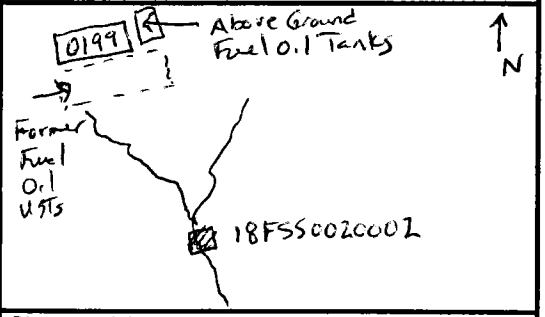
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TPH-DRO/ERO, PAH (Fuel Oil Parameters)	1- 4 oz w/m glass, 4°C	✓ x3
BTEX (Fuel Oil Parameters)	1 Terracore Kit, $NaHSO_4$ & CH_3OH	✓
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~PCB~~	~~1- 4 oz w/m glass, 4°C~~	
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	

Strike thru Parameters that are not required - Add pH, if required to Metals

OBSERVATIONS / NOTES:

- Refusal at 8 inches bgs.
- Previously not flagged - Pin Flag/Ribbon added to location

MAP:



Circle if Applicable:
MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[Y] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18FCP001 0002
Sample Location: 18FCP001
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date: 10/22/11	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
0845	0840	0-2'	Light Brown	Silty Sand, semi-moist
Method: HA	0841	0-1'	"	Clayey silt, very moist
	0843	0-2'	"	Silty Sand, semi moist
Monitor Readings	0844	0-2'	"	Silty Sand, semi moist
(Range in ppm):				
0.0 ↓ 0.0				

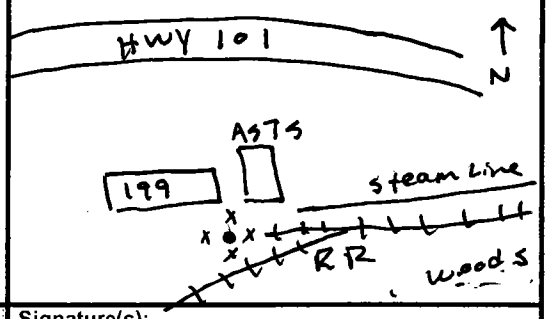
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ → Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
PCB	1- 4 oz w/m glass, 4°C	✓
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

- Pin flag located @ end of railroad tracks, South of ASTs
- Refusal @ 1' @ E comp
- Comps @ N-S-E-W of flag @ 2' intervals

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Chuck Ng

Tetra Tech NUS, Inc.

SOIL SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[✓] Surface Soil
[ ] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18FCP002 0002
Sample Location: 18FCP002
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date: 10/22	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
0830	0825	0 - 1'	Brown	Silty Sand
Method: HA	0826	0 - 2'	Brown/Light Brown	clay / Sandy Clay
	0828	0 - 1'	Brown	Silty Sand
Monitor Readings	0829	0 - 1'	Brown	" "
(Range in ppm):				
0.0 ↓ 0.0				

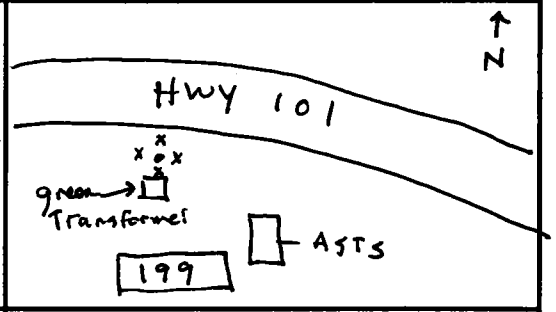
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ → Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ → Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~ → Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
PCB	1- 4 oz w/m glass, 4°C	✓
~~SVOCs~~	~~1- 4 oz w/m glass, 4°C~~	
Strike thru Parameters that are not required - Add pH, if required to Metals		

OBSERVATIONS / NOTES:

- Pin flag located @ green transformer
- Comp locations N - S - E - W @ 2' intervals
- All refusal @ 1' except N Comp location
- Sample time 0830

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Chuck

APPENDIX E

BOGGS CREEK - SAMPLE LOG SHEETS

BOGGS CREEK

SEDIMENT SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SD001GOC6
Sample Location: 18SD001
Sampled By: CR/CK
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/14	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1520	0-6"	medium brown	silty sand
Method: Grab			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

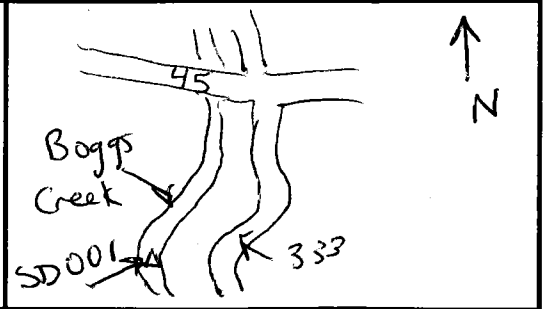
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	1- 4 oz w/m glass, 4°C	
~~TAL Metals & TOC~~ ← METALS + TOC	~~1- 4 oz w/m glass, 4°C~~	✓
RCRA Metals	1- 4 oz w/m glass, 4°C	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

- Location pin flag found approx 200 yds west of 333
- Small island in middle of stream
- Sediment samples collected from left side of high flow side of island/stream (i.e., right stream, Left bank)

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chuck Ray

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SD002000W
Sample Location: 18SDCC2
Sampled By: CK / CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/19/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1600	0-6"	Light Brown/ gray	Silty clay
Method: Grab / Trowel			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

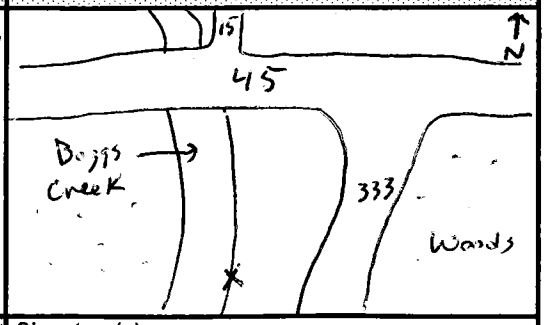
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TAL Metals & TOC	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	1 Terracore Kit, $NaHSO_4$ & CH_3OH	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

- Located Pin Flag on cutbank above stream, left Bank, ~ 100-120 yds W of 333, ~ 250 S of 45
- Sample collected from Left Bank below cut bank

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chuck Ray

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 185D003D006
Sample Location: 185D003
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/21/11	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0845	0-6"	Brown	Sandy Gravely Sediment, moist
Method: Trowel			
Monitor Reading (ppm): 6.0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
~~Explosives + NG~~	~~1- 4 oz w/m glass, 4°C~~	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	
TAL Metals & TOC	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	

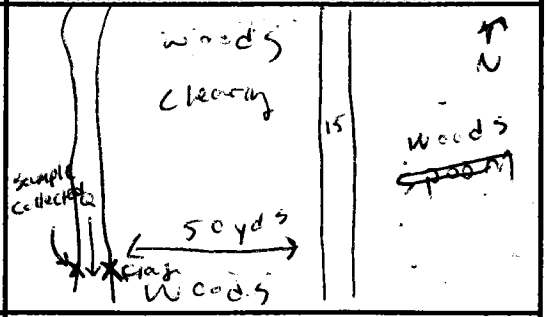
Stet Collected

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

- Stream bed on west side of Road (Hwy 15)
- Pin Flag Located
- Sediment collected from right Bank across stream from flag, no sediment @ Pin Flag Location

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chris Ky

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SD004000[illegible]
Sample Location: 18SD004
Sampled By:
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 10/21/11 Time: 0930 Method: Trowel Monitor Reading (ppm): 0.0	0-6"	Brown	Gravely Sand

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

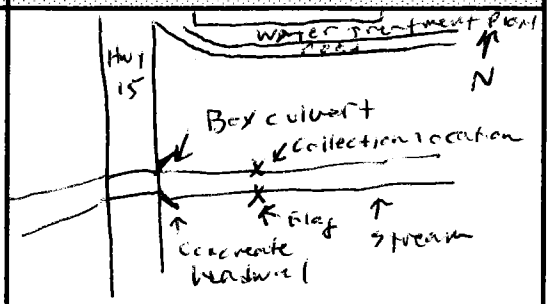
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	X3
TAL Metals & TOC	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH DRO/ERO, PAH~~ Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
Strike thru Parameters that are not required		

OBSERVATIONS / NOTES:

- Pin Flag located on left Bank
- Sediment collected from ~~left~~ right Bank due to no sediment @ Pin location
- Location approx 30' E of Box culvert

MAP:



Circle if Applicable:

MS/MSD ✓

Duplicate ID No.:

Signature(s): [signature]

Tetra Tech NUS, Inc.

SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[ ] Surface Soil
[ ] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SD005000-6
Sample Location: 18SD005
Sampled By: CK CR
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 10/21/11 Time: 1020 Method: Trowel Monitor Reading (ppm): 0.0	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0 - 6"	Light/ medium Brown	Silty Sand

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

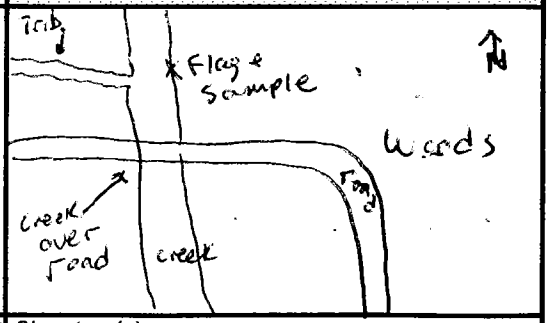
Analysis	Container Requirements	Collected
~~Explosives~~	~~1- 4 oz w/m glass, 4°C~~	
Explosives + NG	1- 4 oz w/m glass, 4°C	✓
~~TAL Metals~~	~~1- 4 oz w/m glass, 4°C~~	✓ X 2
TAL Metals & TOC	1- 4 oz w/m glass, 4°C	✓
~~RCRA Metals~~	~~1- 4 oz w/m glass, 4°C~~	
~~TPH-DRO/ERO, PAH~~ > Fuel Oil Parameters	~~1- 4 oz w/m glass, 4°C~~	
~~BTEX~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	
~~VOCs~~ > Fuel Oil Parameters	~~1 Terracore Kit, $NaHSO_4$ & CH_3OH~~	

Strike thru Parameters that are not required

OBSERVATIONS / NOTES:

- Sediment collect @ Pin Flag Location
- ~~Left~~ ~~Right~~ Left Bank of creek, appx 50' upstream of road crossing
- Dup Collected

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD102111-04

Signature(s):

SURFACE WATER SAMPLING LOG SHEETS

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

[X] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Sample ID No.: 18SW001
Sample Location: 18SW001
Sampled By: CR/CK
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	ORP mV	Other
Date: 1 Time: ~~1525~~ 1525 Depth: Surface Method: Grab	clear	7.03	0.4	13.0	8.6	12.97	185	

SAMPLE COLLECTION INFORMATION:

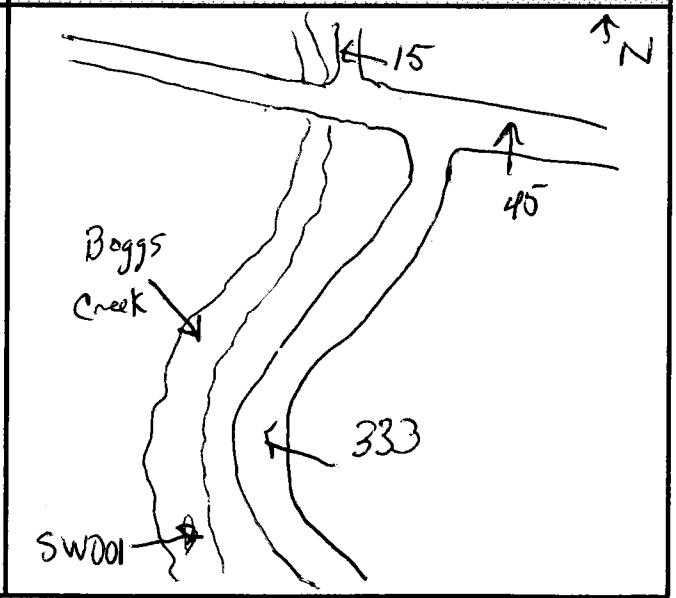
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	~~✓~~ CR
Explosives plus NG	4°C	2 - 1 liter amber glass	✓
Perchlorate	4°C	1 - 250 mL PE	✓
Total TAL Metals	HNO3 - 4°C	1 - 250mL PE	✓
Dissolved TAL Metals	HNO3 - 4°C	1 - 250mL PE, field filtered	✓
~~TPH-DRO/ERO~~ Fuel Oil Parameters	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ Fuel Oil Parameters	~~4°C~~	~~2 - 1 liter amber glass~~	
~~BTEX + Naph.~~ Fuel Oil Parameters	~~HCL - 4°C~~	~~3- 40mL vials~~	
Ammonia	- H_2SO_4-4°C	1 - 250mL PE	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate 50 GPM

- Location pin flag found ~200 yds W of 333
- Samples collected from middle of stream on high flow side
- Location was on small island in middle of stream w/ high flow on one side & minimal flow & depth on other.
- stream Depth ~1.5' in center

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): C. [signature]

1

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18SW002
Sample Location: 18SW002
Sampled By: CK / CR
C.O.C. No.:

[X] Stream
[ ] Spring
[ ] Pond
[ ] Lake
[ ] Other:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 10/19/11 Time: 1605 Depth: Surface Method: Grab	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	ORP mV	Other
	clear	7.04	0.471	12.96	2.7	10.87	193	

SAMPLE COLLECTION INFORMATION:

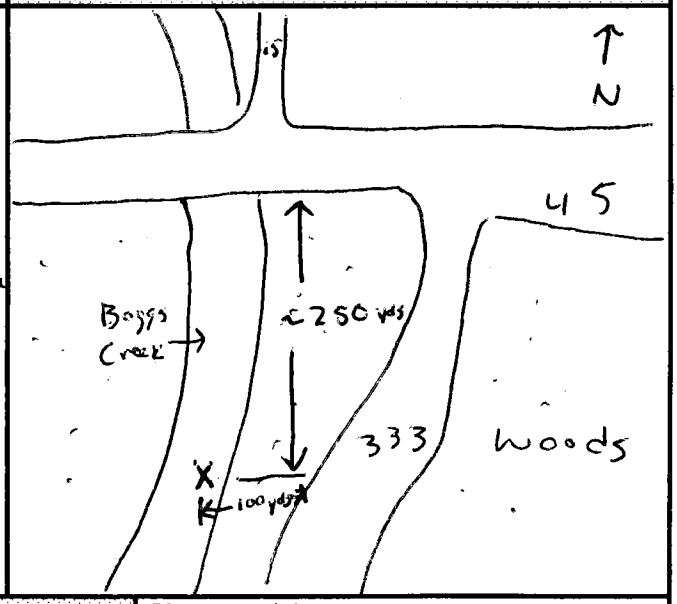
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
Explosives plus NG	4°C	2 - 1 liter amber glass	✓
Perchlorate	4°C	1 - 250 mL PE	✓
Total TAL Metals	HNO3 - 4°C	1 - 250mL PE	✓
Dissolved TAL Metals	HNO3 - 4°C	1 - 250mL PE, field filtered	✓
~~TPH-DRO/ERO~~	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ > Fuel Oil Parameters	~~4°C~~	~~2 - 1 liter amber glass~~	
~~BTEX + Naph.~~	~~HCL - 4°C~~	~~3 - 40mL vials~~	
Ammonia	H_2SO_4 - 4°C	1 - 250 mL PE	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate 50 GPM

- Located Pin flag on cut bank above stream, ~ 100-120 yds west of 333, ~ 250yds South of Highway 45
- Sample collected from midstream
- ~~Soon~~ stream depth ~ 1' in center

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Chuck Ray

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18SW003
Sample Location: 18SW003
Sampled By: CR/CK
C.O.C. No.:

[X] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 10/21 Time: 0845 Depth: surface Method: DF	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	ORP mV	Other
	clear	6.0	0.37	11.4	3.3	11	264	

SAMPLE COLLECTION INFORMATION:

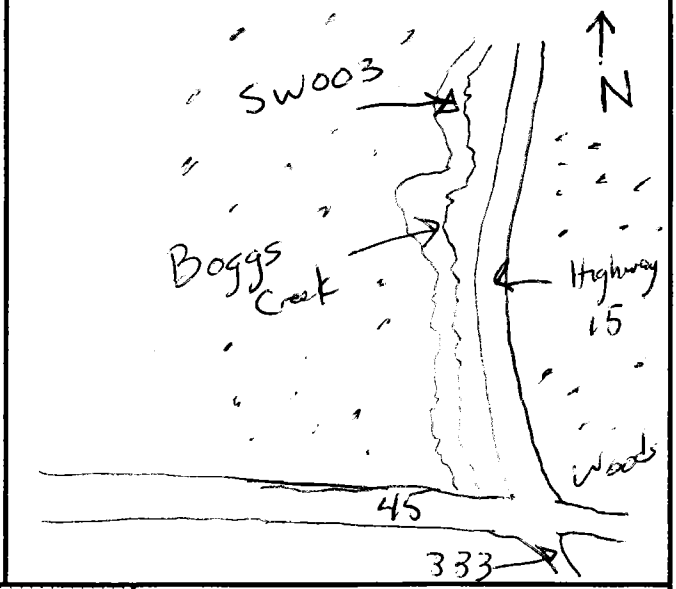
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
Explosives plus NG	4°C	2 - 1 liter amber glass	✓
Perchlorate	4°C	1 - 250 mL PE	✓
Total TAL Metals	HNO3 - 4°C	1 - 250mL PE	✓
Dissolved TAL Metals	HNO3 - 4°C	1 - 250mL PE, field filtered	✓
~~TPH DRO/ERO~~	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ ~~Fuel Oil Parameters~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~BTEX + Naph.~~	~~HCL - 4°C~~	~~3- 40mL vials~~	
Ammonia		1- 250mL PE	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate GPM : 25

- Depth at sampling appx. 1ft.
- collected midstream

MAP:



Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

C. Rol

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18SW004
Sample Location: 18SW004
Sampled By: CRICK
C.O.C. No.:

[X] Stream
[ ] Spring
[ ] Pond
[ ] Lake
[ ] Other:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 10/21/11	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	ORP mV	Other
Time: 0930								
Depth: surface	clear	6.3	0.47	8.5	3.1	14.5	202	
Method: DF								

SAMPLE COLLECTION INFORMATION:

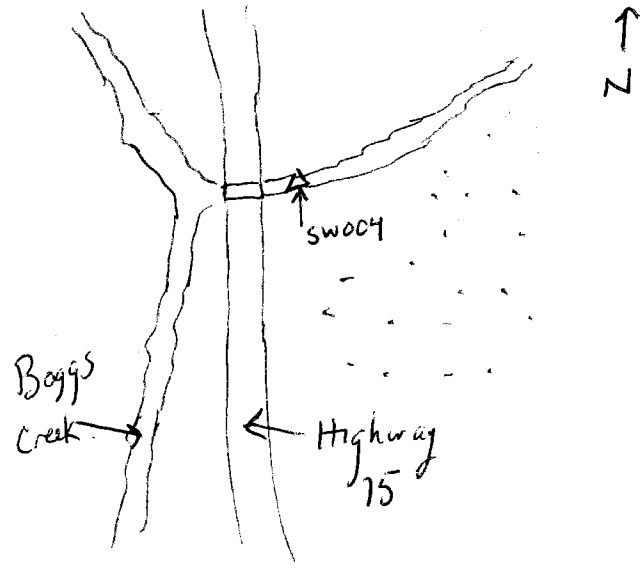
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
Explosives plus NG	4°C	2 - 1 liter amber glass	✓
Perchlorate	4°C	1 - 250 mL PE	✓
Total TAL Metals	HNO3 - 4°C	1 - 250mL PE	✓
Dissolved TAL Metals	HNO3 - 4°C	1 - 250mL PE, field filtered	✓
~~TPH-DRO/ERO~~	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ ~~Fuel Oil Parameters~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~BTEX + Naph.~~	~~HCL - 4°C~~	~~3 - 40mL vials~~	
Ammonia	H_2SO_4 - 4°C	1 - 250 mL PE	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate GPM : 10

- collected midstream
- approximately 6 inches deep at sampling location

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
	FD102111-03

Signature(s):

C. R

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSA Crane, SWMU 18
Project No.: 112G01851

Sample ID No.: 18SW005
Sample Location: 18SW005
Sampled By:
C.O.C. No.:

[X] Stream
[ ] Spring
[ ] Pond
[ ] Lake
[ ] Other:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 10/21/11	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1020	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	
Depth: Surface	clear	6.6	0.28	9.4	2.5	11.7	180	
Method: DF								

SAMPLE COLLECTION INFORMATION:

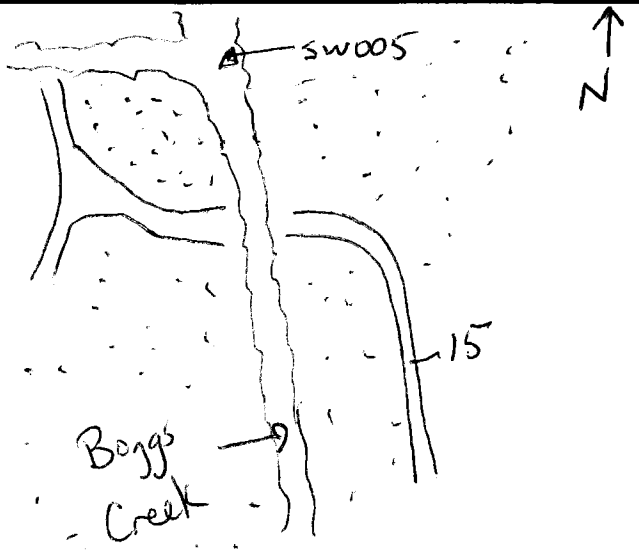
Analysis	Preservative	Container Requirements	Collected
~~Explosives~~	~~4°C~~	~~2 - 1 liter amber glass~~	
Explosives plus NG	4°C	2 - 1 liter amber glass	✓
Perchlorate	4°C	1 - 250 mL PE	✓
Total TAL Metals	HNO3 - 4°C	1 - 250mL PE	✓
Dissolved TAL Metals	HNO3 - 4°C	1 - 250mL PE, field filtered	✓
~~TPH-DRO/ERO~~	~~HCL - 4°C~~	~~2 - 1 liter amber glass~~	
~~PAH~~ ~~Fuel Oil Parameters~~	~~4°C~~	~~2 - 1 liter amber glass~~	
~~BTEX + Naph.~~	~~HCL - 4°C~~	~~3 - 40mL vials~~	
Ammonia	H_2SO_4 - 4°C	1 - 250 mL PE	✓
Strike thru Parameters that are not required			

OBSERVATIONS / NOTES:

Est. Flow Rate GPM 40

- Collected eastern side of creek

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

C. Rea

APPENDIX F

DATA QUALITY REVIEW

DATA QUALITY REVIEW

This section presents the data quality review (DQR) for the SWMU RFI data. A description of the data review processes used to determine whether analytical laboratory data were of acceptable technical quality for use in decision making is presented in this data quality review (DQR). The review began with data verification and validation. Verification is a process used to ensure that contractual requirements were satisfied which includes reviewing the data received from the laboratory and comparing it the laboratory scope of work to ensure all contractual requirements were met. For this project it was verified that the laboratory satisfactorily adhered to contractual requirements. Validation is a comparison of data quality indicators (DQIs) against prescribed acceptance criteria to assess analytical method performance. The DQIs used are measures to assess the bias and precision of the analytical calibrations and sample analyses. This DQR includes evaluations of data completeness, accuracy, sensitivity, comparability, and representativeness. The data review process culminates with a data usability assessment during which the final usability of the data is established relative to the intended data use. . The data usability was assessed in accordance with the UFP-SAP (Tetra Tech, 2011).

F.1 DATA VALIDATION PROCESS

Data validation is a systematic review of the analytical data package with respect to sample receipt and handling, compliance with QC requirements of the analytical methods, data reporting and deliverables, and document control. A qualified chemist reviewed the analytical data packages for compliance with pre-established measurement performance criteria. The analytical results were validated according to several specifications. Assignment of data qualification flags conformed to USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1999) and Inorganic Data Review (USEPA, 2004) to the greatest extent practicable for non-Contract Laboratory Program Data. Assignment of data qualification flags also conformed to rules prescribed in the project specific SAP (September 2011) and the Department of Defense (DoD) document entitles Quality Systems Manual (QSM) for Environmental Laboratories (April 2009).

If no qualifier flag is assigned to a result that has been validated, the data user is assured that no analytical performance deficiencies were identified during validation. If a significant performance deficiency was identified, one or more qualifier flags were assigned to the affected data. The qualifier flags used are defined below.

U – Indicates that the chemical was not detected at the numerical detection limit noted. Non-detected results are reported with a "U" qualifier when received from the laboratory. Additionally, a "U" qualifier is assigned to a result reported by the laboratory if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis. In these cases the reported non-detect value is the observed contaminant concentration multiplied by 10 (for common laboratory contaminants) or by 5 (for all other contaminants).

UJ – Indicates that the chemical was not detected. However, the detection limit (sample-specific quantitation limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate.

J – Indicates that the chemical was detected. However, the associated numerical result is not an accurate representation of the amount 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. The "UR" 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 noncompliances, and extremely low QC recoveries).

R – Indicates that the chemical may or may not be present. The analytical result reported by the laboratory is considered to be unreliable and unusable. The "R" 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 noncompliances, and extremely low QC recoveries).

The preceding data qualifiers may be categorized as indicative of major or minor problems. Major problems are defined as issues that result in the rejection of data and assignment of validation qualifier flags containing an "R" or "UR". Rejected data are considered invalid and are not used for decision making purposes unless used in a qualitative way and the use is justified and documented. Less severe deficiencies, associated with "U," "J," and "UJ" data validation qualifiers, are defined as issues resulting in the estimation of data. Estimated analytical results are considered to be suitable for 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. Also, 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.

Qualified data and the reason for qualification during RFI at SWMU 18 – Load and Fill Area at NSA Crane are presented in Tables F.1.1-F.1.15. Numerous sample results in this review had multiple qualifications. Samples are listed only once in Tables F.1.1 through F.1.15. If the sample had multiple qualifications, the sample will be listed in the table with the qualifier flag in alphabetical order. For example, cobalt in sample 18DSB0070507 was qualified as estimated (J) with the qualifier flags "CDFP". This result is listed in Table F.1.3 for calibration noncompliances, even though other noncompliances were noted in this sample.

F.2 DATA VALIDATION OUTPUTS

After laboratory 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 judgments and/or comments regarding 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 data reviewed encompasses 20 sample delivery groups. The net result was a data package that had been carefully reviewed for its adherence to prescribed technical requirements. Data validators incorporated data qualifiers into the electronic database and submitted the information to the Tetra Tech, Inc. data management group. Pertinent quality estimates are summarized in a quantitative format in the following sections.

F.3 DATA QUALITY REVIEW

The DQR provided herein is designed to provide an overall quantitative measure of analytical performance not provided by data validation. The analytical performance quantitative evaluations are frequently analyte-specific and reflect deficiencies such as biases associated with the quantification of particular analytes in a particular sample matrix.

In some cases, samples were analyzed after they were diluted. These dilutions translate into elevated detection limits and result in an elevated non-detect value being reported when the measured concentration of a target analyte was less than the elevated detection limit. These instances are noted in the descriptions below and the effect on data use is also noted. In some cases, laboratory method blank contamination was observed. If reported target analyte concentrations in samples of the same analytical batch exceeded 10 times the blank contamination level (for common laboratory contaminants) or five times the blank contamination level (for all other target analytes), and the data use was not adversely affected for other quality reasons, the situation is noted but the affected data use was generally

considered to be uncompromised. If measured target analyte concentrations were less than the concentrations represented by these 5-fold or 10-fold adjusted contaminant levels, the situation is noted, and if data use is also compromised, the compromise is noted.

For all analyses, detections less than the limit of quantitation (LOQ) but greater than the method detection limit (MDL) were qualified as estimated, (J), to reflect the fact that concentration measurements in this concentration range are inherently less precise than at higher concentrations. All concentrations were measured down to the MDL and results less than the MDL were reported as the limit of detection (LOD) value with a "U" validation qualifier.

F.3.1 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 two different bases: samples collected and laboratory measurements.

- Sample completeness was a measure of the usable samples collected as compared to those intended to be collected.

- Laboratory measurement completeness was a measure of the amount of usable, valid laboratory measurements per matrix obtained for each target analyte.

Usable, valid samples 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. 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)

Sample Completeness is shown individually for each Subarea as described in the SAP (September 2011) in Tables F.3.1.1-F.3.1.13. All scheduled analyses were conducted on the collected samples, indicating

that sample collection completeness is 100 percent, in so far as the samples were representative of the intended populations.

According to the field notes, some scheduled sampling did not occur. The reasons noted were refusal in sampling and sample turbidity. The sample completeness for the scheduled samples collected compared to the number of samples collected and analyzed is shown in Table F.3.1.14. The sample completeness is 100 percent for surface water, 98 percent for groundwater, 95 percent for sediment and 97 percent for soil samples.

Table F.3.1.15 shows the laboratory completeness. One result (bromomethane in sample TB-102511-01) was rejected out of a total of 93 bromomethane results for 86 samples, including seven field duplicates. This constitutes approximately 1.1 percent of all bromomethane results and is yet a much smaller percentage of the total number of VOC results across all samples. The nondetected bromomethane result in sample TB-102511-01 was less than the minimum project screening level (PSL), 0.5 ug/L versus 0.87 ug/L. Therefore, this single rejection has no adverse effect on data usability, and project objectives were achieved with regard to data completeness.

F.3.2 Sensitivity

Detection limits reported by the laboratory are evaluated in Tables F.3.2.1 through F.3.2.6. Those tables present the detection limit exceedance evaluations of non-detected analytical results per human health or ecological project screening level per matrix of corresponding screening criteria listed in Worksheet #15 of the project SAP (September 2011). Tables F.3.2.1 through F.3.2.6 indicate the number and percentage of non-detected results that exceed corresponding screening levels. The highlighted rows of target analytes correspond to the expected detection limit exceedances according to Worksheet #15 of the SAP (September 2011). Disregarding these analytes, the following section discusses detection limit exceedances in other target analytes.

Groundwater, Human Health- As shown in Table F.3.2.1, nondetected antimony results exceeded the groundwater human health criteria 100 percent. The groundwater samples analyzed for antimony were not diluted for analyses. The laboratory failed to meet the detection limits provided in Worksheet #15 of the SAP (September 2011).

Fifty-three of all perchlorate groundwater results were reported at a concentration greater than the corresponding minimum groundwater screening criteria; therefore, it is uncertain whether or not that

compound exists in groundwater at concentrations that exceeded corresponding minimum groundwater detection limits. The groundwater samples analyzed for perchlorate were not diluted for analyses.

A smaller percentage of beryllium, cadmium, lead, selenium and thallium nondetected groundwater results exceeded human health criteria. These results were from diluted groundwater samples. It is uncertain if beryllium, cadmium, lead, selenium and thallium exist in groundwater at concentrations that exceeded corresponding minimum groundwater detection limits due to the sample dilutions.

Sediment, Ecological- As shown in Table F.3.2.2, several nondetected results in various fractions exceed the sediment ecological criteria. A high percentage of antimony and 100 percent of the silver results exceed sediment criteria. Samples were diluted for analyses of these metals.

The other target analyte with 100 percent of nondetected results exceeding PSL is methylene chloride. The two sediment samples from which the methylene chloride was analyzed contained less than 30 percent solids.

As shown in Table F.3.2.2, numerous nondetected analytes exceeded sediment ecological criteria. In some instances, the percent solids of the sample was less than 30 percent and in other situations sample dilutions elevated the detection limits. Due to the minimum sediment detection limit exceedances it is uncertain whether or not those chemicals exist in sediment at concentrations that exceeded corresponding minimum sediment detection limits.

Sediment, Human Health- All nondetected results for cobalt and methylene chloride exceeded sediment screening criteria. The cobalt nondetected result was from sample 18JSD0020006, which contained less than 30 percent solids. The methylene chloride results were from samples 18CSD0030006 and 18CSD0030006-D which also contained less than 30% solids. The remaining percentage of nondetected results which exceed human health criteria is relatively minor and is the result of either sample dilutions and /or percent solids less than 30 percent. Due to the minimum sediment detection limit exceedances it is uncertain whether or not those chemicals exist in sediment at concentrations that exceeded corresponding minimum sediment detection limits.

Soil, Human Health- Detection limits for one metal, a few SVOCs, VOCs and PAHs exceeded soil human health screening criteria as shown in Table F.3.2.4. All nondetected 1,4-dioxane soil results exceeded soil human health screening criteria. The soil samples were analyzed by the low level SVOC method instead

of SIM mode. Therefore, the laboratory was unable to obtain the lower detection limits for 1,4-dioxane as shown in worksheet #15 of the SAP (September 2011).

The antimony and several VOC, SVOC and PAH target analytes exceeded soil human health screening criteria as shown in Table F.3.2.4 because of sample dilutions. Examples of analytes exceeding criteria because of sample dilutions are bromoform, acenaphthylene and 4-methylphenol. Other target PAH analytes such as 2-methylnaphthalene, naphthalene, dibenzo(a,h)anthracene and benzo(a)anthracene and benzo(a)pyrene were analyzed by the laboratory by the low level SVOC method which did not enable the laboratory to obtain lower detection limits for these target analytes as shown in Worksheet #15 of the SAP (September 2011).

It was noted by the data reviewer, that in some instances, nondetected VOC target analytes exceeded human health soil criteria without sample dilution or percent solids less than 30 percent. This was the case for nondetected benzene results in two samples, 18FSS0020002 and 18CSB0040002. The benzene human health soil screening level is 0.0042 mg/kg and these samples had nondetected benzene levels of 0.00504 mg/kg and 0.00462 mg/kg, respectively. Due to the minimum soil detection limit exceedances it is uncertain whether or not those chemicals exist in soil at concentrations that exceeded corresponding minimum soil detection limits.

Surface Soil, Ecological- All nondetected 1,4-dioxane soil results exceeded soil ecological screening criteria. The surface soil samples were analyzed by the low level SVOC method instead of SIM mode. Therefore, the laboratory was unable to obtain the lower detection limits for 1,4-dioxane as shown in Worksheet #15 of the SAP (September 2011).

The high percentage of cadmium and selenium nondetected surface soil results which exceeded surface soil ecological screening criteria was the result of sample dilutions. Due to the minimum surface soil detection limit exceedances it is uncertain whether or not those chemicals exist in surface soil at concentrations that exceeded corresponding minimum surface soil detection limits.

As shown in Table F.3.2.5, 100 percent of the nondetected 2,6-dinitrotoluene results exceeded the minimum surface soil ecological criteria. It is uncertain whether or not 2,6-dinitrotoluene exists in surface soil at concentrations exceeding the corresponding minimum surface soil detection limits.

The nondetected SVOC and VOC target analyte results exceeding surface soil ecological screening criteria was the result of sample dilution. Due to the minimum surface soil detection limit exceedances it is

uncertain whether or not those chemicals exist in surface soil at concentrations that exceeded corresponding minimum surface soil detection limits.

Surface Water, Ecological- There were no surface water ecological screening level exceedances for any target analyte other than those analytes expected in Worksheet #15 of the SAP.

In conclusion, the majority of detection limits for non-detected analtye results were less than corresponding minimum screening criteria listed in the SAP therefore, sensitivity of analytical methodology for the various matrices is considered sufficient to accomplish project objects. Analytical sensitivity was not sufficient in some instances to definitively determine whether or not concentrations of some compounds were less than corresponding minimum screening as described above.

As mentioned in the beginning of this section, several target analytes had been identified for which the analytical sensitivity would be insufficient to support a direct comparison of target analyte concentrations to PSLs to determine whether the analyte concentration exceeds PSLs. Those analytes, which are listed in the SAP, are not discussed in the following discussion unless unusual circumstances caused the analytical detection limits to be greater than the planned detection limits. Disregarding these analytes, the target analyte-specific LODs reported by the laboratory were less than the PSLs for most compounds with the following significant exceptions:

- Sample 18ICP0030002 required dilution by 50-fold for PCB analysis because of the high concentrations of Aroclor 1242 and Aroclor 1254. This dilution elevated detection limits for nondetected results. It is not discernible whether these nondetected Aroclors exceeded PSLs.

- Samples 18DSB012002 and 18ESB0010608 required dilution by 10-fold for PAH analysis because of a few high concentrations of PAHs. This increased the detection limits about 10-fold. As a result in sample 18DSB012002, many PAHs were reported as nondetected and it is not discernible whether these PAHs exceeded PSLs.

- Several samples were diluted in the VOC fraction in order to obtain concentrations of analytes within instrument calibration range. Samples 18ESB0060002, 18CSB0010204, 18ESB0011415 and 18JSD0010006 required a 50-fold dilution and sample 18ESB0010608 a 250-fold dilution. This dilution elevated detection limits nondetected results. It is not discernible whether these nondetected VOC results exceeded PSLs.

- Sample 18DSB0120002 was diluted 10-fold for analysis in the SVOC fraction. The laboratory did not give an explanation in the report for the dilution. All sample results were nondetects. This 10-fold dilution elevated detection limits for the nondetected results. It is not discernible whether these SVOC results exceeded PSLs.

- Numerous samples analyzed in the metals and dissolved metals fractions in soil, sediment and groundwater media were analyzed at a dilution. In the total metals fraction there were 22 groundwater samples, 149 soil samples and 21 sediment samples diluted for analysis. In the dissolved metals fraction, 11 groundwater samples were diluted for analysis. The dilutions ranged from 2 to 25-fold. These dilutions elevated detection limits for the nondetected results in the respective sample. It is not discernible whether these nondetected metal results exceeded PSLs.

- The LODs reported for samples 18CSD0030006, 18CSD0030006-D, 18ESD0040006 and 18JSD0020006 were greater than the LODs reported for other samples. These samples had a high moisture content (83.4, 82.7, 71.8 and 88 percent respectively). Such a high moisture content (low solids content) required qualification of detections with a (J) flag and non-detects with a (UJ). The elevated detection limits represent detection limits under the assumption that all target analytes are associated with the solid portion of that sample.

In general, the elevated non-detect values interfere with the ability to definitively assess whether site concentrations for the affected target analytes are greater than PSLs or not.

F.3.3 Laboratory Accuracy

Accuracy in the laboratory was measured through the comparison of a spiked sample or laboratory control sample/laboratory control sample duplicate (LCS/LCSD) result to a known or calculated value, and is expressed as a percent recovery (%R). Accuracy was also assessed by monitoring the analytical recovery of select surrogate compounds added to samples that are analyzed by organic chromatographic methods, and the analytical recovery of calibration standards for all analyses. LCSs were used to assess the accuracy of laboratory operations with minimal sample matrix effects. Matrix spike/matrix spike duplicate (MS/MSD) and surrogate compound analyses measure the combined accuracy effects of the sample matrix, sample preparation, and sample measurement. LCS and MS analyses were performed at a frequency of one per 20 associated samples of like matrix. Laboratory accuracy was assessed by comparing calculated %R values to accuracy control limits specified by the laboratory using the appropriate SW-846 Method.

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

The inductively coupled plasma (ICP) Interference Check Sample (ICS) is evaluated to verify the laboratory's inter-element and background correction factors, and to account for potential spectral overlaps and stray light interferences caused by interfering analytes aluminum, calcium, iron, and magnesium. ICP ICS interference can affect the accuracy of analyte results and is therefore also evaluated in this section.

LCS/LCSD

A few sample results were qualified due to LCS/LCSD recovery noncompliances (54 out of the 15021 results) or 0.36% of the results. The samples with results qualified due to LCS/LCSD noncompliances can found mainly in Tables F.1.4 and F.1.5. The sample results were in the metals (both total and dissolved), PCB (9 samples) and VOC fractions (6 samples). The positive metal results affected were iron and zinc in two preparation batches. Positive Aroclor 1260 sample results were qualified in the PCB fraction from the same preparation batch. The positive metal and Aroclor 1260 results indicates a high bias in the reported results. In these cases, the biases are marginal and not considered to be significant.

All but two VOC sample results, chloromethane and vinyl chloride, qualified for LCS/LCSD recovery noncompliance were a nondetected result. The qualification of nondetected results for a LCS/LCSD recovery noncompliance indicates a low bias in the reported results. In these cases, the biases are marginal and not considered to be significant.

MS/MSD

Around 5.5 percent of the sample results were qualified due to MS/MSD noncompliances. The sample results qualified due to MS/MSD noncompliances can be found mainly in Tables F.1.3 and F.1.4. The

sample results were in the EXP fraction (8 samples), metals (151 samples), dissolved metals (22 samples) and VOC (8 samples).

Only 3 target EXP analytes were qualified in the 8 soil/sediment samples in the EXP fraction for MS/MSD noncompliances. The analytes were HMX, RDX and 2-nitrotoluene. Eighty percent of the sample results qualified was nondetects indicating a low bias in the majority of the results. The biases were marginal and not considered to be significant.

Approximately 0.24 percent of the VOC sample results were qualified due to MS/MSD noncompliances. There were 12 sample results in 8 samples qualified with a little more than half of the results being nondetects. Most of the qualifications were due to a low recovery of the target analyte in the MS and or MSD. None of the results were qualified as rejected due to the low recovery; therefore the MS/MSD qualifications in the VOC samples are inconsequential to the planned data use.

The vast majority of the samples qualified due to MS/MSD noncompliances were metals. The most frequent metal qualified for this noncompliance was antimony. All of the antimony results qualified were nondetects indicating a low bias in the reported results. Other metals with low MS recoveries were iron, magnesium, potassium, selenium and sodium. The low recovery caused target analytes to be qualified with a (J) flag. High MS recoveries for numerous metals caused detections of those target analytes to be qualified with a (J) flag. A low bias for an MS or MSD indicates a potential low bias in the reported results, and a high MS/MSD bias indicates a potential high bias in reported results. In these cases, the biases are marginal and not considered to be significant.

MS noncompliance indicates that the sample matrix is interfering with the accurate quantitation of target analytes. Understanding how chemical fractions are evaluated for MS noncompliance is essential in assessing the effect of MS non-compliances on data quality. Inorganic analytes are qualified for MS non-compliance by SDG. This means, for example, that if the MS %R for analyte “A” is non-compliant with the applicable %R criterion then analyte “A” results are qualified for MS noncompliance in sample 1 and all other samples in the same SDG. Although an SDG comprises samples of similar matrix, if different samples in a batch have different matrix compositions such as different relative proportions of clay or sand because the spiked sample may not represent matrix effects in all samples of the SDG. This effect is most pronounced on soil and sediment samples, which have a significant potential for compositional differences. Results for organic compounds are qualified only for the sample exhibiting the noncompliant %R values. These differences in qualification protocol emphasize qualification of inorganic data more than organic data. This can lead to conclusions that the inorganic data are of lesser quality than organic data quality even though the quality is similar for inorganic and organic analyses.

Surrogate Recovery

Surrogate recovery noncompliances affected samples analyzed for VOC (11), PAH (1), PCB (8), PET (1) and EXP (2). Surrogate compounds represent analytical performance in the matrix of the samples (as opposed to LCSs, which represent a clean matrix unrelated to soil samples). Overall, the percentage of samples qualified due to surrogate recovery noncompliances was low. Included in the samples qualified due to surrogate noncompliances were one rinsate blank and one groundwater sample. Any potential bias to the sample results due to a high or low surrogate recovery is minimal and has no adverse effect on data usability. No sample results were qualified as rejected due to surrogate recovery noncompliance.

Calibration

Table F.1.3 lists samples with results qualified due to calibration noncompliances. The calibration noncompliances were considered minor and the positive and nondetected results were qualified as estimated (J) or (UJ), respectively. Only one nondetected sample result, bromomethane, in sample TB-102511-01 was qualified as rejected due to calibration noncompliance.

The majority of the sample results qualified was non-detect values (71%), so the (J) flags, which suggest a potential slight high bias, do not indicate any adverse effect on data use. All calibration are inconsequential to the planned data use.

ICP Serial Dilution

Minor serial dilution noncompliances affected 149 sample results to be qualified as (J) as shown mainly in Table F.1.8. Metals qualified were aluminum, barium, chromium, iron, lead, manganese and zinc in 29 samples. There is a potential high bias in these reported metal results. The biases are not considered to adversely impact the metal results.

ICP Interference

As shown mainly in Table F.1.9, twenty-nine samples were qualified due to ICP interference noncompliances. The metals qualified in these samples were arsenic, cadmium, cobalt, lead, nickel, selenium and zinc. Only one lead sample was qualified in the dissolved metals fraction. All of the remaining samples were in the total metals fraction. The overall percentage of metals qualified due to ICP interference noncompliance was very low. The greatest number of metals qualified were cadmium (11),

selenium (9) and arsenic (8) representing less than 4% of the total quantity of metals analyzed. The qualifications due to ICP interference noncompliances suggest a potential slight high bias but do not indicate any adverse effect on data use.

Laboratory Blank Contamination

The data validation reports describe two common laboratory contaminants were detected in analytical method blanks, depending on analytical batch. The presence of this contamination resulted in elevated non-detect values being reported for the affected VOCs in multiple samples. Affected contaminants were acetone and methylene chloride. Acetone and methylene chloride are common laboratory contaminants because they are used in large quantities in the laboratory, and are the VOC contaminants detected most frequently in the method blanks. The elevated non-detect values preclude a direct comparison of sample VOC concentrations to PSLs for methylene chloride and acetone in the affected samples.

Internal Standard

Internal standard noncompliances affected one sample analyzed in the SVOC fraction, 18DSB0140002, and three samples in the VOC fraction; 18ESD0050006, 18ISD0010006 and 18CSB0010002. The internal standard areas were less than the lower quality control limit indicating a low bias in the results. Of the sixty three results qualified due to internal standard noncompliance in the four aforementioned samples only six results were positive detections. Those qualified results were not rejected and therefore are considered to be usable for this project; however, the data users should be aware that QC indicates those results are biased low.

Matrix spikes and surrogate compounds represent analytical performance in the matrix of the samples (as opposed to LCSs, which represent a clean matrix unrelated to soil samples); therefore, greater weight is given to evaluating MS and surrogate compound recoveries than to LCS/LCSD recoveries. A (J) qualifier flag was assigned to several results because of accuracy indicators that indicated a potential bias. Most results, however, were non-detect values, so the (J) flags, which suggest a potential bias, do not indicate any adverse effect on data use. The affected results are identified in the numerous data validations reports.

F.3.4 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 of 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, sub sampling, preparation for analysis, laboratory storage (if applicable), and analysis uncertainties.

Inorganic Target Analytes

Lab duplicate imprecision resulted in the qualification of both total and dissolved metals for one hundred fifteen samples. Of the 412 metal results qualified, only six results were nondetects. Data that were qualified due to laboratory duplicate imprecision are not rejected and therefore are considered acceptable for project use but the data user should be aware of potentially exaggerated imprecision compared to expectations.

Field duplicate imprecision was noted in the following samples affecting target metals; 18ASB0040002 (calcium), 18DSB0050305 (chromium, copper, lead, nickel and zinc), 18DSB0180810 (barium), 18EGWT006 (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium vanadium and zinc), 18ESS0100002 (aluminum, chromium, iron, lead and vanadium), 18HSB0020305 (aluminum) and 18SW004 (zinc). Field duplicate

noncompliance in the inorganic analytes is qualified by media and SDG. This means, for example, that if the RPD for analyte "A" is outside QC criterion then analyte "A" results are qualified for field duplicate imprecision in sample 1 and all other samples in the same SDG of the same media. Therefore, the outcome is qualification of more samples for a particular analyte. Field duplicate imprecision results are shown in Table F.3.4.1.

Aluminum, antimony, arsenic, beryllium, cadmium, calcium, cobalt, copper, iron, magnesium, mercury, potassium, selenium, sodium, vanadium and zinc results were qualified due to uncertainty near the detection limit. Positive results qualified due to uncertainty near the detection limit are considered imprecise; therefore qualified as estimated, because relative error increases as analyte concentrations approach corresponding IDLs. However, such non-compliances are not egregious enough to quality the affected data as rejected according to data validation guidelines used for this project; therefore, data precision is not considered unacceptable due to those data points qualified because of uncertainty near the detection limit.

Precision quality indicators were generally satisfactory for inorganic analytes. Minor exceedances of QC acceptance limits caused results to be qualified with a (J) flag to indicate that the uncertainty is slightly greater than ideal. However, the slightly elevated uncertainty does not represent a significant deficiency relative to the intended data use.

Organic Target Analytes

LCS/LCSD RPD values exceeded acceptance limits for multiple analytes, but the exceedances were generally rare and minor. Similar performance was observed for MS/MSD pairs.

One PCB result in two samples (18FCP0010002 and 18ICP0030002) was qualified as estimated (J flag) because of a difference (>40 percent RPD) between the result for the initial analysis and the required confirmation analysis.

Numerous EXP results were qualified in fifty-six samples in all media because of a difference (>40 percent RPD) between the result for the initial analysis and the required confirmation analysis. All noncompliant results were qualified as estimated (J flag) and were not egregious enough to qualify the affected data as rejected according to data validation guidelines used for this project. The results are considered to be usable for this project; however, the data users should be aware that QC indicates those results are biased.

Approximately 46 percent of the positive organic target analytes were qualified due to uncertainty near the detection limit. Results qualified due to uncertainty near the detection limit are considered imprecise; therefore qualified as estimated, because relative error increases as analyte concentrations approach corresponding IDLs. However, such non-compliances are not egregious enough to quality the affected data as rejected according to data validation guidelines used for this project; therefore, data precision is not considered unacceptable due to those data points qualified because of uncertainty near the detection limit.

Only two field duplicate pairs had target organic analytes qualified due to field duplicate imprecision as shown in Table F.3.4.1. Field duplicate imprecision was noted in the EXP fraction for sample 18HSS0010002 (HMX and nitrobenzene). Sample 18CSD0030006 had field duplicate imprecision in the VOC fraction for isopropylbenzene and methyl cyclohexane. All noncompliant results were qualified as estimated (J flag) and were not egregious enough to qualify the affected data as rejected according to data validation guidelines used for this project. The results are considered to be usable for this project.

Precision quality indicators were generally satisfactory for organic analytes. Minor exceedances of QC acceptance limits caused results to be qualified with a (J) flag to indicate that the uncertainty is slightly greater than ideal. However, the slightly elevated uncertainty does not represent a significant deficiency relative to the intended data use.

F.3.5 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 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 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.

In general, the results of the data described in this review are comparable in quality to the data typically observed for soil, sediment, groundwater and surface water sample VOCs, SVOCs, PAHs, PCBs, EXP, PET, metals, perchlorate, and ammonia analyses. The analytical methods used and the observed analytical performance are typical of methods used throughout the environmental industry.

As indicated in Sections F.3.3 and F.3.4, the accuracy and precision are typical for soil, sediment, groundwater and surface water sample analyses for the analytical methods that were used. As described in Section F.3.2, the greatest deficiency observed for these results is the inability to directly compare reported target analyte concentrations to PSLs for analytes with elevated non-detect values.

F.3.6 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 the site. The use of standardized sampling, sample handling, sample analysis, and data reporting procedures specified in the sampling plan (Tetra Tech, September 2011), and the selection of sampling locations were designed so that the final data would be accurate representations of actual site conditions germane to the decisions that need to be made for this project.

Samples that were qualified for hold time exceedances might have a slight adverse impact on their representativeness. As shown in Table F.1.2, the nondetected results in sample 18EGWT002 were qualified in the PET fraction and the positive RDX result in sample 18EGWT006 was qualified due to hold time exceedances.

Eighteen samples in this data review had positive explosive results qualified due to matrix interference. Three of the samples were groundwater and the remaining samples were soil. These sample results may or may not depict an accurate depiction of the environmental conditions at the site as a result of the matrix interference.

The following sediment samples contained less than 30 percent solids: 18CSD0030006, 18CSD0030006-D, 18ESD0040006 and 18JSD0020006. Parameters analyzed in these sediment samples were qualified as estimated due to the low percent solids. Due to the low percent solids, these samples may not be representative of sediment at the site as a high portion of the sample is aqueous.

As discussed in Section F.3.1, 95 percent and greater completeness was obtained in the scheduled sampling from the intended locations or near enough to those locations, and the data were of acceptable quality; therefore, the collected data are representative of the targeted populations.

F.4 Data Usability

Overall, the data quality for the analyses is typical of VOC, SVOCs, PAHs, EXP, PET, PCBs, metals, ammonia and perchlorate in soil, sediment, groundwater and surface water. Accuracy and precision performance was compromised in relatively isolated cases, and the degree of compromise is inconsequential to the project. Samples that were collected as scheduled appear to represent the intended populations. The level of data quality is comparable to typical environmental soil, sediment, groundwater and surface water analyses. The most significant limitation on data use, however, is non-detect values that exceed PSLs. When such non-detect values are reported, the data user will not be able to declare with certainty whether the site target analyte concentration exceeds the PSL or not. In these cases, the data user is limited to qualitative as well as quantitative data evaluations to assess whether target analyte concentrations exceed PSLs.

Although 22 percent of the sample results were qualified, only one nondetected VOC result was qualified as rejected. The qualified results are considered to be usable for this project; however, the data users should be aware that QC indicates some bias on the results.

Table F.1.1
NSA Crane SWMU 18
Samples Qualified for Laboratory Blank Contamination

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSB0050002-D	METHYLENE CHLORIDE	0.00582	MG/KG	U	A	Laboratory Blank Contamination
18GSB0010810	ACETONE	0.0109	MG/KG	U	A	Laboratory Blank Contamination
18GSB0020305	ACETONE	0.013	MG/KG	U	A	Laboratory Blank Contamination
18GSB0040608	ACETONE	0.00966	MG/KG	U	A	Laboratory Blank Contamination
18HMWT0030204	METHYLENE CHLORIDE	0.00423	MG/KG	U	A	Laboratory Blank Contamination
18HSB0030002	ACETONE	0.0114	MG/KG	U	A	Laboratory Blank Contamination
18HSB0030203	ACETONE	0.0828	MG/KG	U	A	Laboratory Blank Contamination
18HSD0020006	ACETONE	0.281	MG/KG	U	A	Laboratory Blank Contamination
18CSB0020002	METHYLENE CHLORIDE	0.0087	MG/KG	U	A	Laboratory Blank Contamination
18CSB0020507	METHYLENE CHLORIDE	0.0192	MG/KG	U	A	Laboratory Blank Contamination
18CSB0050002	METHYLENE CHLORIDE	0.00454	MG/KG	U	A	Laboratory Blank Contamination
18CSB0060002	METHYLENE CHLORIDE	0.0473	MG/KG	U	A	Laboratory Blank Contamination
18CSB0060203	METHYLENE CHLORIDE	0.0193	MG/KG	U	A	Laboratory Blank Contamination
18CSB0080002	METHYLENE CHLORIDE	0.00615	MG/KG	U	A	Laboratory Blank Contamination
18CSB0080305	METHYLENE CHLORIDE	0.00563	MG/KG	U	A	Laboratory Blank Contamination
18CSB0090204	METHYLENE CHLORIDE	0.00419	MG/KG	U	A	Laboratory Blank Contamination

Table F.1.2
NSA Crane SWMU 18
Samples Qualified for Holding Time Exceedance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT002	DRO (C08-C28)	0.0962	MG/L	UJ	H	Holding Time Exceedance
18EGWT002	DRO (C08-C34)	0.0962	MG/L	UJ	H	Holding Time Exceedance
18EGWT006-D	RDX	2.34	UG/L	J	H	Holding Time Exceedance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSB0050002-D	ACETONE	0.148	MG/KG	J	C	Calibration Noncompliance
08GWT008	CHLOROMETHANE	0.421	UG/L	J	CDEP	Calibration, MS/MSD Recovery and LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
08GWT012	CHLOROMETHANE	0.489	UG/L	J	CDEP	Calibration, MS/MSD Recovery and LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DGWT001	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18DGWT001	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT001-D	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18DGWT001-D	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT002	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18DGWT002	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT003	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18DGWT003	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT004	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT004	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT005	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18DGWT005	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DGWT006	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18DSB0050002	COBALT	2.86	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18DSB0050305	COBALT	9.27	MG/KG	J	C	Calibration Noncompliance
18DSB0050305-D	ANTIMONY	1.7	MG/KG	J	CDP	Calibration and MS/MSD Recovery Noncompliance and Uncertainty Near Detection Limit
18DSB0050305-D	COBALT	15.7	MG/KG	J	C	Calibration Noncompliance
18DSB0060002	COBALT	3.98	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0060406	COBALT	2.57	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0070002	COBALT	9.16	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0070507	COBALT	3.13	MG/KG	J	CDFP	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance and Uncertainty Near the Detection Limit
18DSB0080002	COBALT	10.7	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0080507	COBALT	4.49	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0090002	COBALT	4.18	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0090709	COBALT	42.8	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0100002	COBALT	3.83	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0101113	COBALT	7.71	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0110002	COBALT	7.7	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0110406	COBALT	16.8	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0120002	1,1,2,2-TETRACHLOROETHANE	0.00234	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120002	1,2,3-TRICHLOROBENZENE	0.00234	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120002	1,2,4-TRICHLOROBENZENE	0.00234	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120002	1,2-DIBROMO-3-CHLOROPROPANE	0.00234	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120002	2-HEXANONE	0.00234	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120002	4-METHYL-2-PENTANONE	0.00234	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120002	BENZALDEHYDE	2.02	MG/KG	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120002	DI-N-BUTYL PHTHALATE	2.02	MG/KG	UJ	C	Calibration Noncompliance
18DSB0120002	METHYL ACETATE	0.00467	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	1,1,2,2-TETRACHLOROETHANE	0.00232	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	1,2,3-TRICHLOROBENZENE	0.00232	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	1,2,4-TRICHLOROBENZENE	0.00232	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	1,2-DIBROMO-3-CHLOROPROPANE	0.00232	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	2-HEXANONE	0.00232	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	4-METHYL-2-PENTANONE	0.00232	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0120305	BENZALDEHYDE	0.19	MG/KG	UJ	C	Calibration Noncompliance
18DSB0120305	DI-N-BUTYL PHTHALATE	0.19	MG/KG	UJ	C	Calibration Noncompliance
18DSB0120305	METHYL ACETATE	0.00463	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	1,1,2,2-TETRACHLOROETHANE	0.00243	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	1,2,3-TRICHLOROBENZENE	0.00243	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	1,2,4-TRICHLOROBENZENE	0.00243	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	1,2-DIBROMO-3-CHLOROPROPANE	0.00243	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	2-HEXANONE	0.00243	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	4-METHYL-2-PENTANONE	0.00243	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0130002	BENZALDEHYDE	0.186	MG/KG	UJ	C	Calibration Noncompliance
18DSB0130002	DI-N-BUTYL PHTHALATE	0.186	MG/KG	UJ	C	Calibration Noncompliance
18DSB0130002	METHYL ACETATE	0.00486	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0140002	1,1,2,2-TETRACHLOROETHANE	0.00253	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140002	1,2,3-TRICHLOROBENZENE	0.00253	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140002	1,2,4-TRICHLOROBENZENE	0.00253	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140002	1,2-DIBROMO-3-CHLOROPROPANE	0.00253	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140002	2-HEXANONE	0.00253	MG/KG	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0140002	4-METHYL-2-PENTANONE	0.00253	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140002	BENZALDEHYDE	0.189	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140002	METHYL ACETATE	0.00507	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	1,1,2,2-TETRACHLOROETHANE	0.00256	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	1,2,3-TRICHLOROBENZENE	0.00256	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	1,2,4-TRICHLOROBENZENE	0.00256	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	1,2-DIBROMO-3-CHLOROPROPANE	0.00256	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	2-HEXANONE	0.00256	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	4-METHYL-2-PENTANONE	0.00256	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	BENZALDEHYDE	0.188	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	DI-N-BUTYL PHTHALATE	0.188	MG/KG	UJ	C	Calibration Noncompliance
18DSB0140406	METHYL ACETATE	0.00512	MG/KG	UJ	C	Calibration Noncompliance
18DSB0150002	1,1,2,2-TETRACHLOROETHANE	0.00244	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150002	1,2,3-TRICHLOROBENZENE	0.00244	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150002	1,2,4-TRICHLOROBENZENE	0.00244	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150002	1,2-DIBROMO-3-CHLOROPROPANE	0.00244	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150002	2-HEXANONE	0.00244	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150002	4-METHYL-2-PENTANONE	0.00244	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150002	BENZALDEHYDE	0.199	MG/KG	UJ	C	Calibration Noncompliance
18DSB0150002	DI-N-BUTYL PHTHALATE	0.199	MG/KG	UJ	C	Calibration Noncompliance
18DSB0150002	METHYL ACETATE	0.00487	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150305	1,1,2,2-TETRACHLOROETHANE	0.00242	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150305	1,2,3-TRICHLOROBENZENE	0.00242	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150305	1,2,4-TRICHLOROBENZENE	0.00242	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150305	1,2-DIBROMO-3-CHLOROPROPANE	0.00242	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150305	2-HEXANONE	0.00242	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0150305	4-METHYL-2-PENTANONE	0.00242	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0150305	BENZALDEHYDE	0.189	MG/KG	UJ	C	Calibration Noncompliance
18DSB0150305	DI-N-BUTYL PHTHALATE	0.189	MG/KG	UJ	C	Calibration Noncompliance
18DSB0150305	METHYL ACETATE	0.00484	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18DSB0160002	COBALT	4.22	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0160203	COBALT	4.67	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0170002	1,1,2,2-TETRACHLOROETHANE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170002	1,2,3-TRICHLOROBENZENE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170002	1,2,4-TRICHLOROBENZENE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170002	1,2-DIBROMO-3-CHLOROPROPANE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170002	2-HEXANONE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170002	4-METHYL-2-PENTANONE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170002	METHYL ACETATE	0.00463	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	1,1,2,2-TETRACHLOROETHANE	0.00276	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	1,2,3-TRICHLOROBENZENE	0.00276	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	1,2,4-TRICHLOROBENZENE	0.00276	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	1,2-DIBROMO-3-CHLOROPROPANE	0.00276	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	2-HEXANONE	0.00276	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	4-METHYL-2-PENTANONE	0.00276	MG/KG	UJ	C	Calibration Noncompliance
18DSB0170305	COBALT	5.87	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0170305	METHYL ACETATE	0.00551	MG/KG	UJ	C	Calibration Noncompliance
18DSB0180002	COBALT	6.7	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0180810	COBALT	5.2	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18DSB0180810-D	COBALT	6	MG/KG	J	CDF	Calibration, MS/MSD Recovery and Lab Duplicate Imprecision Noncompliance
18ECP0010002	AROCLOR-1260	0.004	MG/KG	J	CER	Calibration, LCS/LCSD Recovery and Surrogate Recovery Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ECP0020002	AROCLOR-1260	0.00943	MG/KG	J	CE	Calibration and LCS/LCSD Recovery Noncompliance
18ECP0030002	AROCLOR-1260	0.00146	MG/KG	J	CEP	Calibration and LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18EGWT001	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18EGWT002	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18EGWT003	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18EGWT003-D	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18EGWT004	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18ESB0030002	2-BUTANONE	0.00423	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESB0030002	2-HEXANONE	0.0022	MG/KG	UJ	C	Calibration Noncompliance
18ESB0030002	ACETONE	0.0394	MG/KG	J	C	Calibration Noncompliance
18ESB0040002	ACETONE	0.0688	MG/KG	J	C	Calibration Noncompliance
18ESB0050002	2-BUTANONE	0.00641	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESB0050002	2-HEXANONE	0.00243	MG/KG	UJ	C	Calibration Noncompliance
18ESB0050002	ACETONE	0.0722	MG/KG	J	C	Calibration Noncompliance
18ESD0010006	2-BUTANONE	0.0131	MG/KG	J	C	Calibration Noncompliance
18ESD0010006	2-HEXANONE	0.00268	MG/KG	UJ	C	Calibration Noncompliance
18ESD0010006	ACETONE	0.15	MG/KG	J	C	Calibration Noncompliance
18ESD0020006	2-BUTANONE	0.00662	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESD0020006	2-HEXANONE	0.00345	MG/KG	UJ	C	Calibration Noncompliance
18ESD0020006	ACETONE	0.111	MG/KG	J	C	Calibration Noncompliance
18ESD0030006	1,1,2,2-TETRACHLOROETHANE	0.00274	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ESD0030006	1,2,3-TRICHLOROBENZENE	0.00274	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ESD0030006	1,2,4-TRICHLOROBENZENE	0.00274	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ESD0030006	1,2-DIBROMO-3-CHLOROPROPANE	0.00274	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ESD0030006	2-HEXANONE	0.00274	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0030006	4-METHYL-2-PENTANONE	0.00274	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ESD0030006	METHYL ACETATE	0.00548	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ESD0040006	1,1,2,2-TETRACHLOROETHANE	0.011	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0040006	1,2,3-TRICHLOROBENZENE	0.011	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0040006	1,2,4-TRICHLOROBENZENE	0.011	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0040006	1,2-DIBROMO-3-CHLOROPROPANE	0.011	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0040006	2-HEXANONE	0.011	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0040006	4-METHYL-2-PENTANONE	0.011	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0040006	METHYL ACETATE	0.0221	MG/KG	UJ	CRY	Calibration and Surrogate Recovery Noncompliance and Percent Solids <30%
18ESD0050006	1,1,2,2-TETRACHLOROETHANE	0.00218	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2,3-TRICHLOROBENZENE	0.00218	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2,4-TRICHLOROBENZENE	0.00218	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2-DIBROMO-3-CHLOROPROPANE	0.00218	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	2-HEXANONE	0.00218	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0050006	4-METHYL-2-PENTANONE	0.00218	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	METHYL ACETATE	0.00436	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ESS0010002	COBALT	4.97	MG/KG	J	C	Calibration Noncompliance
18ESS0040002	COBALT	9.63	MG/KG	J	C	Calibration Noncompliance
18ESS0050002	ANTIMONY	2.89	MG/KG	J	CD	Calibration and MS/MSD Recovery Noncompliance
18ESS0050002	COBALT	36	MG/KG	J	C	Calibration Noncompliance
18ESS0060002	COBALT	8.34	MG/KG	J	C	Calibration Noncompliance
18ESS0090002	COBALT	9.5	MG/KG	J	C	Calibration Noncompliance
18ESS0100002	ANTIMONY	4.54	MG/KG	J	CD	Calibration and MS/MSD Recovery Noncompliance
18ESS0100002	COBALT	11.1	MG/KG	J	C	Calibration Noncompliance
18ESS0100002-D	COBALT	11.5	MG/KG	J	C	Calibration Noncompliance
18ESS0110002	COBALT	4.97	MG/KG	J	C	Calibration Noncompliance
18ESS0120002	ANTIMONY	0.401	MG/KG	J	CDP	Calibration and MS/MSD Recovery Noncompliance and Uncertainty Near Detection Limit
18ESS0120002	COBALT	13.2	MG/KG	J	C	Calibration Noncompliance
18ESS0130002	MAGNESIUM	1630	MG/KG	J	C	Calibration Noncompliance
18ESS0140002	COBALT	6.73	MG/KG	J	C	Calibration Noncompliance
18ESS0150002	COBALT	2.93	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESS0160002	COBALT	5.05	MG/KG	J	C	Calibration Noncompliance
18ESS0170002	ANTIMONY	9.95	MG/KG	J	CD	Calibration and MS/MSD Recovery Noncompliance
18ESS0170002	COBALT	71.7	MG/KG	J	C	Calibration Noncompliance
18ESW001	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18ESW001	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18ESW001	CALCIUM	47300	UG/L	J	C	Calibration Noncompliance
18ESW001	CALCIUM	52000	UG/L	J	C	Calibration Noncompliance
18ESW001	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18ESW001	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESW001	COPPER	1.94	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESW001	COPPER	3.93	UG/L	J	C	Calibration Noncompliance
18ESW001	IRON	84.4	UG/L	J	CD	Calibration and MS/MSD Recovery Noncompliance
18ESW001	IRON	11.8	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESW001	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18ESW001	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18ESW001	SODIUM	21900	UG/L	J	C	Calibration Noncompliance
18ESW001	SODIUM	24200	UG/L	J	C	Calibration Noncompliance
18ESW002	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18ESW002	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18ESW002	CALCIUM	48500	UG/L	J	C	Calibration Noncompliance
18ESW002	CALCIUM	50700	UG/L	J	C	Calibration Noncompliance
18ESW002	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18ESW002	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18ESW002	COPPER	1.95	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18ESW002	COPPER	3.8	UG/L	J	C	Calibration Noncompliance
18ESW002	IRON	60.1	UG/L	J	CD	Calibration and MS/MSD Recovery Noncompliance
18ESW002	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18ESW002	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18ESW002	SODIUM	22900	UG/L	J	C	Calibration Noncompliance
18ESW002	SODIUM	23500	UG/L	J	C	Calibration Noncompliance
18FCP0010002	AROCLOR-1260	0.00167	MG/KG	J	CEPU	Calibration and LCS/LCSD Recovery Noncompliance, Uncertainty Near the Detection Limit and RPD between Columns >40%
18FCP0020002	AROCLOR-1260	0.00269	MG/KG	J	CEP	Calibration and LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GGWT001	CHLOROMETHANE	0.731	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18GGWT002	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18GGWT003	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
18GGWT004	CHLOROMETHANE	0.492	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18GSB0010810	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	1,1-DICHLOROETHENE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	4-METHYL-2-PENTANONE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	BROMOMETHANE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	DICHLORODIFLUOROMETHANE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	METHYLENE CHLORIDE	0.012	MG/KG	J	C	Calibration Noncompliance
18GSB0010810	TETRACHLOROETHENE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	TRANS-1,2-DICHLOROETHENE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0010810	TRICHLOROFLUOROMETHANE	0.00232	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	1,1-DICHLOROETHENE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	4-METHYL-2-PENTANONE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	BROMOMETHANE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	DICHLORODIFLUOROMETHANE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	METHYLENE CHLORIDE	0.014	MG/KG	J	C	Calibration Noncompliance
18GSB0020305	TETRACHLOROETHENE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	TRANS-1,2-DICHLOROETHENE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0020305	TRICHLOROFLUOROMETHANE	0.00259	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	1,1-DICHLOROETHENE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	4-METHYL-2-PENTANONE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	BROMOMETHANE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	DICHLORODIFLUOROMETHANE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	METHYLENE CHLORIDE	0.0187	MG/KG	J	C	Calibration Noncompliance
18GSB0030709	TETRACHLOROETHENE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	TRANS-1,2-DICHLOROETHENE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0030709	TRICHLOROFLUOROMETHANE	0.00237	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	1,1-DICHLOROETHENE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	4-METHYL-2-PENTANONE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	BROMOMETHANE	0.00241	MG/KG	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GSB0040608	DICHLORODIFLUOROMETHANE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	METHYLENE CHLORIDE	0.0133	MG/KG	J	C	Calibration Noncompliance
18GSB0040608	TETRACHLOROETHENE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	TRANS-1,2-DICHLOROETHENE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18GSB0040608	TRICHLOROFLUOROMETHANE	0.00241	MG/KG	UJ	C	Calibration Noncompliance
18HGWT001	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18HGWT001	TETRYL	0.193	UG/L	J	CPQU	Calibration Noncompliance, Uncertainty Near Detection Limit, RPD Between Columns >40% and Other Problems
18HGWT002	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18HGWT003	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
18HMWT0030204	1,2,4-TRICHLOROBENZENE	0.00211	MG/KG	UJ	C	Calibration Noncompliance
18HMWT0030204	2-BUTANONE	0.00423	MG/KG	UJ	C	Calibration Noncompliance
18HMWT0030204	ACETONE	0.00511	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18HMWT0030204	VINYL CHLORIDE	0.00211	MG/KG	UJ	C	Calibration Noncompliance
18HMWT0030608	1,2,4-TRICHLOROBENZENE	0.00245	MG/KG	UJ	C	Calibration Noncompliance
18HMWT0030608	2-BUTANONE	0.0049	MG/KG	UJ	C	Calibration Noncompliance
18HMWT0030608	ACETONE	0.00727	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18HMWT0030608	VINYL CHLORIDE	0.00865	MG/KG	J	CE	Calibration and LCS/LCSD Recovery Noncompliance
18HSB0030002	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	1,1-DICHLOROETHENE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	4-METHYL-2-PENTANONE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	BROMOMETHANE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	DICHLORODIFLUOROMETHANE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	METHYLENE CHLORIDE	0.0171	MG/KG	J	C	Calibration Noncompliance
18HSB0030002	TETRACHLOROETHENE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	TRANS-1,2-DICHLOROETHENE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030002	TRICHLOROFLUOROMETHANE	0.00284	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	1,1-DICHLOROETHENE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	4-METHYL-2-PENTANONE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	BROMOMETHANE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	DICHLORODIFLUOROMETHANE	0.00228	MG/KG	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSB0030203	METHYLENE CHLORIDE	0.0331	MG/KG	J	C	Calibration Noncompliance
18HSB0030203	TETRACHLOROETHENE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	TRANS-1,2-DICHLOROETHENE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSB0030203	TRICHLOROFLUOROMETHANE	0.00228	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	1,1-DICHLOROETHENE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	4-METHYL-2-PENTANONE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	ANTIMONY	7.62	MG/KG	J	CD	Calibration and MS/MSD Recovery Noncompliance
18HSD0010006	BROMOMETHANE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	DICHLORODIFLUOROMETHANE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	METHYLENE CHLORIDE	0.0237	MG/KG	J	C	Calibration Noncompliance
18HSD0010006	TETRACHLOROETHENE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	TRANS-1,2-DICHLOROETHENE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0010006	TRICHLOROFLUOROMETHANE	0.00451	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	1,1-DICHLOROETHENE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	4-METHYL-2-PENTANONE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	BROMOMETHANE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	DICHLORODIFLUOROMETHANE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	METHYLENE CHLORIDE	0.0173	MG/KG	J	C	Calibration Noncompliance
18HSD0020006	TETRACHLOROETHENE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	TRANS-1,2-DICHLOROETHENE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18HSD0020006	TRICHLOROFLUOROMETHANE	0.00281	MG/KG	UJ	C	Calibration Noncompliance
18ICP0010002	AROCLOR-1242	0.00197	MG/KG	UJ	C	Calibration Noncompliance
18ICP0010002	AROCLOR-1254	0.0159	MG/KG	J	CR	Calibration and Surrogate Recovery Noncompliance
18ICP0020002	AROCLOR-1242	0.00171	MG/KG	UJ	C	Calibration Noncompliance
18ICP0020002	AROCLOR-1254	0.0096	MG/KG	J	CR	Calibration and Surrogate Recovery Noncompliance
18ICP0030002	AROCLOR-1242	5.95	MG/KG	J	CRU	Calibration and Surrogate Recovery Noncompliance and RPD between Columns >40%
18ICP0030002	AROCLOR-1254	2.84	MG/KG	J	CR	Calibration and Surrogate Recovery Noncompliance
18ISD0010006	1,1,2,2-TETRACHLOROETHANE	0.00634	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ISD0010006	1,2-DIBROMO-3-CHLOROPROPANE	0.00634	MG/KG	UJ	CNR	Calibration, Internal Standard and Surrogate Recovery Noncompliance
18ISD0010006	2-BUTANONE	0.0562	MG/KG	J	CR	Calibration and Surrogate Recovery Noncompliance
18ISD0010006	2-HEXANONE	0.00634	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ISD0010006	ACETONE	0.227	MG/KG	J	CR	Calibration and Surrogate Recovery Noncompliance
18ISD0010006	BROMOMETHANE	0.00634	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ISD0010006	DICHLORODIFLUOROMETHANE	0.00634	MG/KG	UJ	CR	Calibration and Surrogate Recovery Noncompliance
18ISD0010006	METHYL CYCLOHEXANE	0.471	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW001	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW001	CALCIUM	37900	UG/L	J	C	Calibration Noncompliance
18SW001	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW001	COPPER	2.59	UG/L	J	C	Calibration Noncompliance
18SW001	IRON	43.2	UG/L	J	C	Calibration Noncompliance
18SW001	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW001	SODIUM	25700	UG/L	J	C	Calibration Noncompliance
18SW002	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW002	CALCIUM	43900	UG/L	J	C	Calibration Noncompliance
18SW002	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW002	COPPER	2.75	UG/L	J	C	Calibration Noncompliance
18SW002	IRON	123	UG/L	J	C	Calibration Noncompliance
18SW002	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW002	SODIUM	31400	UG/L	J	C	Calibration Noncompliance
18SW003	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW003	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW003	CALCIUM	40300	UG/L	J	C	Calibration Noncompliance
18SW003	CALCIUM	43200	UG/L	J	C	Calibration Noncompliance
18SW003	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW003	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW003	COPPER	3.33	UG/L	J	C	Calibration Noncompliance
18SW003	COPPER	2.33	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SW003	IRON	223	UG/L	J	CD	Calibration and MS/MSD Recovery Noncompliance
18SW003	IRON	7.66	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW003	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW003	SODIUM	17900	UG/L	J	C	Calibration Noncompliance
18SW003	SODIUM	18600	UG/L	J	C	Calibration Noncompliance
18SW004	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW004	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW004	CALCIUM	53600	UG/L	J	C	Calibration Noncompliance
18SW004	CALCIUM	53600	UG/L	J	C	Calibration Noncompliance
18SW004	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW004	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW004	COPPER	1.71	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW004	COPPER	3.78	UG/L	J	C	Calibration Noncompliance
18SW004	IRON	42.1	UG/L	J	CD	Calibration and MS/MSD Recovery Noncompliance
18SW004	IRON	12.1	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW004	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW004	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW004	SODIUM	29600	UG/L	J	C	Calibration Noncompliance
18SW004	SODIUM	29300	UG/L	J	C	Calibration Noncompliance
18SW004-D	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW004-D	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW004-D	CALCIUM	51700	UG/L	J	C	Calibration Noncompliance
18SW004-D	CALCIUM	53400	UG/L	J	C	Calibration Noncompliance
18SW004-D	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW004-D	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW004-D	COPPER	1.75	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW004-D	COPPER	1.87	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SW004-D	IRON	40.8	UG/L	J	CD	Calibration and MS/MSD Recovery Noncompliance
18SW004-D	IRON	7.63	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW004-D	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW004-D	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW004-D	SODIUM	28500	UG/L	J	C	Calibration Noncompliance
18SW004-D	SODIUM	29600	UG/L	J	C	Calibration Noncompliance
18SW005	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW005	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
18SW005	CALCIUM	39500	UG/L	J	C	Calibration Noncompliance
18SW005	CALCIUM	38700	UG/L	J	C	Calibration Noncompliance
18SW005	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW005	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
18SW005	COPPER	1.31	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW005	COPPER	3.12	UG/L	J	C	Calibration Noncompliance
18SW005	IRON	48.7	UG/L	J	CD	Calibration and MS/MSD Recovery Noncompliance
18SW005	IRON	8.8	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18SW005	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW005	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
18SW005	SODIUM	9160	UG/L	J	C	Calibration Noncompliance
18SW005	SODIUM	9180	UG/L	J	C	Calibration Noncompliance
RB102011-02	1,1,1-TRICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	2-BUTANONE	9.15	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
RB102011-02	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	ACETONE	8.82	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
RB102011-02	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	BROMODICHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	CARBON TETRACHLORIDE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	CIS-1,3-DICHLOROPROPENE	0.5	UG/L	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
RB102011-02	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	COPPER	2	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	M+P-XYLENES	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	TOTAL XYLENES	1.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-02	TRICHLOROFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	1,1,1-TRICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	2-BUTANONE	6.17	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
RB102011-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	ACETONE	9.98	UG/L	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
RB102011-01	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	BROMODICHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	CARBON TETRACHLORIDE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	CIS-1,3-DICHLOROPROPENE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	COPPER	2	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	M+P-XYLENES	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	TOTAL XYLENES	1.5	UG/L	UJ	C	Calibration Noncompliance
RB102011-01	TRICHLOROFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	1,1,1-TRICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	BROMODICHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	CARBON TETRACHLORIDE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	COPPER	2	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	M+P-XYLENES	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-02	TRICHLOROFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	1,1,1-TRICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	ANTIMONY	2	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	BROMODICHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	CARBON TETRACHLORIDE	0.5	UG/L	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
RB102111-01	COBALT	2.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	COPPER	2	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	LEAD	0.75	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	M+P-XYLENES	0.5	UG/L	UJ	C	Calibration Noncompliance
RB102111-01	TRICHLOROFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB-121211-01	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB011812-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB011812-01	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB011812-01	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB012012-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB012012-01	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB012012-01	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB012312-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB011712-01	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB011712-01	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB101811-01	2-BUTANONE	5	UG/L	UJ	C	Calibration Noncompliance
TB101811-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
TB101811-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB101811-01	BROMODICHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	1,1,1-TRICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	2-BUTANONE	5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	BROMODICHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	CARBON TETRACHLORIDE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	CIS-1,3-DICHLOROPROPENE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	M+P-XYLENES	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	TOTAL XYLENES	1.5	UG/L	UJ	C	Calibration Noncompliance
TB102011-01	TRICHLOROFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	1,2-DICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	2-BUTANONE	5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	BROMOMETHANE	0.5	UG/L	UR	C	Calibration Noncompliance
TB102511-01	CHLOROMETHANE	5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	DICHLORODIFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102511-01	METHYL TERT-BUTYL ETHER	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	1,1,1-TRICHLOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
TB110211-01	1,2-DICHLOROETHANE	0.5	UG/L	UJ	CE	Calibration and LCS/LCSD Recovery Noncompliance
TB110211-01	2-BUTANONE	5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	BROMOFORM	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	CARBON DISULFIDE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	CYCLOHEXANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	DICHLORODIFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	METHYL ACETATE	1	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	METHYL TERT-BUTYL ETHER	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	METHYLENE CHLORIDE	1	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	TRANS-1,2-DICHLOROETHENE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	TRICHLOROFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB110211-01	VINYL CHLORIDE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB111811-01	BROMOFORM	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	1,2,3-TRICHLOROBENZENE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	4-METHYL-2-PENTANONE	2.5	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	ACETONE	5	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	BROMOMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	DICHLORODIFLUOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	METHYL ACETATE	1	UG/L	UJ	C	Calibration Noncompliance
TB102211-01	METHYL TERT-BUTYL ETHER	0.5	UG/L	UJ	C	Calibration Noncompliance
18BCP0010002	AROCLOR-1260	0.00345	MG/KG	J	CEP	Calibration and LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18BCP0010002-D	AROCLOR-1260	0.00191	MG/KG	J	CEPR	Calibration, LCS/LCSD Recovery and Surrogate Recovery Noncompliance and Uncertainty Near the Detection Limit
18BCP0020002	AROCLOR-1260	0.039	MG/KG	J	CE	Calibration and LCS/LCSD Recovery Noncompliance
18CCP0010002	AROCLOR-1260	0.0185	MG/KG	J	CE	Calibration and LCS/LCSD Recovery Noncompliance
18CGWT002	CHLOROMETHANE	0.5	UG/L	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CGWT003	CHLOROMETHANE	1.93	UG/L	J	C	Calibration Noncompliance
18CMWT0030204	1,1,2,2-TETRACHLOROETHANE	0.00247	MG/KG	UJ	C	Calibration Noncompliance
18CMWT0030204	1,2-DIBROMO-3-CHLOROPROPANE	0.00247	MG/KG	UJ	C	Calibration Noncompliance
18CMWT0030204	2-BUTANONE	0.00493	MG/KG	UJ	C	Calibration Noncompliance
18CMWT0030204	2-HEXANONE	0.00247	MG/KG	UJ	C	Calibration Noncompliance
18CMWT0030204	ACETONE	0.01	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CMWT0030204	BROMOMETHANE	0.00247	MG/KG	UJ	C	Calibration Noncompliance
18CMWT0030204	DICHLORODIFLUOROMETHANE	0.00247	MG/KG	UJ	C	Calibration Noncompliance
18CSB0010002	TOLUENE	0.00096	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CSB0020002	2-BUTANONE	0.00488	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020002	2-HEXANONE	0.00244	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020002	4-METHYL-2-PENTANONE	0.00244	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020002	ACETONE	0.0124	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CSB0020002	METHYL ACETATE	0.00488	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020507	2-BUTANONE	0.00707	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020507	2-HEXANONE	0.00353	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020507	4-METHYL-2-PENTANONE	0.00353	MG/KG	UJ	C	Calibration Noncompliance
18CSB0020507	ACETONE	0.0196	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CSB0020507	METHYL ACETATE	0.00707	MG/KG	UJ	C	Calibration Noncompliance
18CSB0030002	1,2,4-TRICHLOROBENZENE	0.0028	MG/KG	UJ	C	Calibration Noncompliance
18CSB0030002	2-BUTANONE	0.0056	MG/KG	UJ	C	Calibration Noncompliance
18CSB0030002	ACETONE	0.00927	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CSB0030002	CHLOROBENZENE	0.0028	MG/KG	UJ	C	Calibration Noncompliance
18CSB0030002	TETRACHLOROETHENE	0.0028	MG/KG	UJ	C	Calibration Noncompliance
18CSB0030002	TOLUENE	0.0028	MG/KG	UJ	C	Calibration Noncompliance
18CSB0050002	ACETONE	0.0318	MG/KG	J	C	Calibration Noncompliance
18CSB0060203	2-BUTANONE	0.00465	MG/KG	UJ	C	Calibration Noncompliance
18CSB0060203	4-METHYL-2-PENTANONE	0.00233	MG/KG	UJ	C	Calibration Noncompliance

Table F.1.3
NSA Crane SWMU 18
Samples Qualified for Calibration Noncompliance and Other Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSB0060203	ACETONE	0.00604	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CSB0060203	METHYL ACETATE	0.00465	MG/KG	UJ	C	Calibration Noncompliance
18CSB0080002	ACETONE	0.0481	MG/KG	J	C	Calibration Noncompliance
18CSB0080305	ACETONE	0.161	MG/KG	J	C	Calibration Noncompliance
18CSB0090002	1,1,2,2-TETRACHLOROETHANE	0.00303	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090002	1,2,3-TRICHLOROBENZENE	0.00303	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090002	1,2,4-TRICHLOROBENZENE	0.00303	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090002	1,2-DIBROMO-3-CHLOROPROPANE	0.00303	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090002	2-HEXANONE	0.00303	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090002	4-METHYL-2-PENTANONE	0.00303	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090002	METHYL ACETATE	0.00607	MG/KG	UJ	C	Calibration Noncompliance
18CSB0090204	ACETONE	0.0386	MG/KG	J	C	Calibration Noncompliance
18CSD0010006	TOLUENE	0.0025	MG/KG	UJ	C	Calibration Noncompliance
18CSD0010006-D	TOLUENE	0.00265	MG/KG	UJ	C	Calibration Noncompliance
18CSD0020006	TOLUENE	0.00339	MG/KG	UJ	C	Calibration Noncompliance
18CSD0030006	2-BUTANONE	1.99	MG/KG	UJ	CY	Calibration and Percent Solids <30% Noncompliance
18CSD0030006	ACETONE	3.98	MG/KG	UJ	CY	Calibration and Percent Solids <30% Noncompliance
18CSD0030006-D	2-BUTANONE	1.6	MG/KG	UJ	CY	Calibration and Percent Solids <30% Noncompliance
18CSD0030006-D	ACETONE	3.2	MG/KG	UJ	CY	Calibration and Percent Solids <30% Noncompliance
18CSS0010002	1,2,4-TRICHLOROBENZENE	0.00244	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002	2-BUTANONE	0.0218	MG/KG	J	C	Calibration Noncompliance
18CSS0010002	ACETONE	0.152	MG/KG	J	C	Calibration Noncompliance
18CSS0010002	CHLOROBENZENE	0.00244	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002	TETRACHLOROETHENE	0.00244	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002	TOLUENE	0.00244	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002-D	1,2,4-TRICHLOROBENZENE	0.00226	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002-D	2-BUTANONE	0.00369	MG/KG	J	CP	Calibration and Uncertainty Near the Detection Limit Noncompliances
18CSS0010002-D	ACETONE	0.0721	MG/KG	J	C	Calibration Noncompliance
18CSS0010002-D	CHLOROBENZENE	0.00226	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002-D	TETRACHLOROETHENE	0.00226	MG/KG	UJ	C	Calibration Noncompliance
18CSS0010002-D	TOLUENE	0.00226	MG/KG	UJ	C	Calibration Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
08GWT008	BROMOFORM	0.5	UG/L	UJ	DE	MS/MSD and LCS/LCSD Recovery Noncompliance
08GWT012	BROMOFORM	0.5	UG/L	UJ	DE	MS/MSD and LCS/LCSD Recovery Noncompliance
18DGWT006	ANTIMONY	4	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18DGWT006	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18DSB0010002	ANTIMONY	2.5	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0010002	POTASSIUM	494	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0010204	ANTIMONY	2.5	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0010204	POTASSIUM	395	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0020002	ANTIMONY	2.12	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0020002	POTASSIUM	581	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0020305	ANTIMONY	2.1	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0020305	POTASSIUM	380	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0030002	ANTIMONY	2.38	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0030002	POTASSIUM	516	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0030002	SODIUM	334	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0030305	ANTIMONY	2.09	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0030305	POTASSIUM	353	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0040002	ANTIMONY	2.41	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0040002	POTASSIUM	513	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0040709	ANTIMONY	2.51	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0040709	POTASSIUM	597	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0050002	ANTIMONY	2.16	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0050305	ANTIMONY	2.4	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0060002	ANTIMONY	2.34	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0060002	BARIUM	41.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060002	BERYLLIUM	0.685	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0060002	CALCIUM	1610	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0060002	CHROMIUM	16.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060002	COPPER	9.81	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060002	LEAD	9.43	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0060002	MANGANESE	88.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060002	NICKEL	9.61	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060002	POTASSIUM	473	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0060002	VANADIUM	25.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060002	ZINC	25.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0060406	ANTIMONY	0.429	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0060406	BARIUM	11.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060406	BERYLLIUM	0.263	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0060406	CALCIUM	498	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0060406	CHROMIUM	11.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060406	COPPER	6.93	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060406	LEAD	8.36	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0060406	MANGANESE	46.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060406	NICKEL	12.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060406	POTASSIUM	555	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0060406	RDX	0.0388	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0060406	VANADIUM	5.5	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0060406	ZINC	19.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070002	ANTIMONY	2.35	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0070002	BARIUM	43.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070002	BERYLLIUM	0.446	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0070002	CALCIUM	1900	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0070002	CHROMIUM	13.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070002	COPPER	7.08	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0070002	LEAD	9.27	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0070002	MANGANESE	63.5	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070002	NICKEL	9.16	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070002	POTASSIUM	672	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0070002	VANADIUM	11.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070002	ZINC	15.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	ANTIMONY	2.09	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0070507	BARIUM	30.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	BERYLLIUM	0.435	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0070507	CALCIUM	365	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0070507	CHROMIUM	14.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	COPPER	8.72	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	LEAD	3.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0070507	MANGANESE	117	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	NICKEL	15.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	POTASSIUM	1000	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0070507	VANADIUM	10.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0070507	ZINC	31.5	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	ANTIMONY	2.45	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0080002	BARIUM	61.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	BERYLLIUM	0.947	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0080002	CALCIUM	11900	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0080002	CHROMIUM	18.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	COPPER	22	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	LEAD	27.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0080002	MANGANESE	385	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	NICKEL	23	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	POTASSIUM	777	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0080002	VANADIUM	18.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080002	ZINC	70.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	ANTIMONY	2.45	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0080507	BARIUM	49.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	BERYLLIUM	0.636	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0080507	CALCIUM	1770	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0080507	CHROMIUM	21.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	COPPER	11	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	LEAD	12.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0080507	MANGANESE	65.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	NICKEL	8.16	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	POTASSIUM	656	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0080507	VANADIUM	34	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0080507	ZINC	23.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090002	ANTIMONY	2.51	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0090002	BARIUM	64.5	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090002	BERYLLIUM	0.851	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0090002	CALCIUM	2440	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0090002	CHROMIUM	19.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090002	COPPER	15.5	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090002	LEAD	12.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0090002	MANGANESE	88.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090002	NICKEL	11.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0090002	POTASSIUM	754	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0090002	VANADIUM	32.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090002	ZINC	39.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	ANTIMONY	2.19	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0090709	BARIUM	16.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	BERYLLIUM	0.444	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0090709	CALCIUM	74200	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0090709	CHROMIUM	7.89	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	COPPER	7.87	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	LEAD	7.92	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0090709	MANGANESE	543	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	NICKEL	23.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	POTASSIUM	659	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0090709	VANADIUM	5.79	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0090709	ZINC	27.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0100002	ANTIMONY	2.34	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0100002	BARIUM	39.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0100002	BERYLLIUM	0.663	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0100002	CALCIUM	2390	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0100002	CHROMIUM	18.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0100002	COPPER	12.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0100002	LEAD	11.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0100002	MANGANESE	138	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0100002	NICKEL	9.65	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0100002	POTASSIUM	563	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0100002	VANADIUM	29.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0100002	ZINC	29.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	ANTIMONY	2.28	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0101113	BARIUM	17.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	BERYLLIUM	1.04	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0101113	CALCIUM	437	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0101113	CHROMIUM	10.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	COPPER	8.83	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	LEAD	7.23	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0101113	MANGANESE	589	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	NICKEL	21.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	POTASSIUM	762	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0101113	VANADIUM	4.97	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0101113	ZINC	37	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	ANTIMONY	2.37	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0110002	BARIUM	95	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	BERYLLIUM	0.899	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0110002	CALCIUM	10300	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0110002	CHROMIUM	21.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	COPPER	17.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	LEAD	14.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0110002	MANGANESE	306	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	NICKEL	17.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	POTASSIUM	891	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0110002	VANADIUM	27.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110002	ZINC	39.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0110406	ANTIMONY	2.17	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0110406	BARIUM	27.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110406	BERYLLIUM	0.323	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0110406	CALCIUM	585	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0110406	CHROMIUM	7.63	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110406	COPPER	4.99	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110406	LEAD	8.11	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0110406	MANGANESE	133	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110406	NICKEL	3.82	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110406	POTASSIUM	1070	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0110406	VANADIUM	5.15	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0110406	ZINC	3.95	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18DSB0120002	ANTIMONY	2.49	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0120002	BARIUM	55.6	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0120002	CHROMIUM	15.8	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18DSB0120002	COBALT	9.29	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120002	LEAD	17.8	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0120002	VANADIUM	21.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0120305	ANTIMONY	2.42	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0120305	BARIUM	60.4	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0120305	CHROMIUM	11.8	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18DSB0120305	COBALT	7.15	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0120305	LEAD	7.97	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0120305	VANADIUM	19.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0130002	ANTIMONY	2.27	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0130002	BARIUM	60.2	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0130002	CHROMIUM	16.2	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18DSB0130002	COBALT	4.18	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0130002	LEAD	11.7	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0130002	VANADIUM	25.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0140002	METHYLENE CHLORIDE	0.0538	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0140002	RDX	0.0377	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0140406	ANTIMONY	2.39	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0140406	BARIUM	42.8	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0140406	CHROMIUM	17.7	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18DSB0140406	COBALT	4.27	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0140406	LEAD	8.52	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0140406	METHYLENE CHLORIDE	0.042	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0140406	TRICHLOROETHENE	0.00256	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0140406	VANADIUM	29.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0140406-D	ANTIMONY	2.25	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0140406-D	BARIUM	32.4	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0140406-D	CHROMIUM	21.7	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18DSB0140406-D	COBALT	3.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0140406-D	LEAD	12.3	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18DSB0140406-D	VANADIUM	28.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0150002	ANTIMONY	2.46	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0150002	POTASSIUM	459	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0150305	ANTIMONY	2.34	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0150305	POTASSIUM	469	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0160002	ANTIMONY	2.43	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0160002	BARIUM	62.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0160002	BERYLLIUM	0.873	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0160002	CALCIUM	3790	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0160002	CHROMIUM	26.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160002	COPPER	13	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160002	LEAD	13.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0160002	MANGANESE	94.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160002	NICKEL	10.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160002	POTASSIUM	545	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0160002	VANADIUM	37	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160002	ZINC	19.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160203	ANTIMONY	2.23	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0160203	BARIUM	62.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160203	BERYLLIUM	0.655	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0160203	CALCIUM	2510	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0160203	CHROMIUM	19.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160203	COPPER	11.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160203	LEAD	9.74	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0160203	MANGANESE	117	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0160203	NICKEL	9.95	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160203	POTASSIUM	472	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0160203	VANADIUM	26.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0160203	ZINC	21.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0170002	METHYLENE CHLORIDE	0.0552	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0170305	ANTIMONY	2.4	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0170305	BARIUM	46.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0170305	BERYLLIUM	0.699	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0170305	CALCIUM	545	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0170305	CHROMIUM	18.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0170305	COPPER	14.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0170305	LEAD	11	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0170305	MANGANESE	31	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0170305	NICKEL	11.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0170305	POTASSIUM	987	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0170305	VANADIUM	30.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0170305	ZINC	20.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	ANTIMONY	2.41	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0180002	BARIUM	56.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	BERYLLIUM	0.771	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180002	CALCIUM	21300	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0180002	CHROMIUM	18.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	COPPER	12	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	LEAD	13.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0180002	MANGANESE	359	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	NICKEL	11.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	POTASSIUM	570	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180002	VANADIUM	28.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180002	ZINC	48.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810	ANTIMONY	2.39	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0180810	BARIUM	268	MG/KG	J	DFG	MS/MSD Recovery Noncompliance, Lab Duplicate and Field Duplicate Imprecision
18DSB0180810	BERYLLIUM	0.993	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0180810	CALCIUM	387	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180810	CHROMIUM	31.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810	COPPER	16.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810	LEAD	12.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSB0180810	MANGANESE	20.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810	NICKEL	12.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810	POTASSIUM	478	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180810	VANADIUM	37.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810	ZINC	17.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810-D	ANTIMONY	2.36	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSB0180810-D	BARIUM	85	MG/KG	J	DFG	MS/MSD Recovery Noncompliance, Lab Duplicate and Field Duplicate Imprecision
18DSB0180810-D	BERYLLIUM	1.26	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180810-D	CALCIUM	442	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180810-D	CHROMIUM	34.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810-D	COPPER	18.2	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810-D	LEAD	15	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0180810-D	MANGANESE	26	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810-D	NICKEL	14	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810-D	POTASSIUM	576	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DSB0180810-D	VANADIUM	44.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSB0180810-D	ZINC	20.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18DSS0010002	ANTIMONY	2.44	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSS0010002	LEAD	62.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0010002	MAGNESIUM	14700	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0010002	MANGANESE	235	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0010002	ZINC	95.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0020002	ANTIMONY	2.46	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18DSS0020002	LEAD	24.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0020002	MAGNESIUM	2000	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0020002	MANGANESE	2240	MG/KG	J	D	MS/MSD Recovery Noncompliance
18DSS0020002	ZINC	87.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18EGWT001	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT001	ARSENIC	1.5	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT001	IRON	15	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT001	POTASSIUM	1310	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT001	SELENIUM	1.25	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT002	ANTIMONY	4	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT002	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT003	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT003	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT004	ANTIMONY	4	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT005	ANTIMONY	1.61	UG/L	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18EGWT005	ARSENIC	1.44	UG/L	J	DGP	MS/MSD Recovery Noncompliance, Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT005	IRON	15	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT005	POTASSIUM	158000	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT005	SELENIUM	4.69	UG/L	J	D	MS/MSD Recovery Noncompliance
18EGWT006	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT006	ARSENIC	4.03	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT006	IRON	585	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT006	POTASSIUM	1900	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT006	SELENIUM	1.25	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT006-D	ANTIMONY	20	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT006-D	ARSENIC	15	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT006-D	IRON	388	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT006-D	POTASSIUM	5320	UG/L	J	DGP	MS/MSD Recovery Noncompliance, Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT006-D	SELENIUM	12.5	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18EGWT007	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT007	ARSENIC	1.5	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT007	IRON	15	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT007	POTASSIUM	3220	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18EGWT007	SELENIUM	1.48	UG/L	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESB0030002	ANTIMONY	2.17	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0030002	LEAD	13.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030002	MAGNESIUM	25600	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030002	MANGANESE	858	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030002	ZINC	202	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030203	ANTIMONY	2.15	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0030203	LEAD	12.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030203	MAGNESIUM	2390	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030203	MANGANESE	410	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0030203	ZINC	40.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050002	ANTIMONY	2.3	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0050002	LEAD	14.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050002	MAGNESIUM	1230	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESB0050002	MANGANESE	259	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050002	ZINC	39.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050608	ANTIMONY	2.3	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0050608	LEAD	16.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050608	MAGNESIUM	1600	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050608	MANGANESE	329	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0050608	ZINC	44.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0060002	ANTIMONY	2.21	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0060002	LEAD	10.6	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESB0060002	MAGNESIUM	2230	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0060002	MANGANESE	118	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0060002	ZINC	32	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0060810	ANTIMONY	2.24	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0060810	LEAD	5.34	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0060810	MAGNESIUM	839	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESB0060810	MANGANESE	30.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESB0060810	ZINC	29.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	ANTIMONY	2.64	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0010006	ARSENIC	20.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	BARIUM	95.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	CADMIUM	0.514	MG/KG	J	DFKP	MS/MSD Recovery and ICP Interference Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18ESD0010006	CHROMIUM	42.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	COBALT	20.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	COPPER	22.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	LEAD	30.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	MAGNESIUM	1010	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0010006	POTASSIUM	535	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0010006	SELENIUM	1.65	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0010006	VANADIUM	34.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0010006	ZINC	216	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18ESD0020006	ANTIMONY	3.22	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0020006	ARSENIC	9.24	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0020006	BARIUM	65.1	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0020006	CHROMIUM	17.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0020006	COBALT	13.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0020006	COPPER	15.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0020006	LEAD	15.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0020006	MAGNESIUM	1090	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0020006	POTASSIUM	630	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0020006	SELENIUM	2.01	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0020006	VANADIUM	19	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0020006	ZINC	50.7	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18ESD0030006	ANTIMONY	2.21	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0030006	BARIUM	53	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESD0030006	CHROMIUM	14.3	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESD0030006	COBALT	2.95	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0030006	LEAD	18.6	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESD0030006	VANADIUM	9.35	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0040006	ANTIMONY	7.1	MG/KG	UJ	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18ESD0040006	BARIUM	1580	MG/KG	J	DFIY	MS/MSD and ICP Serial Dilution Noncompliance, Lab Duplicate Imprecision and Percent solids <30%

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0040006	CHROMIUM	147	MG/KG	J	DIY	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Percent Solids <30%
18ESD0040006	COBALT	12	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18ESD0040006	LEAD	318	MG/KG	J	DFIY	MS/MSD and ICP Serial Dilution Noncompliance, Lab Duplicate Imprecision and Percent solids <30%
18ESD0040006	VANADIUM	21.3	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18ESD0050006	ANTIMONY	2.54	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0050006	BARIUM	891	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESD0050006	CHROMIUM	31.4	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESD0050006	COBALT	3.08	MG/KG	J	DKP	MS/MSD Recovery and ICP Interference Noncompliance and Uncertainty Near the Detection Limit
18ESD0050006	LEAD	64	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESD0050006	VANADIUM	14.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESD0060006	ANTIMONY	3.96	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESD0060006	BARIUM	214	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESD0060006	CHROMIUM	26.9	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESD0060006	COBALT	6.41	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0060006	LEAD	151	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESD0060006	VANADIUM	17.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0010002	ANTIMONY	2.53	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0020002	ANTIMONY	2.35	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0020002	BARIUM	445	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0020002	CHROMIUM	53.5	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESS0020002	COBALT	13.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0020002	LEAD	124	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0020002	VANADIUM	18.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0030002	ANTIMONY	2.5	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0030002	BARIUM	722	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0030002	CHROMIUM	19.2	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESS0030002	COBALT	7.15	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0030002	LEAD	35.9	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0030002	VANADIUM	21	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0040002	ANTIMONY	2.45	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0060002	ANTIMONY	2.57	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0070002	ANTIMONY	2.55	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0070002	BARIUM	277	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESS0070002	CHROMIUM	16.5	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESS0070002	COBALT	8.14	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0070002	LEAD	27.5	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0070002	VANADIUM	25	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0080002	ANTIMONY	2.42	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0080002	BARIUM	30.8	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0080002	CHROMIUM	30.1	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESS0080002	COBALT	3.84	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0080002	LEAD	9.91	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ESS0080002	VANADIUM	11.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0090002	ANTIMONY	2.31	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0100002-D	ANTIMONY	2.54	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0110002	ANTIMONY	2.53	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0120002	MERCURY	0.15	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0120002	RDX	0.0751	MG/KG	J	DQPU	MS/MSD Recovery Noncompliance, Uncertainty Near the Detection Limit, RPD Between Columns >40% and Other Problems
18ESS0130002	2-NITROTOLUENE	0.0374	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0130002	ANTIMONY	2.49	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0130002	CHROMIUM	31.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ESS0130002	SELENIUM	1.55	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0130002	VANADIUM	50.4	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESS0140002	ANTIMONY	2.48	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0150002	ANTIMONY	2.51	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0150002	RDX	0.0367	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESS0160002	ANTIMONY	2.54	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ESW001	ALUMINUM	78.8	UG/L	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESW001	POTASSIUM	1660	UG/L	J	D	MS/MSD Recovery Noncompliance
18ESW001	POTASSIUM	1850	UG/L	J	D	MS/MSD Recovery Noncompliance
18ESW002	ALUMINUM	71.6	UG/L	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ESW002	POTASSIUM	1680	UG/L	J	D	MS/MSD Recovery Noncompliance
18ESW002	POTASSIUM	1760	UG/L	J	D	MS/MSD Recovery Noncompliance
18FSB0010002	ANTIMONY	2.23	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSB0010002	BARIUM	36.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0010002	CALCIUM	36700	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0010002	CHROMIUM	12.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0010002	MAGNESIUM	1780	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0010002	POTASSIUM	697	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0010002	VANADIUM	10.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0010507	ANTIMONY	2.29	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSB0010507	BARIUM	54.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0010507	CALCIUM	706	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18FSB0010507	CHROMIUM	18	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0010507	MAGNESIUM	1440	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18FSB0010507	POTASSIUM	891	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0010507	VANADIUM	15.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0020002	ANTIMONY	2.22	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSB0020002	BARIUM	42.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0020002	CALCIUM	1590	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0020002	CHROMIUM	15.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0020002	MAGNESIUM	1430	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0020002	POTASSIUM	493	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0020002	VANADIUM	24.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0020507	ANTIMONY	2.39	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSB0020507	BARIUM	80	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0020507	CALCIUM	525	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18FSB0020507	CHROMIUM	13.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0020507	MAGNESIUM	1110	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0020507	POTASSIUM	628	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0020507	VANADIUM	13.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0030002	ANTIMONY	2.37	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSB0030002	BARIUM	105	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18FSB0030002	CALCIUM	9510	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0030002	CHROMIUM	15.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0030002	MAGNESIUM	3080	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0030002	POTASSIUM	564	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0030002	VANADIUM	26.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0030507	ANTIMONY	2.46	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSB0030507	BARIUM	99.5	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18FSB0030507	CALCIUM	722	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18FSB0030507	CHROMIUM	25.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0030507	MAGNESIUM	1790	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSB0030507	POTASSIUM	805	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18FSB0030507	VANADIUM	31.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18FSS0020002	NAPHTHALENE	0.00504	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18FSS0020002	TOTAL XYLENES	0.00504	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GGWT001	ANTIMONY	4	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18GGWT001	ARSENIC	2.75	UG/L	J	DGP	MS/MSD Recovery Noncompliance, Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18GGWT001	IRON	22700	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GGWT001	POTASSIUM	1210	UG/L	J	DGP	MS/MSD Recovery Noncompliance, Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18GGWT001	SELENIUM	2.5	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18GGWT004	ANTIMONY	4	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18GGWT004	ARSENIC	8.61	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18GGWT004	IRON	766	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18GGWT004	POTASSIUM	5000	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18GGWT004	SELENIUM	2.5	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18GSB0010002	ANTIMONY	2.48	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0010002	BARIUM	139	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0010002	CALCIUM	457	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18GSB0010002	CHROMIUM	13	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0010002	MAGNESIUM	2020	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0010002	POTASSIUM	604	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0010002	VANADIUM	27.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0010810	ANTIMONY	2.28	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0010810	BARIUM	24.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0010810	CALCIUM	294	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GSB0010810	CHROMIUM	8.69	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0010810	MAGNESIUM	464	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0010810	POTASSIUM	499	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0010810	VANADIUM	15.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020002	ANTIMONY	2.71	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0020002	BARIUM	134	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0020002	CALCIUM	90200	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0020002	CHROMIUM	18.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020002	MAGNESIUM	4870	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020002	POTASSIUM	563	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0020002	VANADIUM	20.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020305	ANTIMONY	2.43	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0020305	BARIUM	114	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0020305	CALCIUM	705	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0020305	CHROMIUM	19.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020305	MAGNESIUM	1480	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020305	POTASSIUM	582	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0020305	VANADIUM	31.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0030002	ANTIMONY	2.38	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0030002	BARIUM	72.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0030002	CALCIUM	90400	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GSB0030002	CHROMIUM	17.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0030002	MAGNESIUM	2450	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0030002	POTASSIUM	724	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0030002	VANADIUM	20.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0030709	ANTIMONY	2.41	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0030709	BARIUM	78	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0030709	CALCIUM	640	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18GSB0030709	CHROMIUM	22.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0030709	MAGNESIUM	1170	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0030709	POTASSIUM	425	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0030709	VANADIUM	34.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0040002	ANTIMONY	2.39	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0040002	BARIUM	41.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0040002	CALCIUM	972	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18GSB0040002	CHROMIUM	16.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0040002	MAGNESIUM	2040	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0040002	POTASSIUM	571	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GSB0040002	VANADIUM	26.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0040608	ANTIMONY	2.53	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSB0040608	BARIUM	35.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18GSB0040608	CALCIUM	754	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18GSB0040608	CHROMIUM	12.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0040608	MAGNESIUM	2270	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSB0040608	POTASSIUM	513	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSB0040608	VANADIUM	18.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0010002	ANTIMONY	2.72	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSS0010002	LEAD	91.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0010002	MAGNESIUM	1920	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0010002	MANGANESE	115	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0010002	ZINC	115	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0020002	ANTIMONY	2.29	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18GSS0020002	LEAD	9.21	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0020002	MAGNESIUM	1370	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18GSS0020002	MANGANESE	350	MG/KG	J	D	MS/MSD Recovery Noncompliance
18GSS0020002	ZINC	43.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HGWT001	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18HGWT001	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18HGWT002	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18HGWT003	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18HSB0020305	ANTIMONY	0.457	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18HSB0020305	BARIUM	11.6	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSB0020305	CALCIUM	321	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSB0020305	CHROMIUM	7.41	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0020305	MAGNESIUM	307	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0020305	POTASSIUM	421	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0020305	VANADIUM	8.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0030002	ANTIMONY	2.5	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18HSB0030002	BARIUM	132	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSB0030002	CALCIUM	2330	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSB0030002	CHROMIUM	14.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0030002	MAGNESIUM	1790	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0030002	POTASSIUM	618	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18HSB0030002	VANADIUM	29.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0030203	ANTIMONY	2.27	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18HSB0030203	BARIUM	15.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSB0030203	CALCIUM	427	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18HSB0030203	CHROMIUM	27.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSB0030203	MAGNESIUM	318	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18HSB0030203	POTASSIUM	398	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18HSB0030203	VANADIUM	34.7	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSD0010006	BARIUM	969	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSD0010006	CALCIUM	17200	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSD0010006	CHROMIUM	120	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSD0010006	MAGNESIUM	5360	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSD0010006	POTASSIUM	524	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18HSD0010006	VANADIUM	20.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSD0020006	ANTIMONY	2.83	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18HSD0020006	BARIUM	14.9	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSD0020006	CALCIUM	92000	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSD0020006	CHROMIUM	11.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSD0020006	MAGNESIUM	12500	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSD0020006	VANADIUM	9.18	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSS0030002	ANTIMONY	2.25	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18HSS0030002	BARIUM	37.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18HSS0030002	CALCIUM	666	MG/KG	J	DFP	MS/MSD Recvoery Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18HSS0030002	CHROMIUM	19	MG/KG	J	D	MS/MSD Recovery Noncompliance
18HSS0030002	MAGNESIUM	551	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18HSS0030002	POTASSIUM	320	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18HSS0030002	VANADIUM	14.6	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ISD0010006	ANTIMONY	2.49	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ISD0010006	POTASSIUM	696	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ISD0020006	ANTIMONY	0.578	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISD0020006	POTASSIUM	475	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ISD0020006	SODIUM	217	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0010002	ANTIMONY	0.481	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0010002	HMX	0.49	MG/KG	J	DU	MS/MSD Recovery Noncompliance and RPD Between Columns >40%
18ISS0010002	POTASSIUM	530	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ISS0010002	RDX	0.0367	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0020002	ANTIMONY	2.65	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0020002	POTASSIUM	778	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ISS0030002	ANTIMONY	3.27	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0030002	POTASSIUM	780	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ISS0040002	ANTIMONY	2.88	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0040002	POTASSIUM	906	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ISS0050002	ANTIMONY	2.46	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ISS0050002	POTASSIUM	923	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18JGWT001	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18JGWT003	ANTIMONY	50	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18JGWT003	ANTIMONY	50	UG/L	UJ	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18JGWT004	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18JGWT004	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18JGWT005	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18JGWT005	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18JSD0010006	ARSENIC	4.18	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18JSD0010006	BARIUM	97.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18JSD0020006	ARSENIC	2850	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18JSD0020006	BARIUM	95.9	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18JSD0020006	CADMIUM	12.3	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18SD0030006	ANTIMONY	2.48	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0030006	ARSENIC	19.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	BARIUM	92.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	CADMIUM	0.691	MG/KG	J	DFKP	MS/MSD Recovery and ICP Interference Noncompliance, Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18SD0030006	CHROMIUM	31.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	COBALT	12.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	COPPER	10.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	LEAD	20.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	MAGNESIUM	767	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18SD0030006	POTASSIUM	383	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18SD0030006	SELENIUM	1.55	MG/KG	UJ	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SD0030006	VANADIUM	35.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0030006	ZINC	52.3	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18SD0040006	ANTIMONY	4.44	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0040006	ARSENIC	9.93	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	BARIUM	54.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	CADMIUM	4.24	MG/KG	J	DFK	MS/MSD Recovery and ICP Interference Noncompliance and Lab Duplicate Imprecision
18SD0040006	CHROMIUM	38.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	COBALT	13.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	COPPER	11.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	LEAD	18.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	POTASSIUM	309	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	RDX	0.0381	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0040006	SELENIUM	2.78	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0040006	VANADIUM	33	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0040006	ZINC	72.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18SD0050006	ANTIMONY	2.51	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0050006	ARSENIC	9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	BARIUM	66	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	CHROMIUM	20.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	COBALT	13.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	COPPER	9.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	LEAD	12.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	MAGNESIUM	648	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18SD0050006	POTASSIUM	410	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18SD0050006	SELENIUM	1.57	MG/KG	UJ	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SD0050006	VANADIUM	23.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006	ZINC	32.1	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18SD0050006-D	ANTIMONY	2.53	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0050006-D	ARSENIC	5.78	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	BARIUM	64.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	CHROMIUM	12.9	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	COBALT	11	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	COPPER	7.36	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	LEAD	10.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	MAGNESIUM	751	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18SD0050006-D	POTASSIUM	425	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18SD0050006-D	SELENIUM	1.58	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18SD0050006-D	VANADIUM	19.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18SD0050006-D	ZINC	25.8	MG/KG	J	DF	MS/MSD Recovery Noncompliance and Lab Duplicate Imprecision
18SW003	ALUMINUM	294	UG/L	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18SW003	POTASSIUM	3480	UG/L	J	D	MS/MSD Recovery Noncompliance
18SW003	POTASSIUM	3730	UG/L	J	D	MS/MSD Recovery Noncompliance
18SW004	ALUMINUM	49.5	UG/L	J	DIP	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18SW004	POTASSIUM	3830	UG/L	J	D	MS/MSD Recovery Noncompliance
18SW004	POTASSIUM	3790	UG/L	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SW004-D	ALUMINUM	49.6	UG/L	J	DIP	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18SW004-D	POTASSIUM	3640	UG/L	J	D	MS/MSD Recovery Noncompliance
18SW004-D	POTASSIUM	3770	UG/L	J	D	MS/MSD Recovery Noncompliance
18SW005	ALUMINUM	47.6	UG/L	J	DIP	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18SW005	POTASSIUM	1630	UG/L	J	D	MS/MSD Recovery Noncompliance
18SW005	POTASSIUM	1650	UG/L	J	D	MS/MSD Recovery Noncompliance
RB102011-02	ALUMINUM	25	UG/L	UJ	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
RB102011-02	IRON	15	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102011-02	POTASSIUM	750	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102011-01	ALUMINUM	25	UG/L	UJ	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
RB102011-01	IRON	15	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102011-01	POTASSIUM	750	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102111-02	ALUMINUM	25	UG/L	UJ	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
RB102111-02	IRON	15	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102111-02	POTASSIUM	750	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102111-01	ALUMINUM	25	UG/L	UJ	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
RB102111-01	IRON	15	UG/L	UJ	D	MS/MSD Recovery Noncompliance
RB102111-01	POTASSIUM	750	UG/L	UJ	D	MS/MSD Recovery Noncompliance
TB011012-01	BROMOFORM	0.5	UG/L	UJ	DE	MS/MSD and LCS/LCSD Recovery Noncompliance
18AGWT001	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18AGWT002	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18AGWT002	ARSENIC	0.914	UG/L	J	DGP	MS/MSD Recovery Noncompliance, Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT002	IRON	8830	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18AGWT002	POTASSIUM	4980	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18AGWT002	SELENIUM	6.25	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18AGWT003	ANTIMONY	2	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18AGWT003	ARSENIC	1.5	UG/L	UJ	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18AGWT003	POTASSIUM	1950	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18AGWT003	SELENIUM	0.943	UG/L	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18AGWT004	ANTIMONY	4	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18AGWT004	ARSENIC	3.8	UG/L	J	DGP	MS/MSD Recovery Noncompliance, Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT004	IRON	39500	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18AGWT004	POTASSIUM	5720	UG/L	J	DG	MS/MSD Recovery Noncompliance and Field Duplicate Imprecision
18AGWT004	SELENIUM	2.5	UG/L	UJ	D	MS/MSD Recovery Noncompliance
18ASB0010002	ANTIMONY	2.64	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0010002	LEAD	11.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0010002	MAGNESIUM	1300	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ASB0010002	MANGANESE	174	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASB0010002	ZINC	21.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0010204	ANTIMONY	0.48	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0010204	LEAD	10.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0010204	MAGNESIUM	945	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0010204	MANGANESE	139	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0010204	ZINC	20.3	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0020002	2-NITROTOLUENE	0.0377	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0020002	RDX	0.0377	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0030002	ANTIMONY	2.32	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0030002	LEAD	9.62	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0030002	MAGNESIUM	1640	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0030002	MANGANESE	188	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0030002	ZINC	23.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0030406	ANTIMONY	2.66	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0030406	LEAD	9.69	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0030406	MAGNESIUM	1530	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ASB0030406	MANGANESE	56.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0030406	ZINC	32.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002	ANTIMONY	0.501	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0040002	LEAD	50.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002	MAGNESIUM	1780	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002	MANGANESE	123	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002	ZINC	90.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002-D	ANTIMONY	2.7	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0040002-D	LEAD	39.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002-D	MAGNESIUM	1570	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ASB0040002-D	MANGANESE	97.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0040002-D	ZINC	73.1	MG/KG	J	D	MS/MSD Recovery Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASB0050002	ANTIMONY	2.37	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0050002	LEAD	12.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0050002	MAGNESIUM	1590	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0050002	MANGANESE	355	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0050002	ZINC	46.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0050608	ANTIMONY	2.49	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASB0050608	LEAD	20.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0050608	MAGNESIUM	1500	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ASB0050608	MANGANESE	574	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASB0050608	ZINC	36.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASD0010006	ANTIMONY	3.15	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ASD0010006	BARIUM	110	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASD0010006	CHROMIUM	108	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ASD0010006	COBALT	2.48	MG/KG	J	DP	MS/MSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18ASD0010006	LEAD	444	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASD0010006	VANADIUM	7.02	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0010002	ANTIMONY	2.54	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASS0010002	BARIUM	70.4	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0010002	CHROMIUM	18.7	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASS0010002	COBALT	11.7	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0010002	LEAD	19.1	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0010002	VANADIUM	22.6	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0020002	ANTIMONY	2.68	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASS0020002	BARIUM	168	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0020002	CHROMIUM	22.1	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ASS0020002	COBALT	15.1	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0020002	LEAD	27.1	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0020002	VANADIUM	33	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0030002	ANTIMONY	2.36	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASS0030002	BARIUM	72.3	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0030002	CHROMIUM	17.7	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ASS0030002	COBALT	7.66	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0030002	LEAD	32.4	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0030002	VANADIUM	27.4	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0030002-D	ANTIMONY	2.44	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASS0030002-D	BARIUM	66.8	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0030002-D	CHROMIUM	21.7	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance

Table F.1.4
NSA Crane SWMU 18
MS/MSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASS0030002-D	COBALT	7.48	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0030002-D	LEAD	23.9	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0030002-D	VANADIUM	32.5	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0040002	ANTIMONY	2.5	MG/KG	UJ	D	MS/MSD Recovery Noncompliance
18ASS0040002	BARIUM	83.8	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0040002	CHROMIUM	40.8	MG/KG	J	DI	MS/MSD Recovery and ICP Serial Dilution Noncompliance
18ASS0040002	COBALT	20.2	MG/KG	J	D	MS/MSD Recovery Noncompliance
18ASS0040002	LEAD	41.5	MG/KG	J	DFI	MS/MSD Recovery and ICP Serial Dilution Noncompliance and Lab Duplicate Imprecision
18ASS0040002	VANADIUM	43.8	MG/KG	J	D	MS/MSD Recovery Noncompliance
18CSD0030006	ARSENIC	51.8	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18CSD0030006	BARIUM	394	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18CSD0030006	CADMIUM	25.7	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18CSD0030006	VINYL CHLORIDE	0.994	MG/KG	UJ	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18CSD0030006-D	ARSENIC	68	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18CSD0030006-D	BARIUM	353	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%
18CSD0030006-D	CADMIUM	25.6	MG/KG	J	DY	MS/MSD Recovery Noncompliance and Percent Solids < 30%

Table F.1.5
NSA Crane SWMU 18
Samples Qualified for LCS/LCSD Noncompliances

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DGWT001	ZINC	2.16	UG/L	J	EP	LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DGWT001	ZINC	2.77	UG/L	J	EP	LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DGWT001-D	ZINC	1.63	UG/L	J	EP	LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DGWT001-D	ZINC	2.95	UG/L	J	EP	LCS/LCSD Recovery Noncompliance and Uncertainty Near the Detection Limit
18DGWT002	ZINC	189	UG/L	J	E	LCS/LCSD Recovery Noncompliance
18DGWT003	ZINC	122	UG/L	J	E	LCS/LCSD Recovery Noncompliance
18DGWT004	ZINC	119	UG/L	J	E	LCS/LCSD Recovery Noncompliance
18DGWT005	ZINC	177	UG/L	J	E	LCS/LCSD Recovery Noncompliance
18FSB0010002	IRON	14400	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18FSB0010507	IRON	13800	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18FSB0020002	IRON	17400	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18FSB0020507	IRON	12200	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18FSB0030002	IRON	20500	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18FSB0030507	IRON	21200	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0010002	IRON	16300	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0010810	IRON	15200	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0020002	IRON	15600	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0020305	IRON	16300	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0030002	IRON	14800	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0030709	IRON	46200	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0040002	IRON	19300	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18GSB0040608	IRON	29700	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18HSB0020305	IRON	12400	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18HSB0030002	IRON	17700	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18HSB0030203	IRON	93300	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18HSD0010006	IRON	27700	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18HSD0020006	IRON	11100	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
18HSS0030002	IRON	14600	MG/KG	J	E	LCS/LCSD Recovery Noncompliance
TB110211-01	BROMODICHLOROMETHANE	0.5	UG/L	UJ	E	LCS/LCSD Recovery Noncompliance
TB102211-01	BROMODICHLOROMETHANE	0.5	UG/L	UJ	E	LCS/LCSD Recovery Noncompliance

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DGWT006	ALUMINUM	5690	UG/L	J	F	Lab Duplicate Imprecision
18DGWT006	ALUMINUM	125	UG/L	UJ	F	Lab Duplicate Imprecision
18DGWT006	IRON	27900	UG/L	J	F	Lab Duplicate Imprecision
18DGWT006	IRON	75	UG/L	UJ	F	Lab Duplicate Imprecision
18DGWT006	LEAD	3.75	UG/L	UJ	F	Lab Duplicate Imprecision
18DSB0010002	MANGANESE	210	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0010204	MANGANESE	118	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0020002	MANGANESE	9.4	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0020305	MANGANESE	10.8	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0030002	MANGANESE	119	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0030305	MANGANESE	23.5	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0040002	MANGANESE	289	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0040709	MANGANESE	794	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0060002	IRON	16700	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0060406	IRON	4540	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0070002	IRON	9050	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0070507	IRON	7940	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0080002	IRON	23400	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0080507	IRON	23900	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0090002	IRON	27800	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0090709	IRON	6810	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0100002	IRON	20900	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0101113	IRON	18900	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0110002	IRON	22300	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0110406	IRON	2560	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0120002	CALCIUM	3750	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0120002	COPPER	16.7	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0120002	MANGANESE	466	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120002	ZINC	56.3	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0120305	CALCIUM	3830	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0120305	COPPER	8.16	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0120305	MANGANESE	146	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0120305	ZINC	28	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0130002	CALCIUM	6240	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0130002	COPPER	9.82	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0130002	MANGANESE	135	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0130002	ZINC	23.3	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0140406	CALCIUM	659	MG/KG	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18DSB0140406	COPPER	8.91	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0140406	MANGANESE	141	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0140406	ZINC	13.6	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0140406-D	CALCIUM	537	MG/KG	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18DSB0140406-D	COPPER	8.48	MG/KG	J	F	Lab Duplicate Imprecision

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0140406-D	MANGANESE	170	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0140406-D	ZINC	13.9	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18DSB0150002	MANGANESE	584	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0150305	MANGANESE	62.1	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0160002	IRON	30600	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0160203	IRON	23600	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0170305	IRON	10700	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0180002	IRON	23000	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0180810	IRON	35000	MG/KG	J	F	Lab Duplicate Imprecision
18DSB0180810-D	IRON	45700	MG/KG	J	F	Lab Duplicate Imprecision
18DSS0010002	CALCIUM	111000	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18DSS0020002	CALCIUM	7320	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18EGWT002	ALUMINUM	8360	UG/L	J	F	Lab Duplicate Imprecision
18EGWT002	ALUMINUM	357	UG/L	J	F	Lab Duplicate Imprecision
18EGWT002	IRON	35400	UG/L	J	F	Lab Duplicate Imprecision
18EGWT002	IRON	1550	UG/L	J	F	Lab Duplicate Imprecision
18EGWT003	ALUMINUM	2880	UG/L	J	F	Lab Duplicate Imprecision
18EGWT003	ALUMINUM	111	UG/L	J	F	Lab Duplicate Imprecision
18EGWT003	IRON	14900	UG/L	J	F	Lab Duplicate Imprecision
18EGWT003	IRON	9690	UG/L	J	F	Lab Duplicate Imprecision
18EGWT004	ALUMINUM	4250	UG/L	J	F	Lab Duplicate Imprecision
18EGWT004	IRON	17500	UG/L	J	F	Lab Duplicate Imprecision
18ESB0030002	CALCIUM	94200	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ESB0030203	CALCIUM	2230	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ESB0050002	CALCIUM	2590	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ESB0050608	CALCIUM	4110	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ESB0060002	CALCIUM	3030	MG/KG	J	FG	Lab and Field Duplicate Imprecision

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESB0060810	CALCIUM	340	MG/KG	J	FGP	Lab and Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18ESD0010006	MANGANESE	1560	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0020006	CADMIUM	0.805	MG/KG	UJ	F	Lab Duplicate Imprecision
18ESD0020006	MANGANESE	714	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0030006	CALCIUM	153000	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0030006	COPPER	23.2	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0030006	MANGANESE	219	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESD0030006	ZINC	318	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESD0040006	CALCIUM	4440	MG/KG	J	FY	Lab Duplicate Imprecision and Percent Solids <30%
18ESD0040006	COPPER	129	MG/KG	J	FY	Lab Duplicate Imprecision and Percent Solids <30%
18ESD0040006	MANGANESE	692	MG/KG	J	FIY	Lab Duplicate Imprecision, ICP Serial Dilution Noncompliance and Percent Solids <30%
18ESD0040006	ZINC	2120	MG/KG	J	FIY	Lab Duplicate Imprecision, ICP Serial Dilution Noncompliance and Percent Solids <30%
18ESD0050006	CALCIUM	113000	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0050006	COPPER	14.7	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0050006	MANGANESE	107	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESD0050006	ZINC	195	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESD0060006	CALCIUM	30800	MG/KG	J	F	Lab Duplicate Imprecision

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0060006	COPPER	53.6	MG/KG	J	F	Lab Duplicate Imprecision
18ESD0060006	MANGANESE	479	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESD0060006	ZINC	325	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0020002	CALCIUM	3440	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0020002	COPPER	29.1	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0020002	MANGANESE	1410	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0020002	ZINC	140	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0030002	CALCIUM	3890	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0030002	COPPER	20.8	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0030002	MANGANESE	522	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0030002	ZINC	126	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0070002	CALCIUM	4510	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0070002	COPPER	43.6	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0070002	MANGANESE	352	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0070002	ZINC	140	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0080002	CALCIUM	728	MG/KG	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESS0080002	COPPER	6.26	MG/KG	J	F	Lab Duplicate Imprecision
18ESS0080002	MANGANESE	72.8	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ESS0080002	ZINC	285	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18GSS0010002	CALCIUM	3910	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18GSS0020002	CALCIUM	775	MG/KG	J	FGP	Lab and Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18HGWT001	ALUMINUM	107	UG/L	J	F	Lab Duplicate Imprecision
18HGWT001	ALUMINUM	20.5	UG/L	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18HGWT001	IRON	73.3	UG/L	J	F	Lab Duplicate Imprecision
18HGWT001	IRON	23.7	UG/L	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18HGWT002	ALUMINUM	118	UG/L	J	F	Lab Duplicate Imprecision
18HGWT002	IRON	35.2	UG/L	J	F	Lab Duplicate Imprecision
18HGWT003	ALUMINUM	523	UG/L	J	F	Lab Duplicate Imprecision
18HGWT003	IRON	1940	UG/L	J	F	Lab Duplicate Imprecision
18ISD0010006	MANGANESE	139	MG/KG	J	F	Lab Duplicate Imprecision
18ISD0020006	CADMIUM	2.8	MG/KG	J	F	Lab Duplicate Imprecision
18ISS0010002	MANGANESE	121	MG/KG	J	F	Lab Duplicate Imprecision
18ISS0020002	MANGANESE	430	MG/KG	J	F	Lab Duplicate Imprecision
18ISS0030002	MANGANESE	642	MG/KG	J	F	Lab Duplicate Imprecision
18ISS0040002	MANGANESE	357	MG/KG	J	F	Lab Duplicate Imprecision
18ISS0050002	MANGANESE	285	MG/KG	J	F	Lab Duplicate Imprecision
18JGWT001	ALUMINUM	1550	UG/L	J	F	Lab Duplicate Imprecision
18JGWT001	IRON	1220	UG/L	J	F	Lab Duplicate Imprecision
18JGWT003	ALUMINUM	3490	UG/L	J	F	Lab Duplicate Imprecision

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18JGWT003	ALUMINUM	3190	UG/L	J	F	Lab Duplicate Imprecision
18JGWT003	IRON	102000	UG/L	J	F	Lab Duplicate Imprecision
18JGWT003	IRON	94000	UG/L	J	F	Lab Duplicate Imprecision
18JGWT004	ALUMINUM	447	UG/L	J	F	Lab Duplicate Imprecision
18JGWT004	ALUMINUM	405	UG/L	J	F	Lab Duplicate Imprecision
18JGWT004	IRON	4690	UG/L	J	F	Lab Duplicate Imprecision
18JGWT004	IRON	4540	UG/L	J	F	Lab Duplicate Imprecision
18JGWT005	ALUMINUM	726	UG/L	J	F	Lab Duplicate Imprecision
18JGWT005	ALUMINUM	26.6	UG/L	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18JGWT005	IRON	2290	UG/L	J	F	Lab Duplicate Imprecision
18JGWT005	IRON	38.7	UG/L	J	F	Lab Duplicate Imprecision
18JSD0010006	LEAD	14	MG/KG	J	F	Lab Duplicate Imprecision
18JSD0020006	LEAD	85.7	MG/KG	J	FY	Lab Duplicate Imprecision and Percent Solids <30%
18SD0030006	MANGANESE	1460	MG/KG	J	F	Lab Duplicate Imprecision
18SD0040006	MANGANESE	765	MG/KG	J	F	Lab Duplicate Imprecision
18SD0050006	CADMIUM	0.627	MG/KG	UJ	F	Lab Duplicate Imprecision
18SD0050006	MANGANESE	1030	MG/KG	J	F	Lab Duplicate Imprecision
18SD0050006-D	CADMIUM	0.632	MG/KG	UJ	F	Lab Duplicate Imprecision
18SD0050006-D	MANGANESE	792	MG/KG	J	F	Lab Duplicate Imprecision
18AGWT001	ALUMINUM	3110	UG/L	J	F	Lab Duplicate Imprecision
18AGWT001	IRON	1970	UG/L	J	F	Lab Duplicate Imprecision
18ASB0010002	CALCIUM	1580	MG/KG	J	FGP	Lab and Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18ASB0010204	CALCIUM	984	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ASB0030002	CALCIUM	2470	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ASB0030406	CALCIUM	716	MG/KG	J	FGP	Lab and Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18ASB0040002	CALCIUM	16200	MG/KG	J	FG	Lab and Field Duplicate Imprecision

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASB0040002-D	CALCIUM	3860	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ASB0050002	CALCIUM	9930	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ASB0050608	CALCIUM	1860	MG/KG	J	FG	Lab and Field Duplicate Imprecision
18ASD0010006	CALCIUM	136000	MG/KG	J	F	Lab Duplicate Imprecision
18ASD0010006	COPPER	359	MG/KG	J	F	Lab Duplicate Imprecision
18ASD0010006	MANGANESE	161	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASD0010006	ZINC	208	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0010002	CALCIUM	1470	MG/KG	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18ASS0010002	COPPER	11.3	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0010002	MANGANESE	660	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0010002	ZINC	33.3	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0020002	CALCIUM	1070	MG/KG	J	FP	Lab Duplicate Imprecision and Uncertainty Near the Detection Limit
18ASS0020002	COPPER	12.8	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0020002	MANGANESE	194	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0020002	ZINC	102	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0030002	CALCIUM	2850	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0030002	COPPER	15.5	MG/KG	J	F	Lab Duplicate Imprecision

Table F.1.6
NSA Crane SWMU 18
Samples Qualified for Lab Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASS0030002	MANGANESE	450	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0030002	ZINC	71.3	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0030002-D	CALCIUM	2250	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0030002-D	COPPER	14.6	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0030002-D	MANGANESE	320	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0030002-D	ZINC	43.8	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0040002	CALCIUM	29300	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0040002	COPPER	27.3	MG/KG	J	F	Lab Duplicate Imprecision
18ASS0040002	MANGANESE	1650	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18ASS0040002	ZINC	161	MG/KG	J	FI	Lab Duplicate Imprecision and ICP Serial Dilution Noncompliance
18CSD0030006	LEAD	1310	MG/KG	J	FY	Lab Duplicate Imprecision and Percent Solids <30%
18CSD0030006-D	LEAD	1360	MG/KG	J	FY	Lab Duplicate Imprecision and Percent Solids <30%

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0050305	CHROMIUM	20.3	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305	COPPER	13.3	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305	LEAD	13.4	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305	NICKEL	22.1	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305	ZINC	54.6	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305-D	CHROMIUM	102	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305-D	COPPER	28.4	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305-D	LEAD	26.8	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305-D	NICKEL	57.7	MG/KG	J	G	Field Duplicate Imprecision
18DSB0050305-D	ZINC	105	MG/KG	J	G	Field Duplicate Imprecision
18EGWT001	ALUMINUM	146	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	ALUMINUM	14.1	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT001	BARIUM	30.3	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	BERYLLIUM	0.5	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT001	CALCIUM	15200	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	CHROMIUM	0.872	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT001	COBALT	3.08	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT001	COPPER	1.06	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT001	IRON	246	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	LEAD	0.75	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT001	MAGNESIUM	5180	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	MANGANESE	47.5	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	MERCURY	0.146	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT001	NICKEL	3.12	UG/L	J	G	Field Duplicate Imprecision
18EGWT001	VANADIUM	2.5	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT001	ZINC	6.66	UG/L	J	G	Field Duplicate Imprecision

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT005	ALUMINUM	460	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	ALUMINUM	50	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT005	BARIUM	145	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	BERYLLIUM	0.5	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT005	CALCIUM	112000	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	CHROMIUM	109	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	COBALT	11.5	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	COPPER	2.94	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	IRON	885	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	LEAD	0.668	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT005	MAGNESIUM	37600	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	MANGANESE	1040	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT005	NICKEL	37.8	UG/L	J	G	Field Duplicate Imprecision
18EGWT005	VANADIUM	1.42	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT005	ZINC	4.46	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT006	ALUMINUM	5260	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	ALUMINUM	85.7	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	BARIUM	75.1	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	BERYLLIUM	0.751	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT006	CALCIUM	6080	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	CHROMIUM	10.3	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	COBALT	20.5	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	COPPER	9.66	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	IRON	30800	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	LEAD	9.89	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	MAGNESIUM	4570	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	MANGANESE	1680	UG/L	J	G	Field Duplicate Imprecision

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT006	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT006	NICKEL	31.7	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	VANADIUM	11.8	UG/L	J	G	Field Duplicate Imprecision
18EGWT006	ZINC	44.7	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	ALUMINUM	38200	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	ALUMINUM	44.4	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT006-D	BARIUM	299	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	BERYLLIUM	5.97	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT006-D	CALCIUM	17600	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	CHROMIUM	76.9	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	COBALT	83	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	COPPER	77	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	IRON	227000	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	LEAD	93.7	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	MAGNESIUM	19000	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	MANGANESE	6000	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	MERCURY	0.327	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	NICKEL	177	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	VANADIUM	68.7	UG/L	J	G	Field Duplicate Imprecision
18EGWT006-D	ZINC	328	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	ALUMINUM	134	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	ALUMINUM	25	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT007	BARIUM	47.5	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	BERYLLIUM	0.5	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT007	CALCIUM	105000	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	CHROMIUM	1.04	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT007	COBALT	35.5	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	COPPER	1.08	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT007	IRON	603	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	LEAD	0.75	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT007	MAGNESIUM	28200	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	MANGANESE	3900	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18EGWT007	NICKEL	119	UG/L	J	G	Field Duplicate Imprecision
18EGWT007	VANADIUM	1.33	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18EGWT007	ZINC	18.9	UG/L	J	G	Field Duplicate Imprecision
18ESS0100002	ALUMINUM	5670	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002	CHROMIUM	181	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002	IRON	23600	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002	LEAD	798	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002	VANADIUM	17.2	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002-D	ALUMINUM	10000	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002-D	CHROMIUM	27.1	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002-D	IRON	39700	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002-D	LEAD	55.1	MG/KG	J	G	Field Duplicate Imprecision
18ESS0100002-D	VANADIUM	33.4	MG/KG	J	G	Field Duplicate Imprecision
18ESW001	ZINC	16.8	UG/L	J	G	Field Duplicate Imprecision
18ESW002	ZINC	3.49	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18GGWT001	ALUMINUM	2010	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	ALUMINUM	334	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	BARIUM	41.6	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	BERYLLIUM	1.04	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18GGWT001	CALCIUM	7660	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	CHROMIUM	6.2	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	COBALT	24.3	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	COPPER	5.07	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	IRON	25300	UG/L	J	G	Field Duplicate Imprecision

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GGWT001	LEAD	4.06	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	MAGNESIUM	6560	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	MANGANESE	793	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18GGWT001	NICKEL	59.3	UG/L	J	G	Field Duplicate Imprecision
18GGWT001	VANADIUM	4.23	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18GGWT001	ZINC	103	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	ALUMINUM	6210	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	ALUMINUM	366	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	BARIUM	74.6	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	BERYLLIUM	1.16	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18GGWT004	CALCIUM	24200	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	CHROMIUM	11.4	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	COBALT	34	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	COPPER	21.6	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	IRON	11300	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	LEAD	11.7	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	MAGNESIUM	10800	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	MANGANESE	1180	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18GGWT004	NICKEL	88.1	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	VANADIUM	7.47	UG/L	J	G	Field Duplicate Imprecision
18GGWT004	ZINC	78.2	UG/L	J	G	Field Duplicate Imprecision
18HSB0020305	ALUMINUM	2110	MG/KG	J	G	Field Duplicate Imprecision
18HSB0020305-D	ALUMINUM	10600	MG/KG	J	G	Field Duplicate Imprecision
18HSS0010002	HMX	0.637	MG/KG	J	GU	Field Duplicate Imprecision and RPD Between Columns >40%
18HSS0010002	NITROBENZENE	0.218	MG/KG	J	GU	Field Duplicate Imprecision and RPD Between Columns >40%

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSS0010002-D	HMX	0.0555	MG/KG	J	GPU	Field Duplicate Imprecisiom, Uncertainty Near the Detection Limit and RPD Between Columns >40%
18HSS0010002-D	NITROBENZENE	0.118	MG/KG	J	GU	Field Duplicate Imprecision and RPD Between Columns >40%
18SW003	ZINC	11.1	UG/L	J	G	Field Duplicate Imprecision
18SW004	ZINC	1.52	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18SW004-D	ZINC	19.8	UG/L	J	G	Field Duplicate Imprecision
18SW005	ZINC	2.5	UG/L	UJ	G	Field Duplicate Imprecision
RB102011-02	ZINC	2.5	UG/L	UJ	G	Field Duplicate Imprecision
RB102011-01	ZINC	2.5	UG/L	UJ	G	Field Duplicate Imprecision
RB102111-02	ZINC	2.5	UG/L	UJ	G	Field Duplicate Imprecision
RB102111-01	ZINC	2.5	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT002	ALUMINUM	752	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	ALUMINUM	37.2	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT002	BARIUM	26.2	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	BERYLLIUM	0.5	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT002	CALCIUM	88700	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	CHROMIUM	4.53	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT002	COBALT	84.4	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	COPPER	2.25	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT002	IRON	9130	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	LEAD	3.75	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT002	MAGNESIUM	70700	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	MANGANESE	6290	UG/L	J	G	Field Duplicate Imprecision
18AGWT002	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT002	NICKEL	299	UG/L	J	G	Field Duplicate Imprecision

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18AGWT002	VANADIUM	12.5	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT002	ZINC	109	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	ALUMINUM	2900	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	BARIUM	22.2	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	BERYLLIUM	1.86	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	CALCIUM	37100	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	CHROMIUM	2.18	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT003	COBALT	192	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	COPPER	3.47	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	IRON	501	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	LEAD	0.75	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT003	MAGNESIUM	22700	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	MANGANESE	5260	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	MERCURY	0.2	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT003	NICKEL	259	UG/L	J	G	Field Duplicate Imprecision
18AGWT003	VANADIUM	2.5	UG/L	UJ	G	Field Duplicate Imprecision
18AGWT003	ZINC	382	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	ALUMINUM	21100	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	ALUMINUM	19100	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	BARIUM	62.6	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	BERYLLIUM	3.54	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	CALCIUM	26000	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	CHROMIUM	9.43	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	COBALT	204	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	COPPER	57.9	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	IRON	43700	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	LEAD	11.7	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	MAGNESIUM	18000	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	MANGANESE	6330	UG/L	J	G	Field Duplicate Imprecision
18AGWT004	MERCURY	0.0976	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT004	NICKEL	283	UG/L	J	G	Field Duplicate Imprecision

Table F.1.7
NSA Crane SWMU 18
Samples Qualified for Field Duplicate Imprecision

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18AGWT004	VANADIUM	5.27	UG/L	J	GP	Field Duplicate Imprecision and Uncertainty Near the Detection Limit
18AGWT004	ZINC	391	UG/L	J	G	Field Duplicate Imprecision
18CSD0030006	ISOPROPYLBENZENE	27.3	MG/KG	J	GY	Field Duplicate Imprecision and Percent Solids< 30%
18CSD0030006	METHYL CYCLOHEXANE	24.9	MG/KG	J	GY	Field Duplicate Imprecision and Percent Solids< 30%
18CSD0030006-D	ISOPROPYLBENZENE	5.1	MG/KG	J	GY	Field Duplicate Imprecision and Percent Solids< 30%
18CSD0030006-D	METHYL CYCLOHEXANE	5.78	MG/KG	J	GY	Field Duplicate Imprecision and Percent Solids< 30%

Table F.1.8
NSA Crane SWMU 18
Samples Qualified for ICP Serial Dilution Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120002	ALUMINUM	8100	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0120002	IRON	23200	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0120305	ALUMINUM	8310	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0120305	IRON	18400	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0130002	ALUMINUM	9490	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0130002	IRON	19200	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0140406	ALUMINUM	11100	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0140406	IRON	18400	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0140406-D	ALUMINUM	9150	MG/KG	J	I	ICP Serial Dilution Noncompliance
18DSB0140406-D	IRON	20100	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESD0030006	ALUMINUM	3570	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESD0030006	IRON	6450	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESD0040006	ALUMINUM	9470	MG/KG	J	IY	ICP Serial Dilution Noncompliance and Percent Solids <30%
18ESD0040006	IRON	77700	MG/KG	J	IY	ICP Serial Dilution Noncompliance and Percent Solids <30%
18ESD0050006	ALUMINUM	2720	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESD0050006	IRON	11800	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESD0060006	ALUMINUM	7710	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESD0060006	IRON	17700	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0020002	ALUMINUM	7580	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0020002	IRON	15100	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0030002	ALUMINUM	6220	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0030002	IRON	23300	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0070002	ALUMINUM	24200	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0070002	IRON	19500	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0080002	ALUMINUM	6760	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESS0080002	IRON	10700	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ESW001	ALUMINUM	35.7	UG/L	J	IP	ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18ESW002	ALUMINUM	27	UG/L	J	IP	ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit

Table F.1.8
NSA Crane SWMU 18
Samples Qualified for ICP Serial Dilution Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SW003	ALUMINUM	40.2	UG/L	J	IP	ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18SW004	ALUMINUM	28.3	UG/L	J	IP	ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18SW004-D	ALUMINUM	26.6	UG/L	J	IP	ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18SW005	ALUMINUM	25.9	UG/L	J	IP	ICP Serial Dilution Noncompliance and Uncertainty Near the Detection Limit
18ASD0010006	ALUMINUM	1940	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASD0010006	IRON	5500	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0010002	ALUMINUM	7110	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0010002	IRON	19000	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0020002	ALUMINUM	14700	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0020002	IRON	26700	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0030002	ALUMINUM	10300	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0030002	IRON	21100	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0030002-D	ALUMINUM	10500	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0030002-D	IRON	28500	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0040002	ALUMINUM	7660	MG/KG	J	I	ICP Serial Dilution Noncompliance
18ASS0040002	IRON	41800	MG/KG	J	I	ICP Serial Dilution Noncompliance

Table F.1.9
NSA Crane SWMU 18
Samples Qualified for ICP Interference

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DGWT006	LEAD	11.4	UG/L	J	K	ICP Serial Interference Noncompliance
18DSB0030305	SELENIUM	1.3	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18DSB0040002	SELENIUM	1.5	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18DSB0090709	ARSENIC	1.58	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18DSB0180810	ARSENIC	5.14	MG/KG	J	K	ICP Serial Interference Noncompliance
18DSB0180810-D	ARSENIC	6.43	MG/KG	J	K	ICP Serial Interference Noncompliance
18DSS0010002	CADMIUM	0.947	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18DSS0030002	NICKEL	21	MG/KG	J	K	ICP Serial Interference Noncompliance
18DSS0030002	ZINC	53.9	MG/KG	J	K	ICP Serial Interference Noncompliance
18ESB0080911	SELENIUM	1.35	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18ESB0110305	SELENIUM	1.54	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18ESB0120507	SELENIUM	1.57	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18ESD0030006	CADMIUM	1.02	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18ESS0100002-D	CADMIUM	0.841	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18ESS0120002	CADMIUM	0.0806	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18ESS0140002	ARSENIC	6.43	MG/KG	J	K	ICP Serial Interference Noncompliance
18GSB0020002	ARSENIC	4.9	MG/KG	J	K	ICP Serial Interference Noncompliance
18GSB0020002	CADMIUM	1.32	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18GSB0030002	ARSENIC	3.77	MG/KG	J	K	ICP Serial Interference Noncompliance
18GSB0030002	CADMIUM	0.394	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit

Table F.1.9
NSA Crane SWMU 18
Samples Qualified for ICP Interference

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSB0030203	ARSENIC	1.06	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18HSB0030203	LEAD	8	MG/KG	J	K	ICP Serial Interference Noncompliance
18HSD0020006	ARSENIC	2.76	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18HSD0020006	CADMIUM	1.21	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit
18ISD0020006	SELENIUM	0.361	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18ISS0010002	SELENIUM	0.3	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18ISS0020002	SELENIUM	1.65	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18JGWT003	LEAD	18.8	UG/L	UJ	K	ICP Serial Interference Noncompliance
18JGWT003	LEAD	18.8	UG/L	UJ	K	ICP Serial Interference Noncompliance
18ASD0010006	SELENIUM	1.62	MG/KG	UJ	K	ICP Serial Interference Noncompliance
18ASS0040002	CADMIUM	1.77	MG/KG	J	K	ICP Serial Interference Noncompliance
18DSS0030002	CADMIUM	0.422	MG/KG	J	KP	ICP Serial Interference Noncompliance and Uncertainty Near the Detection Limit

Table F.1.10
NSA Crane SWMU 18
Samples Qualified for Internal Standard Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0140002	3,3'-DICHLOROBENZIDINE	0.189	MG/KG	UJ	N	Internal Standard Recovery Noncompliance
18DSB0140002	BIS(2-ETHYLHEXYL)PHTHALATE	0.189	MG/KG	UJ	N	Internal Standard Recovery Noncompliance
18DSB0140002	BUTYL BENZYL PHTHALATE	0.189	MG/KG	UJ	N	Internal Standard Recovery Noncompliance
18DSB0140002	DI-N-OCTYL PHTHALATE	0.189	MG/KG	UJ	N	Internal Standard Recovery Noncompliance
18ESD0050006	1,1,1-TRICHLOROETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,1,2-TRICHLOROETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2-TRICHLOROTRIFLUOROETHAN	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,1-DICHLOROETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,1-DICHLOROETHENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2-DIBROMOETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2-DICHLOROBENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2-DICHLOROETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,2-DICHLOROPROPANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,3-DICHLOROBENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	1,4-DICHLOROBENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	2-BUTANONE	0.0537	MG/KG	J	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	ACETONE	0.203	MG/KG	J	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	BENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	BROMOCHLOROMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	BROMODICHLOROMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	BROMOFORM	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance

Table F.1.10
NSA Crane SWMU 18
Samples Qualified for Internal Standard Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0050006	BROMOMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CARBON DISULFIDE	0.0034	MG/KG	J	NPR	Internal Standard and Surrogate Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0050006	CARBON TETRACHLORIDE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CHLOROBENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CHLORODIBROMOMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CHLOROETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CHLOROFORM	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CHLOROMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CIS-1,2-DICHLOROETHENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CIS-1,3-DICHLOROPROPENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	CYCLOHEXANE	0.00145	MG/KG	J	NPR	Internal Standard and Surrogate Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0050006	DICHLORODIFLUOROMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	ETHYLBENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	ISOPROPYLBENZENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	M+P-XYLENES	0.00436	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	METHYL CYCLOHEXANE	0.00122	MG/KG	J	NPR	Internal Standard and Surrogate Recovery Noncompliance and Uncertainty Near the Detection Limit
18ESD0050006	METHYL TERT-BUTYL ETHER	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	METHYLENE CHLORIDE	0.155	MG/KG	J	NR	Internal Standard and Surrogate Recovery Noncompliance

Table F.1.10
NSA Crane SWMU 18
Samples Qualified for Internal Standard Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0050006	O-XYLENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	STYRENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TETRACHLOROETHENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TOLUENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TOTAL XYLENES	0.00655	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TRANS-1,2-DICHLOROETHENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TRANS-1,3-DICHLOROPROPENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TRICHLOROETHENE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	TRICHLOROFLUOROMETHANE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ESD0050006	VINYL CHLORIDE	0.00218	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ISD0010006	1,2,3-TRICHLOROBENZENE	0.00634	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ISD0010006	1,2,4-TRICHLOROBENZENE	0.00634	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ISD0010006	1,2-DICHLOROBENZENE	0.00634	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ISD0010006	1,3-DICHLOROBENZENE	0.00634	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18ISD0010006	1,4-DICHLOROBENZENE	0.00634	MG/KG	UJ	NR	Internal Standard and Surrogate Recovery Noncompliance
18CSB0010002	NAPHTHALENE	0.00242	MG/KG	UJ	N	Internal Standard Recovery Noncompliance

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
08GWT008	ARSENIC	1.24	UG/L	J	P	Uncertainty Near the Detection Limit
08GWT008	CHROMIUM	1.18	UG/L	J	P	Uncertainty Near the Detection Limit
08GWT008	TRICHLOROETHENE	0.568	UG/L	J	P	Uncertainty Near the Detection Limit
08GWT012	ARSENIC	1.28	UG/L	J	P	Uncertainty Near the Detection Limit
08GWT012	BARIUM	8.57	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	ALUMINUM	28.5	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	ALUMINUM	21.1	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	IRON	12.7	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	NICKEL	1.56	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	NICKEL	1.8	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	POTASSIUM	1170	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001	POTASSIUM	1210	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001-D	ALUMINUM	31.7	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001-D	ALUMINUM	23.8	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001-D	IRON	19.2	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001-D	NICKEL	1.76	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001-D	NICKEL	2.2	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT001-D	POTASSIUM	1160	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT002	ARSENIC	0.861	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT002	BERYLLIUM	1.08	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT002	CADMIUM	0.561	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT002	CHROMIUM	0.674	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT002	TRICHLOROETHENE	0.251	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT002	VINYL CHLORIDE	0.6	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT003	BERYLLIUM	0.793	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT003	CHLOROFORM	0.309	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT003	COPPER	1.89	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT003	LEAD	2	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT003	TRICHLOROETHENE	0.544	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT004	BERYLLIUM	0.958	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT004	CADMIUM	0.26	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT004	CHLOROFORM	0.323	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT004	COPPER	2.29	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT005	CADMIUM	0.767	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT005	CHLOROFORM	0.749	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT005	CHROMIUM	0.783	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT005	MERCURY	0.198	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DGWT005	TRICHLOROETHENE	0.965	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT006	ARSENIC	4.73	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT006	BERYLLIUM	0.59	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT006	COPPER	1.68	UG/L	J	P	Uncertainty Near the Detection Limit
18DGWT006	SELENIUM	1.86	UG/L	J	P	Uncertainty Near the Detection Limit
18DSB0010002	BERYLLIUM	0.768	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0010002	MERCURY	0.0252	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0010204	BERYLLIUM	0.554	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0010204	MAGNESIUM	1050	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0010204	MERCURY	0.0235	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0020002	BARIUM	9.7	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0020002	BERYLLIUM	0.394	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0020002	CALCIUM	668	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0020002	MAGNESIUM	291	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0020305	BARIUM	8.59	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0020305	BERYLLIUM	0.379	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030002	BERYLLIUM	0.837	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030002	MERCURY	0.018	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030305	BARIUM	10.4	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030305	BERYLLIUM	0.443	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030305	CALCIUM	494	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030305	COBALT	2.95	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030305	MAGNESIUM	781	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0030305	MERCURY	0.0165	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0040002	BERYLLIUM	0.634	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0040709	BERYLLIUM	0.959	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0040709	CALCIUM	641	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0040709	MAGNESIUM	1320	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0040709	MERCURY	0.0258	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0040709	THALLIUM	1.05	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050002	ARSENIC	2.22	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050002	BERYLLIUM	0.322	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050002	MERCURY	0.0205	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050002	POTASSIUM	407	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050305	BERYLLIUM	1.22	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050305	MERCURY	0.0237	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050305	POTASSIUM	715	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0050305-D	MAGNESIUM	1190	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050305-D	MERCURY	0.033	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0050305-D	POTASSIUM	722	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0060002	MERCURY	0.0162	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0070002	ARSENIC	2	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0070002	MAGNESIUM	1040	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0070002	MERCURY	0.0181	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0070507	ARSENIC	1.99	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0070507	MAGNESIUM	1170	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0070507	MERCURY	0.0225	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0080002	MERCURY	0.0307	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0080507	MAGNESIUM	985	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0090709	THALLIUM	0.892	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0100002	MERCURY	0.025	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0101113	ARSENIC	2.18	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0101113	MAGNESIUM	683	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0101113	MERCURY	0.0125	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0110002	MERCURY	0.0269	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0110406	ARSENIC	1.35	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0110406	MAGNESIUM	650	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0110406	MERCURY	0.0168	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120002	2-BUTANONE	0.00553	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0120002	BERYLLIUM	0.859	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120002	CARBON DISULFIDE	0.00138	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0120002	CYCLOHEXANE	0.00174	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0120002	MAGNESIUM	1390	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120002	MERCURY	0.0347	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120002	METHYL CYCLOHEXANE	0.0018	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0120002	PHENANTHRENE	22	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120002	POTASSIUM	662	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120002	TOLUENE	0.00129	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120305	2-BUTANONE	0.00501	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0120305	ARSENIC	3	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	BENZO(B)FLUORANTHENE	2.5	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	BERYLLIUM	0.771	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	CHRYSENE	2.12	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	FLUORANTHENE	2.33	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	MAGNESIUM	1370	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	MERCURY	0.0208	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	PHENANTHRENE	6.95	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	POTASSIUM	498	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0120305	PYRENE	2.47	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0130002	ACENAPHTHENE	2.05	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0130002	ANTHRACENE	4.61	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0130002	BERYLLIUM	0.67	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0130002	DIBENZO(A,H)ANTHRACENE	7.22	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0130002	MERCURY	0.0336	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0130002	POTASSIUM	374	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140002	ACETONE	0.0124	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140002	BERYLLIUM	0.835	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140002	POTASSIUM	494	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406	ACETONE	0.00803	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406	BERYLLIUM	0.744	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406	MAGNESIUM	1320	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406-D	BERYLLIUM	0.729	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406-D	MAGNESIUM	1170	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406-D	MERCURY	0.0157	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0140406-D	POTASSIUM	289	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150002	2-METHYLNAPHTHALENE	2.44	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150002	ACETONE	0.0133	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0150002	BERYLLIUM	0.965	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150002	CADMIUM	0.554	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150002	CYCLOHEXANE	0.00292	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0150002	METHYL CYCLOHEXANE	0.0031	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0150002	TOLUENE	0.00184	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0150305	ACETONE	0.00954	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18DSB0150305	ARSENIC	2.92	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	BERYLLIUM	0.548	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	CALCIUM	1220	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	COBALT	3.48	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	FLUORANTHENE	2.31	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	MAGNESIUM	839	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	MERCURY	0.0172	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	PHENANTHRENE	2.46	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0150305	PYRENE	2.38	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0160002	MAGNESIUM	1490	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0160002	MERCURY	0.0319	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0160203	MAGNESIUM	1290	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0160203	MERCURY	0.0255	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170002	ACETONE	0.0158	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170002	BERYLLIUM	0.632	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170002	CADMIUM	0.285	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170002	MERCURY	0.0234	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170002	POTASSIUM	410	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170305	ACETONE	0.00896	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170305	MAGNESIUM	1060	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0170305	MERCURY	0.0256	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0180002	CADMIUM	0.343	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0180002	MERCURY	0.0209	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSB0180810	MAGNESIUM	1470	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSS0010002	4-NITROTOLUENE	0.0347	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18DSS0010002	BERYLLIUM	0.396	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSS0010002	POTASSIUM	449	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSS0020002	BERYLLIUM	1.14	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSS0020002	HMX	0.0498	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18DSS0020002	POTASSIUM	423	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSS0030002	BERYLLIUM	1.2	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSS0030002	MERCURY	0.0251	MG/KG	J	P	Uncertainty Near the Detection Limit
18DSS0030002	THALLIUM	2.08	MG/KG	J	P	Uncertainty Near the Detection Limit
18EGWT001	COBALT	2.84	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT001	MERCURY	0.13	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT001	POTASSIUM	310	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	ACETONE	4.41	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	ARSENIC	0.771	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	BERYLLIUM	0.726	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	CHROMIUM	1.06	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	COPPER	2.48	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	FLUORANTHENE	0.0487	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT002	TETRACHLOROETHENE	0.629	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT003	2-NITROTOLUENE	0.105	UG/L	J	PQRU	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance, RPD between columns > 40%, Other Problems
18EGWT003	4-AMINO-2,6-DINITROTOLUENE	0.157	UG/L	J	PRU	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance, RPD between columns > 40%
18EGWT003	ARSENIC	2.3	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT003	BERYLLIUM	0.302	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT003	CHROMIUM	0.686	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT003	CIS-1,2-DICHLOROETHENE	0.531	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT003	HMX	0.149	UG/L	J	PRU	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance, RPD between columns > 40%
18EGWT003	NITROBENZENE	0.106	UG/L	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18EGWT003-D	CIS-1,2-DICHLOROETHENE	0.492	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT004	ACETONE	3.32	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT004	ALUMINUM	44.6	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT004	BERYLLIUM	0.625	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT004	POTASSIUM	1840	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT004	TRICHLOROETHENE	0.953	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT005	COPPER	2.09	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT006	COPPER	1.79	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT006	POTASSIUM	962	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT006-D	CHROMIUM	0.508	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT006-D	POTASSIUM	886	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT007	2-NITROTOLUENE	0.146	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT007	CHROMIUM	0.549	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT007	COPPER	1.02	UG/L	J	P	Uncertainty Near the Detection Limit
18EGWT007	HMX	0.124	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18EGWT007	SELENIUM	1.71	UG/L	J	P	Uncertainty Near the Detection Limit
18ESB0010002	BENZO(B)FLUORANTHENE	0.00234	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ESB0010002	BENZO(K)FLUORANTHENE	0.00208	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ESB0010002	CHRYSENE	0.00259	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ESB0010002	DIBENZO(A,H)ANTHRACENE	0.00356	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ESB0010608	ETHYLBENZENE	0.58	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0011415	ACENAPHTHENE	0.00347	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0011415	BENZO(B)FLUORANTHENE	0.0041	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0011415	DIBENZO(A,H)ANTHRACENE	0.00324	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0011415	INDENO(1,2,3-CD)PYRENE	0.00425	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0020002	2-METHYLNAPHTHALENE	0.00503	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0020406	NAPHTHALENE	0.00564	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0020406	PHENANTHRENE	0.00536	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0020406	PYRENE	0.00422	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	2-AMINO-4,6-DINITROTOLUENE	0.0266	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	BENZENE	0.00136	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	BERYLLIUM	0.539	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	CARBON DISULFIDE	0.00298	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	CYCLOHEXANE	0.00396	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	MERCURY	0.0234	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	POTASSIUM	537	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	THALLIUM	1.34	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030002	TOLUENE	0.00329	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030203	BERYLLIUM	0.822	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0030203	POTASSIUM	764	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040002	2,4,6-TRINITROTOLUENE	0.0427	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040002	2-BUTANONE	0.00473	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESB0040002	BERYLLIUM	0.704	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040002	MAGNESIUM	1380	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040002	POTASSIUM	413	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040203	BERYLLIUM	0.438	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040203	CALCIUM	786	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040203	COBALT	2.03	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0040203	MAGNESIUM	1000	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	BERYLLIUM	0.824	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	CADMIUM	0.78	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	CARBON DISULFIDE	0.00287	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	CYCLOHEXANE	0.00317	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	HMX	0.0389	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	MERCURY	0.0257	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	METHYL CYCLOHEXANE	0.00336	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	POTASSIUM	522	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	TOLUENE	0.00203	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	TRICHLOROETHENE	0.00317	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050608	BERYLLIUM	1.43	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050608	CADMIUM	0.366	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050608	HMX	0.0476	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050608	MERCURY	0.0355	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050608	POTASSIUM	518	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060002	BERYLLIUM	0.702	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060002	POTASSIUM	757	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060810	ARSENIC	2.68	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060810	BARIUM	10.5	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060810	BERYLLIUM	0.309	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060810	COBALT	2.5	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0060810	POTASSIUM	297	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0070002	BERYLLIUM	0.685	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0070002	POTASSIUM	476	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0071214	BERYLLIUM	1.28	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0071214	CALCIUM	1140	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0071214	MERCURY	0.0179	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0071214	RDX	0.0489	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESB0080002	BERYLLIUM	0.563	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESB0080002	COBALT	2.61	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0080002	MAGNESIUM	1220	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0080002	MERCURY	0.0144	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0080002	POTASSIUM	348	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0080911	BERYLLIUM	0.761	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0080911	POTASSIUM	448	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0090002	BERYLLIUM	0.641	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0090002	COBALT	2.51	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0090002	MAGNESIUM	933	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0090002	POTASSIUM	351	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0091113	BERYLLIUM	0.428	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0091113	MAGNESIUM	877	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0091113	MERCURY	0.026	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0091113	POTASSIUM	821	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0100002	BERYLLIUM	0.694	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0100002	HMX	0.0393	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0100002	POTASSIUM	546	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0100002	RDX	0.0216	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESB0110002	BERYLLIUM	0.589	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110002	CALCIUM	323	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110002	COBALT	2.84	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110002	MAGNESIUM	1100	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110002	MERCURY	0.0143	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110002	POTASSIUM	402	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110002	RDX	0.0301	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESB0110305	CALCIUM	638	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110305	MERCURY	0.017	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110305	POTASSIUM	595	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0110305	RDX	0.0337	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESB0110305	THALLIUM	2.43	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0120002	BERYLLIUM	0.733	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0120002	CALCIUM	1040	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0120002	COBALT	3.75	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0120002	MAGNESIUM	1310	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESB0120002	MERCURY	0.0273	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0120002	POTASSIUM	498	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0120507	MERCURY	0.0286	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0010006	BERYLLIUM	1.52	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0010006	MERCURY	0.0332	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0010006	THALLIUM	2.24	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0020006	BERYLLIUM	0.863	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0020006	CARBON DISULFIDE	0.00408	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0020006	MERCURY	0.0296	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0020006	RDX	0.0333	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0030006	ARSENIC	1.88	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0030006	BERYLLIUM	0.612	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0030006	CYCLOHEXANE	0.0019	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ESD0030006	MERCURY	0.0179	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0030006	METHYL CYCLOHEXANE	0.00176	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ESD0040006	1,3-DINITROBENZENE	0.0605	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18ESD0040006	2,4,6-TRINITROTOLUENE	0.0754	MG/KG	J	PUY	Uncertainty Near the Detection Limit, RPD between Columns >40%, Percent Solids <30%
18ESD0040006	CARBON DISULFIDE	0.0155	MG/KG	J	PRY	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance, Percent Solids<30%
18ESD0040006	MAGNESIUM	1390	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18ESD0050006	2,4-DINITROTOLUENE	0.0336	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESD0050006	4-NITROTOLUENE	0.0668	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESD0050006	ARSENIC	2.93	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0050006	BERYLLIUM	0.432	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0050006	HMX	0.0424	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0050006	NITROBENZENE	0.0307	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESD0050006	RDX	0.076	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0060006	ARSENIC	4.32	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0060006	BERYLLIUM	0.77	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0060006	CADMIUM	2.18	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESD0060006	NITROBENZENE	0.0436	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESD0060006	POTASSIUM	614	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0010002	BERYLLIUM	0.954	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0010002	POTASSIUM	392	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0020002	BERYLLIUM	0.988	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0020002	HMX	0.0262	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0020002	MAGNESIUM	1160	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0020002	POTASSIUM	612	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0030002	BERYLLIUM	0.651	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0030002	CADMIUM	1.02	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0030002	HMX	0.0342	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0030002	MAGNESIUM	994	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0030002	POTASSIUM	512	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0030002	RDX	0.0538	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESS0040002	BERYLLIUM	0.639	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0040002	CALCIUM	922	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0040002	MAGNESIUM	737	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0040002	MERCURY	0.0331	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0040002	POTASSIUM	428	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0050002	BERYLLIUM	0.864	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0050002	CALCIUM	1220	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0050002	MAGNESIUM	833	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0050002	POTASSIUM	451	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0060002	BERYLLIUM	1.19	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0060002	CALCIUM	631	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0060002	MAGNESIUM	507	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0060002	POTASSIUM	361	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0070002	2,4-DINITROTOLUENE	0.0371	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESS0070002	BERYLLIUM	0.686	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0070002	CADMIUM	1.07	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0070002	MAGNESIUM	1250	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESS0070002	POTASSIUM	673	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0080002	BERYLLIUM	0.485	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0080002	MAGNESIUM	913	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0080002	MERCURY	0.0253	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0080002	POTASSIUM	525	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0090002	3-NITROTOLUENE	0.0459	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ESS0090002	BERYLLIUM	0.859	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0090002	CALCIUM	1030	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0090002	POTASSIUM	620	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002	BERYLLIUM	0.686	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002	CADMIUM	0.505	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002	POTASSIUM	364	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002	THALLIUM	1.15	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002-D	1,3-DINITROBENZENE	0.0617	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0100002-D	BERYLLIUM	1.1	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002-D	POTASSIUM	539	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0100002-D	THALLIUM	0.957	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0110002	BERYLLIUM	0.672	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0110002	POTASSIUM	450	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0120002	4-AMINO-2,6-DINITROTOLUENE	0.023	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0130002	MERCURY	0.0384	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0140002	1,3,5-TRINITROBENZENE	0.0386	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0140002	CALCIUM	957	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0140002	MERCURY	0.0169	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0140002	POTASSIUM	624	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0150002	BERYLLIUM	0.866	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0150002	CALCIUM	587	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0150002	MAGNESIUM	928	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0150002	MERCURY	0.0158	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0150002	POTASSIUM	437	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0160002	BERYLLIUM	1.16	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0160002	CALCIUM	745	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0160002	POTASSIUM	452	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0170002	BERYLLIUM	0.931	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0170002	CALCIUM	1240	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESS0170002	MAGNESIUM	842	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0170002	POTASSIUM	510	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESS0170002	SELENIUM	1.52	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESW001	CHROMIUM	0.613	UG/L	J	P	Uncertainty Near the Detection Limit
18ESW001	CHROMIUM	0.526	UG/L	J	P	Uncertainty Near the Detection Limit
18ESW002	NICKEL	2.3	UG/L	J	P	Uncertainty Near the Detection Limit
18FCP0010002	AROCLOR-1016	0.00367	MG/KG	J	P	Uncertainty Near the Detection Limit
18FGWT001-D	PHENANTHRENE	0.0519	UG/L	J	P	Uncertainty Near the Detection Limit
18FSB0010002	ARSENIC	2.39	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0010002	BERYLLIUM	0.574	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0010507	ARSENIC	1.94	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0010507	BERYLLIUM	0.969	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0020002	BERYLLIUM	0.636	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0020002	COBALT	3.45	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0020002	MERCURY	0.0327	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0020507	ARSENIC	2.28	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0020507	BERYLLIUM	0.445	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0020507	MERCURY	0.0175	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0030002	BERYLLIUM	0.872	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0030507	BERYLLIUM	0.812	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSB0030507	MERCURY	0.0319	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSS0010002-D	2-METHYLNAPHTHALENE	0.00758	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSS0010002-D	BENZENE	0.00063	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSS0010002-D	TOLUENE	0.001	MG/KG	J	P	Uncertainty Near the Detection Limit
18FSS0020002	2-METHYLNAPHTHALENE	0.00244	MG/KG	J	P	Uncertainty Near the Detection Limit
18GGWT001	BERYLLIUM	0.777	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT001	CHROMIUM	1.67	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT001	COPPER	2.54	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT001	POTASSIUM	1130	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT002	BERYLLIUM	1.05	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT002	BERYLLIUM	0.951	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT002	CHROMIUM	1.38	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT002	CHROMIUM	1.02	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT002	POTASSIUM	1140	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT002	POTASSIUM	1070	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT003	AMMONIA-N	0.195	MG/L	J	P	Uncertainty Near the Detection Limit
18GGWT003	BERYLLIUM	0.544	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18GGWT003	CARBON DISULFIDE	0.409	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT003	CHLOROMETHANE	0.382	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT003	CHROMIUM	1.31	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT003	CIS-1,2-DICHLOROETHENE	0.35	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT003	COPPER	1.48	UG/L	J	P	Uncertainty Near the Detection Limit
18GGWT004	AMMONIA-N	0.238	MG/L	J	P	Uncertainty Near the Detection Limit
18GGWT004	CHROMIUM	1.02	UG/L	J	P	Uncertainty Near the Detection Limit
18GSB0010002	BERYLLIUM	1.21	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0010002	MERCURY	0.0229	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0010002	THALLIUM	2.23	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0010810	BERYLLIUM	0.727	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0010810	COBALT	1.63	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0010810	MERCURY	0.02	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0010810	SELENIUM	0.928	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0020002	BERYLLIUM	0.774	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0020002	THALLIUM	2.37	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0020305	MERCURY	0.0336	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0030002	BERYLLIUM	0.744	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0030709	BERYLLIUM	1.24	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0040002	BERYLLIUM	0.732	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSB0040608	BERYLLIUM	1.35	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSS0010002	BERYLLIUM	0.86	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSS0010002	POTASSIUM	494	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSS0020002	BERYLLIUM	1.01	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSS0020002	MERCURY	0.0264	MG/KG	J	P	Uncertainty Near the Detection Limit
18GSS0020002	POTASSIUM	432	MG/KG	J	P	Uncertainty Near the Detection Limit
18HCP0020002	AROCLOR-1260	0.00149	MG/KG	J	P	Uncertainty Near the Detection Limit
18HGWT001	COPPER	1.63	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT001	MERCURY	0.136	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT001	POTASSIUM	1190	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT001	ZINC	2.69	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT002	CIS-1,2-DICHLOROETHENE	0.665	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT002	LEAD	0.613	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT002	POTASSIUM	842	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT002	TETRACHLOROETHENE	0.261	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	AMMONIA-N	0.11	MG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	ARSENIC	0.87	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HGWT003	BERYLLIUM	1.02	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	CADMIUM	0.804	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	CHLOROFORM	0.522	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	METHYLENE CHLORIDE	0.512	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	PERCHLORATE	2	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	POTASSIUM	1020	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	TRANS-1,2-DICHLOROETHENE	0.298	UG/L	J	P	Uncertainty Near the Detection Limit
18HGWT003	VINYL CHLORIDE	0.967	UG/L	J	P	Uncertainty Near the Detection Limit
18HMWT0030204	CIS-1,2-DICHLOROETHENE	0.00157	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030204	HMX	0.0268	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	CALCIUM	575	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	ETHYLBENZENE	0.0034	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	M+P-XYLENES	0.00946	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	MERCURY	0.024	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	O-XYLENE	0.00322	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	SELENIUM	0.404	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	TOTAL XYLENES	0.0127	MG/KG	J	P	Uncertainty Near the Detection Limit
18HMWT0030608	TRANS-1,2-DICHLOROETHENE	0.00334	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010002	2-BUTANONE	0.00974	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010002	BERYLLIUM	1.06	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010002	CHLOROMETHANE	0.00566	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010002	POTASSIUM	751	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010002	SODIUM	509	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010204	ACETONE	0.00946	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010204	CALCIUM	1030	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0010204	POTASSIUM	910	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	2-BUTANONE	0.00871	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	BERYLLIUM	0.834	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	CIS-1,2-DICHLOROETHENE	0.00282	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	CYCLOHEXANE	0.00328	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	MERCURY	0.0341	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	POTASSIUM	806	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	TOLUENE	0.0014	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020002	TRICHLOROETHENE	0.00255	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020305	ACETONE	0.00728	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020305-D	ACETONE	0.00548	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020305-D	ARSENIC	2.63	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSB0020305-D	BERYLLIUM	0.547	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020305-D	CALCIUM	750	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020305-D	MAGNESIUM	1180	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0020305-D	POTASSIUM	592	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0030002	BERYLLIUM	1.27	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0030002	MERCURY	0.0322	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0030002	SELENIUM	1	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0030002	THALLIUM	1.47	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0030203	THALLIUM	0.885	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040002	ACETONE	0.00633	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040002	BERYLLIUM	0.786	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040002	MERCURY	0.0147	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040002	POTASSIUM	835	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040305	ACETONE	0.00783	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040305	ARSENIC	1.17	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040305	BARIUM	9.61	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040305	COBALT	1.42	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040305	NICKEL	2.44	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSB0040305	POTASSIUM	344	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0010006	BERYLLIUM	1.08	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	CARBON DISULFIDE	0.00539	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	COBALT	3.28	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	CYCLOHEXANE	0.00421	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	MERCURY	0.0256	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	METHYL CYCLOHEXANE	0.00287	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	TETRYL	0.0287	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSD0020006	TOLUENE	0.00165	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002	2,4,6-TRINITROTOLUENE	0.0458	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18HSS0010002	2-NITROTOLUENE	0.0333	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18HSS0010002	3-NITROTOLUENE	0.0416	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002	BERYLLIUM	0.991	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002	CADMIUM	0.811	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002	POTASSIUM	600	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002	THALLIUM	1.72	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002-D	BERYLLIUM	1.03	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18HSS0010002-D	CADMIUM	0.583	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002-D	CALCIUM	1370	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002-D	MAGNESIUM	1710	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002-D	MERCURY	0.0405	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002-D	POTASSIUM	643	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0010002-D	THALLIUM	2.02	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0020002	2-AMINO-4,6-DINITROTOLUENE	0.0359	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18HSS0020002	BERYLLIUM	1.01	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0020002	POTASSIUM	691	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0020002	SELENIUM	1.02	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0030002	BERYLLIUM	0.715	MG/KG	J	P	Uncertainty Near the Detection Limit
18HSS0030002	NITROBENZENE	0.0695	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18HSS0030002	SILVER	1.07	MG/KG	J	P	Uncertainty Near the Detection Limit
18IGWT001	BERYLLIUM	0.591	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT001	CHROMIUM	1.22	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT001	LEAD	0.614	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT001	VANADIUM	1.27	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT003	ALUMINUM	34.9	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT003	ARSENIC	2.45	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT003	ARSENIC	1.33	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT004	CHROMIUM	0.574	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT004	COBALT	1.83	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT004	COPPER	1.29	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT004	LEAD	0.583	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT005	AMMONIA-N	0.235	MG/L	J	P	Uncertainty Near the Detection Limit
18IGWT005	COPPER	1.17	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT005	COPPER	1.47	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT005	ZINC	2.59	UG/L	J	P	Uncertainty Near the Detection Limit
18IGWT005	ZINC	3.38	UG/L	J	P	Uncertainty Near the Detection Limit
18ISB0010305	BENZENE	0.00061	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISD0010006	3-NITROTOLUENE	0.0718	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISD0010006	BERYLLIUM	0.753	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISD0010006	ISOPROPYLBENZENE	0.00509	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18ISD0010006	PHENANTHRENE	0.00717	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ISD0020006	2,6-DINITROTOLUENE	0.0341	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ISD0020006	BERYLLIUM	0.324	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISD0020006	HMX	0.0495	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISD0020006	MERCURY	0.0424	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISD0020006	SILVER	0.246	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0010002	3-NITROTOLUENE	0.0666	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ISS0010002	CADMIUM	0.244	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0020002	BERYLLIUM	1.28	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0020002	MAGNESIUM	1370	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0020002	RDX	0.0575	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ISS0030002	1,3,5-TRINITROBENZENE	0.0282	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ISS0030002	3-NITROTOLUENE	0.0511	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0030002	BERYLLIUM	0.983	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0030002	MAGNESIUM	1560	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0030002	SELENIUM	1.51	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0040002	BERYLLIUM	0.751	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0040002	CADMIUM	1	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0040002	MAGNESIUM	1480	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0050002	BERYLLIUM	0.946	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0050002	DIBENZO(A,H)ANTHRACENE	0.00228	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0050002	MERCURY	0.02	MG/KG	J	P	Uncertainty Near the Detection Limit
18ISS0050002	PHENANTHRENE	0.00742	MG/KG	J	P	Uncertainty Near the Detection Limit
18JGWT001	BERYLLIUM	0.722	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT001	CADMIUM	1.17	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT001	CHROMIUM	0.696	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT001	COPPER	1.4	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT001	PERCHLORATE	2.79	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT002	CADMIUM	0.451	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT002	CADMIUM	0.431	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT002	CHROMIUM	0.962	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT002	COPPER	1.14	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT002	LEAD	0.44	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT002	SELENIUM	0.756	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18JGWT004	BERYLLIUM	0.772	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT004	BERYLLIUM	0.775	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT004	CADMIUM	0.902	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT004	CADMIUM	0.915	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT004	COPPER	1.9	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT005	ARSENIC	1.11	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT005	COPPER	2.29	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT005	SELENIUM	0.925	UG/L	J	P	Uncertainty Near the Detection Limit
18JGWT005	VANADIUM	2.55	UG/L	J	P	Uncertainty Near the Detection Limit
18JSB0010002	BERYLLIUM	0.769	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0010002	MERCURY	0.0216	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0010002	POTASSIUM	687	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0010608	BERYLLIUM	0.625	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0010608	CALCIUM	426	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0010608	COBALT	2.81	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0010608	MAGNESIUM	1080	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0020002	BERYLLIUM	0.993	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0020002	POTASSIUM	873	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0020406	BERYLLIUM	0.896	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0020406	CALCIUM	524	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSB0020406	POTASSIUM	493	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0010006	BERYLLIUM	0.653	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0010006	COBALT	4.56	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0010006	INDENO(1,2,3-CD)PYRENE	0.0112	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0010006	MAGNESIUM	1640	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0010006	MERCURY	0.0514	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0010006	POTASSIUM	760	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSD0020006	CALCIUM	3460	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18JSD0020006	VANADIUM	10.5	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18JSS0010002	BERYLLIUM	0.607	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0010002	CADMIUM	0.753	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0010002	MERCURY	0.0301	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0010002	POTASSIUM	481	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0010002	SILVER	0.392	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0020002	BERYLLIUM	0.68	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18JSS0020002	MERCURY	0.0286	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0020002	POTASSIUM	526	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0030002	BERYLLIUM	0.583	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0030002	CALCIUM	1150	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0030002	MAGNESIUM	642	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0040002	BERYLLIUM	1.34	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0040002	MAGNESIUM	1180	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0040002	MERCURY	0.0399	MG/KG	J	P	Uncertainty Near the Detection Limit
18JSS0040002	POTASSIUM	521	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0010006	BERYLLIUM	0.63	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0010006	CADMIUM	0.681	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0010006	CALCIUM	549	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0020006	BERYLLIUM	0.652	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0020006	CALCIUM	601	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0020006	COBALT	3.9	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0020006	MAGNESIUM	449	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0030006	CALCIUM	1240	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0030006	MERCURY	0.0298	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0030006	THALLIUM	2.28	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0040006	MERCURY	0.0212	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006	BERYLLIUM	1.03	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006	CALCIUM	938	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006	MERCURY	0.0342	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006	THALLIUM	1.41	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006-D	BERYLLIUM	0.843	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006-D	CALCIUM	970	MG/KG	J	P	Uncertainty Near the Detection Limit
18SD0050006-D	MERCURY	0.0268	MG/KG	J	P	Uncertainty Near the Detection Limit
18SW001	2-NITROTOLUENE	0.145	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18SW001	ALUMINUM	27.3	UG/L	J	P	Uncertainty Near the Detection Limit
18SW001	CHROMIUM	0.905	UG/L	J	P	Uncertainty Near the Detection Limit
18SW001	IRON	9.99	UG/L	J	P	Uncertainty Near the Detection Limit
18SW001	NICKEL	1.88	UG/L	J	P	Uncertainty Near the Detection Limit
18SW001	NICKEL	2.2	UG/L	J	P	Uncertainty Near the Detection Limit
18SW002	ALUMINUM	31.4	UG/L	J	P	Uncertainty Near the Detection Limit
18SW002	CADMIUM	0.255	UG/L	J	P	Uncertainty Near the Detection Limit
18SW002	CHROMIUM	0.527	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18SW002	CHROMIUM	0.849	UG/L	J	P	Uncertainty Near the Detection Limit
18SW002	IRON	11.9	UG/L	J	P	Uncertainty Near the Detection Limit
18SW002	NICKEL	1.08	UG/L	J	P	Uncertainty Near the Detection Limit
18SW003	AMMONIA-N	0.124	MG/L	J	P	Uncertainty Near the Detection Limit
18SW003	CADMIUM	0.272	UG/L	J	P	Uncertainty Near the Detection Limit
18SW003	CHROMIUM	0.874	UG/L	J	P	Uncertainty Near the Detection Limit
18SW003	LEAD	0.436	UG/L	J	P	Uncertainty Near the Detection Limit
18SW003	MANGANESE	2.18	UG/L	J	P	Uncertainty Near the Detection Limit
18SW003	NICKEL	1.38	UG/L	J	P	Uncertainty Near the Detection Limit
18SW003	NICKEL	1.36	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004	CHROMIUM	0.581	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004	MANGANESE	1.17	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004	MANGANESE	1.82	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004	NICKEL	2.49	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004-D	CHROMIUM	0.508	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004-D	MANGANESE	1.45	UG/L	J	P	Uncertainty Near the Detection Limit
18SW004-D	ZINC	2.23	UG/L	J	P	Uncertainty Near the Detection Limit
18SW005	MANGANESE	2	UG/L	J	P	Uncertainty Near the Detection Limit
18SW005	MANGANESE	3.01	UG/L	J	P	Uncertainty Near the Detection Limit
18SW005	ZINC	4.04	UG/L	J	P	Uncertainty Near the Detection Limit
18ACP0020002	AROCLOR-1260	0.00187	MG/KG	J	P	Uncertainty Near the Detection Limit
18AGWT001	CADMIUM	0.462	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT001	CHROMIUM	0.816	UG/L	J	P	Uncertainty Near the Detection Limit
RB102011-01	4-AMINO-2,6-DINITROTOLUENE	0.14	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
RB102011-01	NAPHTHALENE	0.0846	UG/L	J	P	Uncertainty Near the Detection Limit
RB102011-01	NITROBENZENE	0.217	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
RB102011-02	2-AMINO-4,6-DINITROTOLUENE	0.183	UG/L	J	P	Uncertainty Near the Detection Limit
RB102011-02	2-NITROTOLUENE	0.133	UG/L	J	P	Uncertainty Near the Detection Limit
RB102011-02	4-NITROTOLUENE	0.196	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
RB102011-02	NAPHTHALENE	0.0891	UG/L	J	P	Uncertainty Near the Detection Limit
RB102111-01	2-BUTANONE	8.69	UG/L	J	P	Uncertainty Near the Detection Limit
RB102111-01	2-NITROTOLUENE	0.192	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
RB102111-01	ACETONE	6.41	UG/L	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
RB102111-01	NAPHTHALENE	0.0805	UG/L	J	P	Uncertainty Near the Detection Limit
TB102211-01	METHYLENE CHLORIDE	1.01	UG/L	J	P	Uncertainty Near the Detection Limit
RB102111-02	2-AMINO-4,6-DINITROTOLUENE	0.22	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
RB102111-02	2-BUTANONE	7.78	UG/L	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
RB102111-02	2-NITROTOLUENE	0.114	UG/L	J	P	Uncertainty Near the Detection Limit
RB102111-02	4-NITROTOLUENE	0.197	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
RB102111-02	ACETONE	7.73	UG/L	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
RB102111-02	NAPHTHALENE	0.104	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT002	CADMIUM	0.413	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT002	CADMIUM	0.269	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT003	2-NITROTOLUENE	0.207	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT003	4-NITROTOLUENE	0.215	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT003	CADMIUM	1.01	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT004	ARSENIC	1.05	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT004	CADMIUM	1.21	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT004	CADMIUM	1.18	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT004	CHROMIUM	4.09	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT004	LEAD	3.14	UG/L	J	P	Uncertainty Near the Detection Limit
18AGWT004	NITROBENZENE	0.202	UG/L	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18AMWT0040002	BENZENE	0.0005	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	BENZO(A)PYRENE	0.00757	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	CADMIUM	0.497	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	ETHYLBENZENE	0.00079	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	INDENO(1,2,3-CD)PYRENE	0.00668	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	MERCURY	0.0332	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	PHENANTHRENE	0.00499	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	SELENIUM	0.347	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	TOLUENE	0.00156	MG/KG	J	P	Uncertainty Near the Detection Limit
18AMWT0040002	TOTAL XYLENES	0.00337	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0010002	BERYLLIUM	1.09	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0010002	MERCURY	0.0236	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0010002	POTASSIUM	390	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ASB0020002	HMX	0.0584	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0020002	SODIUM	411	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0020405	CALCIUM	261	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0030002	BERYLLIUM	0.696	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0030002	MERCURY	0.0152	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0030002	POTASSIUM	464	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0030406	BERYLLIUM	1.14	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0030406	POTASSIUM	608	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0040002-D	BERYLLIUM	1.08	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0040002-D	POTASSIUM	471	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0050002	BERYLLIUM	1.22	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0050002	MERCURY	0.0271	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0050002	POTASSIUM	578	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0050608	BERYLLIUM	1	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASB0050608	POTASSIUM	631	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASD0010006	ARSENIC	1.82	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASD0010006	MERCURY	0.0233	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0010002	BERYLLIUM	0.826	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0010002	CADMIUM	0.503	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0010002	MAGNESIUM	982	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0010002	POTASSIUM	459	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0010002	RDX	0.0694	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ASS0020002	BERYLLIUM	1.07	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0020002	MAGNESIUM	1600	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0020002	POTASSIUM	699	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0030002	BERYLLIUM	0.807	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0030002	POTASSIUM	494	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0030002-D	BERYLLIUM	0.942	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0030002-D	CADMIUM	0.513	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0030002-D	MAGNESIUM	1320	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0030002-D	POTASSIUM	440	MG/KG	J	P	Uncertainty Near the Detection Limit
18ASS0040002	NITROBENZENE	0.0274	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18ASS0040002	THALLIUM	2.2	MG/KG	J	P	Uncertainty Near the Detection Limit
18BCP0030002	AROCLOR-1260	0.00168	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18BSB0020002	NITROBENZENE	0.0227	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18BSB0040002	2,4,6-TRINITROTOLUENE	0.0559	MG/KG	J	P	Uncertainty Near the Detection Limit
18BSB0040002	2,4-DINITROTOLUENE	0.0436	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18BSB0040002	NITROBENZENE	0.054	MG/KG	J	PU	Uncertainty Near the Detection Limit, RPD between Columns >40%
18BSB0050002	1,3,5-TRINITROBENZENE	0.0261	MG/KG	J	PU	U
18CGWT001	ARSENIC	1.79	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT001	ARSENIC	1.62	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT001	BARIUM	14	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT001-D	ARSENIC	1.78	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT001-D	ARSENIC	1.42	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT001-D	CADMIUM	0.283	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT002	BENZENE	0.286	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT002	CADMIUM	0.898	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT002	CHROMIUM	1.6	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT002	TOLUENE	0.4	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT003	ARSENIC	1.71	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT003	CHROMIUM	4.1	UG/L	J	P	Uncertainty Near the Detection Limit
18CGWT003	SELENIUM	1.81	UG/L	J	P	Uncertainty Near the Detection Limit
18CMWT0030204	MERCURY	0.0179	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0010002	BENZO(B)FLUORANTHENE	0.00611	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0010002	PYRENE	0.00779	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0010204	BENZO(B)FLUORANTHENE	0.00257	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0010204	INDENO(1,2,3-CD)PYRENE	0.00429	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0030002	ARSENIC	2.42	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0040002	PHENANTHRENE	0.00242	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0040507	ACENAPHTHENE	0.00266	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0040507	ANTHRACENE	0.00247	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0040507	FLUORANTHENE	0.00897	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0040507	PYRENE	0.00731	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0050002	CADMIUM	1.21	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0050002-D	MERCURY	0.0225	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0060002	ACETONE	0.00535	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0060002	TRICHLOROETHENE	0.00216	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0060203	METHYL CYCLOHEXANE	0.00173	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSB0070002	BENZENE	0.00125	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070002	ETHYLBENZENE	0.0014	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070002	PYRENE	0.00307	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070002	TOLUENE	0.00344	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070002	TOTAL XYLENES	0.00233	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070406	BENZENE	0.00045	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18CSB0070406	BENZO(A)PYRENE	0.00445	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070406	BENZO(B)FLUORANTHENE	0.00596	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070406	BENZO(K)FLUORANTHENE	0.00275	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0070406	ETHYLBENZENE	0.00138	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18CSB0070406	TOLUENE	0.00139	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18CSB0070406	TOTAL XYLENES	0.00356	MG/KG	J	PR	Uncertainty Near the Detection Limit, Surrogate Recovery Noncompliance
18CSB0080002	2-BUTANONE	0.0074	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0080305	CADMIUM	0.438	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0080305	CYCLOHEXANE	0.00441	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0080305	METHYL CYCLOHEXANE	0.00531	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0080305	TOLUENE	0.00205	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB009_0002	CADMIUM	0.561	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0090002	ACETONE	0.0185	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSB0090204	2-BUTANONE	0.00425	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	BENZO(A)PYRENE	0.004	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	BENZO(B)FLUORANTHENE	0.00734	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	BENZO(G,H,I)PERYLENE	0.00505	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	BENZO(K)FLUORANTHENE	0.00314	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	FLUORANTHENE	0.00513	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	INDENO(1,2,3-CD)PYRENE	0.00501	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	PHENANTHRENE	0.00251	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006	PYRENE	0.0049	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006-D	BENZO(A)ANTHRACENE	0.00721	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006-D	BENZO(A)PYRENE	0.00794	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006-D	BENZO(K)FLUORANTHENE	0.00565	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006-D	DIBENZO(A,H)ANTHRACENE	0.00413	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0010006-D	PHENANTHRENE	0.00388	MG/KG	J	P	Uncertainty Near the Detection Limit

Table F.1.11
NSA Crane SWMU 18
Samples Qualified Due to Uncertainty Near the Detection Limit

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSD0020006	2-METHYLNAPHTHALENE	0.0081	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0020006	ACENAPHTHENE	0.00336	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSD0030006	CYCLOHEXANE	1.21	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006	ETHYLBENZENE	1.09	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006	MERCURY	0.0997	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006	TOTAL XYLENES	5.65	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006-D	M+P-XYLENES	1.4	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006-D	MERCURY	0.091	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006-D	METHYL ACETATE	0.932	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSD0030006-D	TOTAL XYLENES	1.64	MG/KG	J	PY	Uncertainty Near the Detection Limit, Percent Solids <30%
18CSS0010002	MERCURY	0.0383	MG/KG	J	P	Uncertainty Near the Detection Limit
18CSS0010002-D	MERCURY	0.0375	MG/KG	J	P	Uncertainty Near the Detection Limit
18ESB0050002	RDX	0.0355	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0040002	HMX	0.0668	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0090002	RDX	0.0682	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0100002	RDX	0.0694	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0100002-D	RDX	0.0282	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0140002	RDX	0.0254	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems
18ESS0160002	RDX	0.0213	MG/KG	J	PQU	Uncertainty Near the Detection Limit, RPD between Columns >40%, Other Problems

Table F.1.12
NSA Crane SWMU 18
Samples Qualified for Matrix Interference and RPD Between Columns >40%

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18EGWT003	3-NITROTOLUENE	0.269	UG/L	J	QU	RPD Between Columns >40%, Other Problems
18EGWT004	RDX	0.845	UG/L	J	QU	RPD Between Columns >40%, Other Problems
18ESB0120002	RDX	0.076	MG/KG	J	QU	RPD Between Columns >40%, Other Problems
18ESS0090002	HMX	0.223	MG/KG	J	QU	RPD Between Columns >40%, Other Problems
18ESS0100002	1,3-DINITROBENZENE	0.147	MG/KG	J	QU	RPD Between Columns >40%, Other Problems
18ESS0110002	HMX	0.134	MG/KG	J	QU	RPD Between Columns >40%, Other Problems
18ESS0150002	TETRYL	0.147	MG/KG	J	QU	RPD Between Columns >40%, Other Problems
18ESS0170002	RDX	0.0742	MG/KG	J	QU	RPD Between Columns >40%, Other Problems
18IGWT005	3-NITROTOLUENE	0.363	UG/L	J	QU	RPD Between Columns >40%, Other Problems

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DCP0020002	AROCLOR-1016	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DCP0020002	AROCLOR-1221	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DCP0020002	AROCLOR-1232	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DCP0020002	AROCLOR-1242	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DCP0020002	AROCLOR-1248	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DCP0020002	AROCLOR-1254	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DCP0020002	AROCLOR-1260	0.00196	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,1,1-TRICHLOROETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,1,2-TRICHLOROETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,1-DICHLOROETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,1-DICHLOROETHENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,2-DIBROMOETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,2-DICHLOROBENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,2-DICHLOROETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,2-DICHLOROPROPANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,3-DICHLOROBENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	1,4-DICHLOROBENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	ACETONE	0.0942	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0120002	BENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	BROMOCHLOROMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	BROMODICHLOROMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	BROMOFORM	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	BROMOMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CARBON TETRACHLORIDE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CHLOROBENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CHLORODIBROMOMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CHLOROETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CHLOROFORM	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CHLOROMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CIS-1,2-DICHLOROETHENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	CIS-1,3-DICHLOROPROPENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	DICHLORODIFLUOROMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	ETHYLBENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	ISOPROPYLBENZENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	M+P-XYLENES	0.00467	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120002	METHYL TERT-BUTYL ETHER	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	METHYLENE CHLORIDE	0.0291	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0120002	O-XYLENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	STYRENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	TETRACHLOROETHENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	TOTAL XYLENES	0.00701	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	TRANS-1,2-DICHLOROETHENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	TRANS-1,3-DICHLOROPROPENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	TRICHLOROETHENE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	TRICHLOROFLUOROMETHANE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120002	VINYL CHLORIDE	0.00234	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,1,1-TRICHLOROETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,1,2-TRICHLOROETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,1-DICHLOROETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,1-DICHLOROETHENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,2-DIBROMOETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,2-DICHLOROBENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,2-DICHLOROETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,2-DICHLOROPROPANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,3-DICHLOROBENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	1,4-DICHLOROBENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	ACETONE	0.0562	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0120305	BENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	BROMOCHLOROMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	BROMODICHLOROMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	BROMOFORM	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	BROMOMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CARBON DISULFIDE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CARBON TETRACHLORIDE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CHLOROBENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CHLORODIBROMOMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CHLOROETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CHLOROFORM	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CHLOROMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CIS-1,2-DICHLOROETHENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0120305	CIS-1,3-DICHLOROPROPENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	CYCLOHEXANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	DICHLORODIFLUOROMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	ETHYLBENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	ISOPROPYLBENZENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	M+P-XYLENES	0.00463	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	METHYL CYCLOHEXANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	METHYL TERT-BUTYL ETHER	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	METHYLENE CHLORIDE	0.0288	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0120305	O-XYLENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	STYRENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TETRACHLOROETHENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TOLUENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TOTAL XYLENES	0.00695	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TRANS-1,2-DICHLOROETHENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TRANS-1,3-DICHLOROPROPENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TRICHLOROETHENE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	TRICHLOROFLUOROMETHANE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0120305	VINYL CHLORIDE	0.00232	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,1,1-TRICHLOROETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,1,2-TRICHLOROETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,1-DICHLOROETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,1-DICHLOROETHENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,2-DIBROMOETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,2-DICHLOROBENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,2-DICHLOROETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,2-DICHLOROPROPANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,3-DICHLOROBENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	1,4-DICHLOROBENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	2-BUTANONE	0.00486	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	ACETONE	0.0324	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0130002	BENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	BROMOCHLOROMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	BROMODICHLOROMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	BROMOFORM	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0130002	BROMOMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CARBON DISULFIDE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CARBON TETRACHLORIDE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CHLOROBENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CHLORODIBROMOMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CHLOROETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CHLOROFORM	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CHLOROMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CIS-1,2-DICHLOROETHENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CIS-1,3-DICHLOROPROPENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	CYCLOHEXANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	DICHLORODIFLUOROMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	ETHYLBENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	ISOPROPYLBENZENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	M+P-XYLENES	0.00486	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	METHYL CYCLOHEXANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	METHYL TERT-BUTYL ETHER	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	METHYLENE CHLORIDE	0.0338	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0130002	O-XYLENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	STYRENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TETRACHLOROETHENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TOLUENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TOTAL XYLENES	0.00729	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TRANS-1,2-DICHLOROETHENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TRANS-1,3-DICHLOROPROPENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TRICHLOROETHENE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	TRICHLOROFLUOROMETHANE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0130002	VINYL CHLORIDE	0.00243	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,1,1-TRICHLOROETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,1,2-TRICHLOROETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,1-DICHLOROETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,1-DICHLOROETHENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,2-DIBROMOETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,2-DICHLOROBENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,2-DICHLOROETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0150002	1,2-DICHLOROPROPANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,3-DICHLOROBENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	1,4-DICHLOROBENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	2-BUTANONE	0.00487	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	BENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	BROMOCHLOROMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	BROMODICHLOROMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	BROMOFORM	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	BROMOMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CARBON DISULFIDE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CARBON TETRACHLORIDE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CHLOROBENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CHLORODIBROMOMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CHLOROETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CHLOROFORM	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CHLOROMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CIS-1,2-DICHLOROETHENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	CIS-1,3-DICHLOROPROPENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	DICHLORODIFLUOROMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	ETHYLBENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	ISOPROPYLBENZENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	M+P-XYLENES	0.00487	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	METHYL TERT-BUTYL ETHER	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	METHYLENE CHLORIDE	0.0588	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0150002	O-XYLENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	STYRENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	TETRACHLOROETHENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	TOTAL XYLENES	0.00731	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	TRANS-1,2-DICHLOROETHENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	TRANS-1,3-DICHLOROPROPENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	TRICHLOROETHENE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	TRICHLOROFLUOROMETHANE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150002	VINYL CHLORIDE	0.00244	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,1,1-TRICHLOROETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,1,2-TRICHLOROETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0150305	1,1-DICHLOROETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,1-DICHLOROETHENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,2-DIBROMOETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,2-DICHLOROBENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,2-DICHLOROETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,2-DICHLOROPROPANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,3-DICHLOROBENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	1,4-DICHLOROBENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	2-BUTANONE	0.00484	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	BENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	BROMOCHLOROMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	BROMODICHLOROMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	BROMOFORM	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	BROMOMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CARBON DISULFIDE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CARBON TETRACHLORIDE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CHLOROBENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CHLORODIBROMOMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CHLOROETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CHLOROFORM	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CHLOROMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CIS-1,2-DICHLOROETHENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CIS-1,3-DICHLOROPROPENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	CYCLOHEXANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	DICHLORODIFLUOROMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	ETHYLBENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	ISOPROPYLBENZENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	M+P-XYLENES	0.00484	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	METHYL CYCLOHEXANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	METHYL TERT-BUTYL ETHER	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	METHYLENE CHLORIDE	0.0294	MG/KG	J	R	Surrogate Recovery Noncompliance
18DSB0150305	O-XYLENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	STYRENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	TETRACHLOROETHENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	TOLUENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	TOTAL XYLENES	0.00726	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DSB0150305	TRANS-1,2-DICHLOROETHENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	TRANS-1,3-DICHLOROPROPENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	TRICHLOROETHENE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	TRICHLOROFLUOROMETHANE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18DSB0150305	VINYL CHLORIDE	0.00242	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18EGWT003	1,3,5-TRINITROBENZENE	1.74	UG/L	J	RU	Surrogate Recovery Noncompliance, RPD Between Columns >40%
18EGWT003	4-NITROTOLUENE	0.345	UG/L	J	RU	Surrogate Recovery Noncompliance, RPD Between Columns >40%
18ESD0030006	1,1,1-TRICHLOROETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,1,2-TRICHLOROETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,1-DICHLOROETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,1-DICHLOROETHENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,2-DIBROMOETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,2-DICHLOROBENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,2-DICHLOROETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,2-DICHLOROPROPANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,3-DICHLOROBENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	1,4-DICHLOROBENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	2-BUTANONE	0.0139	MG/KG	J	R	Surrogate Recovery Noncompliance
18ESD0030006	ACETONE	0.0752	MG/KG	J	R	Surrogate Recovery Noncompliance
18ESD0030006	BENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	BROMOCHLOROMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	BROMODICHLOROMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	BROMOFORM	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	BROMOMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CARBON DISULFIDE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CARBON TETRACHLORIDE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CHLOROBENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CHLORODIBROMOMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CHLOROETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CHLOROFORM	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CHLOROMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CIS-1,2-DICHLOROETHENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	CIS-1,3-DICHLOROPROPENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0030006	DICHLORODIFLUOROMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	ETHYLBENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	ISOPROPYLBENZENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	M+P-XYLENES	0.00548	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	METHYL TERT-BUTYL ETHER	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	METHYLENE CHLORIDE	0.0306	MG/KG	J	R	Surrogate Recovery Noncompliance
18ESD0030006	O-XYLENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	STYRENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TETRACHLOROETHENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TOLUENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TOTAL XYLENES	0.00822	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TRANS-1,2-DICHLOROETHENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TRANS-1,3-DICHLOROPROPENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TRICHLOROETHENE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	TRICHLOROFLUOROMETHANE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0030006	VINYL CHLORIDE	0.00274	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ESD0040006	1,1,1-TRICHLOROETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,1,2-TRICHLOROETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,1,2-TRICHLOROTRIFLUOROETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,1-DICHLOROETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,1-DICHLOROETHENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,2-DIBROMOETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,2-DICHLOROBENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,2-DICHLOROETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,2-DICHLOROPROPANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	1,3-DICHLOROBENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0040006	1,4-DICHLOROBENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	2-BUTANONE	0.0662	MG/KG	J	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	ACETONE	0.375	MG/KG	J	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	BENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	BROMOCHLOROMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	BROMODICHLOROMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	BROMOFORM	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	BROMOMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CARBON TETRACHLORIDE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CHLOROBENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CHLORODIBROMOMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CHLOROETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CHLOROFORM	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CHLOROMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CIS-1,2-DICHLOROETHENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CIS-1,3-DICHLOROPROPENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	CYCLOHEXANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	DICHLORODIFLUOROMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	ETHYLBENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0040006	ISOPROPYLBENZENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	M+P-XYLENES	0.0221	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	METHYL CYCLOHEXANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	METHYL TERT-BUTYL ETHER	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	METHYLENE CHLORIDE	0.115	MG/KG	J	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	O-XYLENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	STYRENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TETRACHLOROETHENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TOLUENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TOTAL XYLENES	0.0331	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TRANS-1,2-DICHLOROETHENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TRANS-1,3-DICHLOROPROPENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TRICHLOROETHENE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	TRICHLOROFLUOROMETHANE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESD0040006	VINYL CHLORIDE	0.011	MG/KG	UJ	RY	Surrogate Recovery Noncompliance, Percent Solids <30%
18ESS0170002	2,4,6-TRINITROTOLUENE	0.426	MG/KG	J	R	Surrogate Recovery Noncompliance
18ESS0170002	HMX	0.322	MG/KG	J	R	Surrogate Recovery Noncompliance
18FCP0020002	AROCLOR-1016	0.00188	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18FCP0020002	AROCLOR-1221	0.00188	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18FCP0020002	AROCLOR-1232	0.00188	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18FCP0020002	AROCLOR-1242	0.00188	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18FCP0020002	AROCLOR-1248	0.00188	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18FCP0020002	AROCLOR-1254	0.00188	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,1,1-TRICHLOROETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,1,2-TRICHLOROETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,1,2-TRICHLOROTRIFLUOROETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,1-DICHLOROETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,1-DICHLOROETHENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,2-DIBROMOETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,2-DICHLOROETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	1,2-DICHLOROPROPANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	4-METHYL-2-PENTANONE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	BENZENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	BROMOCHLOROMETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	BROMODICHLOROMETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	BROMOFORM	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CARBON DISULFIDE	0.0366	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	CARBON TETRACHLORIDE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CHLOROBENZENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CHLORODIBROMOMETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CHLOROETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CHLOROFORM	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CHLOROMETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CIS-1,2-DICHLOROETHENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CIS-1,3-DICHLOROPROPENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	CYCLOHEXANE	0.223	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	DRO (C08-C28)	2430	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	DRO (C08-C34)	8090	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	ETHYLBENZENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	M+P-XYLENES	0.149	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	METHYL ACETATE	0.0127	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	METHYL TERT-BUTYL ETHER	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	METHYLENE CHLORIDE	0.058	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	O-XYLENE	0.0137	MG/KG	J	R	Surrogate Recovery Noncompliance
18ISD0010006	STYRENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	TETRACHLOROETHENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	TOLUENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	TOTAL XYLENES	0.163	MG/KG	J	R	Surrogate Recovery Noncompliance

Table F.1.13
NSA Crane
Samples Qualified Due to Surrogate Recovery Noncompliance

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ISD0010006	TRANS-1,2-DICHLOROETHENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	TRANS-1,3-DICHLOROPROPENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	TRICHLOROETHENE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	TRICHLOROFLUOROMETHANE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18ISD0010006	VINYL CHLORIDE	0.00634	MG/KG	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1016	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1221	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1232	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1242	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1248	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1254	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
RB102011-02	AROCLOR-1260	0.0278	UG/L	UJ	R	Surrogate Recovery Noncompliance
18BCP0010002-D	AROCLOR-1016	0.00198	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18BCP0010002-D	AROCLOR-1221	0.00198	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18BCP0010002-D	AROCLOR-1232	0.00198	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18BCP0010002-D	AROCLOR-1242	0.00198	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18BCP0010002-D	AROCLOR-1248	0.00198	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18BCP0010002-D	AROCLOR-1254	0.00198	MG/KG	UJ	R	Surrogate Recovery Noncompliance
18CSB0070406	NAPHTHALENE	0.00219	MG/KG	UJ	R	Surrogate Recovery Noncompliance

Table F.1.14
NSA Crane SWMU 18
Samples Qualified for RPD Between Columns > 40 Percent

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18DGWT006	RDX	0.475	UG/L	J	U	RPD Between Columns >40%
18DSS0030002	1,3-DINITROBENZENE	0.115	MG/KG	J	U	RPD Between Columns >40%
18EGWT004	3-NITROTOLUENE	0.231	UG/L	J	U	RPD Between Columns >40%
18ESB0080911	RDX	0.0801	MG/KG	J	U	RPD Between Columns >40%
18ESD0010006	TETRYL	0.099	MG/KG	J	U	RPD Between Columns >40%
18ESD0020006	TETRYL	0.0922	MG/KG	J	U	RPD Between Columns >40%
18ESD0060006	RDX	0.34	MG/KG	J	U	RPD Between Columns >40%
18ESS0020002	RDX	0.133	MG/KG	J	U	RPD Between Columns >40%
18ESS0100002	HMX	0.209	MG/KG	J	U	RPD Between Columns >40%
18ESS0100002-D	HMX	0.282	MG/KG	J	U	RPD Between Columns >40%
18HGWT001	2-AMINO-4,6-DINITROTOLUENE	0.467	UG/L	J	U	RPD Between Columns >40%
18HSD0010006	NITROBENZENE	0.209	MG/KG	J	U	RPD Between Columns >40%
18HSD0010006	RDX	0.118	MG/KG	J	U	RPD Between Columns >40%
18HSS0010002	4-NITROTOLUENE	0.0818	MG/KG	J	U	RPD Between Columns >40%
18HSS0020002	2-NITROTOLUENE	0.322	MG/KG	J	U	RPD Between Columns >40%
18HSS0030002	HMX	0.333	MG/KG	J	U	RPD Between Columns >40%
18ISD0010006	NITROBENZENE	0.178	MG/KG	J	U	RPD Between Columns >40%
18ISS0010002	NITROBENZENE	0.163	MG/KG	J	U	RPD Between Columns >40%
RB102011-01	2-NITROTOLUENE	1.81	UG/L	J	U	RPD Between Columns >40%
RB102011-01	NITROGLYCERIN	0.734	UG/L	J	U	RPD Between Columns >40%
RB102011-01	RDX	0.841	UG/L	J	U	RPD Between Columns >40%
RB102011-02	NITROGLYCERIN	0.333	UG/L	J	U	RPD Between Columns >40%
RB102111-01	NITROGLYCERIN	0.357	UG/L	J	U	RPD Between Columns >40%
RB102111-02	NITROGLYCERIN	0.335	UG/L	J	U	RPD Between Columns >40%
18AGWT004	HMX	0.721	UG/L	J	U	RPD Between Columns >40%
18ASB0020405	RDX	0.0785	MG/KG	J	U	RPD Between Columns >40%
18ASS0040002	HMX	0.123	MG/KG	J	U	RPD Between Columns >40%
18BSB0010608	RDX	0.0238	MG/KG	J	U	RPD Between Columns >40%
18BSB0020002	RDX	0.0356	MG/KG	J	U	RPD Between Columns >40%
18BSB0020002	TETRYL	0.0537	MG/KG	J	U	RPD Between Columns >40%
18BSB0040002	1,3-DINITROBENZENE	0.0833	MG/KG	J	U	RPD Between Columns >40%

Table F.1.15
NSA Crane SWMU 18
Samples Qualified for Percent Solids <30 Percent

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18ESD0040006	1,3,5-TRINITROBENZENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	2,4-DINITROTOLUENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	2,6-DINITROTOLUENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	2-AMINO-4,6-DINITROTOLUENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	2-NITROTOLUENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	3-NITROTOLUENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	4-AMINO-2,6-DINITROTOLUENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	4-NITROTOLUENE	0.135	MG/KG	J	Y	Percent Solids <30%
18ESD0040006	ARSENIC	12	MG/KG	J	Y	Percent Solids <30%
18ESD0040006	BERYLLIUM	1.77	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	CADMIUM	134	MG/KG	J	Y	Percent Solids <30%
18ESD0040006	HMX	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	MERCURY	0.199	MG/KG	J	Y	Percent Solids <30%
18ESD0040006	NICKEL	22.1	MG/KG	J	Y	Percent Solids <30%
18ESD0040006	NITROBENZENE	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	POTASSIUM	2660	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	RDX	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	SELENIUM	4.44	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	SILVER	1.77	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	SODIUM	2660	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	TETRYL	0.04	MG/KG	UJ	Y	Percent Solids <30%
18ESD0040006	THALLIUM	3.55	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	ALUMINUM	7110	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	ANTIMONY	31.8	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	BERYLLIUM	4.18	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	CHROMIUM	1560	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	COBALT	20.9	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	COPPER	2400	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	IRON	78200	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	MAGNESIUM	6270	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	MANGANESE	341	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	MERCURY	1.55	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	NICKEL	34.9	MG/KG	J	Y	Percent Solids <30%
18JSD0020006	POTASSIUM	6270	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	SELENIUM	10.4	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	SILVER	4.18	MG/KG	UJ	Y	Percent Solids <30%

Table F.1.15
NSA Crane SWMU 18
Samples Qualified for Percent Solids <30 Percent

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18JSD0020006	SODIUM	6270	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	THALLIUM	8.36	MG/KG	UJ	Y	Percent Solids <30%
18JSD0020006	ZINC	6210	MG/KG	J	Y	Percent Solids <30%
18CSD0030006	1,1,1-TRICHLOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,1,2,2-TETRACHLOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,1,2-TRICHLOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,1,2-TRICHLOROTRIFLUOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,1-DICHLOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,1-DICHLOROETHENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2,3-TRICHLOROBENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2,4-TRICHLOROBENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2-DIBROMO-3-CHLOROPROPANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2-DIBROMOETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2-DICHLOROBENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2-DICHLOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,2-DICHLOROPROPANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,3-DICHLOROBENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	1,4-DICHLOROBENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	2-HEXANONE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	4-METHYL-2-PENTANONE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	BENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	BROMOCHLOROMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	BROMODICHLOROMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	BROMOFORM	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	BROMOMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CARBON DISULFIDE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CARBON TETRACHLORIDE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CHLOROBENZENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CHLORODIBROMOMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CHLOROETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CHLOROFORM	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CHLOROMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CHROMIUM	9660	MG/KG	J	Y	Percent Solids <30%
18CSD0030006	CIS-1,2-DICHLOROETHENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	CIS-1,3-DICHLOROPROPENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	DICHLORODIFLUOROMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%

Table F.1.15
NSA Crane SWMU 18
Samples Qualified for Percent Solids <30 Percent

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSD0030006	M+P-XYLENES	5.25	MG/KG	J	Y	Percent Solids <30%
18CSD0030006	METHYL ACETATE	1.99	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	METHYL TERT-BUTYL ETHER	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	METHYLENE CHLORIDE	1.99	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	O-XYLENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	SELENIUM	15	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	SILVER	6	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	STYRENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	TETRACHLOROETHENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	TOLUENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	TRANS-1,2-DICHLOROETHENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	TRANS-1,3-DICHLOROPROPENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	TRICHLOROETHENE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006	TRICHLOROFLUOROMETHANE	0.994	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,1,1-TRICHLOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,1,2,2-TETRACHLOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,1,2-TRICHLOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,1,2-TRICHLOROTRIFLUOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,1-DICHLOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,1-DICHLOROETHENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2,3-TRICHLOROBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2,4-TRICHLOROBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2-DIBROMO-3-CHLOROPROPANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2-DIBROMOETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2-DICHLOROBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2-DICHLOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,2-DICHLOROPROPANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,3-DICHLOROBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	1,4-DICHLOROBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	2-HEXANONE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	4-METHYL-2-PENTANONE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	BENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	BROMOCHLOROMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	BROMODICHLOROMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	BROMOFORM	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	BROMOMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%

Table F.1.15
NSA Crane SWMU 18
Samples Qualified for Percent Solids <30 Percent

Sample Identification	Parameter	Validation Results	Units	Validation Qualification	Validation Code	Reason for Qualification
18CSD0030006-D	CARBON DISULFIDE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CARBON TETRACHLORIDE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CHLOROBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CHLORODIBROMOMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CHLOROETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CHLOROFORM	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CHLOROMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CHROMIUM	11900	MG/KG	J	Y	Percent Solids <30%
18CSD0030006-D	CIS-1,2-DICHLOROETHENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CIS-1,3-DICHLOROPROPENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	CYCLOHEXANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	DICHLORODIFLUOROMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	ETHYLBENZENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	METHYL TERT-BUTYL ETHER	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	METHYLENE CHLORIDE	1.6	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	O-XYLENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	SELENIUM	13.9	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	SILVER	5.56	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	STYRENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	TETRACHLOROETHENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	TOLUENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	TRANS-1,2-DICHLOROETHENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	TRANS-1,3-DICHLOROPROPENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	TRICHLOROETHENE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	TRICHLOROFLUOROMETHANE	0.801	MG/KG	UJ	Y	Percent Solids <30%
18CSD0030006-D	VINYL CHLORIDE	0.801	MG/KG	UJ	Y	Percent Solids <30%

Table F.3.1.1
Sample Completeness
Subarea A- Building 105 Area

SUBAREA A – BUILDING 105 AREA

SAMPLE ID	EXP	Metals	Metals- Filtered	pH	PCBs	Ammonia
18ASB0010002	X	X				
18ASB0010204	X	X				
18ASB0020002	X	X				
18ASB0020405	X	X				
18ASB0030002	X	X				
18ASB0030406	X	X				
18ASB0040002	X	X		X		
18ASB0050002	X	X				
18ASB0050608	X	X				
18ASS0010002	X	X		X		
18ASS0020002	X	X				
18ASS0030002	X	X				
18ASS0040002	X	X				
18ASD0010006	X	X				
18ACP0010002					X	
18ACP0020002					X	
18AGWT001	X	X				X
18AGWT002	X	X	X			X
18AGWT003	X	X				X
18AGWT004	X	X	X			X
Total Fraction Collected	18	18	2	2	2	4
Total Fraction Proposed	18	18	2	2	2	4
Sample Collection Percentage	100%	100%	100%	100%	100%	100%

Table F.3.1.2
Sample Completeness
Subarea B- Buildings 101, 102 and 103 Area

SUBAREA B – BUILDINGS 101, 102, AND 103 AREA		
SAMPLE ID	**EXP**	**PCBs**
18BSB0010002	X	
18BSB0010608	X	
18BSB0020002	X	
18BSB0020507	X	
18BSB0030002	X	
18BSB0030203	X	
18BSB0040002	X	
18BSB0050002	X	
18BSB0060002	X	
18BSS0010002	X	
18BSS0020002	X	
18BSS0030002	X	
18BSS0040002	X	
18BCP0010002		X
18BCP0020002		X
18BCP0030002		X
Total Fraction Collected	13	3
Total Fraction Proposed	13	3
Sample Collection Percentage	100%	100%

Table F.3.1.3
Sample Completeness
Subarea C- Inert Operation Area

SUBAREA C – INERT OPERATION AREA

SAMPLE ID	Metals	Metals- Filtered	pH	VOCs	PAHs	PET	PCBs
18CSB0010002				X	X	X	
18CSB0010204				X	X	X	
18CSB0020002	X			X			
18CSB0020507	X			X			
18CSB0030002	X			X			
18CSB0040002				X	X	X	
18CSB0040507				X	X	X	
18CSB0050002	X			X			
18CSB0060002	X		X	X			
18CSB0060203	X			X			
18CSB0070002				X	X	X	
18CSB0070406				X	X	X	
18CSB0080002	X			X			
18CSB0080305	X			X			
18CSB0090002	X			X			
18CSB0090204	X			X			
18CSS0010002	X		X	X			
18CCP0010002							X
18CGWT001	X	X		X			
18CGWT002	X			X			
18CGWT003	X	X		X			
08GWT008	X	X		X			
08GWT012	X			X			
18CSW001				X	X	X	
18CSW002				X	X	X	
18CSD0010006				X	X	X	
18CSD0020006				X	X	X	
18CSD0030006	X			X			
Total Fraction Collected	17	3	2	27	10	10	1
Total Fraction Proposed	17	3	2	20	12	12	1
Sample Collection Percentage	100%	100%	100%	135%	83%	83%	100%

Table F.3.1.4
Sample Completeness
Subarea D- SP Area

SUBAREA D – SP AREA

SAMPLE ID	Metals	Metals- Filtered	EXP	pH	VOCs	PAHs	PCBs	SVOCs
18DSB0010002	X		X					
18DSB0010204	X		X					
18DSB0020002	X		X					
18DSB0020305	X		X					
18DSB0030002	X		X					
18DSB0030305	X		X					
18DSB0040002	X		X					
18DSB0040709	X		X					
18DSB0050002	X		X					
18DSB0050305	X		X					
18DSB0060002	X		X					
18DSB0060406	X		X					
18DSB0070002	X		X					
18DSB0070507	X		X					
18DSB0080002	X		X					
18DSB0080507	X		X					
18DSB0090002	X		X					
18DSB0090709	X		X					
18DSB0100002	X		X					
18DSB0101113	X		X					
18DSB0110002	X		X					
18DSB0110406	X		X					
18DSB0120002	X		X	X	X	X		X
18DSB0120305	X		X		X	X		X
18DSB0130002	X		X		X	X		X
18DSB0140002	X		X		X	X		X
18DSB0140406	X		X		X	X		X
18DSB0150002	X		X		X	X		X

Table F.3.1.4
Sample Completeness
Subarea D- SP Area

SAMPLE ID	Metals	Metals- Filtered	EXP	pH	VOCs	PAHs	PCBs	SVOCs
18DSB0150305	X		X		X	X		X
18DSB0160002	X		X					
18DSB0160203	X		X					
18DSB0170002	X		X		X			
18DSB0170305	X		X		X			
18DSB0180002	X		X		X			
18DSB0180810	X		X		X			
18DSS0010002	X		X	X				
18DSS0020002	X		X					
18DSS0030002	X		X					
18DCP0010002							X	
18DCP0020002							X	
18DGWT001	X	X	X					
18DGWT002	X		X					
18DGWT003	X		X					
18DGWT004	X		X					
18DGWT005	X		X					
18DGWT006	X	X	X					
Total Fraction Collected	44	2	44	2	11	7	2	7
Total Fraction Proposed	44	2	44	2	11	7	2	7
Sample Collection Percentage	100%	100%	100%	100%	100%	100%	100%	100%

Table F.3.1.5
Sample Completeness
Subarea E- Building 104 Area

SUBAREA E – BUILDING 104 AREA

SAMPLE ID	Metals	Metals- Filtered	EXP	pH	VOCs	PAHs	PCBs	PET	Ammonia	TOCs
18ESB0010002					X	X		X		
18ESB0010608					X	X		X		
18ESB0011415					X	X		X		
18ESB0020002					X	X		X		
18ESB0020406					X	X		X		
18ESB0030002	X		X	X	X					
18ESB0030203	X		X							
18ESB0040002	X		X		X					
18ESB0040203	X		X							
18ESB0050002	X		X		X					
18ESB0050608	X		X							
18ESB0060002	X		X		X					
18ESB0060810	X		X							
18ESB0110002	X		X							
18ESB0110305	X		X							
18ESB0120002	X		X							
18ESB0120507	X		X							
18ESS0010002	X		X							
18ESS0020002	X		X							
18ESS0030002	X		X							
18ESS0040002	X		X							
18ESS0050002	X		X							
18ESS0060002	X		X							
18ESS0070002	X		X							
18ESS0080002	X		X							
18ESS0090002	X		X	X						
18ECP0010002							X			
18ECP0020002							X			
18ECP0030002							X			
18EGWT001	X	X	X		X					

Table F.3.1.5
Sample Completeness
Subarea E- Building 104 Area

SAMPLE ID	Metals	Metals- Filtered	EXP	pH	VOCs	PAHs	PCBs	PET	Ammonia	TOCs
18EGWT002	X	X	X		X	X		X	X	
18EGWT003	X	X	X		X				X	
18EGWT004	X	X	X		X				X	
18ESW001	X	X	X						X	
18ESW002	X	X	X						X	
18ESD0010006	X		X		X					X
18ESD0020006	X		X		X					X
18ESD0030006	X		X		X					
18ESD0040006	X		X		X					
18ESD0050006	X		X		X					
Total Fraction Collected	32	6	32	2	18	6	3	6	5	2
Total Fraction Proposed	32	6	32	2	13	5	3	5	5	2
Sample Collection Percentage	100%	100%	100%	100%	138%	120%	100%	120%	100%	100%

Table F.3.1.7
Sample Completeness
Subarea E- Areas 1 2

SUBAREA E – AREAS 1 & 2

SAMPLE ID	Metals	EXP
18ESS0120002	X	X
18ESS0130002	X	X
18ESS0140002	X	X
18ESS0150002	X	X
18ESS0160002	X	X
18ESS0170002	X	X
Total Fraction Collected	6	6
Total Fraction Proposed	5	5
Sample Collection Percentage	120%	120%

Table F.3.1.8
Sample Completeness
Subarea F- Buildings 2084, and 2540 Area

SUBAREA F – BUILDINGS 2084, 2084, AND 2540 AREA

SAMPLE ID	Metals	EXP	pH	VOCs	PAHs	PCBs	PET
18FSB0010002	X	X					
18FSB0010507	X	X					
18FSB0020002	X	X					
18FSB0020507	X	X					
18FSB0030002	X	X	X				
18FSB0030507	X	X					
18FSS0010002				X	X		X
18FSS0020002				X	X		X
18FCP0010002						X	
18FCP0020002						X	
18FGWT001				X	X		X
Total Fraction Collected	6	6	1	3	3	2	3
Total Fraction Proposed	6	6	1	1	3	2	3
Sample Collection Percentage	100%	100%	100%	300%	100%	100%	100%

Table F.3.1.9
Sample Completeness
Subarea G- ASD I Area

SUBAREA G – ASD I AREA

SAMPLE ID	Metals	Metal Filtered	pH	VOCs	AMMONIA	PERCHLORATE
18GSB0010002	X					
18GSB0010810	X			X		
18GSB0020002	X					
18GSB0020305	X			X		
18GSB0030002	X					
18GSB0030709	X			X		
18GSB0040002	X		X			
18GSB0040608	X			X		
18GSS0010002	X		X			
18GSS0020002	X					
18GGWT001	X	X		X	X	X
18GGWT002	X	X		X	X	X
18GGWT003	X			X	X	X
18GGWT004	X	X		X	X	X
Total Fraction Collected	14	3	2	8	4	4
Total Fraction Proposed	14	3	2	8	4	4
Sample Collection Percentage	100%	100%	100%	100%	100%	100%

Table F.3.1.10
Sample Completeness
Subarea H- Building 198 Area

SUBAREA H – BUILDING 198 AREA

SAMPLE ID	Metals	Metals Filtered	EXP	pH	VOCs	AMMONIA	PCBs	PERCHLORATE
18HSB0010002	X		X	X	X			
18HSB0010204	X		X		X			
18HSB0020002	X		X		X			
18HSB0020305	X		X		X			
18HSB0030002	X		X		X			
18HSB0030203	X		X		X			
18HSB0040002	X		X		X			
18HSB0040305	X		X		X			
18HSS0010002	X		X	X				
18HSS0020002	X		X					
18HSS0030002	X		X					
18HCP0010002							X	
18HCP0020002							X	
18HCP0030002							X	
18HSD0010006	X		X		X			
18HSD0020006	X		X		X			
18HGWT001	X	X	X		X	X		X
18HGWT002	X		X		X	X		X
18HGWT003	X		X		X	X		X
Total Fraction Collected	16	1	16	2	13	3	3	3
Total Fraction Proposed	16	1	16	2	13	3	3	3
Sample Collection Percentage	100%	100%	100%	100%	100%	100%	100%	100%

Table F.3.1.11
Sample Completeness
Subarea I- Building 200 Area

SUBAREA I – BUILDING 200 AREA

SAMPLE ID	Metals	Metals Filtered	EXP	SVOC	VOCs	PAH	PET	pH	PCB	AMMONIA	PERCHLORATE
18ISB0010002			X		X	X	X				
18ISB0010305			X		X	X	X				
18ISB0020002			X								
18ISB0020406			X								
18ISB0030002			X								
18ISB0030911			X								
18ISB0040002			X								
18ISB0040204			X								
18ISB0050002			X								
18ISB0050204			X								
18ISS0010002	X		X					X			
18ISS0020002	X		X								
18ISS0030002	X		X	X	X		X				
18ISS0040002	X		X	X	X		X				
18ISS0050002	X		X	X	X		X				
18ICP0010002									X		
18ICP0020002									X		
18ICP0030002									X		
18IGWT001	X	X	X							X	X
18IGWT003	X	X	X							X	X
18IGWT004	X	X	X							X	X
18IGWT005	X	X	X							X	X
18ISD0010006	X		X	X	X		X				
18ISD0020006	X		X								
Total Fraction Collected	11	4	19	4	4	2	4	1	3	4	4
Total Fraction Proposed	10	4	19	4	4	2	4	1	3	4	4
Sample Collection Percentage	110%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table F.3.1.12
Sample Completeness
Subarea J-ASD II Area

SUBAREA J – ASD II AREA

SAMPLE ID	Metals	Metals Filtered	VOCs	PAH	PET	pH	PERCHLORATE
18JSB0010002	X						
18JSB0010608	X		X	X	X		
18JSB0020002	X					X	
18JSB0020406	X		X	X	X		
18JSS0010002	X					X	
18JSS0020002	X						
18JSS0030002	X						
18JSS0040002	X						
18JGWT001	X						X
18JGWT002	X	X					X
18JGWT003	X	X					X
18JGWT004	X	X					X
18JGWT005	X	X					X
18JSD0010006	X		X	X	X		
18JSD0020006	X						
Total Fraction Collected	15	4	3	3	3	2	5
Total Fraction Proposed	15	4	3	3	3	2	5
Sample Collection Percentage	100%	100%	100%	100%	100%	100%	100%

Table F.3.1.13
Sample Completeness
Boggs Creek

BOGGS CREEK –
SURFACE WATER AND SEDIMENT

SAMPLE ID	Metals	Metals Filtered	EXP	TOC	AMMONIA	PERCHLORATE
18SW001	X	X	X		X	X
18SW002	X	X	X		X	X
18SW003	X	X	X		X	X
18SW004	X	X	X		X	X
18SW005	X	X	X		X	X
18SD0010006	X		X	X		
18SD0020006	X		X	X		
18SD0030006	X		X	X		
18SD0040006	X		X	X		
18SD0050006	X		X	X		
Total Fraction Collected	10	5	10	5	5	5
Total Fraction Proposed	10	5	10	5	5	5
Sample Collection Percentage	100%	100%	100%	100%	100%	100%

Table F.3.1.14
NSA Crane, SWMU 18
SUBAREAS A through J and BOGGS CREEK
Sampling Collection Summary
FALL/WINTER 2011 & 2012
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Matrix	Samples	Collected	Sample Completeness
Soil	204	197	97%
Sediment	21	20	95%
Groundwater	40	39	98%
Surface Water	9	9	100%

TABLE F.3.1.15
NSA Crane, SWMU 18
LABORATORY COMPLETENESS SUMMARY

FRACTION	MATRIX	SITE	TOTAL NUMBER OF DATA POINTS	REJECTED DATA POINTS	ANALYTICAL PERCENT COMPLETENESS
VOCs	GW	BUILDING 106 POND	104	0	100%
	GW	LOAD AND FILL AREA BLDGS	1045	0	100%
	QC		832	1	99.9%
	SD	LOAD AND FILL AREA BLDGS	483	0	100%
	SO	LOAD AND FILL AREA BLDGS	2138	0	100%
	SW	LOAD AND FILL AREA BLDGS	10	0	100%
SVOCs	SD	LOAD AND FILL AREA BLDGS	17	0	100%
	SO	LOAD AND FILL AREA BLDGS	408	0	100%
PAH	GW	LOAD AND FILL AREA BLDGS	34	0	100%
	QC		68	0	100%
	SD	LOAD AND FILL AREA BLDGS	51	0	100%
	SO	LOAD AND FILL AREA BLDGS	449	0	100%
	SW	LOAD AND FILL AREA BLDGS	34	0	100%
PCB	QC		28	0	100%
	SO	LOAD AND FILL AREA BLDGS	133	0	100%
PET	GW	LOAD AND FILL AREA BLDGS	4	0	100%
	QC		8	0	100%
	SD	LOAD AND FILL AREA BLDGS	8	0	100%
	SO	LOAD AND FILL AREA BLDGS	44	0	100%
	SW	LOAD AND FILL AREA BLDGS	4	0	100%
EXP	GW	LOAD AND FILL AREA BLDGS	342	0	100%
	QC		60	0	100%
	SD	LOAD AND FILL AREA BLDGS	229	0	100%
	SO	LOAD AND FILL AREA BLDGS	1981	0	100%
	SW	LOAD AND FILL AREA BLDGS	103	0	100%
Metals	GW	BUILDING 106 POND	16	0	100%
	GW	LOAD AND FILL AREA BLDGS	783	0	100%
	QC		92	0	100%
	SD	LOAD AND FILL AREA BLDGS	422	0	100%
	SO	LOAD AND FILL AREA BLDGS	3132	0	100%
	SW	LOAD AND FILL AREA BLDGS	161	0	100%

TABLE F.3.1.15
NSA Crane, SWMU 18
LABORATORY COMPLETENESS SUMMARY

FRACTION	MATRIX	SITE	TOTAL NUMBER OF DATA POINTS	REJECTED DATA POINTS	ANALYTICAL PERCENT COMPLETENESS
Metals Filtered	GW	BUILDING 106 POND	8	0	100%
	GW	LOAD AND FILL AREA BLDGS	545	0	100%
	SW	LOAD AND FILL AREA BLDGS	161	0	100%
MISC	GW	LOAD AND FILL AREA BLDGS	41	0	100%
	SD	LOAD AND FILL AREA BLDGS	7	0	100%
	SO	LOAD AND FILL AREA BLDGS	18	0	100%
	SW	LOAD AND FILL AREA BLDGS	12	0	100%

Table F.3.2.1
NSA Crane, SWMU 18
PSL Exceedances- Human Health
Groundwater

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (ug/L)
EXP					
NITROBENZENE	22	22	100	26	0.12
NITROGLYCERIN	7	7	100	7	0.37
METALS					
ANTIMONY	34	34	100	35	1.5
ARSENIC	20	20	100	41	0.045
BERYLLIUM	14	1	7	35	4
CADMIUM	28	1	4	41	5
CHROMIUM	14	14	100	41	0.042
COBALT	2	2	100	35	1.1
LEAD	21	1	5	41	15
SELENIUM	36	6	17	41	5
THALLIUM	35	6	17	35	2
VANADIUM	21	21	100	35	0.26
METALS FILTERED					
ANTIMONY	25	25	100	25	1.5
ARSENIC	21	21	100	29	0.045
BERYLLIUM	21	1	5	25	4
CADMIUM	25	1	4	29	5
CHROMIUM	16	16	100	29	0.042
COBALT	3	3	100	25	1.1
LEAD	25	1	4	29	15
SELENIUM	24	6	25	29	5
THALLIUM	25	5	20	25	2
VANADIUM	24	24	100	25	0.26
MISC					
PERCHLORATE	19	10	53	21	2.6
VOC					
1,1,2,2-TETRACHLOROETHANE	25	25	100	25	0.067
1,1,2-TRICHLOROETHANE	24	24	100	25	0.24
1,2-DIBROMO-3-CHLOROPROPANE	25	25	100	25	0.00032
1,2-DIBROMOETHANE	25	25	100	25	0.0065
1,2-DICHLOROETHANE	25	25	100	25	0.15
1,2-DICHLOROPROPANE	25	25	100	25	0.39
1,4-DICHLOROBENZENE	25	25	100	25	0.43
BENZENE	26	26	100	27	0.41
BROMODICHLOROMETHANE	25	25	100	25	0.12
CARBON TETRACHLORIDE	25	25	100	25	0.36
CHLORODIBROMOMETHANE	25	25	100	25	0.15
CHLOROFORM	20	20	100	25	0.19
CIS-1,3-DICHLOROPROPENE	25	25	100	25	0.43
TETRACHLOROETHENE	23	23	100	25	0.11
TRANS-1,3-DICHLOROPROPENE	25	25	100	25	0.43

Table F.3.2.1
NSA Crane, SWMU 18
PSL Exceedances- Human Health
Groundwater

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (ug/L)
VINYL CHLORIDE	22	22	100	25	0.016
PAH (ug/L)					
BENZO(A)ANTHRACENE	3	3	100	3	0.029
BENZO(A)PYRENE	3	3	100	3	0.0029
BENZO(B)FLUORANTHENE	3	3	100	3	0.029
DIBENZO(A,H)ANTHRACENE	3	3	100	3	0.0029
INDENO(1,2,3-CD)PYRENE	3	3	100	3	0.029

Table F.3.2.2
NSA Crane, SWMU 18
PSL Exceedances - Ecological
Sediment

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (mg/kg)
EXP					
1,3-DINITROBENZENE	16	16	100	17	0.00861
2,4-DINITROTOLUENE	16	16	100	17	0.0144
2,6-DINITROTOLUENE	16	3	19	17	0.0398
METALS					
ANTIMONY	15	14	93	19	2
CADMIUM	5	1	20	21	0.99
SELENIUM	21	10	48	21	2
SILVER	19	19	100	21	0.5
VOC					
1,1,1-TRICHLOROETHANE	10	2	20	10	0.213
1,1,2,2-TETRACHLOROETHANE	10	1	10	10	0.85
1,1,2-TRICHLOROETHANE	10	2	20	10	0.518
1,1-DICHLOROETHANE	10	10	100	10	0.000575
1,1-DICHLOROETHENE	10	2	20	10	0.0194
1,2,3-TRICHLOROBENZENE	10	1	10	10	0.858
1,2-DICHLOROBENZENE	10	2	20	10	0.294
1,2-DICHLOROETHANE	10	2	20	10	0.26
1,2-DICHLOROPROPANE	10	2	20	10	0.333
1,4-DICHLOROBENZENE	10	2	20	10	0.318
2-BUTANONE	3	2	67	10	0.0424
2-HEXANONE	10	2	20	10	0.0582
4-METHYL-2-PENTANONE	10	2	20	10	0.0251
ACETONE	4	4	100	10	0.0099
BENZENE	14	3	21	14	0.142
BROMOFORM	10	2	20	10	0.492
BROMOMETHANE	10	10	100	10	0.00137
CARBON DISULFIDE	4	2	50	10	0.0239
CHLOROBENZENE	10	2	20	10	0.291
CHLOROFORM	10	2	20	10	0.121
CIS-1,2-DICHLOROETHENE	10	2	20	10	0.20894
CIS-1,3-DICHLOROPROPENE	10	6	60	10	0.00296
ETHYLBENZENE	13	2	15	14	0.175
METHYLENE CHLORIDE	2	2	100	10	0.159
NAPHTHALENE	4	1	25	4	0.176
STYRENE	10	2	20	10	0.254
TETRACHLOROETHENE	10	1	10	10	0.99
TRANS-1,2-DICHLOROETHENE	10	2	20	10	0.654
TRANS-1,3-DICHLOROPROPENE	10	6	60	10	0.00296
TRICHLOROETHENE	10	2	20	10	0.112
VINYL CHLORIDE	10	2	20	10	0.202
PAH					
ACENAPHTHENE	3	1	33	4	0.00671
ACENAPHTHYLENE	3	1	33	4	0.00587

Table F.3.2.3
NSA Crane, SWMU 18
PSL Exceedances- Human Health
Sediment

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (mg/kg)
EXP					
NITROBENZENE	13	13	100	17	0.028
METALS					
ANTIMONY	15	5	33	19	3.1
COBALT	1	1	100	19	2.3
SELENIUM	21	3	14	21	5.2
THALLIUM	16	2	13	19	2.8
VOC					
1,1,2,2-TETRACHLOROETHANE	10	3	30	10	0.007
1,1-DICHLOROETHENE	10	2	20	10	0.058
1,2-DIBROMO-3-CHLOROPROPANE	10	4	40	10	0.0054
1,2-DIBROMOETHANE	10	10	100	10	0.00034
1,2-DICHLOROETHANE	10	2	20	10	0.024
1,2-DICHLOROPROPANE	10	2	20	10	0.03
BENZENE	14	3	21	14	0.034
BROMODICHLOROMETHANE	10	2	20	10	0.27
BROMOFORM	10	2	20	10	0.6
BROMOMETHANE	10	2	20	10	0.052
CARBON TETRACHLORIDE	10	2	20	10	0.066
CHLORODIBROMOMETHANE	10	2	20	10	0.68
CHLOROETHANE	10	2	20	10	0.65
CHLOROFORM	10	2	20	10	0.29
CIS-1,2-DICHLOROETHENE	10	2	20	10	0.4
METHYL TERT-BUTYL ETHER	10	2	20	10	0.18
METHYLENE CHLORIDE	2	2	100	10	0.023
TETRACHLOROETHENE	10	2	20	10	0.058
TRANS-1,2-DICHLOROETHENE	10	2	20	10	0.68
TRICHLOROETHENE	10	2	20	10	0.057
VINYL CHLORIDE	10	2	20	10	0.013

Table F.3.2.4
NSA Crane, SWMU 18
PSL Exceedances- Human Health
Soil

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (mg/kg)
EXP					
2,4-DINITROTOLUENE	141	141	100	143	0.0058
2-NITROTOLUENE	141	141	100	143	0.0058
NITROBENZENE	136	136	100	143	0.00158
NITROGLYCERIN	65	65	100	65	0.032
RDX	119	119	100	143	0.0046
METALS					
ANTIMONY	135	1	1	140	3.1
COBALT	3	3	100	140	0.0166
SVOC					
1,2,4,5-TETRACHLOROBENZENE	7	1	14	7	1.02
2,2'-OXYBIS(1-CHLOROPROPANE)	7	7	100	7	0.0024
2,4,6-TRICHLOROPHENOL	7	7	100	7	0.07
2,4-DICHLOROPHENOL	7	1	14	7	1.1
2,4-DINITROPHENOL	7	7	100	7	0.29
2,4-DINITROTOLUENE	7	7	100	7	0.0058
2,6-DINITROTOLUENE	7	1	14	7	1
2-CHLOROPHENOL	7	1	14	7	0.75
2-NITROANILINE	7	1	14	7	0.67
2-NITROPHENOL	7	1	14	7	1.64
3,3'-DICHLOROBENZIDINE	7	7	100	7	0.0196
4,6-DINITRO-2-METHYLPHENOL	7	7	100	7	0.106
4-CHLOROANILINE	7	7	100	7	0.0028
4-METHYLPHENOL	7	1	14	7	1.1
4-NITROANILINE	7	7	100	7	0.028
ATRAZINE	7	7	100	7	0.0038
BIS(2-CHLOROETHOXY)METHANE	7	1	14	7	0.5
BIS(2-CHLOROETHYL)ETHER	7	7	100	7	0.000062
HEXACHLOROBENZENE	7	7	100	7	0.0106
HEXACHLOROBUTADIENE	7	7	100	7	0.034
HEXACHLOROETHANE	7	7	100	7	0.058
ISOPHORONE	7	1	14	7	0.46
N-NITROSO-DI-N-PROPYLAMINE	7	7	100	7	0.000144
N-NITROSODIPHENYLAMINE	7	1	14	7	1.5
NITROBENZENE	7	7	100	7	0.00158
PENTACHLOROPHENOL	7	7	100	7	0.028
VOC					
1,1,2,2-TETRACHLOROETHANE	42	42	100	42	0.00052
1,1,2-TRICHLOROETHANE	42	42	100	42	0.00156
1,1-DICHLOROETHANE	42	1	2	42	0.0138
1,1-DICHLOROETHENE	42	1	2	42	0.058
1,2-DIBROMO-3-CHLOROPROPANE	42	42	100	42	0.0000028
1,2-DIBROMOETHANE	42	42	100	42	0.000036
1,2-DICHLOROETHANE	42	42	100	42	0.00084
1,2-DICHLOROPROPANE	42	11	26	42	0.0026
1,4-DICHLOROBENZENE	42	1	2	42	0.0082

Table F.3.2.4
NSA Crane, SWMU 18
PSL Exceedances- Human Health
Soil

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (mg/kg)
BENZENE	58	6	10	65	0.0042
BROMODICHLOROMETHANE	42	42	100	42	0.00064
BROMOFORM	42	1	2	42	0.046
BROMOMETHANE	41	1	2	42	0.044
CARBON TETRACHLORIDE	42	2	5	42	0.0034
CHLORODIBROMOMETHANE	42	42	100	42	0.00078
CHLOROFORM	42	42	100	42	0.00106
ETHYLBENZENE	59	3	5	65	0.034
METHYL TERT-BUTYL ETHER	44	1	2	44	0.056
METHYLENE CHLORIDE	12	2	17	42	0.023
NAPHTHALENE	18	1	6	21	0.0094
TETRACHLOROETHENE	42	42	100	42	0.00098
TRICHLOROETHENE	36	1	3	42	0.0144
VINYL CHLORIDE	41	41	100	42	0.000112
PAH					
1,4-DIOXANE	7	7	100	7	0.0028
2-METHYLNAPHTHALENE	21	6	29	27	3.1
ACENAPHTHYLENE	25	1	4	27	18
BENZO(A)ANTHRACENE	21	4	19	27	0.15
BENZO(A)PYRENE	18	4	22	27	0.015
BENZO(B)FLUORANTHENE	14	3	21	27	0.15
BENZO(K)FLUORANTHENE	20	4	20	27	1.5
DIBENZO(A,H)ANTHRACENE	22	5	23	27	0.015
INDENO(1,2,3-CD)PYRENE	16	4	25	27	0.15
NAPHTHALENE	25	7	28	27	0.0094
PCB					
AROCLOR-1221	20	1	5	20	0.0024
AROCLOR-1232	20	1	5	20	0.0024

Table F.3.2.5
NSA Crane, SWMU 18
PSL Exceedances- Surface Soil
Ecological

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (mg/kg)
EXP					
2,6-DINITROTOLUENE	92	92	100	92	0.0328
METALS					
ANTIMONY	85	85	100	89	0.27
CADMIUM	61	60	98	98	0.36
SELENIUM	92	90	98	98	0.52
THALLIUM	72	72	100	89	0.0569
SVOC					
2,3,4,6-TETRACHLOROPHENOL	4	1	25	4	0.199
2,4-DIMETHYLPHENOL	4	4	100	4	0.01
2,4-DINITROPHENOL	4	4	100	4	0.0609
2,4-DINITROTOLUENE	4	1	25	4	1.28
2,6-DINITROTOLUENE	4	4	100	4	0.0328
2-CHLORONAPHTHALENE	4	4	100	4	0.0122
2-CHLOROPHENOL	4	1	25	4	0.243
2-NITROPHENOL	4	1	25	4	1.6
3,3'-DICHLOROBENZIDINE	4	1	25	4	0.646
3-NITROANILINE	4	1	25	4	3.16
4,6-DINITRO-2-METHYLPHENOL	4	4	100	4	0.144
4-CHLOROANILINE	4	1	25	4	1.1
4-NITROPHENOL	4	1	25	4	5.12
BIS(2-CHLOROETHOXY)METHANE	4	1	25	4	0.302
BIS(2-ETHYLHEXYL)PHTHALATE	4	1	25	4	0.925
BUTYL BENZYL PHTHALATE	4	1	25	4	0.239
DI-N-BUTYL PHTHALATE	4	4	100	4	0.15
HEXACHLOROBENZENE	4	1	25	4	0.199
HEXACHLOROBUTADIENE	4	4	100	4	0.0398
HEXACHLOROCYCLOPENTADIENE	4	1	25	4	0.755
HEXACHLOROETHANE	4	1	25	4	0.596
N-NITROSO-DI-N-PROPYLAMINE	4	1	25	4	0.544
N-NITROSODIPHENYLAMINE	4	1	25	4	0.545
NITROBENZENE	4	1	25	4	1.31
PENTACHLOROPHENOL	4	1	25	4	2.1
VOC					
1,2-DIBROMO-3-CHLOROPROPANE	22	1	5	22	0.0352
CARBON DISULFIDE	19	1	5	22	0.0941
PAH					
1,4-DIOXANE	4	4	100	4	2.05

Table F.3.2.5
NSA Crane, SWMU 18
PSL Exceedances- Surface Soil
Ecological

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (mg/kg)
2-METHYLNAPHTHALENE	9	1	11	14	29
ACENAPHTHENE	12	1	8	14	29
ACENAPHTHYLENE	13	1	8	14	29
ANTHRACENE	12	1	8	14	29
BENZO(A)ANTHRACENE	10	1	10	14	1.1
BENZO(A)PYRENE	8	1	13	14	1.1
BENZO(B)FLUORANTHENE	6	1	17	14	1.1
BENZO(G,H,I)PERYLENE	6	1	17	14	1.1
BENZO(K)FLUORANTHENE	9	1	11	14	1.1
CHRYSENE	9	1	11	14	1.1
DIBENZO(A,H)ANTHRACENE	11	2	18	14	1.1
FLUORENE	13	1	8	14	29
INDENO(1,2,3-CD)PYRENE	7	1	14	14	1.1
NAPHTHALENE	13	1	8	14	29
PYRENE	6	1	17	14	1.1
PCB					
AROCLOR-1016	19	19	100	20	0.000332
AROCLOR-1221	20	20	100	20	0.000332
AROCLOR-1232	20	20	100	20	0.000332
AROCLOR-1242	19	19	100	20	0.000332
AROCLOR-1248	20	20	100	20	0.000332
AROCLOR-1254	17	17	100	20	0.000332
AROCLOR-1260	6	6	100	20	0.000332

Table F.3.2.6
NSA Crane, SMWU 18
PSL Exceedances- Surface Water
Ecological

Parameter	Number of Non-Detected Results	Number of Non-Detected Results Exceeding PSL	% of Non-Detected Results Exceeding PSL	No of Analyses	Minimum Screening Level (ug/L)
METALS					
CADMIUM	6	6	100	8	0.25
SILVER	8	8	100	8	0.12
METALS FILTERED					
CADMIUM	8	8	100	8	0.25
SILVER	8	8	100	8	0.12
PAH (ug/L)					
ANTHRACENE	3	3	100	3	0.035
BENZO(A)ANTHRACENE	3	3	100	3	0.025
BENZO(A)PYRENE	3	3	100	3	0.014

TABLE 3.3.4.1
NSA Crane, SWMU 18
FIELD DUPLICATE PRECISION

SAMPLE ID	PARAMETER	FRACTION	ORIGINAL RESULT	DUPLICATE RESULT	RELATIVE PERCENT DIFFERENCE
18ASB0040002	CALCIUM	M	16200	3860	68.06
18CSD0030006	ISOPROPYLBENZENE	OV	27.3	5.1	74.37
18CSD0030006	METHYL CYCLOHEXANE	OV	24.9	5.78	68.80
18DSB0050305	CHROMIUM	M	20.3	102	114.59
18DSB0050305	COPPER	M	13.3	28.4	54.91
18DSB0050305	LEAD	M	13.4	26.8	50.00
18DSB0050305	NICKEL	M	22.1	57.7	69.87
18DSB0050305	ZINC	M	54.6	105	47.06
18DSB0180810	BARIUM	M	268	85	58.94
18EGWT006	ALUMINUM	M	5260	38200	135.22
18EGWT006	ALUMINUM	MF	85.7	44.4	38.28
18EGWT006	ARSENIC	M	4.03	15	95.14
18EGWT006	BARIUM	M	75.1	299	99.69
18EGWT006	BERYLLIUM	M	0.751	5.97	139.69
18EGWT006	CALCIUM	M	6080	17600	77.42
18EGWT006	CHROMIUM	M	10.3	76.9	136.62
18EGWT006	COBALT	M	20.5	83	100.81
18EGWT006	COPPER	M	9.66	77	139.83
18EGWT006	IRON	M	30800	227000	135.97
18EGWT006	IRON	MF	585	388	25.29
18EGWT006	LEAD	M	9.89	93.7	147.71
18EGWT006	MAGNESIUM	M	4570	19000	102.56
18EGWT006	MANGANESE	M	1680	6000	92.31
18EGWT006	MERCURY	M	0.2	0.327	34.94
18EGWT006	NICKEL	M	31.7	177	120.88
18EGWT006	POTASSIUM	M	1900	5320	75.00
18EGWT006	VANADIUM	M	11.8	68.7	123.29
18EGWT006	ZINC	M	44.7	328	135.75
18ESS0100002	ALUMINUM	M	5670	10000	40.58
18ESS0100002	CHROMIUM	M	181	27.1	79.11
18ESS0100002	IRON	M	23600	39700	37.05
18ESS0100002	LEAD	M	798	55.1	89.99
18ESS0100002	VANADIUM	M	17.2	33.4	47.79
18HSB0020305	ALUMINUM	M	2110	10600	114.57
18HSS0010002	HMX	EXP	0.637	0.0555	87.48
18HSS0010002	NITROBENZENE	EXP	0.218	0.118	36.10
18SW004	ZINC	M	1.52	19.8	160.07

APPENDIX G

ANALYTICAL DATA - FULL TABLES

LOCATION	18BSB001		18BSB002		
SAMPLE ID	18BSB0010002	18BSB0010608	18BSB0020002	18BSB0020507	18BSB0020507-D
SAMPLE DATE	20111019	20111019	20111019	20111019	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	DUP
MATRIX	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SB	SB
TOP DEPTH	0	6	0	5	5
BOTTOM DEPTH	2	8	2	7	7
EXPLOSIVES (MG/KG)					
1,3,5-TRINITROBENZENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
1,3-DINITROBENZENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
2,4,6-TRINITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
2,4-DINITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
2,6-DINITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
2-AMINO-4,6-DINITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
2-NITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
3-NITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
4-AMINO-2,6-DINITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
4-NITROTOLUENE	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
HMX	0.0385 U	0.04 U	0.0392 U	0.04 U	0.0396 U
NITROBENZENE	0.0385 U	0.04 U	0.0227 J	0.04 U	0.0396 U
NITROGLYCERIN	0.192 U	0.2 U	0.196 U	0.2 U	0.198 U
RDX	0.0385 U	0.0238 J	0.0356 J	0.04 U	0.0396 U
TETRYL	0.0385 U	0.04 U	0.0537 J	0.04 U	0.0396 U

LOCATION	18BSB003		18BSB004	18BSB005	18BSB006	18BSS001
SAMPLE ID	18BSB0030002	18BSB0030203	18BSB0040002	18BSB0050002	18BSB0060002	18BSS0010002
SAMPLE DATE	20111020	20111020	20111019	20111019	20111020	20111020
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SS	SS	SS
TOP DEPTH	0	2	0	0	0	0
BOTTOM DEPTH	2	3	2	2	2	2
EXPLOSIVES (MG/KG)						
1,3,5-TRINITROBENZENE	0.0381 U	0.0385 U	0.0392 U	0.0261 J	0.04 U	0.04 U
1,3-DINITROBENZENE	0.0381 U	0.0385 U	0.0833 J	0.0381 U	0.04 U	0.04 U
2,4,6-TRINITROTOLUENE	0.0381 U	0.0385 U	0.0559 J	0.0381 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	0.0381 U	0.0385 U	0.0436 J	0.0381 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
2-NITROTOLUENE	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
3-NITROTOLUENE	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
4-AMINO-2,6-DINITROTOLUENE	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
4-NITROTOLUENE	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
HMX	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
NITROBENZENE	0.0381 U	0.0385 U	0.054 J	0.0381 U	0.04 U	0.04 U
NITROGLYCERIN	0.19 U	0.192 U	0.196 U	0.19 U	0.2 U	0.2 U
RDX	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U
TETRYL	0.0381 U	0.0385 U	0.0392 U	0.0381 U	0.04 U	0.04 U

LOCATION	18BSS002	18BSS003		18BSS004
SAMPLE ID	18BSS0020002	18BSS0030002	18BSS0030002-D	18BSS0040002
SAMPLE DATE	20111020	20111020	20111020	20111020
SAMPLE CODE	NORMAL	NORMAL	DUP	NORMAL
MATRIX	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SS	SS	SS
TOP DEPTH	0	0	0	0
BOTTOM DEPTH	2	2	2	2
EXPLOSIVES (MG/KG)				
1,3,5-TRINITROBENZENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
1,3-DINITROBENZENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
2,4,6-TRINITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
2,4-DINITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
2,6-DINITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
2-AMINO-4,6-DINITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
2-NITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
3-NITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
4-AMINO-2,6-DINITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
4-NITROTOLUENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
HMX	0.0392 U	0.0385 U	0.04 U	0.0385 U
NITROBENZENE	0.0392 U	0.0385 U	0.04 U	0.0385 U
NITROGLYCERIN	0.196 U	0.192 U	0.2 U	0.192 U
RDX	0.0392 U	0.0385 U	0.04 U	0.0385 U
TETRYL	0.0392 U	0.0385 U	0.04 U	0.0385 U

LOCATION	18CMWT003	18CSB001		18CSB002		18CSB003
SAMPLE ID	18CMWT0030204	18CSB0010002	18CSB0010204	18CSB0020002	18CSB0020507	18CSB0030002
SAMPLE DATE	20111102	20111019	20111019	20111020	20111020	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SB	SS	SB	SS	SB	SS
TOP DEPTH	2	0	2	0	5	0
BOTTOM DEPTH	4	2	4	2	7	2
METALS (MG/KG)						
ARSENIC	8.55	NA	NA	4.42	5.45	2.42 J
BARIUM	54.8	NA	NA	36.4	48.4	45.2
CADMIUM	0.113 U	NA	NA	0.559 U	0.584 U	0.568 U
CHROMIUM	14.8	NA	NA	14.6	21	17
LEAD	9.66	NA	NA	8.82	11.7	7.09
MERCURY	0.0179 J	NA	NA	0.0321 U	0.0419 U	0.0328 U
SELENIUM	0.283 U	NA	NA	1.4 U	1.46 U	1.42 U
SILVER	0.226 U	NA	NA	0.559 U	0.584 U	0.568 U
MISCELLANEOUS PARAMETERS (S.U.)						
PH	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)						
DRO (C08-C28)	NA	183	437	NA	NA	NA
DRO (C08-C34)	NA	224	463	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)						
2-METHYLNAPHTHALENE	NA	0.00393 U	0.00373 U	NA	NA	NA
ACENAPHTHENE	NA	0.00393 U	0.00373 U	NA	NA	NA
ACENAPHTHYLENE	NA	0.0125	0.0103	NA	NA	NA
ANTHRACENE	NA	0.00393 U	0.00373 U	NA	NA	NA
BENZO(A)ANTHRACENE	NA	0.00393 U	0.00373 U	NA	NA	NA
BENZO(A)PYRENE	NA	0.00393 U	0.00373 U	NA	NA	NA
BENZO(B)FLUORANTHENE	NA	0.00611 J	0.00257 J	NA	NA	NA
BENZO(G,H,I)PERYLENE	NA	0.0666	0.00373 U	NA	NA	NA
BENZO(K)FLUORANTHENE	NA	0.00393 U	0.00373 U	NA	NA	NA
CHRYSENE	NA	0.00393 U	0.00373 U	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	NA	0.00393 U	0.00373 U	NA	NA	NA
FLUORANTHENE	NA	0.00393 U	0.00373 U	NA	NA	NA
FLUORENE	NA	0.00393 U	0.0158	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	NA	0.011	0.00429 J	NA	NA	NA
NAPHTHALENE	NA	0.00393 U	0.00373 U	NA	NA	NA
PHENANTHRENE	NA	0.00393 U	0.0294	NA	NA	NA
PYRENE	NA	0.00779 J	0.0108	NA	NA	NA
VOLATILES (MG/KG)						
1,1,1-TRICHLOROETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,1,2,2-TETRACHLOROETHANE	0.00247 UJ	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,1,2-TRICHLOROETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U

LOCATION	18CMWT003	18CSB001		18CSB002		18CSB003
SAMPLE ID	18CMWT0030204	18CSB0010002	18CSB0010204	18CSB0020002	18CSB0020507	18CSB0030002
SAMPLE DATE	20111102	20111019	20111019	20111020	20111020	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SB	SS	SB	SS	SB	SS
TOP DEPTH	2	0	2	0	5	0
BOTTOM DEPTH	4	2	4	2	7	2
1,1-DICHLOROETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,1-DICHLOROETHENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,2,3-TRICHLOROBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,2,4-TRICHLOROBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 UJ
1,2-DIBROMO-3-CHLOROPROPANE	0.00247 UJ	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,2-DIBROMOETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,2-DICHLOROBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,2-DICHLOROETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,2-DICHLOROPROPANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,3-DICHLOROBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
1,4-DICHLOROBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
2-BUTANONE	0.00493 UJ	NA	NA	0.00488 UJ	0.00707 UJ	0.0056 UJ
2-HEXANONE	0.00247 UJ	NA	NA	0.00244 UJ	0.00353 UJ	0.0028 U
4-METHYL-2-PENTANONE	0.00247 U	NA	NA	0.00244 UJ	0.00353 UJ	0.0028 U
ACETONE	0.01 J	NA	NA	0.0124 J	0.0196 J	0.00927 J
BENZENE	0.00247 U	0.00242 U	0.118 U	0.00244 U	0.00353 U	0.0028 U
BROMOCHLOROMETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
BROMODICHLOROMETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
BROMOFORM	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
BROMOMETHANE	0.00247 UJ	NA	NA	0.00244 U	0.00353 U	0.0028 U
CARBON DISULFIDE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CARBON TETRACHLORIDE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CHLOROBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 UJ
CHLORODIBROMOMETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CHLOROETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CHLOROFORM	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CHLOROMETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CIS-1,2-DICHLOROETHENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CIS-1,3-DICHLOROPROPENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
CYCLOHEXANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
DICHLORODIFLUOROMETHANE	0.00247 UJ	NA	NA	0.00244 U	0.00353 U	0.0028 U
ETHYLBENZENE	0.00247 U	0.00242 U	0.118 U	0.00244 U	0.00353 U	0.0028 U
ISOPROPYLBENZENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
M+P-XYLENES	0.00493 U	NA	NA	0.00488 U	0.00707 U	0.0056 U
METHYL ACETATE	0.00493 U	NA	NA	0.00488 UJ	0.00707 UJ	0.0056 U
METHYL CYCLOHEXANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
METHYL TERT-BUTYL ETHER	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U

LOCATION	18CMWT003	18CSB001		18CSB002		18CSB003
SAMPLE ID	18CMWT0030204	18CSB0010002	18CSB0010204	18CSB0020002	18CSB0020507	18CSB0030002
SAMPLE DATE	20111102	20111019	20111019	20111020	20111020	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SB	SS	SB	SS	SB	SS
TOP DEPTH	2	0	2	0	5	0
BOTTOM DEPTH	4	2	4	2	7	2
METHYLENE CHLORIDE	0.0152	NA	NA	0.0087 U	0.0192 U	0.0266
NAPHTHALENE	NA	0.00242 UJ	0.118 U	NA	NA	NA
O-XYLENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
STYRENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
TETRACHLOROETHENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 UJ
TOLUENE	0.00247 U	0.00096 J	0.118 U	0.00244 U	0.00353 U	0.0028 UJ
TOTAL XYLENES	0.0074 U	0.00242 U	0.118 U	0.00732 U	0.0106 U	0.0084 U
TRANS-1,2-DICHLOROETHENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
TRANS-1,3-DICHLOROPROPENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
TRICHLOROETHENE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
TRICHLOROFLUOROMETHANE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U
VINYL CHLORIDE	0.00247 U	NA	NA	0.00244 U	0.00353 U	0.0028 U

LOCATION	18CSB004		18CSB005		18CSB006	
SAMPLE ID	18CSB0040002	18CSB0040507	18CSB0050002	18CSB0050002-D	18CSB0060002	18CSB0060203
SAMPLE DATE	20111020	20111020	20111019	20111019	20111019	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SS	SS	SB
TOP DEPTH	0	5	0	0	0	2
BOTTOM DEPTH	2	7	2	2	2	3
METALS (MG/KG)						
ARSENIC	NA	NA	5.73	6.43	4.83	7.55
BARIUM	NA	NA	69.2	103	130	41.8
CADMIUM	NA	NA	1.21 J	1.7	0.613 U	0.576 U
CHROMIUM	NA	NA	97.5	66.9	19.7	25.9
LEAD	NA	NA	117	74.9	8.4	7.97
MERCURY	NA	NA	0.0361 U	0.0225 J	0.032 U	0.0322 U
SELENIUM	NA	NA	1.52 U	1.63 U	1.53 U	1.44 U
SILVER	NA	NA	0.608 U	0.653 U	0.613 U	0.576 U
MISCELLANEOUS PARAMETERS (S.U.						
PH	NA	NA	NA	NA	6.84	NA
PETROLEUM HYDROCARBONS (MG/I						
DRO (C08-C28)	8.75	9.45 U	NA	NA	NA	NA
DRO (C08-C34)	23.8	35.5	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCAR						
2-METHYLNAPHTHALENE	0.00395 U	0.00476 U	NA	NA	NA	NA
ACENAPHTHENE	0.00395 U	0.00266 J	NA	NA	NA	NA
ACENAPHTHYLENE	0.00395 U	0.00476 U	NA	NA	NA	NA
ANTHRACENE	0.00395 U	0.00247 J	NA	NA	NA	NA
BENZO(A)ANTHRACENE	0.00395 U	0.00476 U	NA	NA	NA	NA
BENZO(A)PYRENE	0.00395 U	0.00476 U	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	0.00395 U	0.00476 U	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	0.00395 U	0.00476 U	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	0.00395 U	0.00476 U	NA	NA	NA	NA
CHRYSENE	0.00395 U	0.00476 U	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	0.00395 U	0.00476 U	NA	NA	NA	NA
FLUORANTHENE	0.00395 U	0.00897 J	NA	NA	NA	NA
FLUORENE	0.00395 U	0.00476 U	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	0.00395 U	0.00476 U	NA	NA	NA	NA
NAPHTHALENE	0.00395 U	0.00476 U	NA	NA	NA	NA
PHENANTHRENE	0.00242 J	0.0118	NA	NA	NA	NA
PYRENE	0.00395 U	0.00731 J	NA	NA	NA	NA
VOLATILES (MG/KG)						
1,1,1-TRICHLOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,1,2,2-TETRACHLOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,1,2-TRICHLOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,1,2-TRICHLOROTRIFLUOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U

LOCATION	18CSB004		18CSB005		18CSB006	
SAMPLE ID	18CSB0040002	18CSB0040507	18CSB0050002	18CSB0050002-D	18CSB0060002	18CSB0060203
SAMPLE DATE	20111020	20111020	20111019	20111019	20111019	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SS	SS	SB
TOP DEPTH	0	5	0	0	0	2
BOTTOM DEPTH	2	7	2	2	2	3
1,1-DICHLOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,1-DICHLOROETHENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2,3-TRICHLOROBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2,4-TRICHLOROBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2-DIBROMO-3-CHLOROPROPANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2-DIBROMOETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2-DICHLOROBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2-DICHLOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,2-DICHLOROPROPANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,3-DICHLOROBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
1,4-DICHLOROBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
2-BUTANONE	NA	NA	0.00454 U	0.019	0.00473 U	0.00465 UJ
2-HEXANONE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
4-METHYL-2-PENTANONE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 UJ
ACETONE	NA	NA	0.0318 J	0.148 J	0.00535 J	0.00604 J
BENZENE	0.00462 U	0.00296 U	0.00227 U	0.00291 U	0.00237 U	0.00233 U
BROMOCHLOROMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
BROMODICHLOROMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
BROMOFORM	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
BROMOMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CARBON DISULFIDE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CARBON TETRACHLORIDE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CHLOROBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CHLORODIBROMOMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CHLOROETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CHLOROFORM	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CHLOROMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CIS-1,2-DICHLOROETHENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CIS-1,3-DICHLOROPROPENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
CYCLOHEXANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
DICHLORODIFLUOROMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
ETHYLBENZENE	0.00462 U	0.00296 U	0.00227 U	0.00291 U	0.00237 U	0.00233 U
ISOPROPYLBENZENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
M+P-XYLENES	NA	NA	0.00454 U	0.00582 U	0.00473 U	0.00465 U
METHYL ACETATE	NA	NA	0.00454 U	0.00582 U	0.00473 U	0.00465 UJ
METHYL CYCLOHEXANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00173 J
METHYL TERT-BUTYL ETHER	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U

LOCATION	18CSB004		18CSB005		18CSB006	
SAMPLE ID	18CSB0040002	18CSB0040507	18CSB0050002	18CSB0050002-D	18CSB0060002	18CSB0060203
SAMPLE DATE	20111020	20111020	20111019	20111019	20111019	20111019
SAMPLE CODE	NORMAL	NORMAL	NORMAL	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SS	SS	SB
TOP DEPTH	0	5	0	0	0	2
BOTTOM DEPTH	2	7	2	2	2	3
METHYLENE CHLORIDE	NA	NA	0.00454 U	0.00582 U	0.0473 U	0.0193 U
NAPHTHALENE	0.00462 U	0.00296 U	NA	NA	NA	NA
O-XYLENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
STYRENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
TETRACHLOROETHENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
TOLUENE	0.00462 U	0.00296 U	0.00227 U	0.00291 U	0.00237 U	0.00233 U
TOTAL XYLENES	0.00462 U	0.00296 U	0.00681 U	0.00873 U	0.0071 U	0.00698 U
TRANS-1,2-DICHLOROETHENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
TRANS-1,3-DICHLOROPROPENE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
TRICHLOROETHENE	NA	NA	0.00227 U	0.00291 U	0.00216 J	0.00837
TRICHLOROFLUOROMETHANE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U
VINYL CHLORIDE	NA	NA	0.00227 U	0.00291 U	0.00237 U	0.00233 U

LOCATION	18CSB007		18CSB008			18CSB009
SAMPLE ID	18CSB0070002	18CSB0070406	18CSB0080002	18CSB0080305	18CSB009_0002	18CSB0090002
SAMPLE DATE	20111020	20111020	20111018	20111018	20111018	20111025
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SB	SS	SS
TOP DEPTH	0	4	0	3	0	0
BOTTOM DEPTH	2	6	2	5	2	2
METALS (MG/KG)						
ARSENIC	NA	NA	5.96	6.62	9.18	NA
BARIUM	NA	NA	56.2	76	1940	NA
CADMIUM	NA	NA	0.605 U	0.438 J	0.561 J	NA
CHROMIUM	NA	NA	15.6	20	26.8	NA
LEAD	NA	NA	11.2	17.2	16.6	NA
MERCURY	NA	NA	0.0369 U	0.193	0.0409 U	NA
SELENIUM	NA	NA	1.51 U	1.67 U	1.91 U	NA
SILVER	NA	NA	0.605 U	0.67 U	0.765 U	NA
MISCELLANEOUS PARAMETERS (S.U.						
PH	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/I						
DRO (C08-C28)	33.7	4010	NA	NA	NA	NA
DRO (C08-C34)	54.7	4030	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCAR						
2-METHYLNAPHTHALENE	0.0514	0.00399 U	NA	NA	NA	NA
ACENAPHTHENE	0.00387 U	0.00399 U	NA	NA	NA	NA
ACENAPHTHYLENE	0.00387 U	0.00399 U	NA	NA	NA	NA
ANTHRACENE	0.00387 U	0.00399 U	NA	NA	NA	NA
BENZO(A)ANTHRACENE	0.00387 U	0.00399 U	NA	NA	NA	NA
BENZO(A)PYRENE	0.00387 U	0.00445 J	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	0.00387 U	0.00596 J	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	0.00855	0.0122	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	0.00387 U	0.00275 J	NA	NA	NA	NA
CHRYSENE	0.00387 U	0.00399 U	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	0.00387 U	0.00399 U	NA	NA	NA	NA
FLUORANTHENE	0.00387 U	0.00399 U	NA	NA	NA	NA
FLUORENE	0.00387 U	0.00399 U	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	0.00387 U	0.0101	NA	NA	NA	NA
NAPHTHALENE	0.0109	0.00399 U	NA	NA	NA	NA
PHENANTHRENE	0.0128	2.21	NA	NA	NA	NA
PYRENE	0.00307 J	0.109	NA	NA	NA	NA
VOLATILES (MG/KG)						
1,1,1-TRICHLOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,1,2,2-TETRACHLOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 UJ
1,1,2-TRICHLOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,1,2-TRICHLOROTRIFLUOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U

LOCATION	18CSB007		18CSB008			18CSB009
SAMPLE ID	18CSB0070002	18CSB0070406	18CSB0080002	18CSB0080305	18CSB009_0002	18CSB0090002
SAMPLE DATE	20111020	20111020	20111018	20111018	20111018	20111025
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SB	SS	SS
TOP DEPTH	0	4	0	3	0	0
BOTTOM DEPTH	2	6	2	5	2	2
1,1-DICHLOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,1-DICHLOROETHENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,2,3-TRICHLOROBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 UJ
1,2,4-TRICHLOROBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 UJ
1,2-DIBROMO-3-CHLOROPROPANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 UJ
1,2-DIBROMOETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,2-DICHLOROBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,2-DICHLOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,2-DICHLOROPROPANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,3-DICHLOROBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
1,4-DICHLOROBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
2-BUTANONE	NA	NA	0.0074 J	0.0407	NA	0.00607 U
2-HEXANONE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 UJ
4-METHYL-2-PENTANONE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 UJ
ACETONE	NA	NA	0.0481 J	0.161 J	NA	0.0185 J
BENZENE	0.00125 J	0.00045 J	0.00233 U	0.00282 U	NA	0.00303 U
BROMOCHLOROMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
BROMODICHLOROMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
BROMOFORM	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
BROMOMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CARBON DISULFIDE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CARBON TETRACHLORIDE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CHLOROBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CHLORODIBROMOMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CHLOROETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CHLOROFORM	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CHLOROMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CIS-1,2-DICHLOROETHENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CIS-1,3-DICHLOROPROPENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
CYCLOHEXANE	NA	NA	0.00233 U	0.00441 J	NA	0.00303 U
DICHLORODIFLUOROMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
ETHYLBENZENE	0.0014 J	0.00138 J	0.00233 U	0.00282 U	NA	0.00303 U
ISOPROPYLBENZENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
M+P-XYLENES	NA	NA	0.00466 U	0.00563 U	NA	0.00607 U
METHYL ACETATE	NA	NA	0.00466 U	0.00563 U	NA	0.00607 UJ
METHYL CYCLOHEXANE	NA	NA	0.00233 U	0.00531 J	NA	0.00303 U
METHYL TERT-BUTYL ETHER	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U

LOCATION	18CSB007		18CSB008			18CSB009
SAMPLE ID	18CSB0070002	18CSB0070406	18CSB0080002	18CSB0080305	18CSB009_0002	18CSB0090002
SAMPLE DATE	20111020	20111020	20111018	20111018	20111018	20111025
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SB	SS	SS
TOP DEPTH	0	4	0	3	0	0
BOTTOM DEPTH	2	6	2	5	2	2
METHYLENE CHLORIDE	NA	NA	0.00615 U	0.00563 U	NA	0.0371
NAPHTHALENE	0.00335 U	0.00219 UJ	NA	NA	NA	NA
O-XYLENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
STYRENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
TETRACHLOROETHENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
TOLUENE	0.00344 J	0.00139 J	0.00233 U	0.00205 J	NA	0.00303 U
TOTAL XYLENES	0.00233 J	0.00356 J	0.00699 U	0.00845 U	NA	0.0091 U
TRANS-1,2-DICHLOROETHENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
TRANS-1,3-DICHLOROPROPENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
TRICHLOROETHENE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
TRICHLOROFLUOROMETHANE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U
VINYL CHLORIDE	NA	NA	0.00233 U	0.00282 U	NA	0.00303 U

LOCATION		18CSS001	
SAMPLE ID	18CSB0090204	18CSS0010002	18CSS0010002-D
SAMPLE DATE	20111018	20111019	20111019
SAMPLE CODE	NORMAL	NORMAL	DUP
MATRIX	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL
SUBMATRIX	SB	SS	SS
TOP DEPTH	2	0	0
BOTTOM DEPTH	4	2	2
METALS (MG/KG)			
ARSENIC	4.35	19.6	15.8
BARIUM	253	104	105
CADMIUM	0.575 U	0.626 U	0.578 U
CHROMIUM	9.45	47.5	29.1
LEAD	5.35	32.8	26.7
MERCURY	0.0282 U	0.0383 J	0.0375 J
SELENIUM	1.44 U	1.57 U	1.44 U
SILVER	0.575 U	0.626 U	0.578 U
MISCELLANEOUS PARAMETERS (S.U.			
PH	NA	7.65	7.31
PETROLEUM HYDROCARBONS (MG/I			
DRO (C08-C28)	NA	NA	NA
DRO (C08-C34)	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCAR			
2-METHYLNAPHTHALENE	NA	NA	NA
ACENAPHTHENE	NA	NA	NA
ACENAPHTHYLENE	NA	NA	NA
ANTHRACENE	NA	NA	NA
BENZO(A)ANTHRACENE	NA	NA	NA
BENZO(A)PYRENE	NA	NA	NA
BENZO(B)FLUORANTHENE	NA	NA	NA
BENZO(G,H,I)PERYLENE	NA	NA	NA
BENZO(K)FLUORANTHENE	NA	NA	NA
CHRYSENE	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	NA	NA	NA
FLUORANTHENE	NA	NA	NA
FLUORENE	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	NA	NA	NA
NAPHTHALENE	NA	NA	NA
PHENANTHRENE	NA	NA	NA
PYRENE	NA	NA	NA
VOLATILES (MG/KG)			
1,1,1-TRICHLOROETHANE	0.0021 U	0.00244 U	0.00226 U
1,1,2,2-TETRACHLOROETHANE	0.0021 U	0.00244 U	0.00226 U
1,1,2-TRICHLOROETHANE	0.0021 U	0.00244 U	0.00226 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.0021 U	0.00244 U	0.00226 U

LOCATION		18CSS001	
SAMPLE ID	18CSB0090204	18CSS0010002	18CSS0010002-D
SAMPLE DATE	20111018	20111019	20111019
SAMPLE CODE	NORMAL	NORMAL	DUP
MATRIX	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL
SUBMATRIX	SB	SS	SS
TOP DEPTH	2	0	0
BOTTOM DEPTH	4	2	2
1,1-DICHLOROETHANE	0.0021 U	0.00244 U	0.00226 U
1,1-DICHLOROETHENE	0.0021 U	0.00244 U	0.00226 U
1,2,3-TRICHLOROBENZENE	0.0021 U	0.00244 U	0.00226 U
1,2,4-TRICHLOROBENZENE	0.0021 U	0.00244 UJ	0.00226 UJ
1,2-DIBROMO-3-CHLOROPROPANE	0.0021 U	0.00244 U	0.00226 U
1,2-DIBROMOETHANE	0.0021 U	0.00244 U	0.00226 U
1,2-DICHLOROBENZENE	0.0021 U	0.00244 U	0.00226 U
1,2-DICHLOROETHANE	0.0021 U	0.00244 U	0.00226 U
1,2-DICHLOROPROPANE	0.0021 U	0.00244 U	0.00226 U
1,3-DICHLOROBENZENE	0.0021 U	0.00244 U	0.00226 U
1,4-DICHLOROBENZENE	0.0021 U	0.00244 U	0.00226 U
2-BUTANONE	0.00425 J	0.0218 J	0.00369 J
2-HEXANONE	0.0021 U	0.00244 U	0.00226 U
4-METHYL-2-PENTANONE	0.0021 U	0.00244 U	0.00226 U
ACETONE	0.0386 J	0.152 J	0.0721 J
BENZENE	0.0021 U	0.00244 U	0.00226 U
BROMOCHLOROMETHANE	0.0021 U	0.00244 U	0.00226 U
BROMODICHLOROMETHANE	0.0021 U	0.00244 U	0.00226 U
BROMOFORM	0.0021 U	0.00244 U	0.00226 U
BROMOMETHANE	0.0021 U	0.00244 U	0.00226 U
CARBON DISULFIDE	0.0021 U	0.00244 U	0.00226 U
CARBON TETRACHLORIDE	0.0021 U	0.00244 U	0.00226 U
CHLOROBENZENE	0.0021 U	0.00244 UJ	0.00226 UJ
CHLORODIBROMOMETHANE	0.0021 U	0.00244 U	0.00226 U
CHLOROETHANE	0.0021 U	0.00244 U	0.00226 U
CHLOROFORM	0.0021 U	0.00244 U	0.00226 U
CHLOROMETHANE	0.0021 U	0.00244 U	0.00226 U
CIS-1,2-DICHLOROETHENE	0.0021 U	0.00244 U	0.00226 U
CIS-1,3-DICHLOROPROPENE	0.0021 U	0.00244 U	0.00226 U
CYCLOHEXANE	0.0021 U	0.00244 U	0.00226 U
DICHLORODIFLUOROMETHANE	0.0021 U	0.00244 U	0.00226 U
ETHYLBENZENE	0.0021 U	0.00244 U	0.00226 U
ISOPROPYLBENZENE	0.0021 U	0.00244 U	0.00226 U
M+P-XYLENES	0.00419 U	0.00488 U	0.00452 U
METHYL ACETATE	0.00419 U	0.00488 U	0.00452 U
METHYL CYCLOHEXANE	0.0021 U	0.00244 U	0.00226 U
METHYL TERT-BUTYL ETHER	0.0021 U	0.00244 U	0.00226 U

LOCATION		18CSS001	
SAMPLE ID	**18CSB0090204**	**18CSS0010002**	**18CSS0010002-D**
SAMPLE DATE	**20111018**	**20111019**	**20111019**
SAMPLE CODE	**NORMAL**	**NORMAL**	**DUP**
MATRIX	**SO**	**SO**	**SO**
SAMPLE TYPE	**NORMAL**	**NORMAL**	**NORMAL**
SUBMATRIX	**SB**	**SS**	**SS**
TOP DEPTH	**2**	**0**	**0**
BOTTOM DEPTH	**4**	**2**	**2**
METHYLENE CHLORIDE	0.00419 U	0.0313	0.0279
NAPHTHALENE	NA	NA	NA
O-XYLENE	0.0021 U	0.00244 U	0.00226 U
STYRENE	0.0021 U	0.00244 U	0.00226 U
TETRACHLOROETHENE	0.0021 U	0.00244 UJ	0.00226 UJ
TOLUENE	0.0021 U	0.00244 UJ	0.00226 UJ
TOTAL XYLENES	0.00629 U	0.00732 U	0.00678 U
TRANS-1,2-DICHLOROETHENE	0.0021 U	0.00244 U	0.00226 U
TRANS-1,3-DICHLOROPROPENE	0.0021 U	0.00244 U	0.00226 U
TRICHLOROETHENE	0.0021 U	0.00244 U	0.00226 U
TRICHLOROFLUOROMETHANE	0.0021 U	0.00244 U	0.00226 U
VINYL CHLORIDE	0.0021 U	0.00244 U	0.00226 U

LOCATION	18FSB001		18FSB002		18FSB003	
SAMPLE ID	18FSB0010002	18FSB0010507	18FSB0020002	18FSB0020507	18FSB0030002	18FSB0030507
SAMPLE DATE	20111022	20111022	20111022	20111022	20111022	20111022
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SB	SS	SB
TOP DEPTH	0	5	0	5	0	5
BOTTOM DEPTH	2	7	2	7	2	7
EXPLOSIVES (MG/KG)						
1,3,5-TRINITROBENZENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
1,3-DINITROBENZENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
2,4,6-TRINITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
2,4-DINITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
2,6-DINITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
2-AMINO-4,6-DINITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
2-NITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
3-NITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
4-AMINO-2,6-DINITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
4-NITROTOLUENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
HMX	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
NITROBENZENE	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
NITROGLYCERIN	0.198 U	0.192 U	0.19 U	0.196 U	0.185 U	0.183 U
RDX	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
TETRYL	0.0396 U	0.0385 U	0.0381 U	0.0392 U	0.037 U	0.0367 U
METALS (MG/KG)						
ALUMINUM	4400	6750	10400	10500	11500	20800
ANTIMONY	2.23 UJ	2.29 UJ	2.22 UJ	2.39 UJ	2.37 UJ	2.46 UJ
ARSENIC	2.39 J	1.94 J	5.09	2.28 J	6.84	6.1
BARIUM	36.3 J	54.9 J	42.8 J	80 J	105 J	99.5 J
BERYLLIUM	0.574 J	0.969 J	0.636 J	0.445 J	0.872 J	0.812 J
CADMIUM	0.558 U	0.572 U	0.555 U	0.597 U	0.592 U	0.615 U
CALCIUM	36700 J	706 J	1590 J	525 J	9510 J	722 J
CHROMIUM	12.6 J	18 J	15.2 J	13.7 J	15.5 J	25.1 J
COBALT	6.89	27.7	3.45 J	7.08	11.3	8.72
COPPER	7.52	11	9.2	18.1	14	13.5
IRON	14400 J	13800 J	17400 J	12200 J	20500 J	21200 J
LEAD	9.95	7.03	11.2	6.23	13.8	10.6
MAGNESIUM	1780 J	1440 J	1430 J	1110 J	3080 J	1790 J
MANGANESE	224	379	150	232	2340	697
MERCURY	0.0359 U	0.0387 U	0.0327 J	0.0175 J	0.0509	0.0319 J
NICKEL	15.4	20	8.1	9.98	13.2	13.5
POTASSIUM	697 J	891 J	493 J	628 J	564 J	805 J
SELENIUM	1.4 U	1.43 U	1.39 U	1.49 U	1.48 U	1.54 U
SILVER	0.558 U	0.572 U	0.555 U	0.597 U	0.592 U	0.615 U
SODIUM	837 U	859 U	833 U	895 U	888 U	923 U

LOCATION	18FSB001		18FSB002		18FSB003	
SAMPLE ID	18FSB0010002	18FSB0010507	18FSB0020002	18FSB0020507	18FSB0030002	18FSB0030507
SAMPLE DATE	20111022	20111022	20111022	20111022	20111022	20111022
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SB	SS	SB	SS	SB
TOP DEPTH	0	5	0	5	0	5
BOTTOM DEPTH	2	7	2	7	2	7
THALLIUM	1.12 U	1.14 U	1.11 U	1.19 U	3.93	1.23 U
VANADIUM	10.2 J	15.3 J	24.7 J	13.6 J	26.7 J	31.3 J
ZINC	35.1	26.1	20.9	32.7	115	48.5
MISCELLANEOUS PARAMETERS (S.U.)						
PH	NA	NA	NA	NA	8.12	NA
PETROLEUM HYDROCARBONS (MG/KG)						
DRO (C08-C28)	NA	NA	NA	NA	NA	NA
DRO (C08-C34)	NA	NA	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)						
2-METHYLNAPHTHALENE	NA	NA	NA	NA	NA	NA
ACENAPHTHENE	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	NA	NA	NA	NA	NA	NA
ANTHRACENE	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	NA	NA	NA	NA	NA	NA
CHRYSENE	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	NA	NA	NA	NA	NA	NA
FLUORANTHENE	NA	NA	NA	NA	NA	NA
FLUORENE	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	NA	NA	NA	NA	NA	NA
NAPHTHALENE	NA	NA	NA	NA	NA	NA
PHENANTHRENE	NA	NA	NA	NA	NA	NA
PYRENE	NA	NA	NA	NA	NA	NA
VOLATILES (MG/KG)						
BENZENE	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA
NAPHTHALENE	NA	NA	NA	NA	NA	NA
TOLUENE	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	NA	NA	NA	NA	NA	NA

LOCATION	18FSS001		18FSS002
SAMPLE ID	18FSS0010002	18FSS0010002-D	18FSS0020002
SAMPLE DATE	20111022	20111022	20111022
SAMPLE CODE	NORMAL	DUP	NORMAL
MATRIX	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SS	SS
TOP DEPTH	0	0	0
BOTTOM DEPTH	2	2	2
EXPLOSIVES (MG/KG)			
1,3,5-TRINITROBENZENE	NA	NA	NA
1,3-DINITROBENZENE	NA	NA	NA
2,4,6-TRINITROTOLUENE	NA	NA	NA
2,4-DINITROTOLUENE	NA	NA	NA
2,6-DINITROTOLUENE	NA	NA	NA
2-AMINO-4,6-DINITROTOLUENE	NA	NA	NA
2-NITROTOLUENE	NA	NA	NA
3-NITROTOLUENE	NA	NA	NA
4-AMINO-2,6-DINITROTOLUENE	NA	NA	NA
4-NITROTOLUENE	NA	NA	NA
HMX	NA	NA	NA
NITROBENZENE	NA	NA	NA
NITROGLYCERIN	NA	NA	NA
RDX	NA	NA	NA
TETRYL	NA	NA	NA
METALS (MG/KG)			
ALUMINUM	NA	NA	NA
ANTIMONY	NA	NA	NA
ARSENIC	NA	NA	NA
BARIUM	NA	NA	NA
BERYLLIUM	NA	NA	NA
CADMIUM	NA	NA	NA
CALCIUM	NA	NA	NA
CHROMIUM	NA	NA	NA
COBALT	NA	NA	NA
COPPER	NA	NA	NA
IRON	NA	NA	NA
LEAD	NA	NA	NA
MAGNESIUM	NA	NA	NA
MANGANESE	NA	NA	NA
MERCURY	NA	NA	NA
NICKEL	NA	NA	NA
POTASSIUM	NA	NA	NA
SELENIUM	NA	NA	NA
SILVER	NA	NA	NA
SODIUM	NA	NA	NA

LOCATION	18FSS001		18FSS002
SAMPLE ID	18FSS0010002	18FSS0010002-D	18FSS0020002
SAMPLE DATE	20111022	20111022	20111022
SAMPLE CODE	NORMAL	DUP	NORMAL
MATRIX	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SS	SS
TOP DEPTH	0	0	0
BOTTOM DEPTH	2	2	2
THALLIUM	NA	NA	NA
VANADIUM	NA	NA	NA
ZINC	NA	NA	NA
MISCELLANEOUS PARAMETERS (S.U.			
PH	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/I			
DRO (C08-C28)	20.8	21.1	31
DRO (C08-C34)	26.8	28	43.2
POLYCYCLIC AROMATIC HYDROCAR			
2-METHYLNAPHTHALENE	0.00397 U	0.00758 J	0.00244 J
ACENAPHTHENE	0.00397 U	0.00392 U	0.00478 U
ACENAPHTHYLENE	0.00397 U	0.00392 U	0.00478 U
ANTHRACENE	0.00397 U	0.00392 U	0.00478 U
BENZO(A)ANTHRACENE	0.00397 U	0.00392 U	0.0215
BENZO(A)PYRENE	0.00397 U	0.00392 U	0.0268
BENZO(B)FLUORANTHENE	0.00397 U	0.00392 U	0.0474
BENZO(G,H,I)PERYLENE	0.00397 U	0.00392 U	0.028
BENZO(K)FLUORANTHENE	0.00397 U	0.00392 U	0.0161
CHRYSENE	0.00397 U	0.00392 U	0.0315
DIBENZO(A,H)ANTHRACENE	0.00397 U	0.00392 U	0.00478 U
FLUORANTHENE	0.00397 U	0.00392 U	0.0464
FLUORENE	0.00397 U	0.00392 U	0.00478 U
INDENO(1,2,3-CD)PYRENE	0.00397 U	0.00392 U	0.0255
NAPHTHALENE	0.00397 U	0.00392 U	0.00478 U
PHENANTHRENE	0.00397 U	0.00392 U	0.00478 U
PYRENE	0.00397 U	0.00392 U	0.0414
VOLATILES (MG/KG)			
BENZENE	0.00246 U	0.00063 J	0.00504 U
ETHYLBENZENE	0.00246 U	0.00238 U	0.00504 U
NAPHTHALENE	0.00246 U	0.00238 U	0.00504 UJ
TOLUENE	0.00246 U	0.001 J	0.00504 U
TOTAL XYLENES	0.00246 U	0.00238 U	0.00504 UJ

LOCATION	18BCP001		18BCP002	18BCP003
SAMPLE ID	18BCP0010002	18BCP0010002-D	18BCP0020002	18BCP0030002
SAMPLE DATE	20111020	20111020	20111020	20111020
SAMPLE CODE	NORMAL	DUP	NORMAL	NORMAL
MATRIX	SO	SO	SO	SO
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SS	SS	SS	SS
TOP DEPTH	0	0	0	0
BOTTOM DEPTH	2	2	2	2
PCBS (MG/KG)				
AROCLOR-1016	0.00188 U	0.00198 UJ	0.00193 U	0.00185 U
AROCLOR-1221	0.00188 U	0.00198 UJ	0.00193 U	0.00185 U
AROCLOR-1232	0.00188 U	0.00198 UJ	0.00193 U	0.00185 U
AROCLOR-1242	0.00188 U	0.00198 UJ	0.00193 U	0.00185 U
AROCLOR-1248	0.00188 U	0.00198 UJ	0.00193 U	0.00185 U
AROCLOR-1254	0.00188 U	0.00198 UJ	0.00193 U	0.00185 U
AROCLOR-1260	0.00345 J	0.00191 J	0.039 J	0.00168 J

LOCATION	**18CCP001**
SAMPLE ID	**18CCP0010002**
SAMPLE DATE	**20111019**
SAMPLE CODE	**NORMAL**
MATRIX	**SO**
SAMPLE TYPE	**NORMAL**
SUBMATRIX	**SS**
TOP DEPTH	**0**
BOTTOM DEPTH	**2**
PCBS (MG/KG)	
AROCLOR-1016	0.00202 U
AROCLOR-1221	0.00202 U
AROCLOR-1232	0.00202 U
AROCLOR-1242	0.00202 U
AROCLOR-1248	0.00202 U
AROCLOR-1254	0.00202 U
AROCLOR-1260	0.0185 J

LOCATION	**18FCP001**	**18FCP002**
SAMPLE ID	**18FCP0010002**	**18FCP0020002**
SAMPLE DATE	**20111022**	**20111022**
SAMPLE CODE	**NORMAL**	**NORMAL**
MATRIX	**SO**	**SO**
SAMPLE TYPE	**NORMAL**	**NORMAL**
SUBMATRIX	**SS**	**SS**
TOP DEPTH	**0**	**0**
BOTTOM DEPTH	**2**	**2**
PCBS (MG/KG)		
AROCLOR-1016	0.00367 J	0.00188 UJ
AROCLOR-1221	0.00195 U	0.00188 UJ
AROCLOR-1232	0.00195 U	0.00188 UJ
AROCLOR-1242	0.00195 U	0.00188 UJ
AROCLOR-1248	0.00195 U	0.00188 UJ
AROCLOR-1254	0.00195 U	0.00188 UJ
AROCLOR-1260	0.00167 J	0.00269 J

LOCATION	18CSW/SD001		18CSW/SD002
SAMPLE ID	18CSW001	18CSW001-D	18CSW002
SAMPLE DATE	20111019	20111019	20111019
SAMPLE CODE	NORMAL	DUP	NORMAL
MATRIX	SW	SW	SW
SAMPLE TYPE	NORMAL	NORMAL	NORMAL
SUBMATRIX	NA	NA	NA
TOP DEPTH	-9999	-9999	-9999
BOTTOM DEPTH	-9999	-9999	-9999
PETROLEUM HYDROCARBONS (MG/L)			
DRO (C08-C28)	0.0943 U	0.0935 U	0.0926 U
DRO (C08-C34)	0.0943 U	0.0935 U	0.0926 U
POLYCYCLIC AROMATIC HYDROCARBONS (UG/L)			
2-METHYLNAPHTHALENE	0.1 U	0.0962 U	0.0935 U
ACENAPHTHENE	0.1 U	0.0962 U	0.0935 U
ACENAPHTHYLENE	0.1 U	0.0962 U	0.0935 U
ANTHRACENE	0.1 U	0.0962 U	0.0935 U
BENZO(A)ANTHRACENE	0.1 U	0.0962 U	0.0935 U
BENZO(A)PYRENE	0.1 U	0.0962 U	0.0935 U
BENZO(B)FLUORANTHENE	0.1 U	0.0962 U	0.0935 U
BENZO(G,H,I)PERYLENE	0.1 U	0.0962 U	0.0935 U
BENZO(K)FLUORANTHENE	0.1 U	0.0962 U	0.0935 U
CHRYSENE	0.1 U	0.0962 U	0.0935 U
DIBENZO(A,H)ANTHRACENE	0.1 U	0.0962 U	0.0935 U
FLUORANTHENE	0.1 U	0.0962 U	0.0935 U
FLUORENE	0.1 U	0.0962 U	0.0935 U
INDENO(1,2,3-CD)PYRENE	0.1 U	0.0962 U	0.0935 U
NAPHTHALENE	0.1 U	0.0962 U	0.0935 U
PHENANTHRENE	0.2 U	0.192 U	0.187 U
PYRENE	0.1 U	0.0962 U	0.0935 U
VOLATILES (UG/L)			
BENZENE	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U
NAPHTHALENE	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U
TOTAL XYLENES	1.5 U	1.5 U	1.5 U

LOCATION	18SW/SD001	18SW/SD002	18SW/SD003	18SW/SD004		18SW/SD005
SAMPLE ID	18SW001	18SW002	18SW003	18SW004	18SW004-D	18SW005
SAMPLE DATE	20111019	20111019	20111021	20111021	20111021	20111021
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	DUP	NORMAL
MATRIX	SW	SW	SW	SW	SW	SW
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	NA	NA	NA	NA	NA	NA
TOP DEPTH	-9999	-9999	-9999	-9999	-9999	-9999
BOTTOM DEPTH	-9999	-9999	-9999	-9999	-9999	-9999
DISSOLVED METALS (UG/L)						
ALUMINUM	27.3 J	31.4 J	40.2 J	28.3 J	26.6 J	25.9 J
ANTIMONY	2 U	2 U	2 UJ	2 UJ	2 UJ	2 UJ
ARSENIC	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BARIUM	39.8	47.8	45.6	49.7	49	34.3
BERYLLIUM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CADMIUM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CALCIUM	35700	42800	43200 J	53600 J	53400 J	38700 J
CHROMIUM	1 U	0.849 J	1 U	0.581 J	0.508 J	1 U
COBALT	2.5 U	2.5 U	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ
COPPER	3.9	4.36	2.33 J	3.78 J	1.87 J	3.12 J
IRON	9.99 J	11.9 J	7.66 J	12.1 J	7.63 J	8.8 J
LEAD	0.75 U	0.75 U	0.75 UJ	0.75 UJ	0.75 UJ	0.75 UJ
MAGNESIUM	6160	7360	7480	8680	8700	6870
MANGANESE	9.33	5.13	2.18 J	1.82 J	1.5 U	3.01 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	2.2 J	3.32	1.36 J	2.49 J	1.5 U	2.62
POTASSIUM	3900	4130	3730 J	3790 J	3770 J	1650 J
SELENIUM	1.25 U	1.25 U	1.25 U	1.25 U	1.25 U	1.25 U
SILVER	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
SODIUM	24800	31000	18600 J	29300 J	29600 J	9180 J
THALLIUM	1 U	1 U	1 U	1 U	1 U	1 U
VANADIUM	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
ZINC	7.96	10.4	5.39	5.53	2.23 J	4.04 J
EXPLOSIVES (UG/L)						
1,3,5-TRINITROBENZENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
1,3-DINITROBENZENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
2,4,6-TRINITROTOLUENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
2,4-DINITROTOLUENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
2,6-DINITROTOLUENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
2-AMINO-4,6-DINITROTOLUENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
2-NITROTOLUENE	0.145 J	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
3-NITROTOLUENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
4-AMINO-2,6-DINITROTOLUENE	0.16 U	0.16 U	0.157 U	0.247	0.243	0.16 U
4-NITROTOLUENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
HMX	0.375	0.346	1.24	2.21	2.19	0.16 U
NITROBENZENE	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U

LOCATION	18SW/SD001	18SW/SD002	18SW/SD003	18SW/SD004		18SW/SD005
SAMPLE ID	18SW001	18SW002	18SW003	18SW004	18SW004-D	18SW005
SAMPLE DATE	20111019	20111019	20111021	20111021	20111021	20111021
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	DUP	NORMAL
MATRIX	SW	SW	SW	SW	SW	SW
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	NA	NA	NA	NA	NA	NA
TOP DEPTH	-9999	-9999	-9999	-9999	-9999	-9999
BOTTOM DEPTH	-9999	-9999	-9999	-9999	-9999	-9999
NITROGLYCERIN	0.4 U	0.4 U	0.392 U	0.4 U	0.4 U	0.4 U
RDX	1.49	1.56	4.52	10.8	10.7	0.16 U
TETRYL	0.16 U	0.16 U	0.157 U	0.16 U	0.16 U	0.16 U
METALS (UG/L)						
ALUMINUM	50.6	97.5	294 J	49.5 J	49.6 J	47.6 J
ANTIMONY	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
ARSENIC	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BARIUM	41.7	48	42.3	51	48.4	34.5
BERYLLIUM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CADMIUM	0.5 U	0.255 J	0.272 J	0.5 U	0.5 U	0.5 U
CALCIUM	37900 J	43900 J	40300 J	53600 J	51700 J	39500 J
CHROMIUM	0.905 J	0.527 J	0.874 J	1 U	1 U	1 U
COBALT	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ
COPPER	2.59 J	2.75 J	3.33 J	1.71 J	1.75 J	1.31 J
IRON	43.2 J	123 J	223 J	42.1 J	40.8 J	48.7 J
LEAD	0.75 UJ	0.75 UJ	0.436 J	0.75 UJ	0.75 UJ	0.75 UJ
MAGNESIUM	6420	7450	6940	8820	8370	6910
MANGANESE	11.1	10.9	27.7	1.17 J	1.45 J	2 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	1.88 J	1.08 J	1.38 J	1.5 U	1.5 U	1.5 U
POTASSIUM	4040	4180	3480 J	3830 J	3640 J	1630 J
SELENIUM	1.25 U	1.25 U	1.25 U	1.25 U	1.25 U	1.25 U
SILVER	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
SODIUM	25700 J	31400 J	17900 J	29600 J	28500 J	9160 J
THALLIUM	1 U	1 U	1 U	1 U	1 U	1 U
VANADIUM	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
ZINC	5.07	11.8	11.1 J	1.52 J	19.8 J	2.5 UJ
MISCELLANEOUS PARAMETERS (MG/L)						
AMMONIA-N	0.774	0.79	0.124 J	0.15 U	0.15 U	0.15 U
MISCELLANEOUS PARAMETERS (UG/L)						
PERCHLORATE	0.2 U	0.2 U	0.2 U	0.4 U	0.4 U	0.2 U

LOCATION	18CSD003		18CSW/SD001		18CSW/SD002
SAMPLE ID	18CSD0030006	18CSD0030006-D	18CSD0010006	18CSD0010006-D	18CSD0020006
SAMPLE DATE	20111018	20111018	20111019	20111019	20111019
SAMPLE CODE	NORMAL	DUP	NORMAL	DUP	NORMAL
MATRIX	SD	SD	SD	SD	SD
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SD	SD	SD	SD	SD
TOP DEPTH	0	0	0	0	0
BOTTOM DEPTH	0.5	0.5	0.5	0.5	0.5
METALS (MG/KG)					
ARSENIC	51.8 J	68 J	NA	NA	NA
BARIUM	394 J	353 J	NA	NA	NA
CADMIUM	25.7 J	25.6 J	NA	NA	NA
CHROMIUM	9660 J	11900 J	NA	NA	NA
LEAD	1310 J	1360 J	NA	NA	NA
MERCURY	0.0997 J	0.091 J	NA	NA	NA
SELENIUM	15 UJ	13.9 UJ	NA	NA	NA
SILVER	6 UJ	5.56 UJ	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)					
DRO (C08-C28)	NA	NA	41.4	32.1	49.8
DRO (C08-C34)	NA	NA	68.8	59	91.7
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)					
2-METHYLNAPHTHALENE	NA	NA	0.00419 U	0.00414 U	0.0081 J
ACENAPHTHENE	NA	NA	0.00419 U	0.00414 U	0.00336 J
ACENAPHTHYLENE	NA	NA	0.00419 U	0.00414 U	0.0367
ANTHRACENE	NA	NA	0.00419 U	0.00414 U	0.0167
BENZO(A)ANTHRACENE	NA	NA	0.00419 U	0.00721 J	0.0903
BENZO(A)PYRENE	NA	NA	0.004 J	0.00794 J	0.17
BENZO(B)FLUORANTHENE	NA	NA	0.00734 J	0.0149	0.217
BENZO(G,H,I)PERYLENE	NA	NA	0.00505 J	0.0113	0.143
BENZO(K)FLUORANTHENE	NA	NA	0.00314 J	0.00565 J	0.0829
CHRYSENE	NA	NA	0.00419 U	0.0109	0.145
DIBENZO(A,H)ANTHRACENE	NA	NA	0.00419 U	0.00413 J	0.0385
FLUORANTHENE	NA	NA	0.00513 J	0.0106	0.0302
FLUORENE	NA	NA	0.00419 U	0.00414 U	0.00426 U
INDENO(1,2,3-CD)PYRENE	NA	NA	0.00501 J	0.00915	0.141
NAPHTHALENE	NA	NA	0.00419 U	0.00414 U	0.00426 U
PHENANTHRENE	NA	NA	0.00251 J	0.00388 J	0.0162
PYRENE	NA	NA	0.0049 J	0.0115	0.0358
VOLATILES (MG/KG)					
1,1,1-TRICHLOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,1,2,2-TETRACHLOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,1,2-TRICHLOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,1,2-TRICHLOROTRIFLUOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,1-DICHLOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,1-DICHLOROETHENE	0.994 UJ	0.801 UJ	NA	NA	NA

LOCATION	18CSD003		18CSW/SD001		18CSW/SD002
SAMPLE ID	18CSD0030006	18CSD0030006-D	18CSD0010006	18CSD0010006-D	18CSD0020006
SAMPLE DATE	20111018	20111018	20111019	20111019	20111019
SAMPLE CODE	NORMAL	DUP	NORMAL	DUP	NORMAL
MATRIX	SD	SD	SD	SD	SD
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SD	SD	SD	SD	SD
TOP DEPTH	0	0	0	0	0
BOTTOM DEPTH	0.5	0.5	0.5	0.5	0.5
1,2,3-TRICHLOROBENZENE	0.994 UJ	0.801 UJ	NA	NA	NA
1,2,4-TRICHLOROBENZENE	0.994 UJ	0.801 UJ	NA	NA	NA
1,2-DIBROMO-3-CHLOROPROPANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,2-DIBROMOETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,2-DICHLOROBENZENE	0.994 UJ	0.801 UJ	NA	NA	NA
1,2-DICHLOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,2-DICHLOROPROPANE	0.994 UJ	0.801 UJ	NA	NA	NA
1,3-DICHLOROBENZENE	0.994 UJ	0.801 UJ	NA	NA	NA
1,4-DICHLOROBENZENE	0.994 UJ	0.801 UJ	NA	NA	NA
2-BUTANONE	1.99 UJ	1.6 UJ	NA	NA	NA
2-HEXANONE	0.994 UJ	0.801 UJ	NA	NA	NA
4-METHYL-2-PENTANONE	0.994 UJ	0.801 UJ	NA	NA	NA
ACETONE	3.98 UJ	3.2 UJ	NA	NA	NA
BENZENE	0.994 UJ	0.801 UJ	0.0025 U	0.00265 U	0.00339 U
BROMOCHLOROMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
BROMODICHLOROMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
BROMOFORM	0.994 UJ	0.801 UJ	NA	NA	NA
BROMOMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
CARBON DISULFIDE	0.994 UJ	0.801 UJ	NA	NA	NA
CARBON TETRACHLORIDE	0.994 UJ	0.801 UJ	NA	NA	NA
CHLOROBENZENE	0.994 UJ	0.801 UJ	NA	NA	NA
CHLORODIBROMOMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
CHLOROETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
CHLOROFORM	0.994 UJ	0.801 UJ	NA	NA	NA
CHLOROMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
CIS-1,2-DICHLOROETHENE	0.994 UJ	0.801 UJ	NA	NA	NA
CIS-1,3-DICHLOROPROPENE	0.994 UJ	0.801 UJ	NA	NA	NA
CYCLOHEXANE	1.21 J	0.801 UJ	NA	NA	NA
DICHLORODIFLUOROMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
ETHYLBENZENE	1.09 J	0.801 UJ	0.0025 U	0.00265 U	0.00339 U
ISOPROPYLBENZENE	27.3 J	5.1 J	NA	NA	NA
M+P-XYLENES	5.25 J	1.4 J	NA	NA	NA
METHYL ACETATE	1.99 UJ	0.932 J	NA	NA	NA
METHYL CYCLOHEXANE	24.9 J	5.78 J	NA	NA	NA
METHYL TERT-BUTYL ETHER	0.994 UJ	0.801 UJ	NA	NA	NA
METHYLENE CHLORIDE	1.99 UJ	1.6 UJ	NA	NA	NA
NAPHTHALENE	NA	NA	0.0025 U	0.00265 U	0.00339 U

LOCATION	18CSD003		18CSW/SD001		18CSW/SD002
SAMPLE ID	18CSD0030006	18CSD0030006-D	18CSD0010006	18CSD0010006-D	18CSD0020006
SAMPLE DATE	20111018	20111018	20111019	20111019	20111019
SAMPLE CODE	NORMAL	DUP	NORMAL	DUP	NORMAL
MATRIX	SD	SD	SD	SD	SD
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SD	SD	SD	SD	SD
TOP DEPTH	0	0	0	0	0
BOTTOM DEPTH	0.5	0.5	0.5	0.5	0.5
O-XYLENE	0.994 UJ	0.801 UJ	NA	NA	NA
STYRENE	0.994 UJ	0.801 UJ	NA	NA	NA
TETRACHLOROETHENE	0.994 UJ	0.801 UJ	NA	NA	NA
TOLUENE	0.994 UJ	0.801 UJ	0.0025 UJ	0.00265 UJ	0.00339 UJ
TOTAL XYLENES	5.65 J	1.64 J	0.0025 U	0.00265 U	0.00339 U
TRANS-1,2-DICHLOROETHENE	0.994 UJ	0.801 UJ	NA	NA	NA
TRANS-1,3-DICHLOROPROPENE	0.994 UJ	0.801 UJ	NA	NA	NA
TRICHLOROETHENE	0.994 UJ	0.801 UJ	NA	NA	NA
TRICHLOROFLUOROMETHANE	0.994 UJ	0.801 UJ	NA	NA	NA
VINYL CHLORIDE	0.994 UJ	0.801 UJ	NA	NA	NA

LOCATION	18SW/SD001	18SW/SD002	18SW/SD003	18SW/SD004	18SW/SD005	
SAMPLE ID	18SD0010006	18SD0020006	18SD0030006	18SD0040006	18SD0050006	18SD0050006-D
SAMPLE DATE	20111019	20111019	20111021	20111021	20111021	20111021
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	DUP
MATRIX	SD	SD	SD	SD	SD	SD
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SD	SD	SD	SD	SD	SD
TOP DEPTH	0	0	0	0	0	0
BOTTOM DEPTH	0.5	0.5	0.5	0.5	0.5	0.5
EXPLOSIVES (MG/KG)						
1,3,5-TRINITROBENZENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
1,3-DINITROBENZENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
2,4,6-TRINITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
2,4-DINITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
2,6-DINITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
2-AMINO-4,6-DINITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
2-NITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
3-NITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
4-AMINO-2,6-DINITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
4-NITROTOLUENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
HMX	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
NITROBENZENE	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
NITROGLYCERIN	0.196 U	0.2 U	0.19 U	0.19 U	0.183 U	0.187 U
RDX	0.0392 U	0.04 U	0.165	0.0381 UJ	0.0367 U	0.0374 U
TETRYL	0.0392 U	0.04 U	0.0381 U	0.0381 U	0.0367 U	0.0374 U
METALS (MG/KG)						
ALUMINUM	2490	4200	6350	4770	6320	6820
ANTIMONY	2.5 U	2.68 U	2.48 UJ	4.44 UJ	2.51 UJ	2.53 UJ
ARSENIC	5.87	4.53	19.5 J	9.93 J	9 J	5.78 J
BARIUM	30.7	45	92.6 J	54.7 J	66 J	64.8 J
BERYLLIUM	0.63 J	0.652 J	2.01	1.47	1.03 J	0.843 J
CADMIUM	0.681 J	0.671 U	0.691 J	4.24 J	0.627 UJ	0.632 UJ
CALCIUM	549 J	601 J	1240 J	1560	938 J	970 J
CHROMIUM	14.2	11.1	31.3 J	38.3 J	20.8 J	12.9 J
COBALT	7.46	3.9 J	12.3 J	13.2 J	13.5 J	11 J
COPPER	6.04	6.66	10.3 J	11.1 J	9.1 J	7.36 J
IRON	19400	10800	119000	68400	28500	19400
LEAD	8.26	7.79	20.7 J	18.6 J	12.5 J	10.2 J
MAGNESIUM	939 U	449 J	767 J	1670 U	648 J	751 J
MANGANESE	487	314	1460 J	765 J	1030 J	792 J
MERCURY	0.0411 U	0.0443 U	0.0298 J	0.0212 J	0.0342 J	0.0268 J
NICKEL	10.4	10.7	25.2	27.8	17	12.7
POTASSIUM	939 U	1010 U	383 J	309 J	410 J	425 J
SELENIUM	1.56 U	1.68 U	1.55 UJ	2.78 UJ	1.57 UJ	1.58 UJ
SILVER	0.626 U	0.671 U	0.62 U	1.11 U	0.627 U	0.632 U
SODIUM	939 U	1010 U	930 U	167 U	940 U	949 U

LOCATION	18SW/SD001	18SW/SD002	18SW/SD003	18SW/SD004	18SW/SD005	
SAMPLE ID	18SD0010006	18SD0020006	18SD0030006	18SD0040006	18SD0050006	18SD0050006-D
SAMPLE DATE	20111019	20111019	20111021	20111021	20111021	20111021
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	DUP
MATRIX	SD	SD	SD	SD	SD	SD
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	SD	SD	SD	SD	SD	SD
TOP DEPTH	0	0	0	0	0	0
BOTTOM DEPTH	0.5	0.5	0.5	0.5	0.5	0.5
THALLIUM	1.25 U	1.34 U	2.28 J	2.22 U	1.41 J	1.26 U
VANADIUM	14.1	12.9	35.2 J	33 J	23.6 J	19.3 J
ZINC	32	21.8	52.3 J	72.8 J	32.1 J	25.8 J
MISCELLANEOUS PARAMETERS (MG/KG)						
TOTAL ORGANIC CARBON	7280	5670	10400	11100	4380	6750

LOCATION	08MWT008	08MWT012	18CMWT001	18CMWT002	18CMWT003
SAMPLE ID	08GWT008	08GWT012	18CGWT001	18CGWT002	18CGWT003
SAMPLE DATE	20120111	20120110	20111217	20111216	20111216
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	NA	NA	NA	NA	NA
TOP DEPTH	-9999	-9999	-9999	-9999	-9999
BOTTOM DEPTH	-9999	-9999	-9999	-9999	-9999
DISSOLVED METALS (UG/L)					
ARSENIC	1.5 U	NA	1.62 J	NA	1.71 J
BARIUM	38	NA	14.3	NA	36.4
CADMIUM	0.5 U	NA	0.5 U	NA	1 U
CHROMIUM	1 U	NA	2.94	NA	4.1 J
LEAD	0.75 U	NA	0.75 U	NA	1.83
MERCURY	0.2 U	NA	0.2 U	NA	0.2 U
SELENIUM	1.25 U	NA	1.25 U	NA	1.66
SILVER	0.5 U	NA	0.5 U	NA	1 U
METALS (UG/L)					
ARSENIC	1.24 J	1.28 J	1.79 J	1.5 U	1.5 U
BARIUM	61.4	8.57 J	14 J	33.7	29.3
CADMIUM	0.5 U	0.5 U	1 U	0.898 J	0.5 U
CHROMIUM	1.18 J	5 U	2 U	1.6 J	1 U
LEAD	0.956	3.75 U	1.5 U	1.5 U	1.5 U
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
SELENIUM	1.25 U	1.25 U	2.5 U	1.25 U	1.81 J
SILVER	0.5 U	2.5 U	1 U	0.5 U	0.5 U
VOLATILES (UG/L)					
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-TRICHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,4-TRICHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMOETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-DICHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-DICHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-BUTANONE	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
4-METHYL-2-PENTANONE	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U

LOCATION	08MWT008	08MWT012	18CMWT001	18CMWT002	18CMWT003
SAMPLE ID	08GWT008	08GWT012	18CGWT001	18CGWT002	18CGWT003
SAMPLE DATE	20120111	20120110	20111217	20111216	20111216
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX	GW	GW	GW	GW	GW
SAMPLE TYPE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SUBMATRIX	NA	NA	NA	NA	NA
TOP DEPTH	-9999	-9999	-9999	-9999	-9999
BOTTOM DEPTH	-9999	-9999	-9999	-9999	-9999
ACETONE	5 U	5 U	5 U	5 U	5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.286 J	0.5 U
BROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON DISULFIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLORODIBROMOMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROMETHANE	0.421 J	0.489 J	0.5 U	0.5 UJ	1.93 J
CIS-1,2-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CYCLOHEXANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DICHLORODIFLUOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ISOPROPYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
M+P-XYLENES	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYL ACETATE	1 U	1 U	1 U	1 U	1 U
METHYL CYCLOHEXANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYL TERT-BUTYL ETHER	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	1 U	1 U	1 U	1 U	1 U
O-XYLENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U	0.4 J	0.5 U
TOTAL XYLENES	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
TRANS-1,2-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.568 J	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROFLUOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

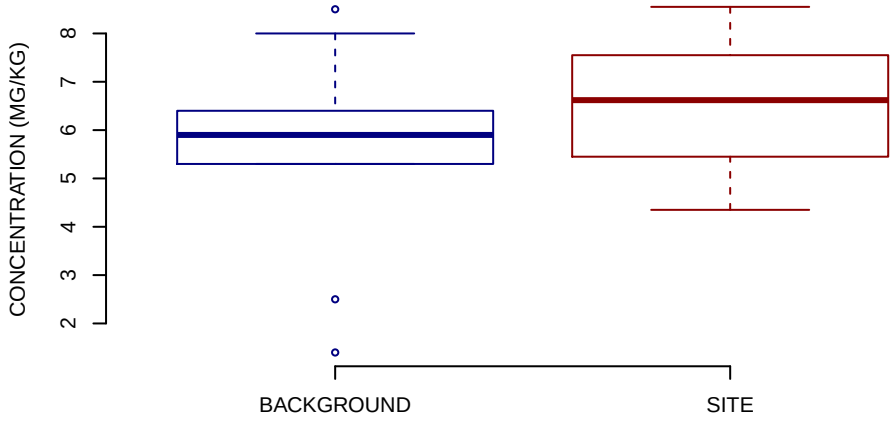
LOCATION	**18FMWT001**
SAMPLE ID	**18FGWT001**
SAMPLE DATE	**20120111**
SAMPLE CODE	**NORMAL**
MATRIX	**GW**
SAMPLE TYPE	**NORMAL**
SUBMATRIX	**NA**
TOP DEPTH	**-9999**
BOTTOM DEPTH	**-9999**
PETROLEUM HYDROCARBONS (MG/L)	
DRO (C08-C28)	0.0962 U
DRO (C08-C34)	0.0962 U
POLYCYCLIC AROMATIC HYDROCARBONS (UG/L)	
2-METHYLNAPHTHALENE	0.105 U
ACENAPHTHENE	0.105 U
ACENAPHTHYLENE	0.105 U
ANTHRACENE	0.105 U
BENZO(A)ANTHRACENE	0.105 U
BENZO(A)PYRENE	0.105 U
BENZO(B)FLUORANTHENE	0.105 U
BENZO(G,H,I)PERYLENE	0.105 U
BENZO(K)FLUORANTHENE	0.105 U
CHRYSENE	0.105 U
DIBENZO(A,H)ANTHRACENE	0.105 U
FLUORANTHENE	0.105 U
FLUORENE	0.105 U
INDENO(1,2,3-CD)PYRENE	0.105 U
NAPHTHALENE	0.105 U
PHENANTHRENE	0.105 U
PYRENE	0.105 U
VOLATILES (UG/L)	
BENZENE	0.5 U
ETHYLBENZENE	0.5 U
NAPHTHALENE	0.5 U
TOLUENE	0.5 U
TOTAL XYLENES	1.5 U

APPENDIX H

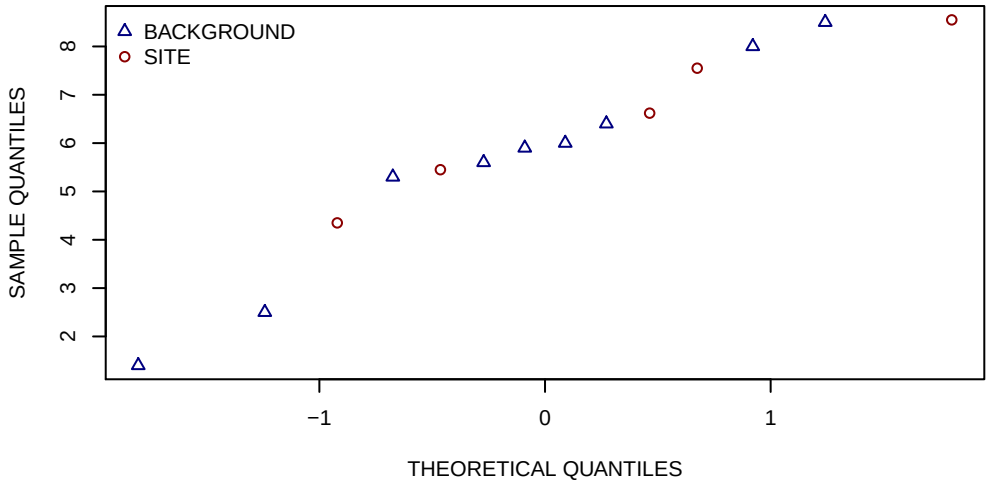
BACKGROUND COMPARISON

ARSENIC SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 1 OF 8

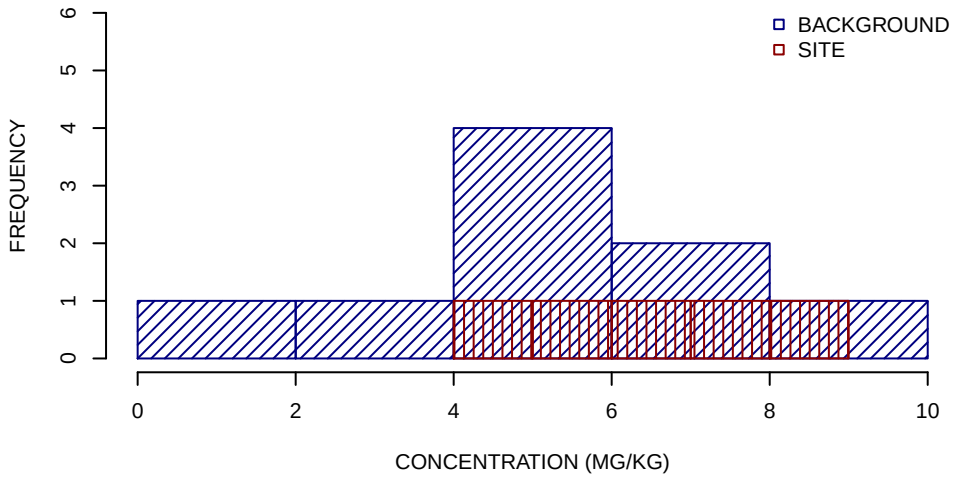
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



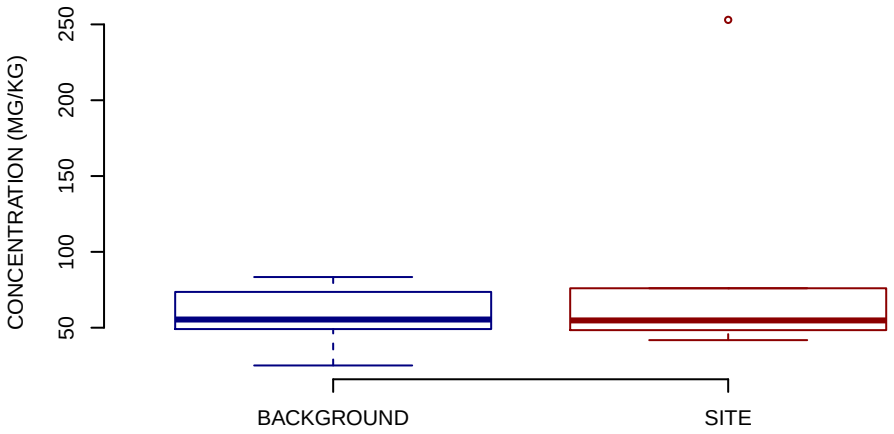
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	1.4	4.4
25TH PERCENTILE	5.3	5.4
MEDIAN	5.9	6.6
MEAN	5.5	6.5
75TH PERCENTILE	6.4	7.6
MAXIMUM	8.5	8.6

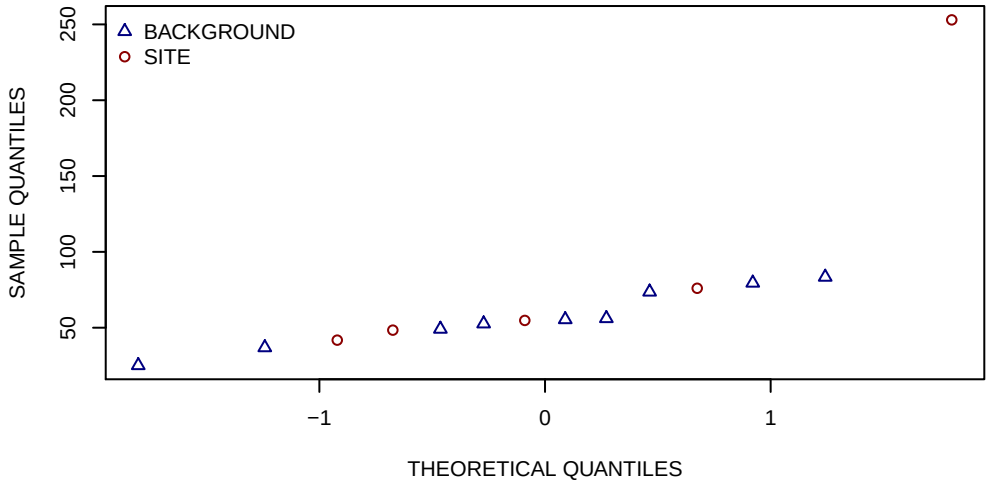
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BARIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 2 OF 8

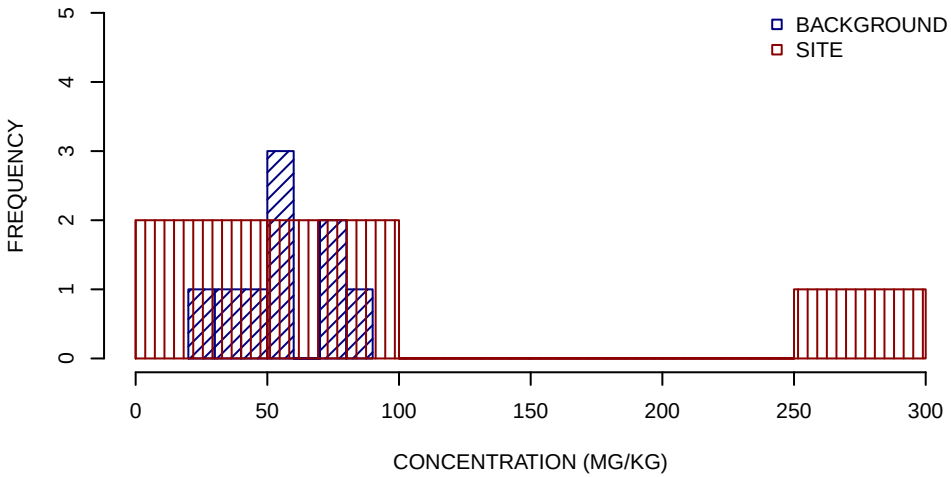
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



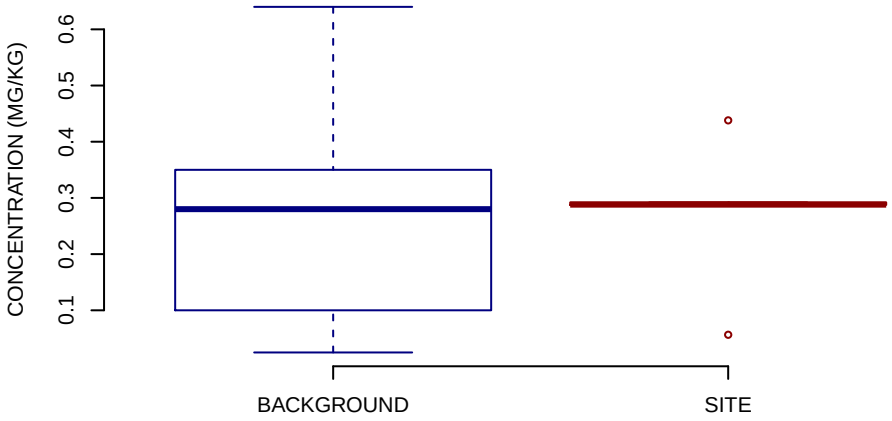
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	25	42
25TH PERCENTILE	49	48
MEDIAN	55	55
MEAN	57	95
75TH PERCENTILE	74	76
MAXIMUM	83	250

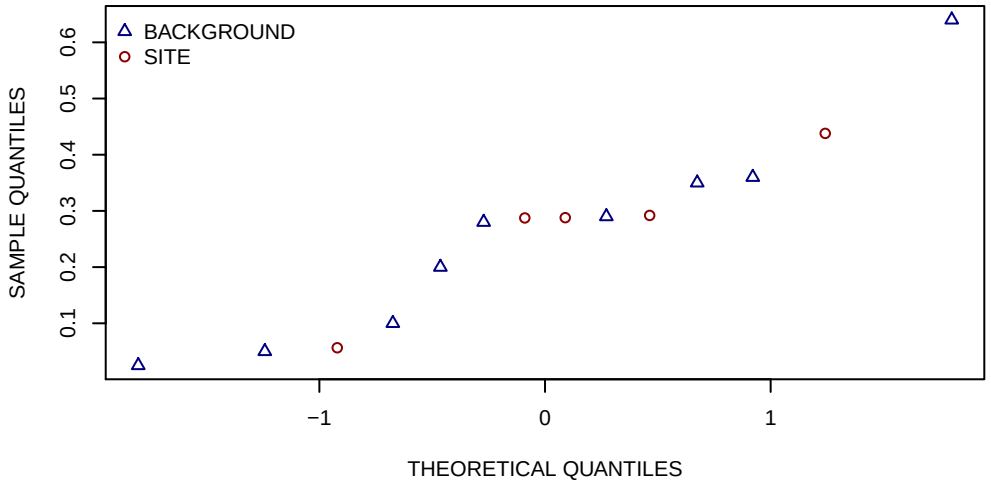
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CADMIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 3 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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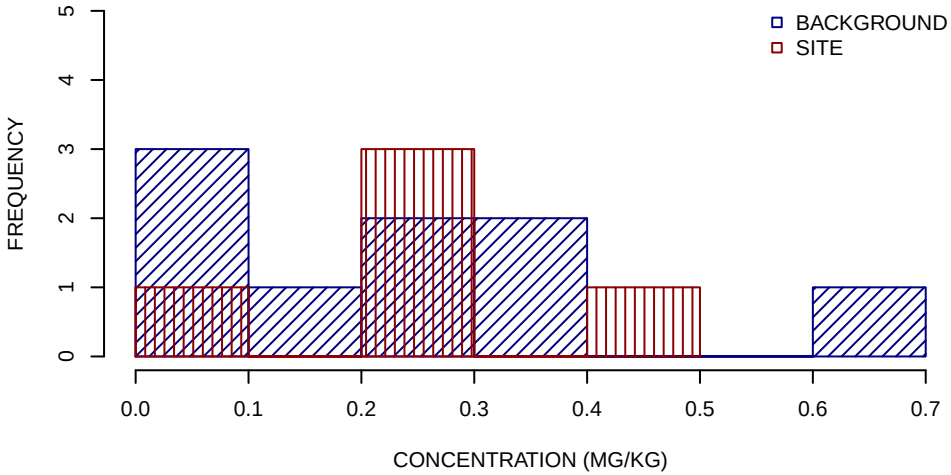


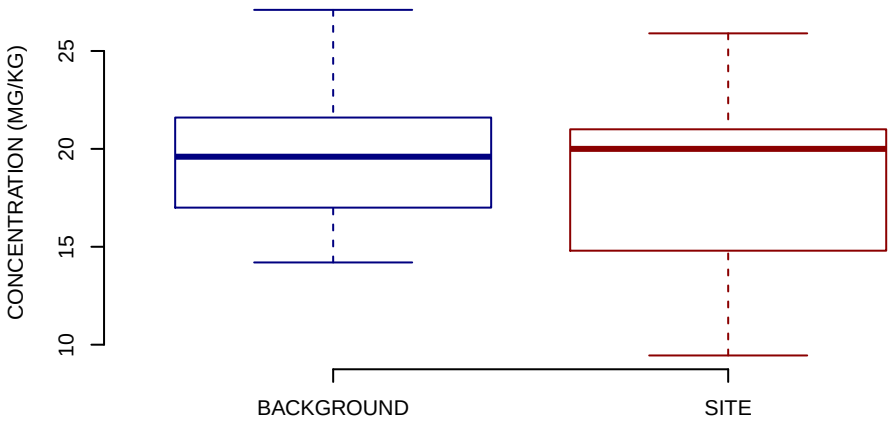
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.025	0.056
25TH PERCENTILE	0.1	0.29
MEDIAN	0.28	0.29
MEAN	0.26	0.27
75TH PERCENTILE	0.35	0.29
MAXIMUM	0.64	0.44

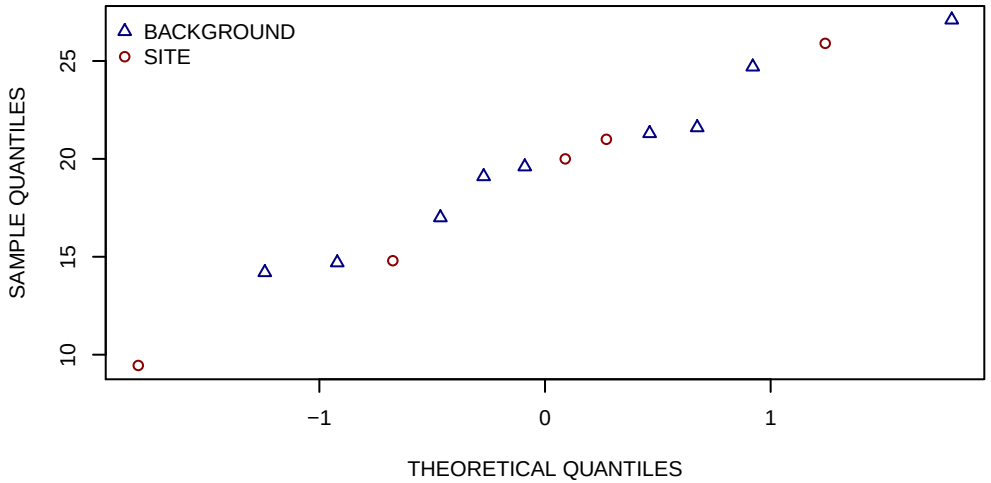
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHROMIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 4 OF 8

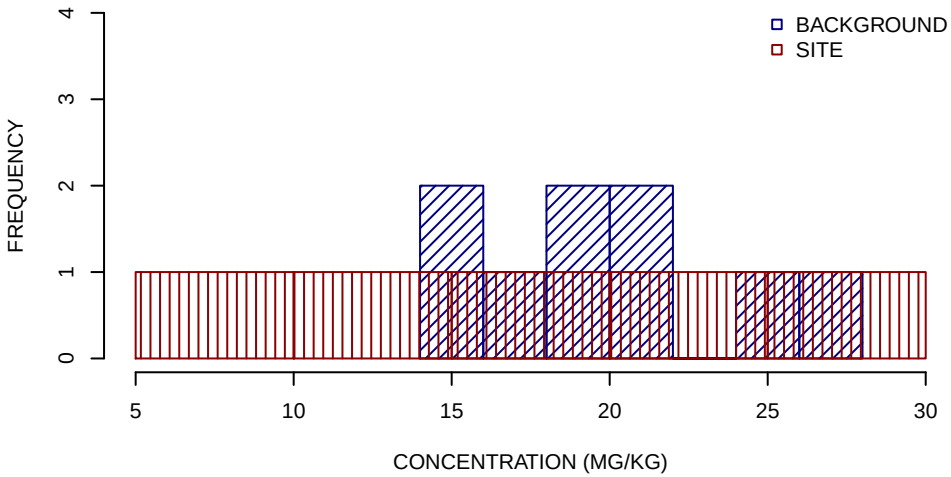
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



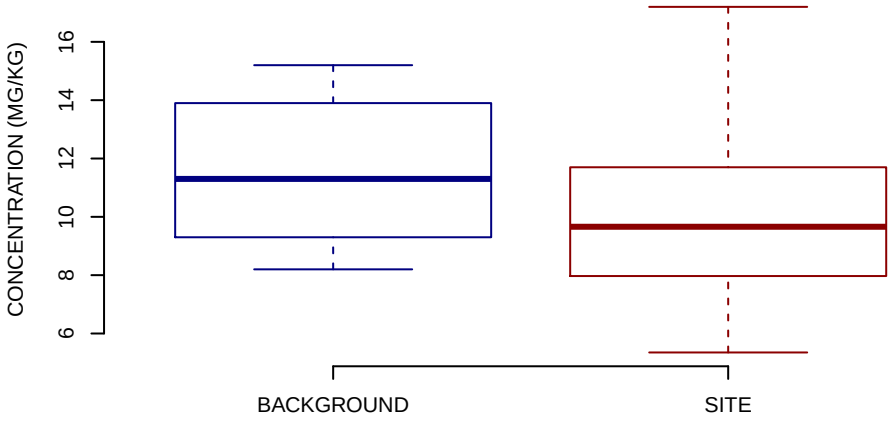
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	14	9.4
25TH PERCENTILE	17	15
MEDIAN	20	20
MEAN	20	18
75TH PERCENTILE	22	21
MAXIMUM	27	26

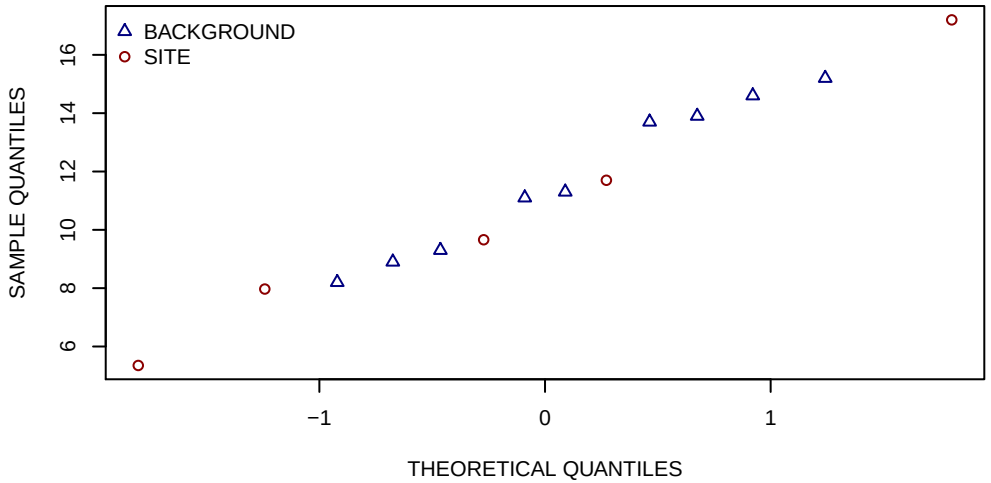
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 5 OF 8

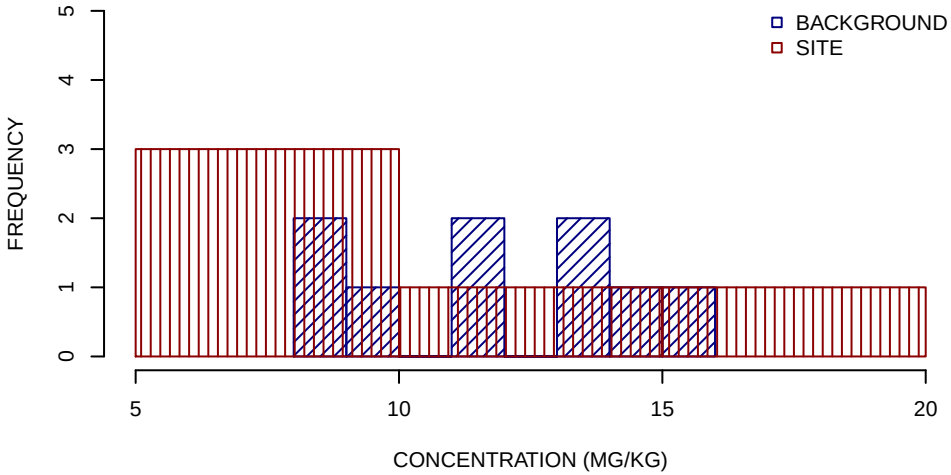
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



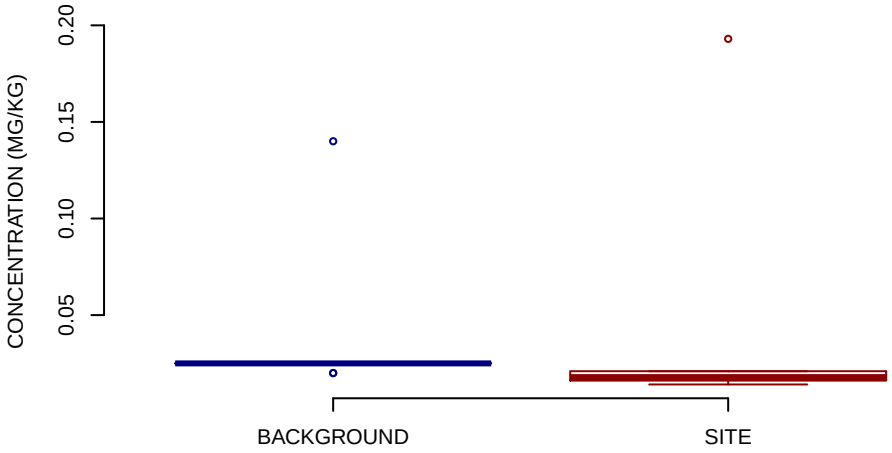
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	8.2	5.4
25TH PERCENTILE	9.3	8
MEDIAN	11	9.7
MEAN	12	10
75TH PERCENTILE	14	12
MAXIMUM	15	17

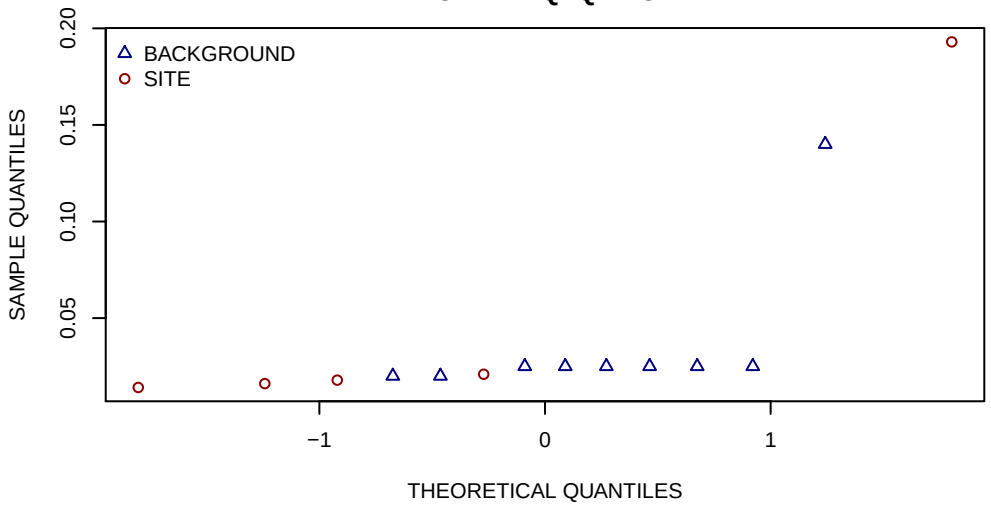
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 6 OF 8

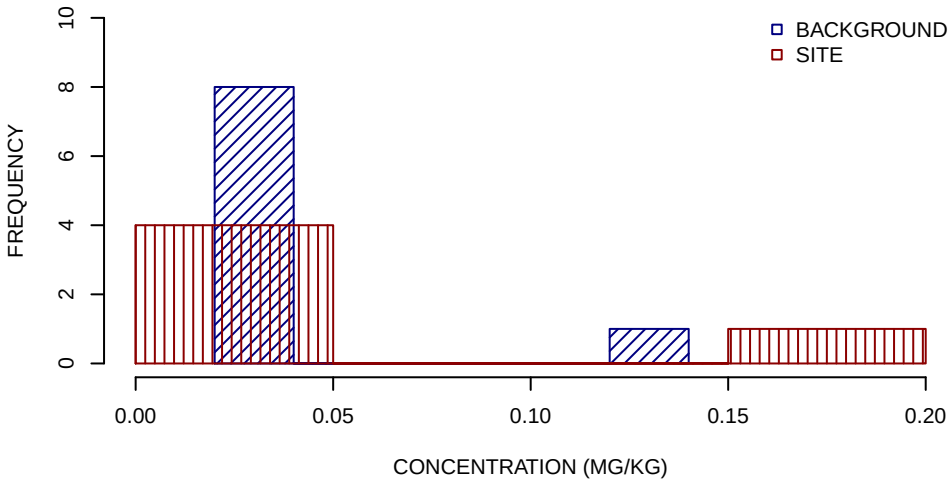
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.02	0.014
25TH PERCENTILE	0.025	0.016
MEDIAN	0.025	0.018
MEAN	0.037	0.052
75TH PERCENTILE	0.025	0.021
MAXIMUM	0.14	0.19

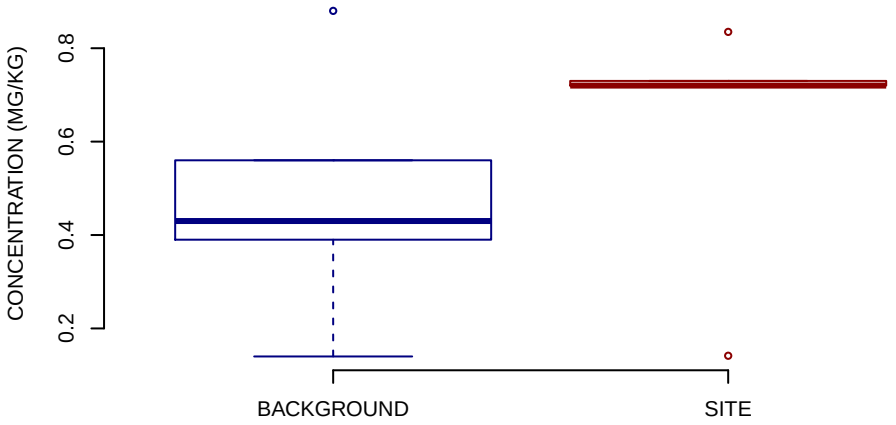
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

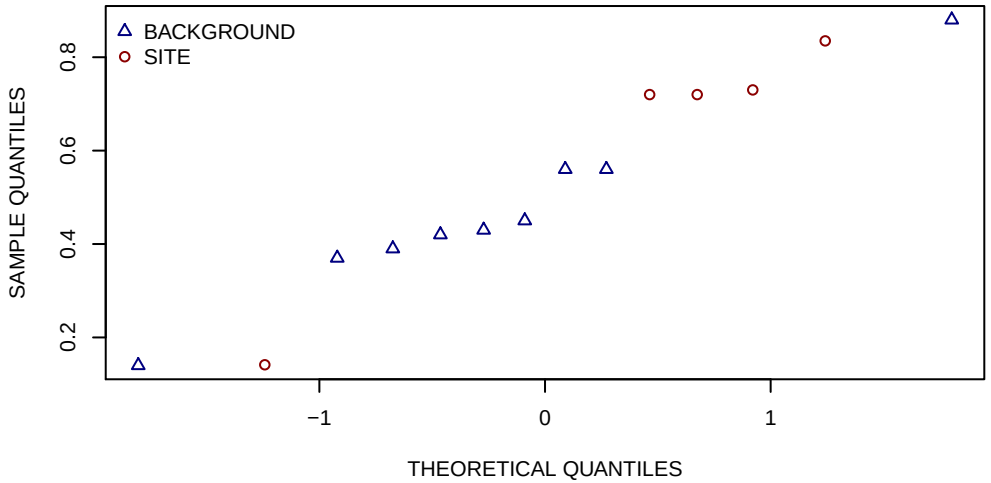
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SELENIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 7 OF 8

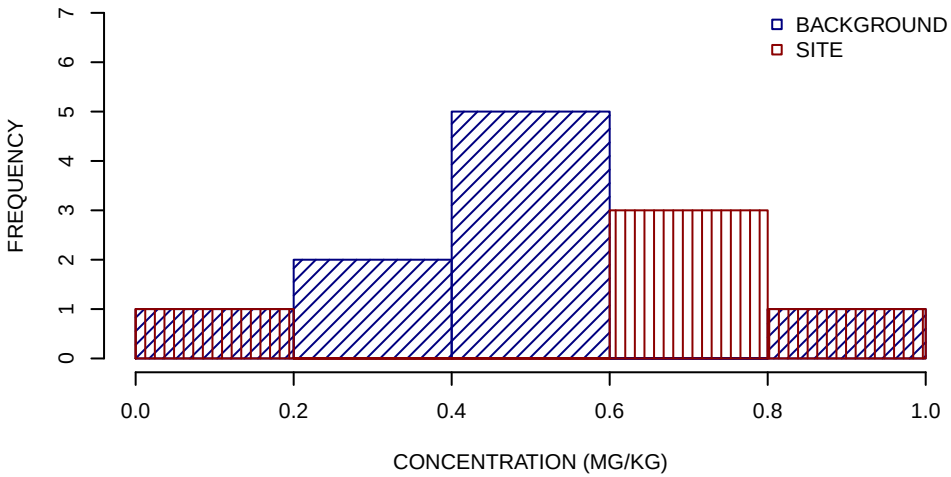
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.14	0.14
25TH PERCENTILE	0.39	0.72
MEDIAN	0.43	0.72
MEAN	0.47	0.63
75TH PERCENTILE	0.56	0.73
MAXIMUM	0.88	0.84

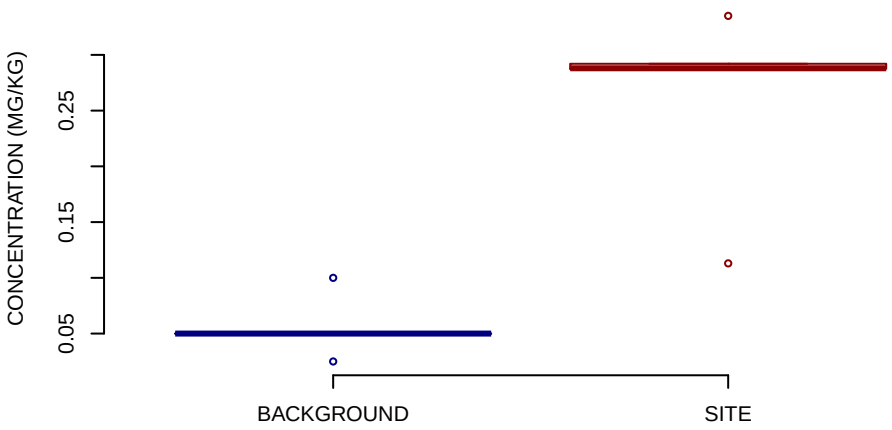
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

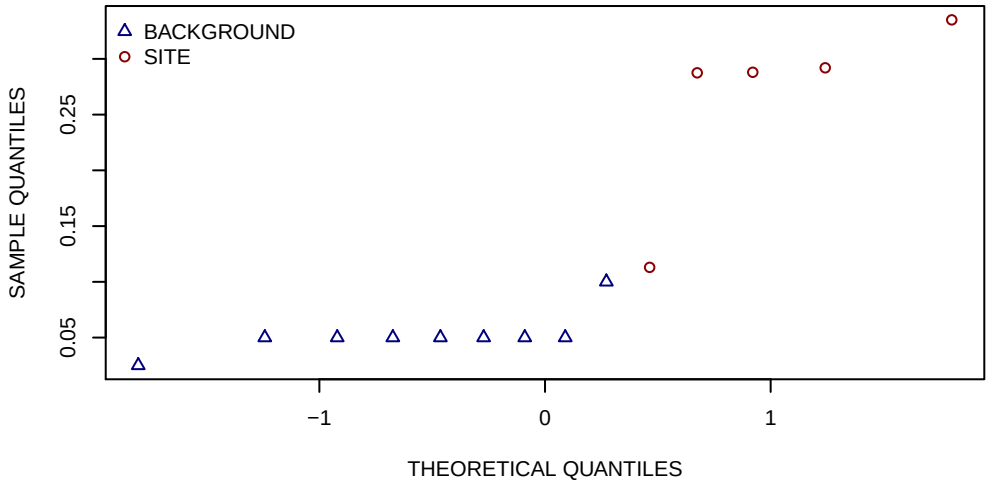
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SILVER SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 8 OF 8

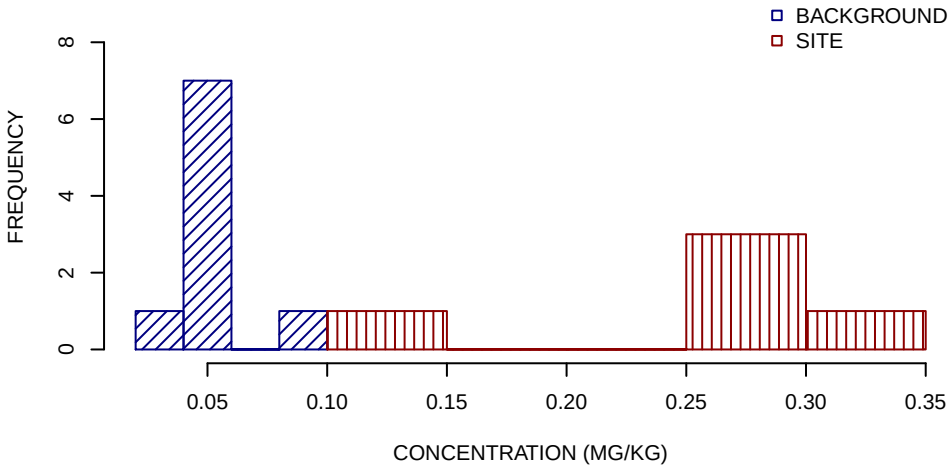
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.025	0.11
25TH PERCENTILE	0.05	0.29
MEDIAN	0.05	0.29
MEAN	0.053	0.26
75TH PERCENTILE	0.05	0.29
MAXIMUM	0.1	0.34

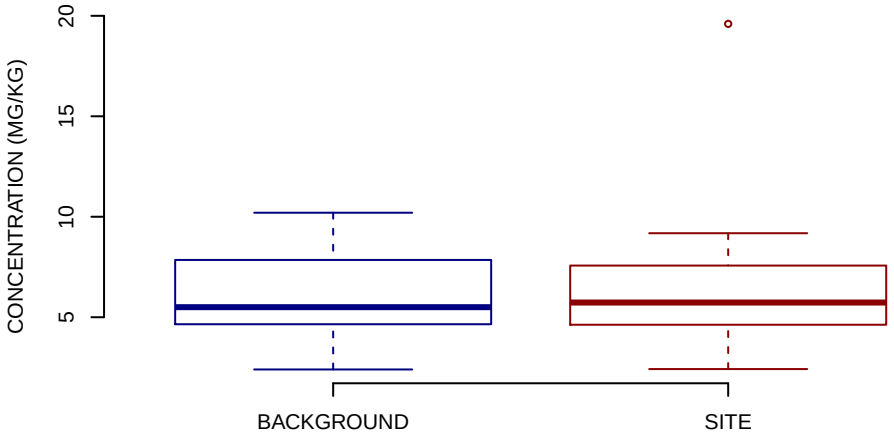
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

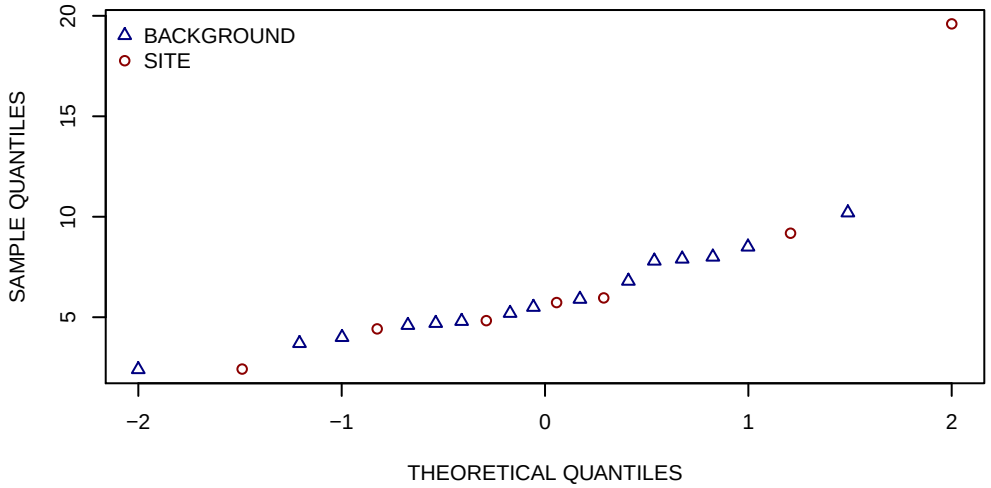
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ARSENIC SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 1 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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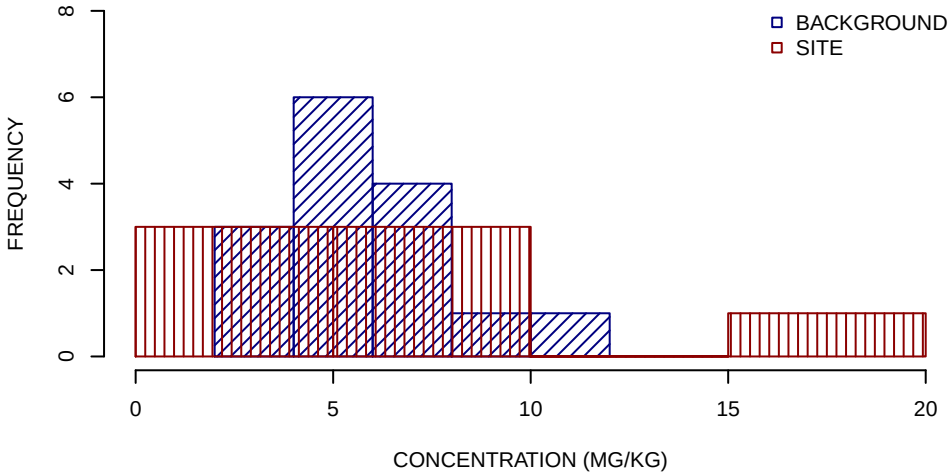


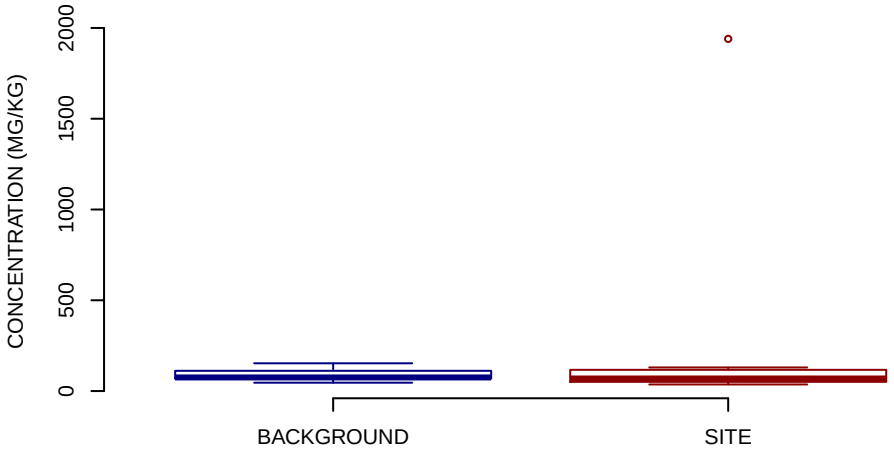
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	2.4	2.4
25TH PERCENTILE	4.6	4.6
MEDIAN	5.5	5.7
MEAN	6	7.4
75TH PERCENTILE	7.8	7.6
MAXIMUM	10	20

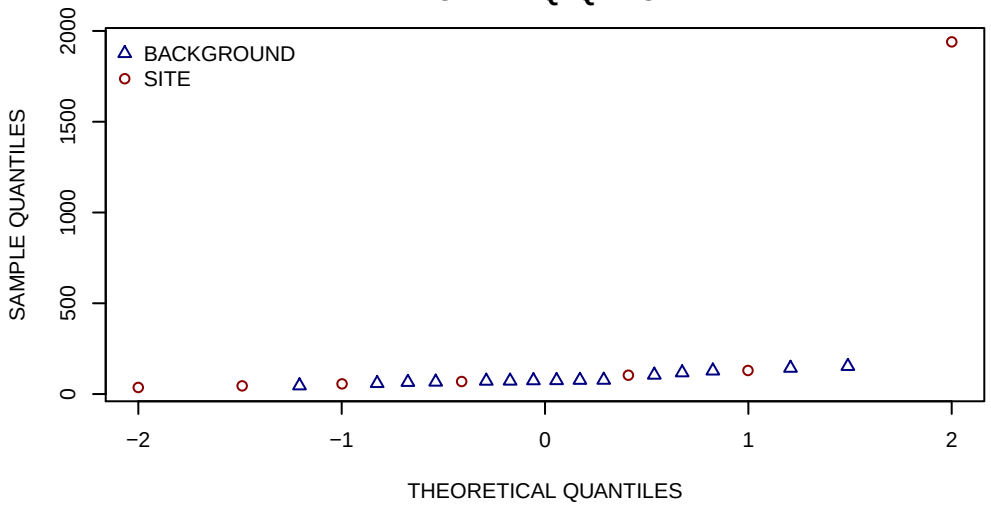
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BARIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 2 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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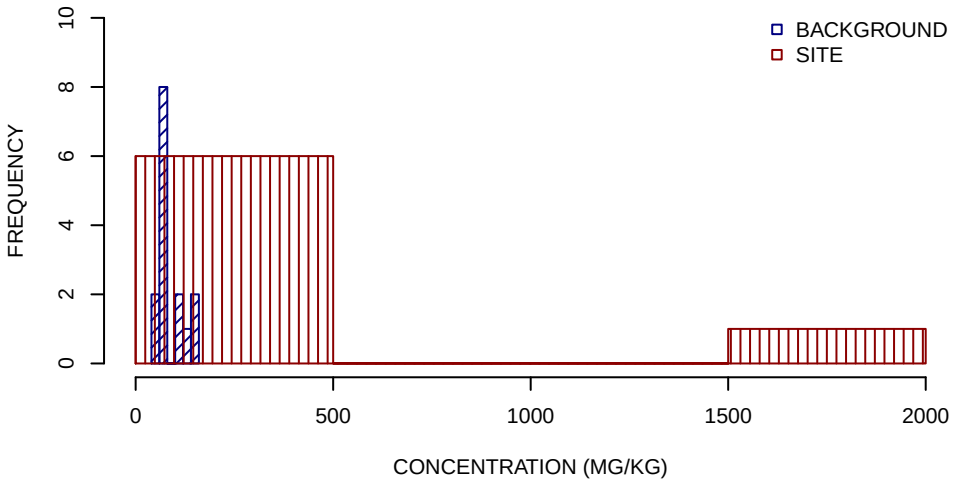


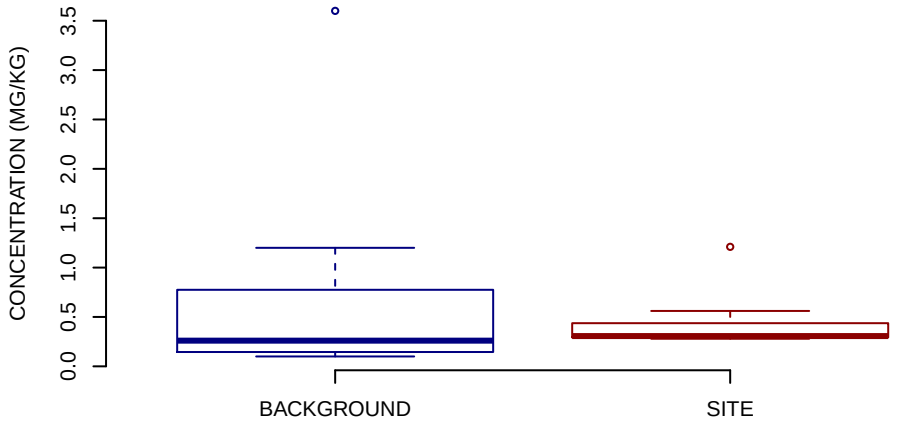
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	46	36
25TH PERCENTILE	69	51
MEDIAN	75	69
MEAN	89	340
75TH PERCENTILE	110	120
MAXIMUM	150	1900

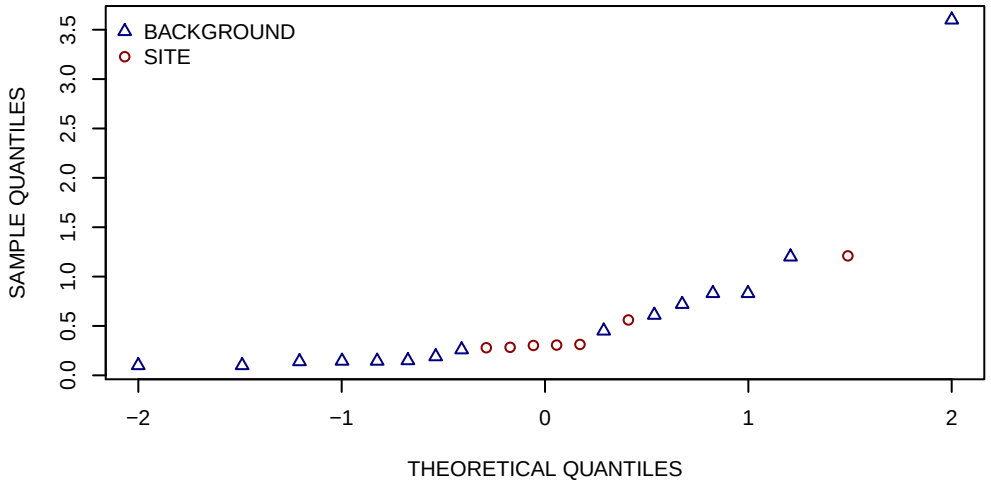
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CADMIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 3 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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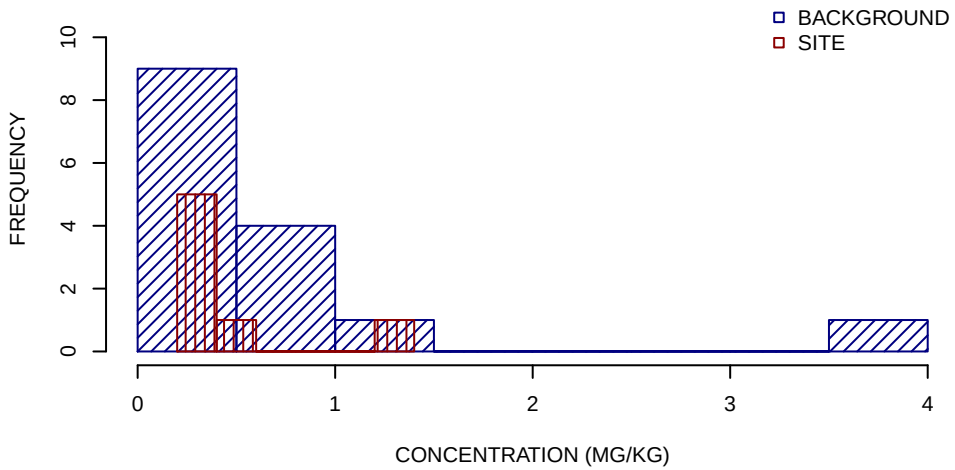


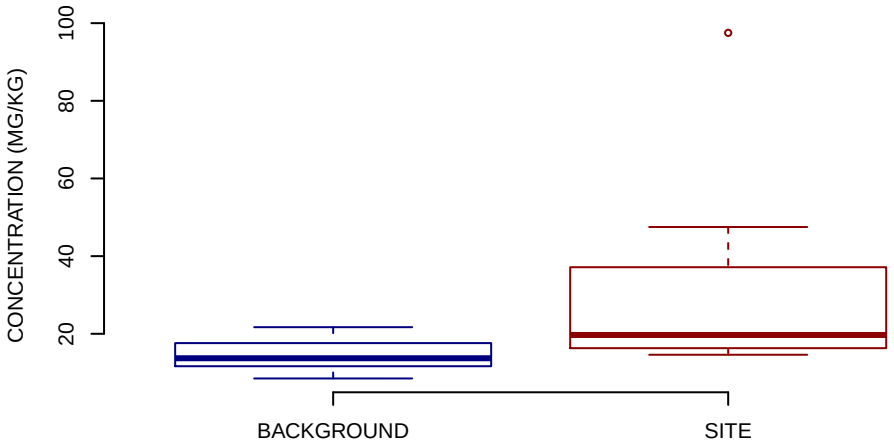
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.1	0.28
25TH PERCENTILE	0.14	0.29
MEDIAN	0.26	0.31
MEAN	0.63	0.47
75TH PERCENTILE	0.78	0.44
MAXIMUM	3.6	1.2

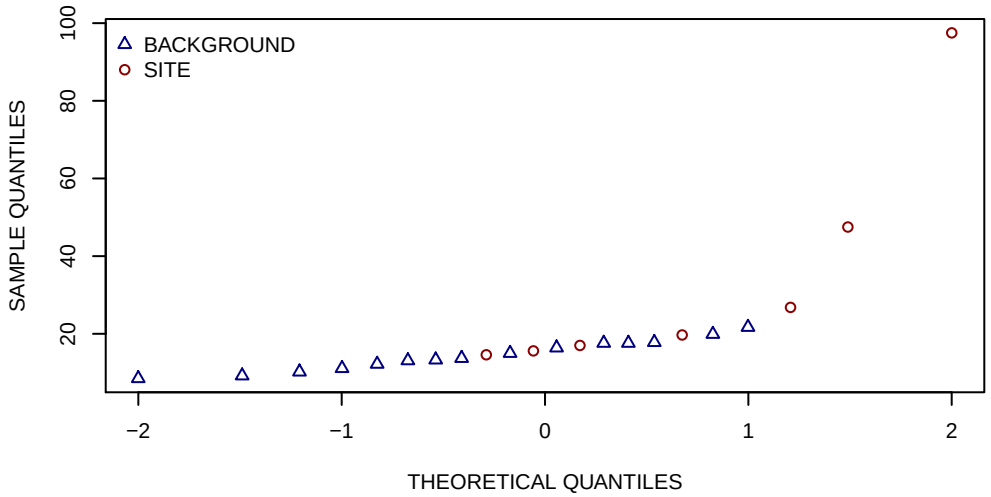
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHROMIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 4 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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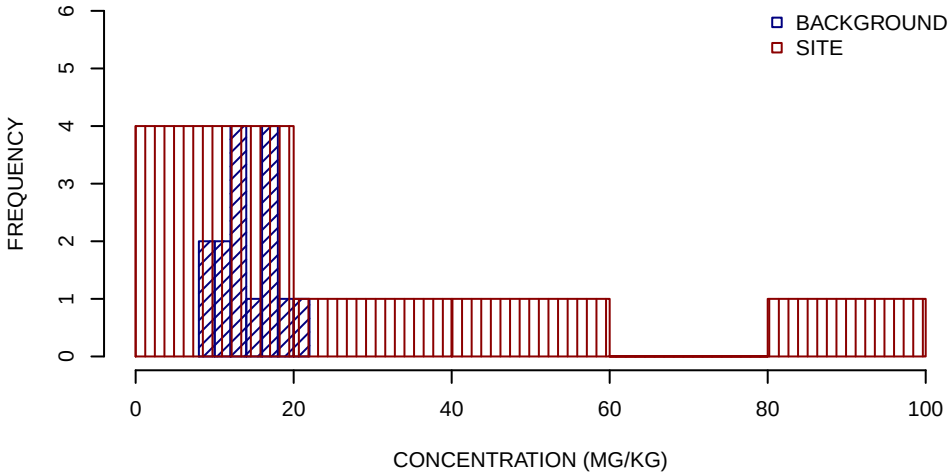


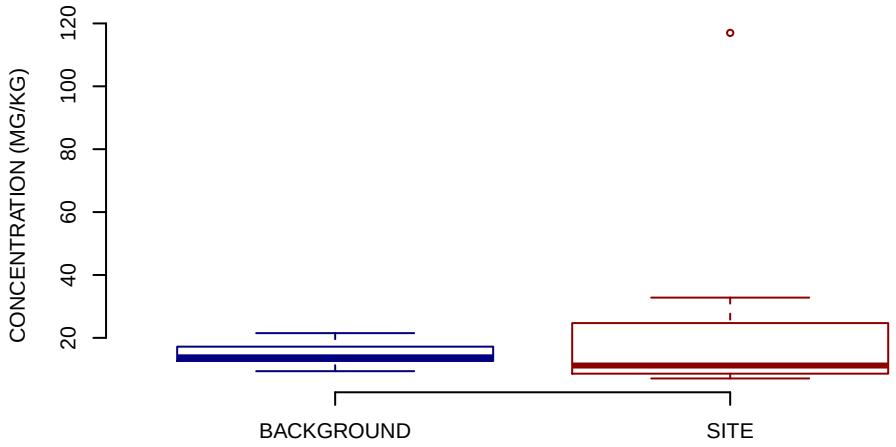
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	8.5	15
25TH PERCENTILE	12	16
MEDIAN	14	20
MEAN	14	34
75TH PERCENTILE	18	37
MAXIMUM	22	98

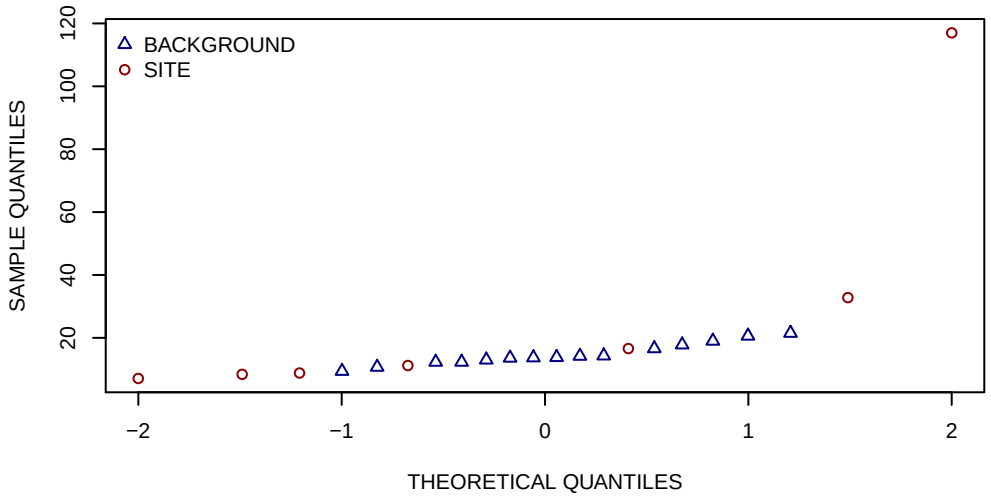
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 5 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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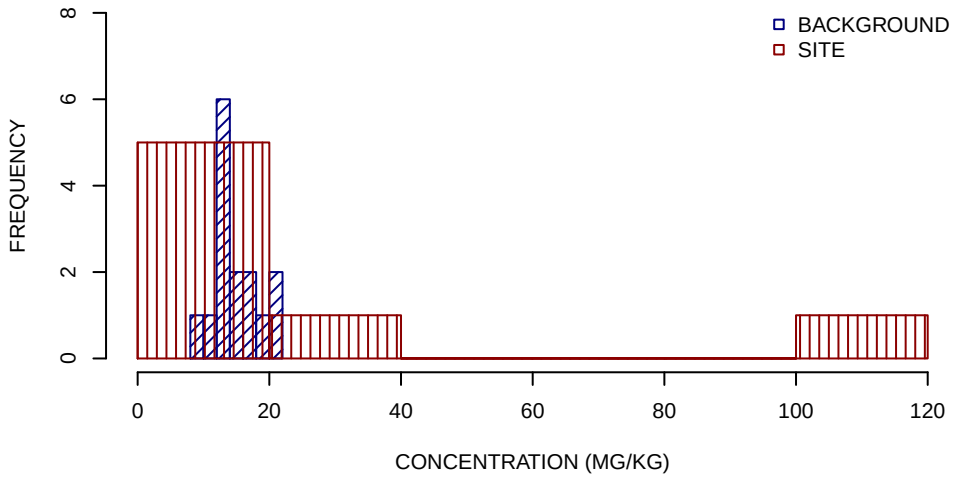


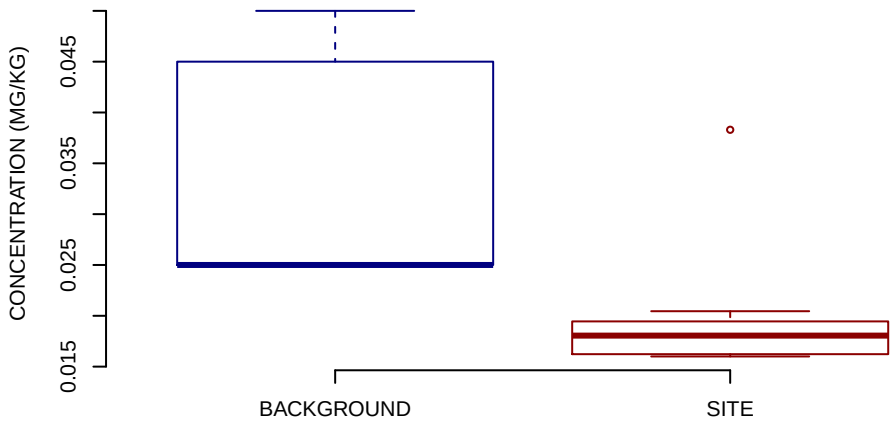
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	9.4	7.1
25TH PERCENTILE	13	8.6
MEDIAN	14	11
MEAN	15	29
75TH PERCENTILE	17	25
MAXIMUM	22	120

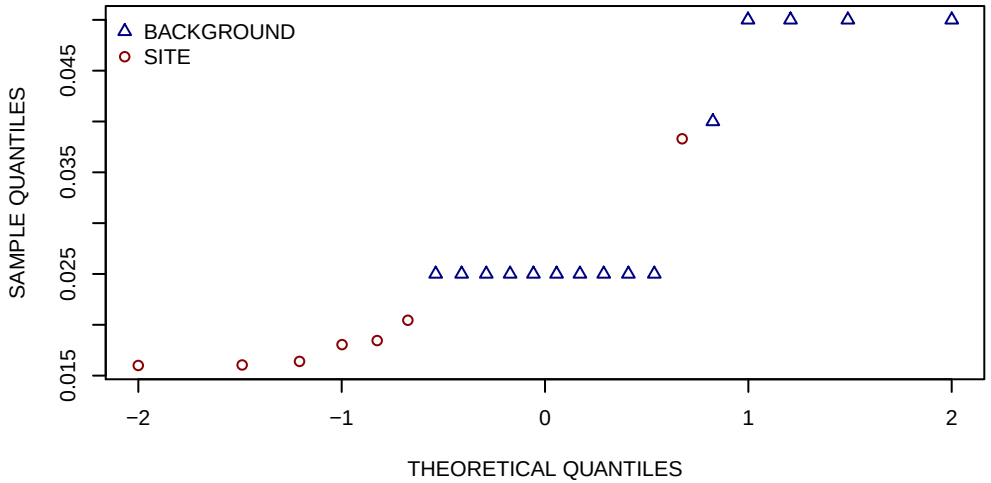
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 6 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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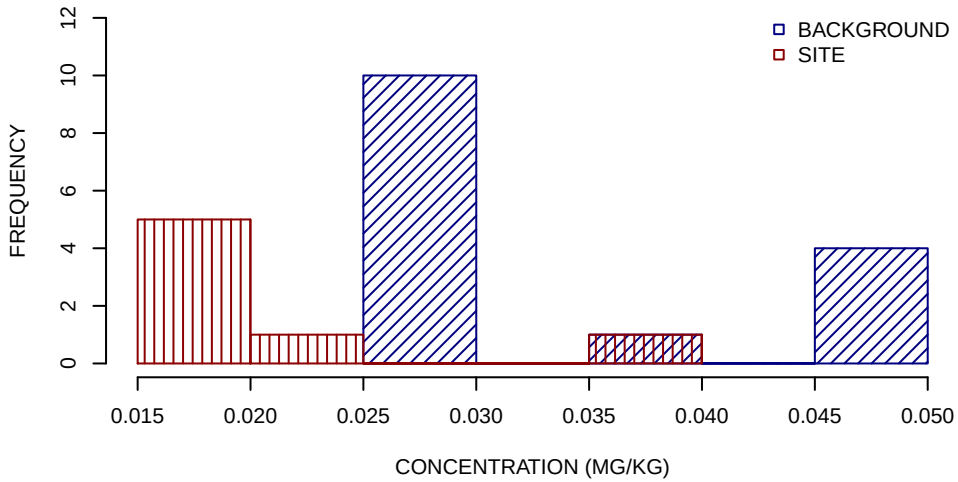


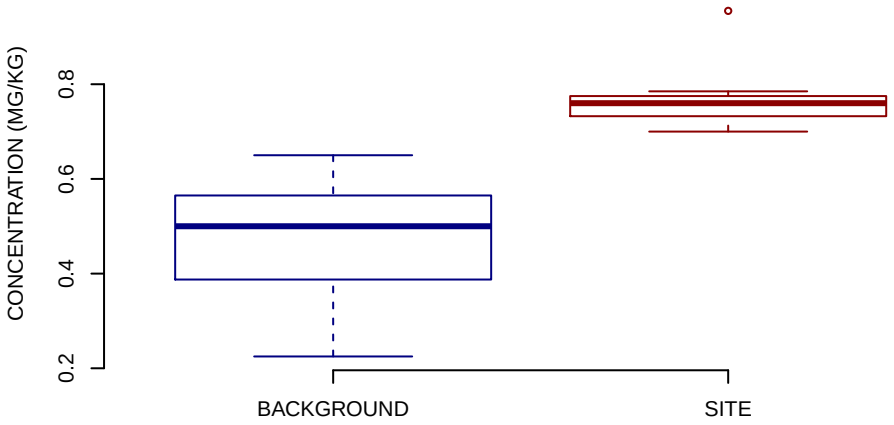
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.025	0.016
25TH PERCENTILE	0.025	0.016
MEDIAN	0.025	0.018
MEAN	0.033	0.021
75TH PERCENTILE	0.045	0.019
MAXIMUM	0.05	0.038

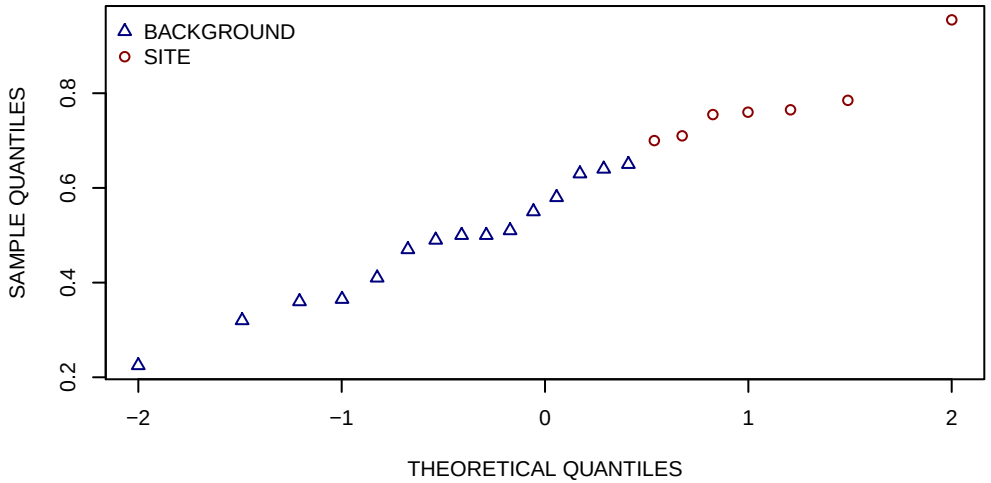
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SELENIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 7 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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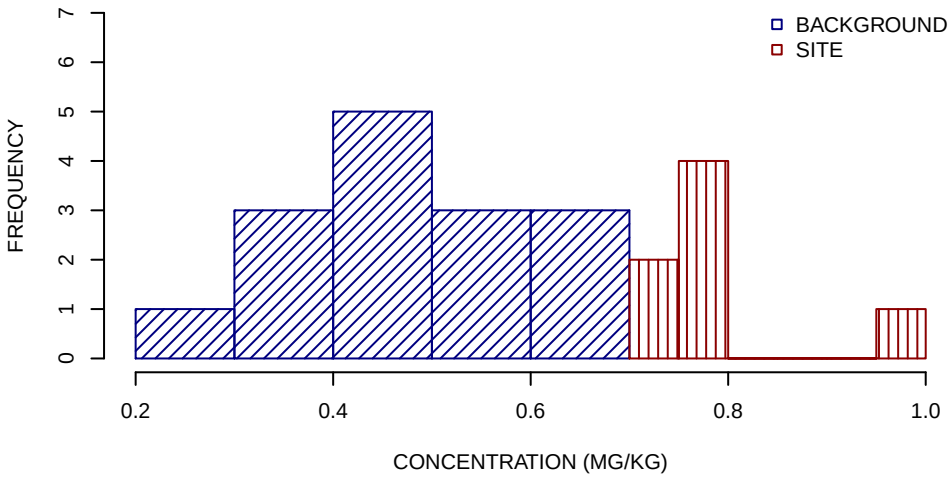


SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.22	0.7
25TH PERCENTILE	0.39	0.73
MEDIAN	0.5	0.76
MEAN	0.48	0.78
75TH PERCENTILE	0.56	0.78
MAXIMUM	0.65	0.96

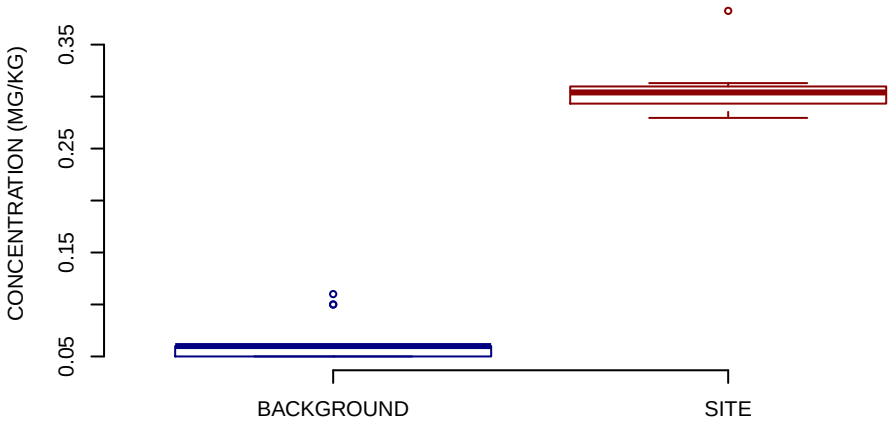
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

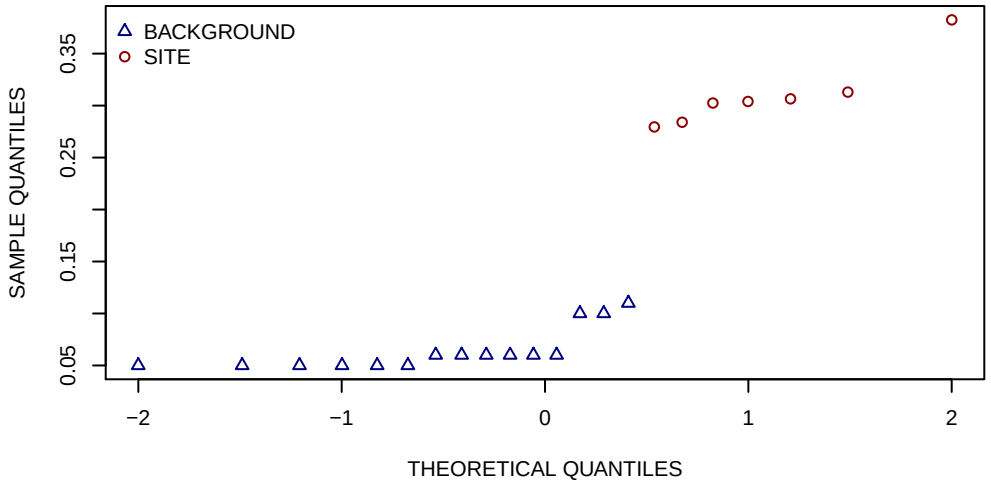
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SILVER SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA C
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 8 OF 8

BOXPLOTS



NORMAL Q−Q PLOT



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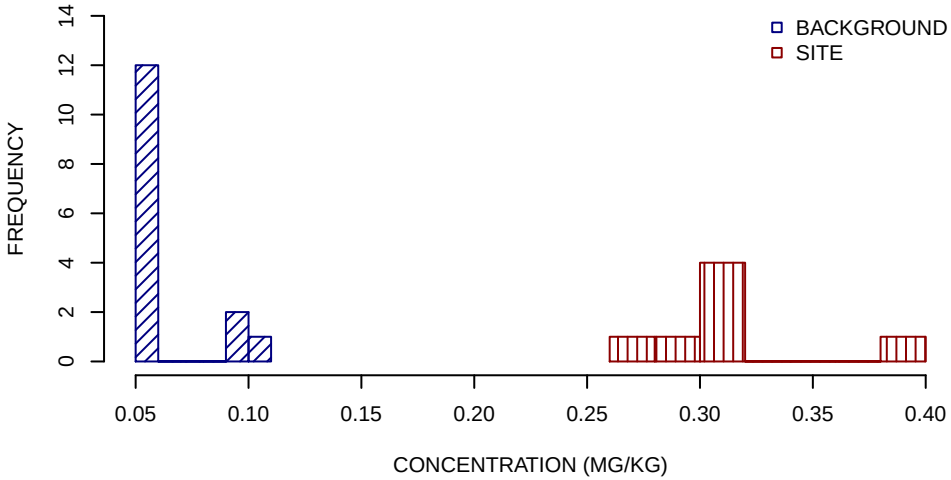


SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.05	0.28
25TH PERCENTILE	0.05	0.29
MEDIAN	0.06	0.3
MEAN	0.065	0.31
75TH PERCENTILE	0.06	0.31
MAXIMUM	0.11	0.38

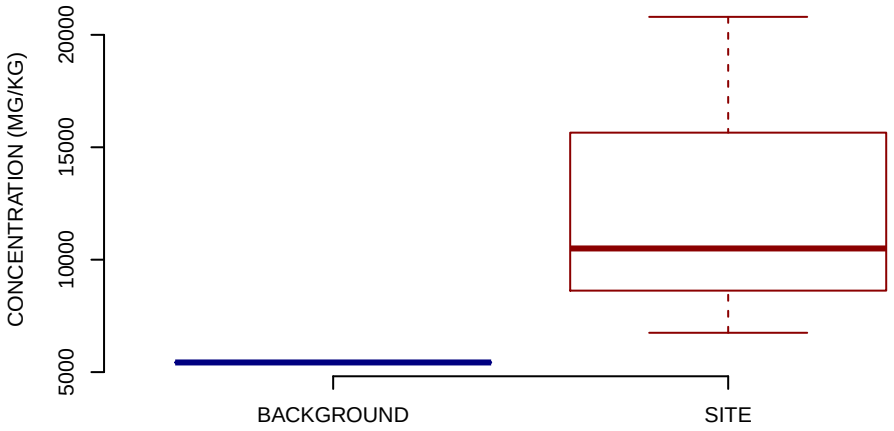
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

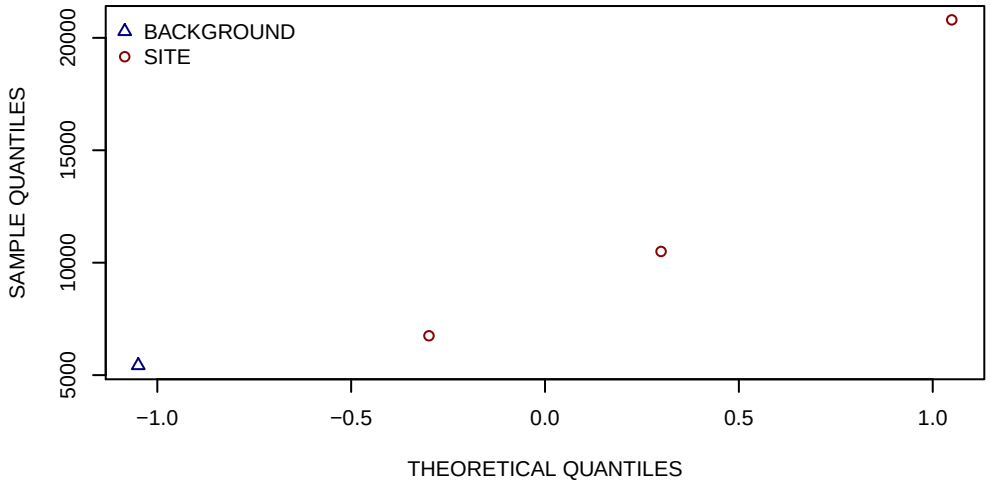
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ALUMINUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 1 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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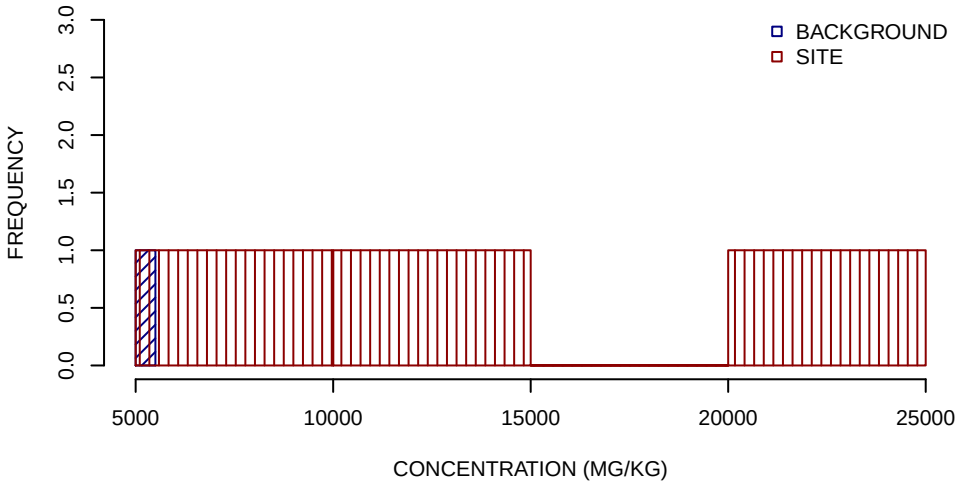


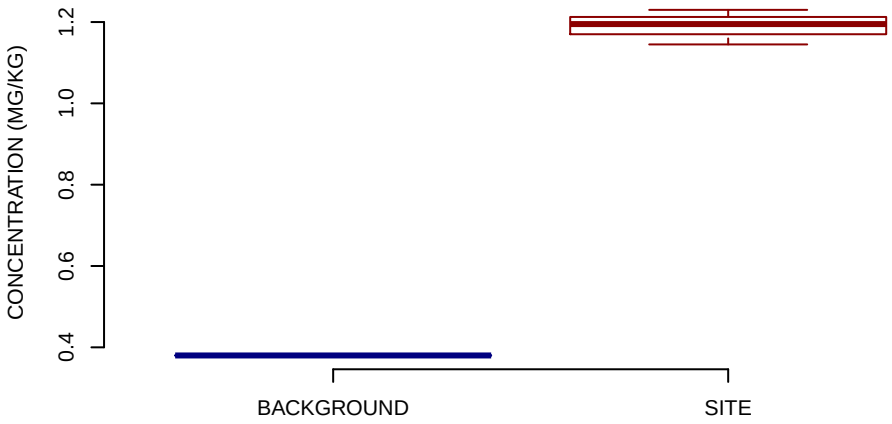
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	5400	6800
25TH PERCENTILE	5400	8600
MEDIAN	5400	10000
MEAN	5400	13000
75TH PERCENTILE	5400	16000
MAXIMUM	5400	21000

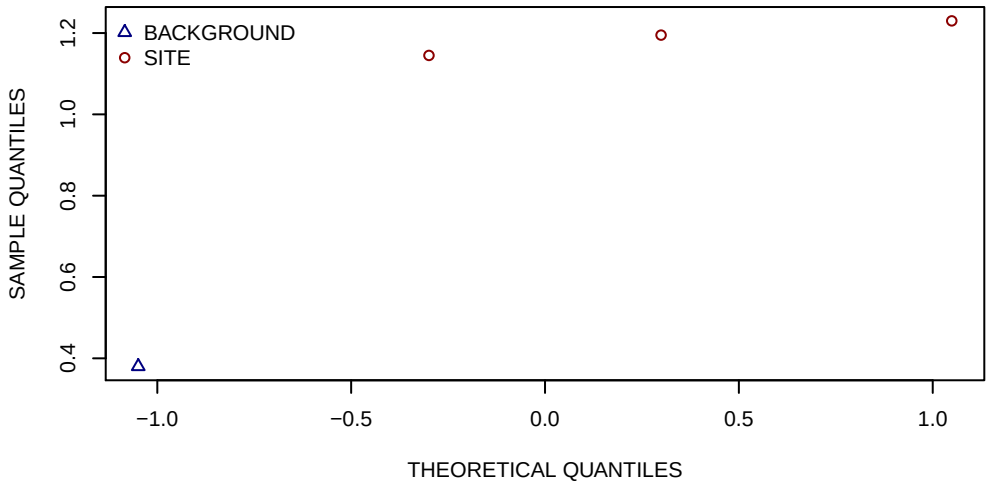
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ANTIMONY SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 2 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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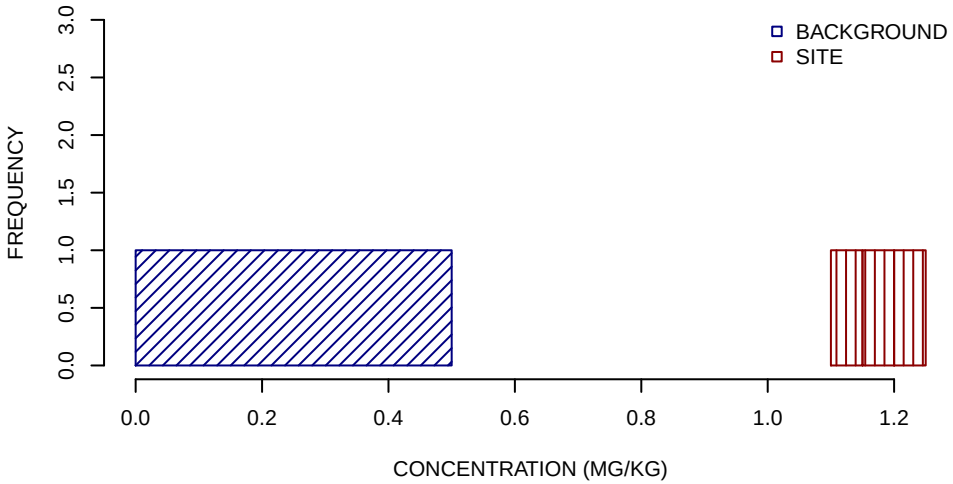


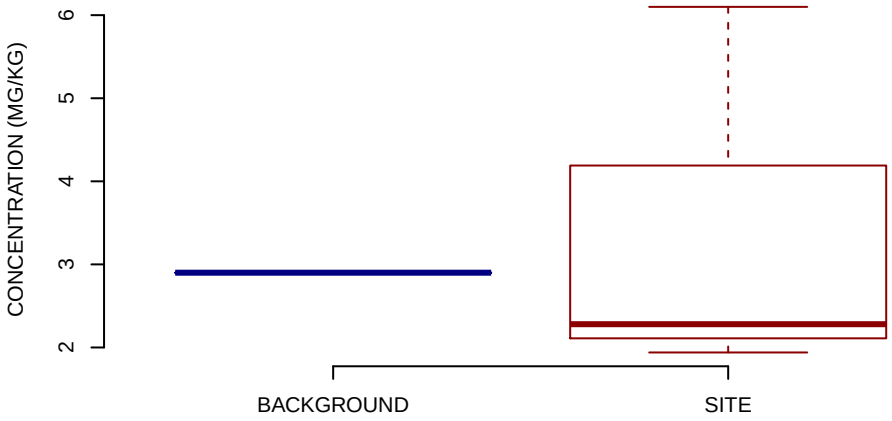
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.38	1.1
25TH PERCENTILE	0.38	1.2
MEDIAN	0.38	1.2
MEAN	0.38	1.2
75TH PERCENTILE	0.38	1.2
MAXIMUM	0.38	1.2

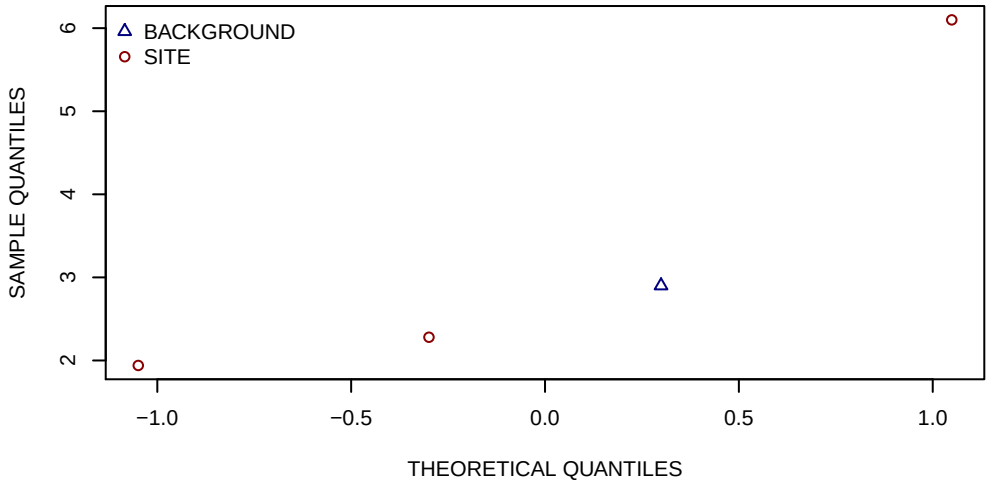
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ARSENIC SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 3 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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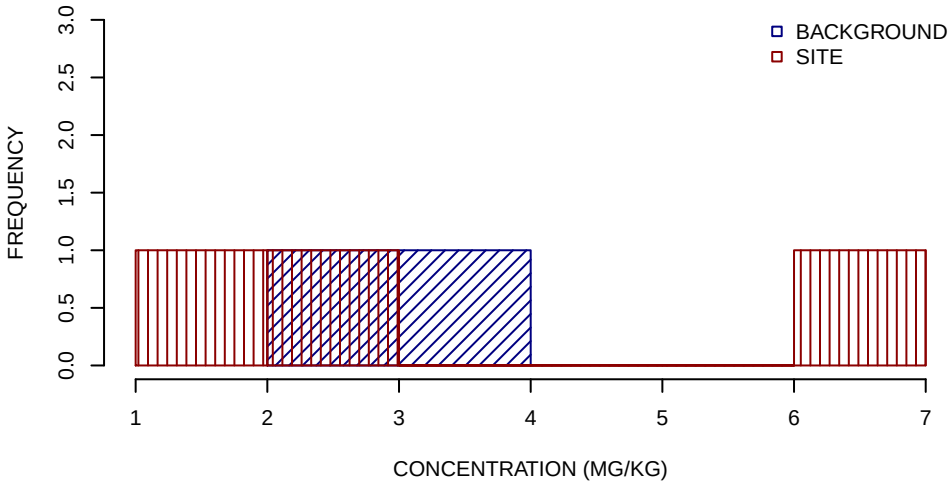


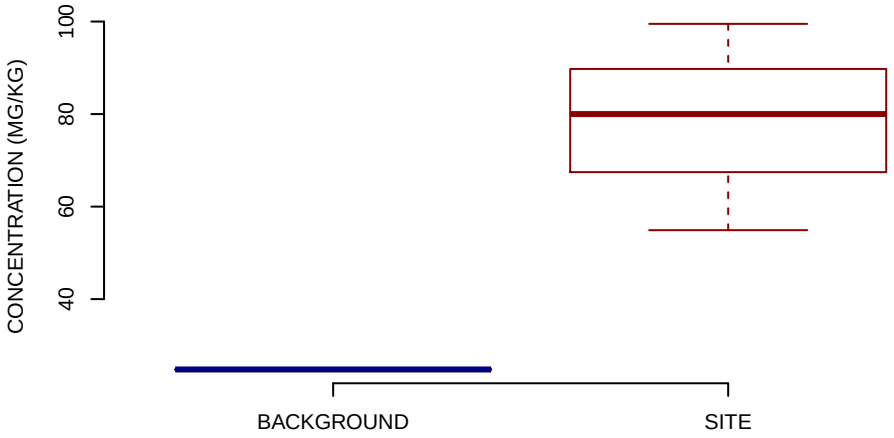
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	2.9	1.9
25TH PERCENTILE	2.9	2.1
MEDIAN	2.9	2.3
MEAN	2.9	3.4
75TH PERCENTILE	2.9	4.2
MAXIMUM	2.9	6.1

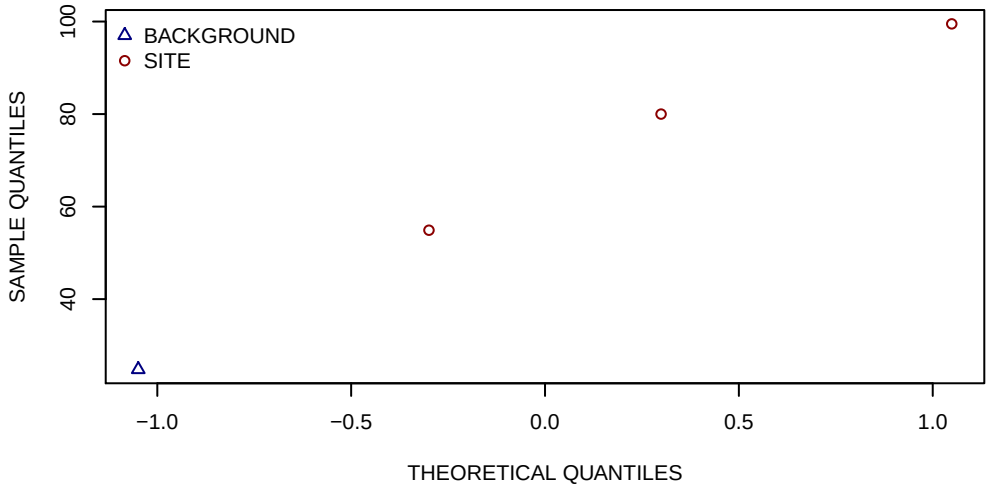
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BARIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 4 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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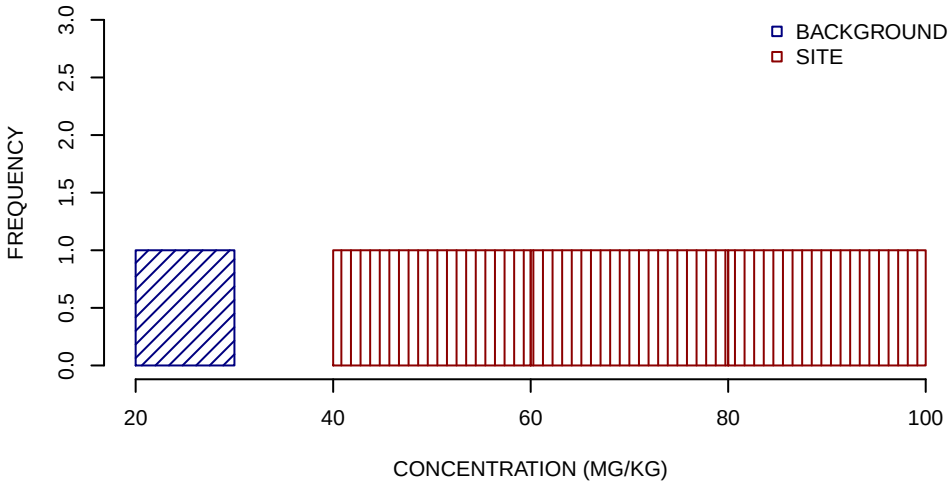


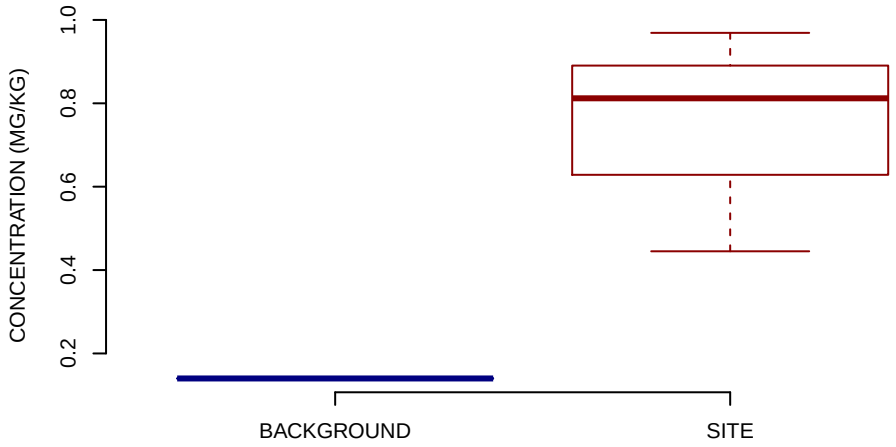
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	25	55
25TH PERCENTILE	25	67
MEDIAN	25	80
MEAN	25	78
75TH PERCENTILE	25	90
MAXIMUM	25	100

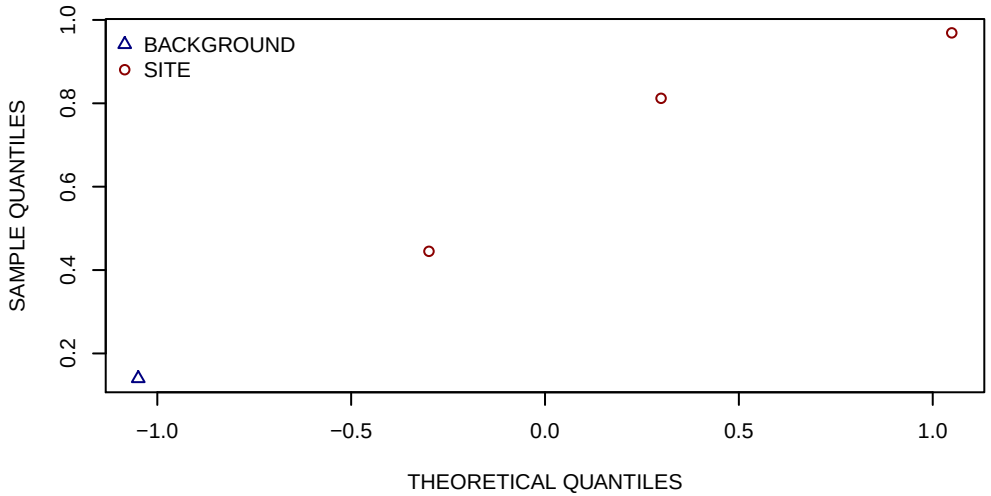
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BERYLLIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 5 OF 23

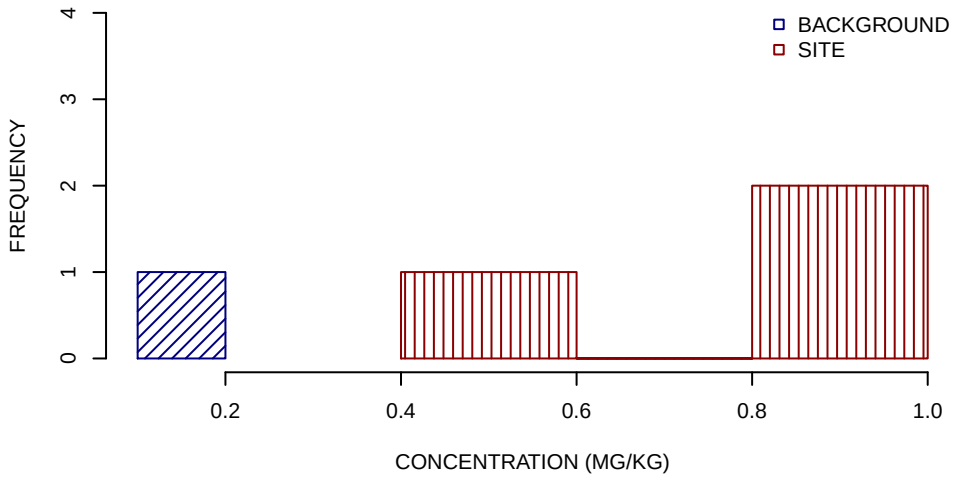
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



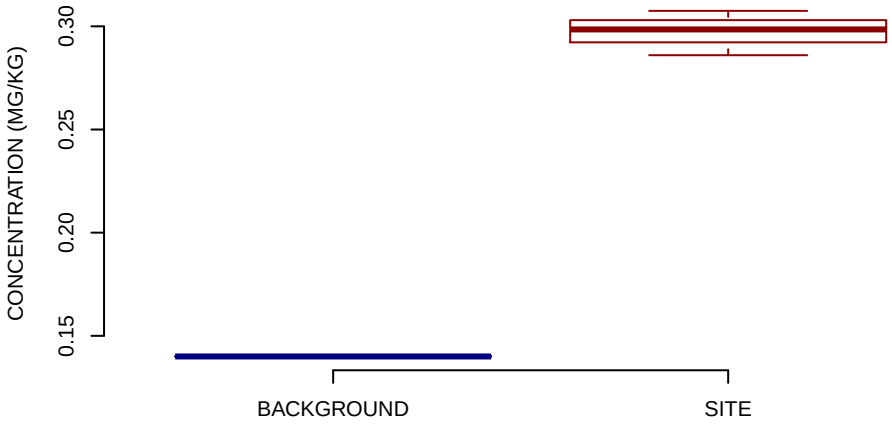
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.14	0.44
25TH PERCENTILE	0.14	0.63
MEDIAN	0.14	0.81
MEAN	0.14	0.74
75TH PERCENTILE	0.14	0.89
MAXIMUM	0.14	0.97

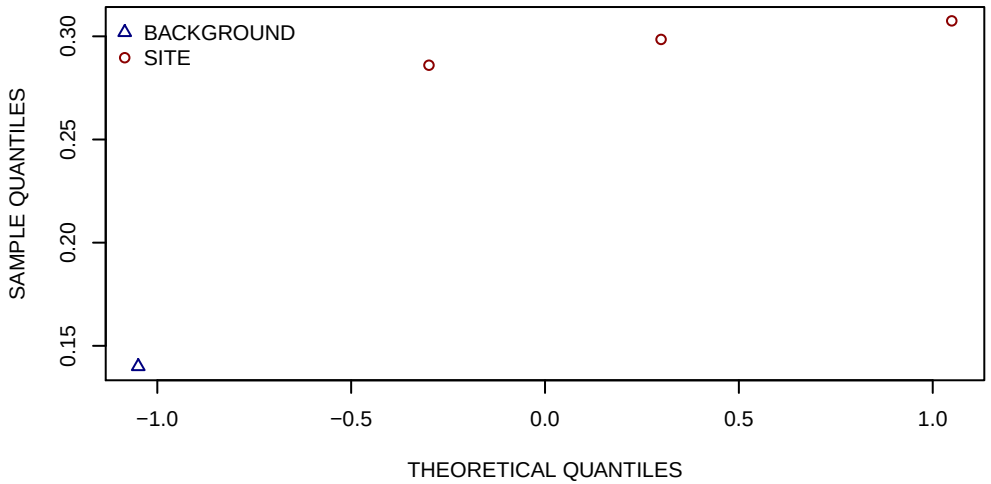
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CADMIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 6 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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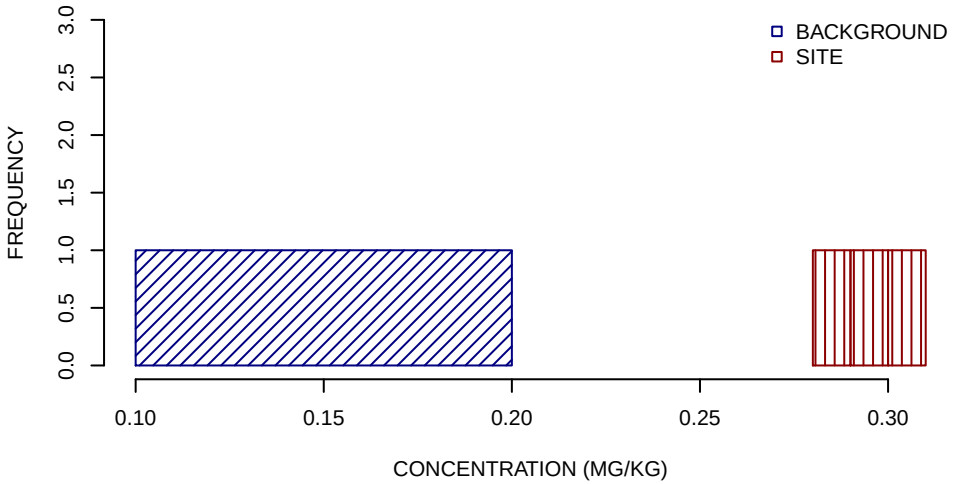


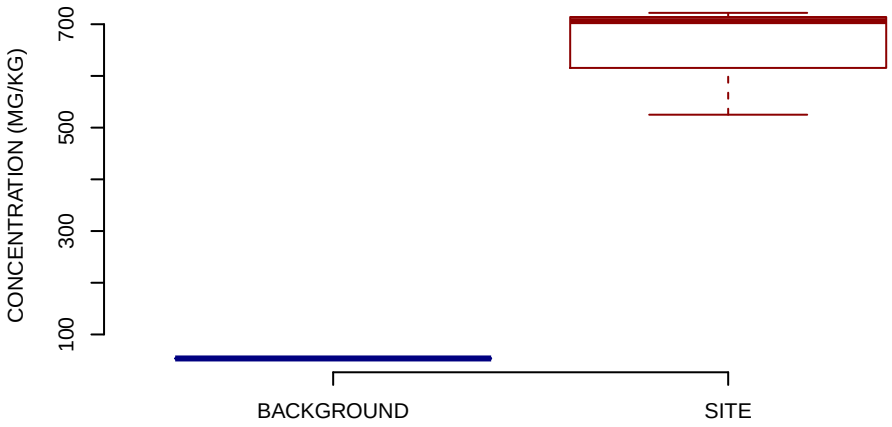
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.14	0.29
25TH PERCENTILE	0.14	0.29
MEDIAN	0.14	0.3
MEAN	0.14	0.3
75TH PERCENTILE	0.14	0.3
MAXIMUM	0.14	0.31

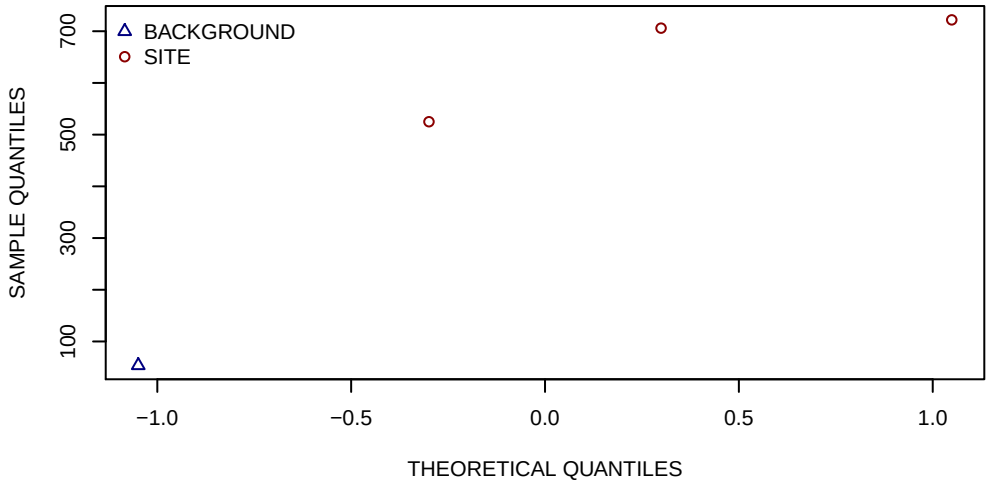
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CALCIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 7 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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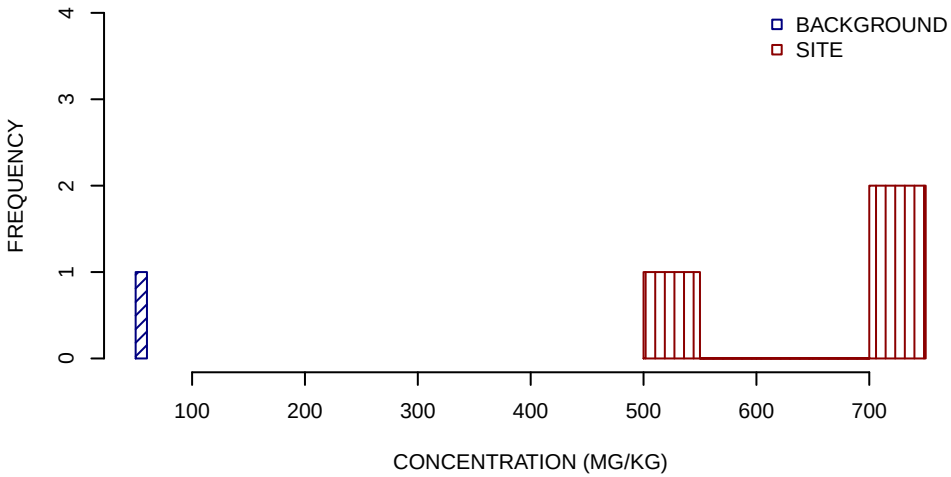


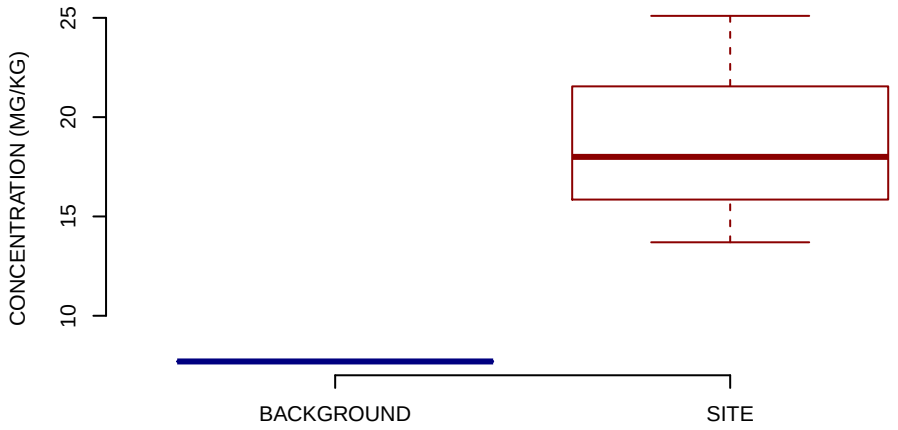
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	54	520
25TH PERCENTILE	54	620
MEDIAN	54	710
MEAN	54	650
75TH PERCENTILE	54	710
MAXIMUM	54	720

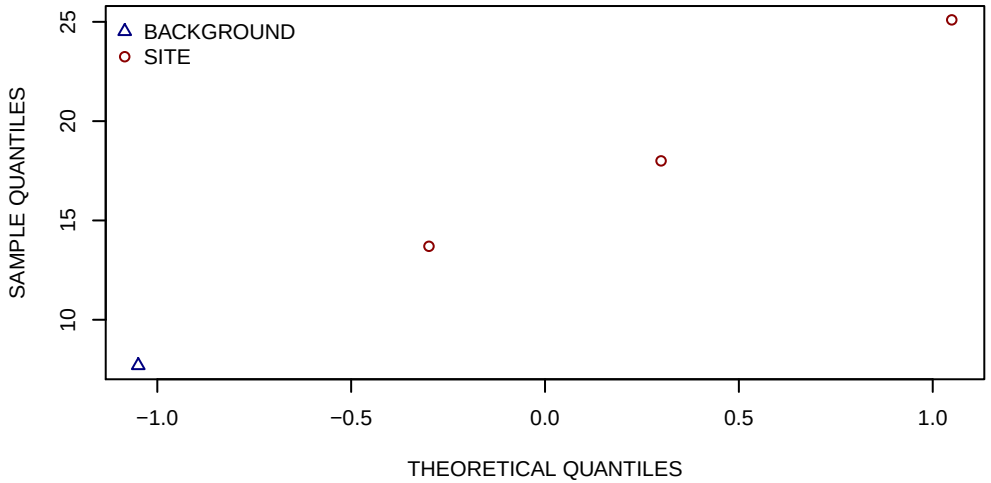
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHROMIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 8 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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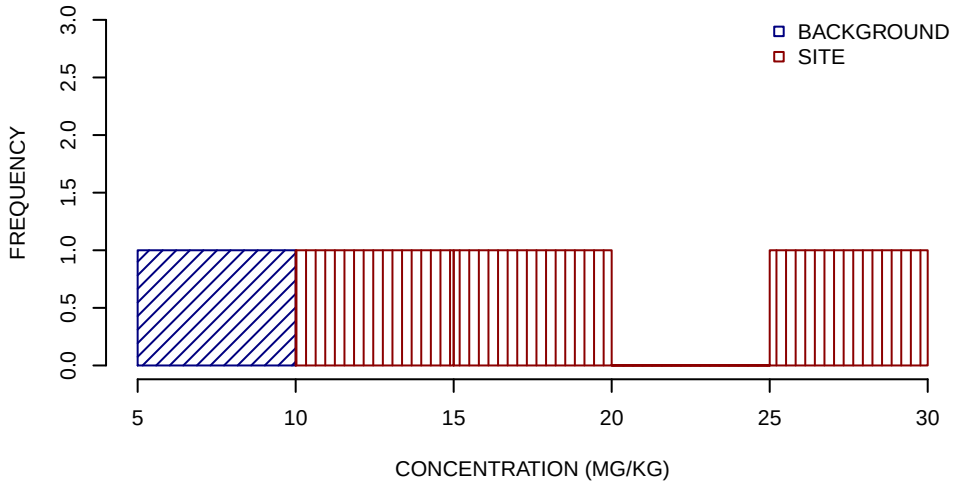


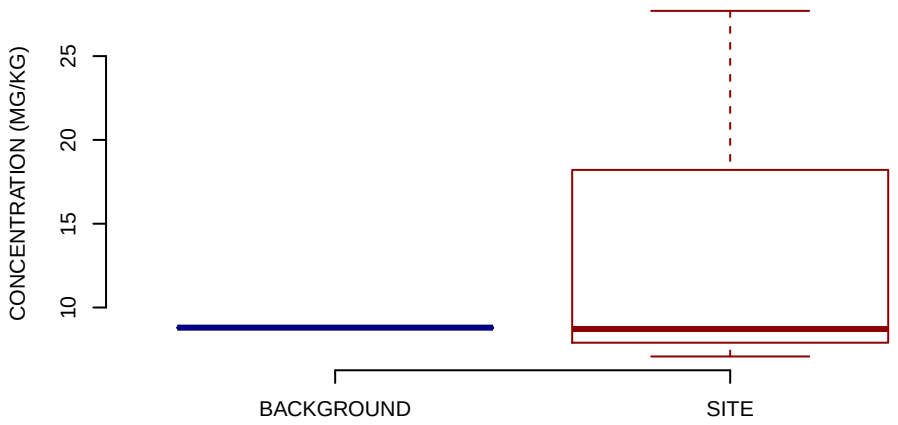
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	7.7	14
25TH PERCENTILE	7.7	16
MEDIAN	7.7	18
MEAN	7.7	19
75TH PERCENTILE	7.7	22
MAXIMUM	7.7	25

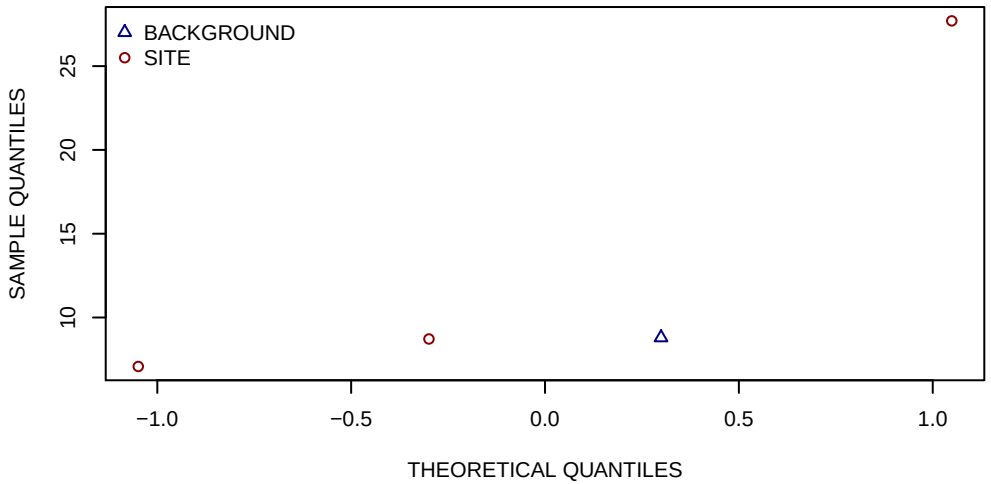
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

COBALT SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 9 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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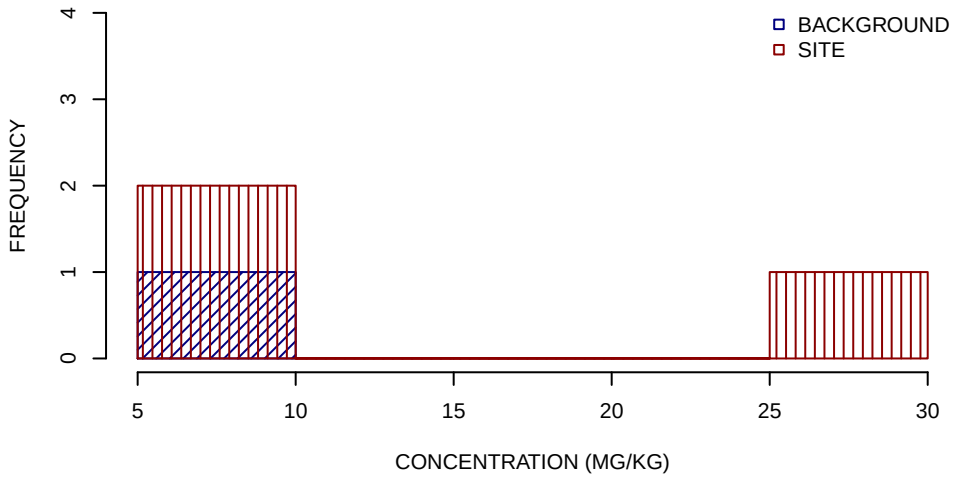


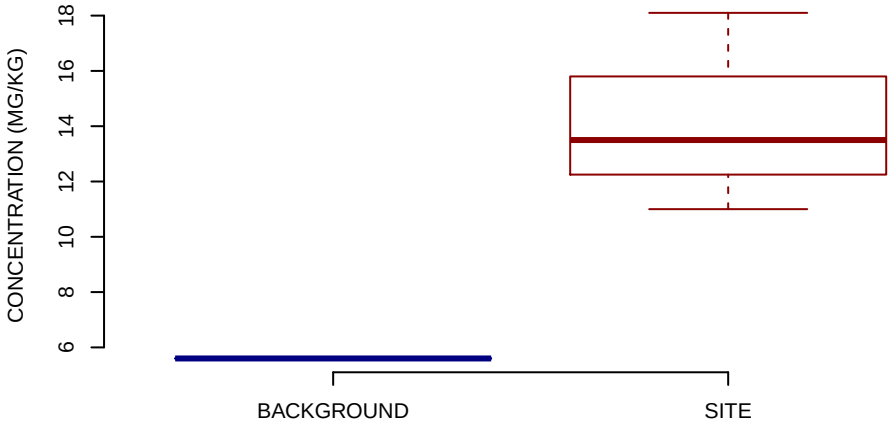
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	8.8	7.1
25TH PERCENTILE	8.8	7.9
MEDIAN	8.8	8.7
MEAN	8.8	14
75TH PERCENTILE	8.8	18
MAXIMUM	8.8	28

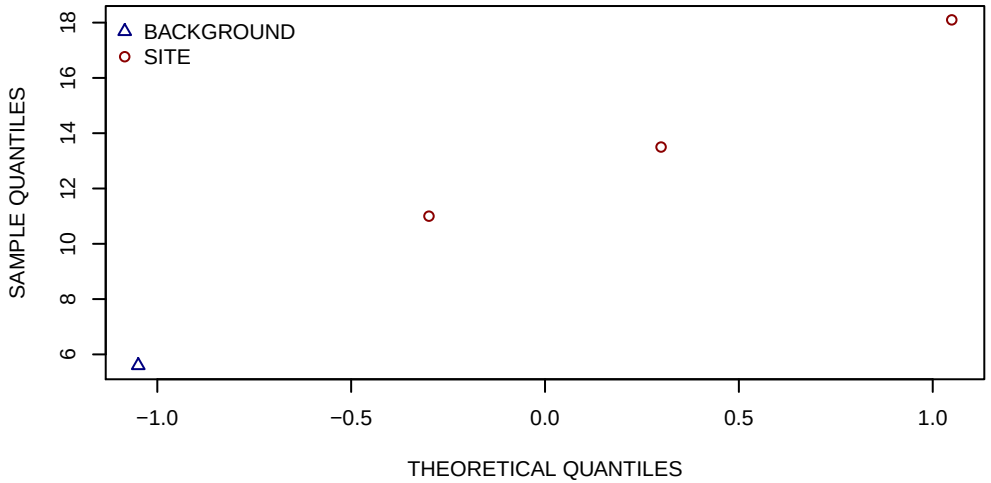
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

COPPER SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 10 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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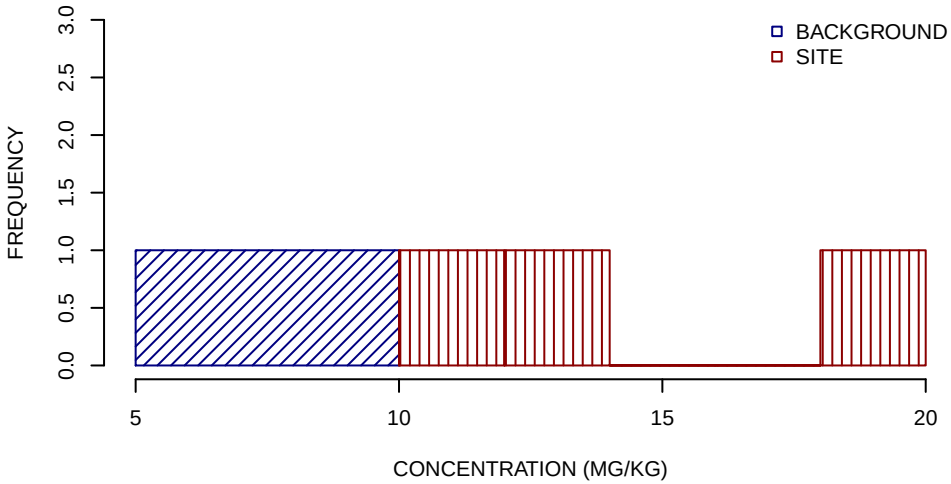


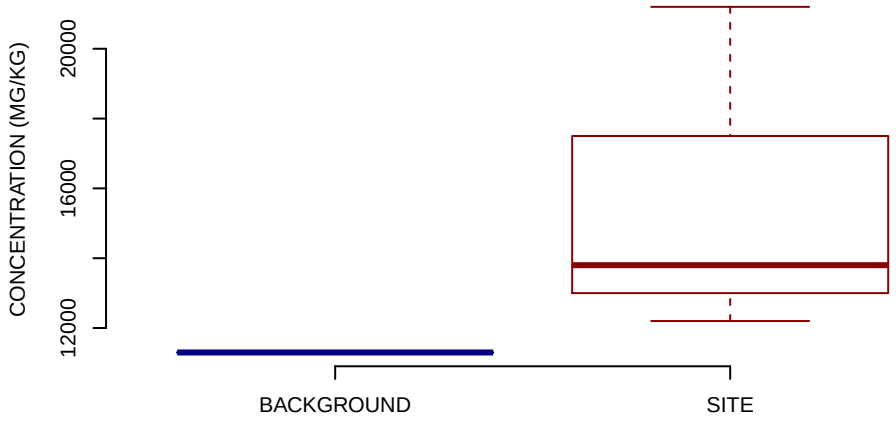
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	5.6	11
25TH PERCENTILE	5.6	12
MEDIAN	5.6	14
MEAN	5.6	14
75TH PERCENTILE	5.6	16
MAXIMUM	5.6	18

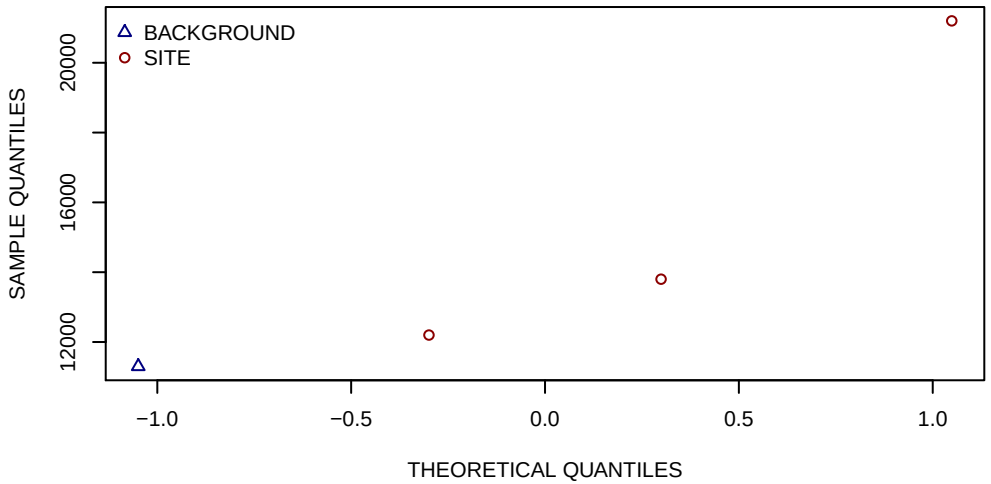
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

IRON SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 11 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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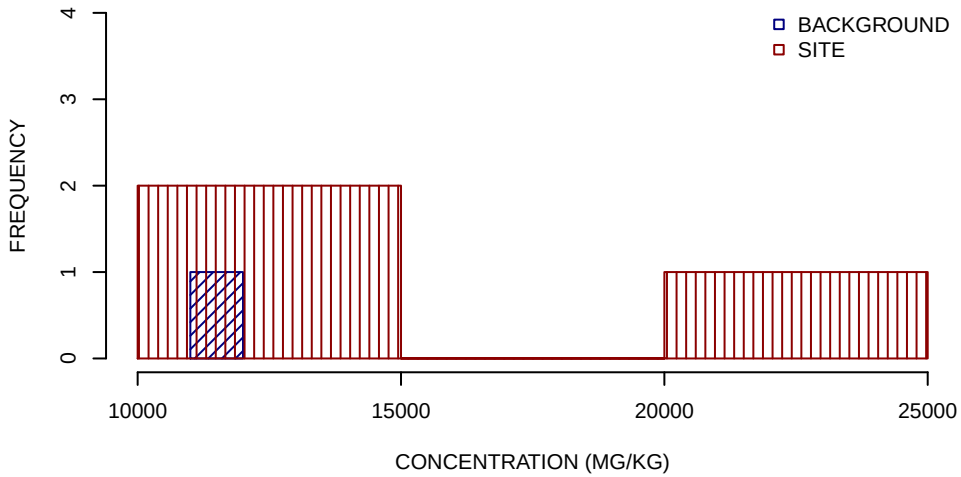


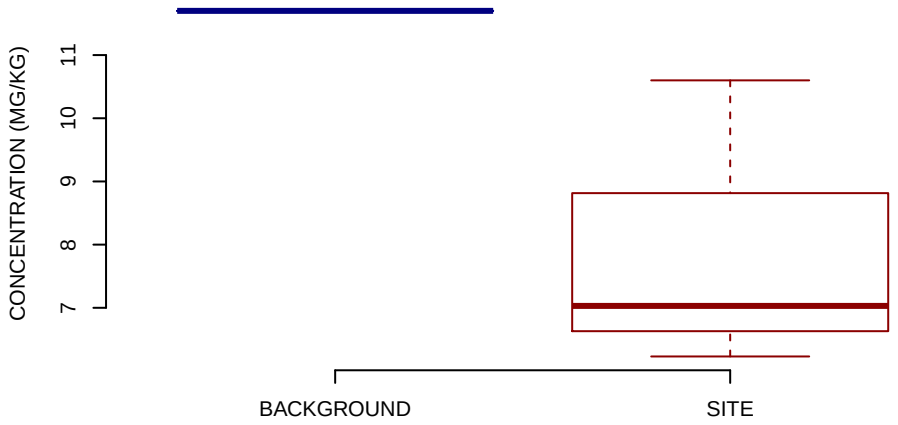
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	11000	12000
25TH PERCENTILE	11000	13000
MEDIAN	11000	14000
MEAN	11000	16000
75TH PERCENTILE	11000	18000
MAXIMUM	11000	21000

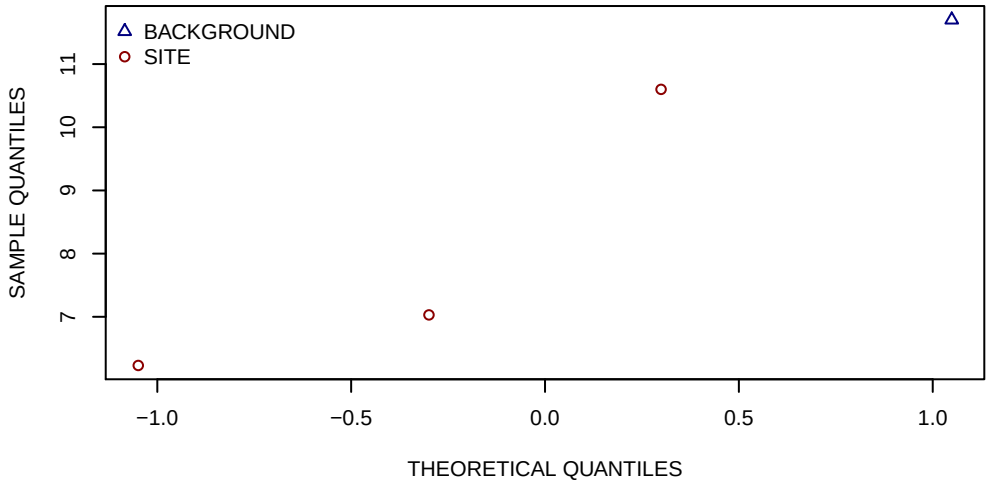
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 12 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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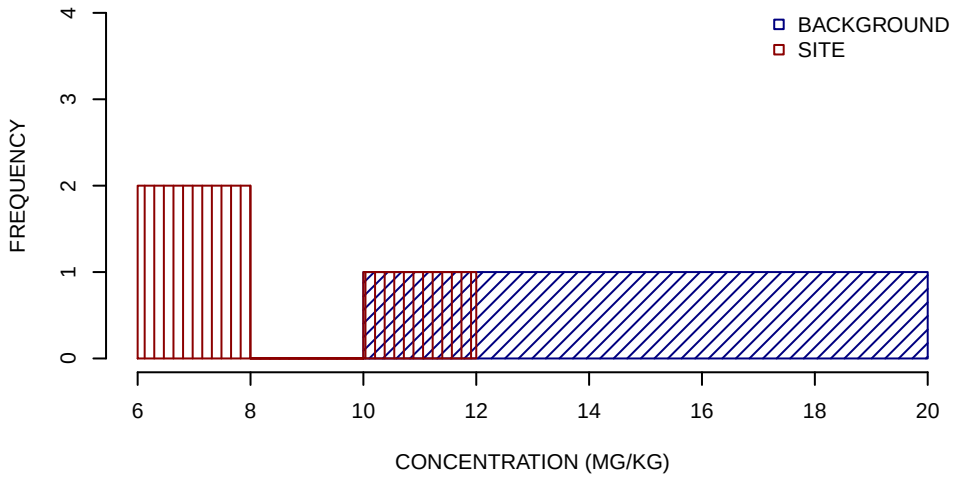


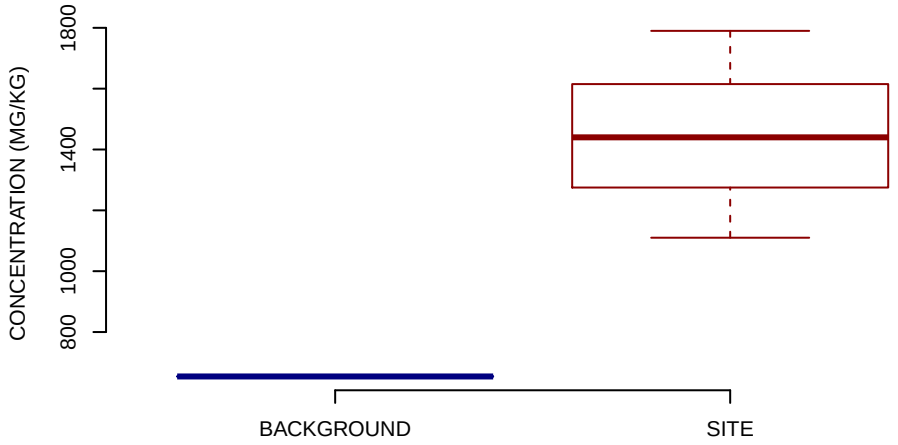
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	12	6.2
25TH PERCENTILE	12	6.6
MEDIAN	12	7
MEAN	12	8
75TH PERCENTILE	12	8.8
MAXIMUM	12	11

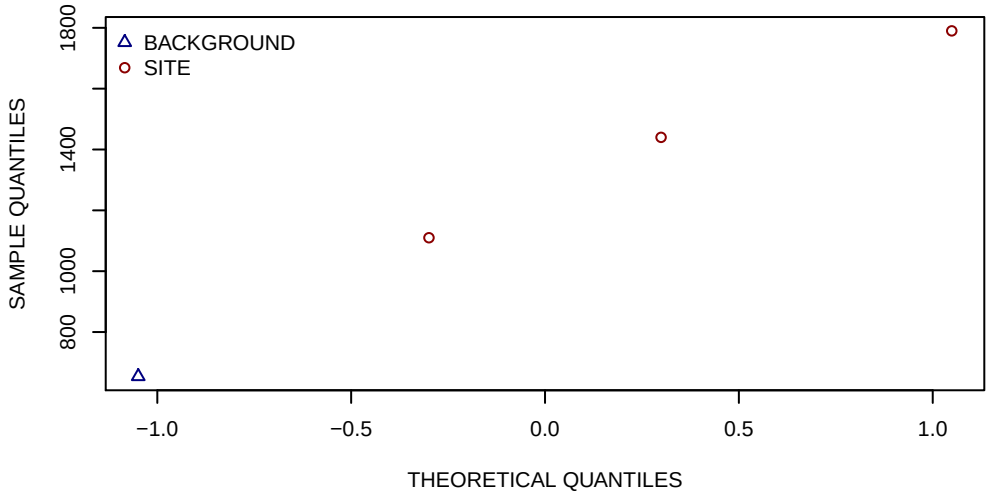
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MAGNESIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 13 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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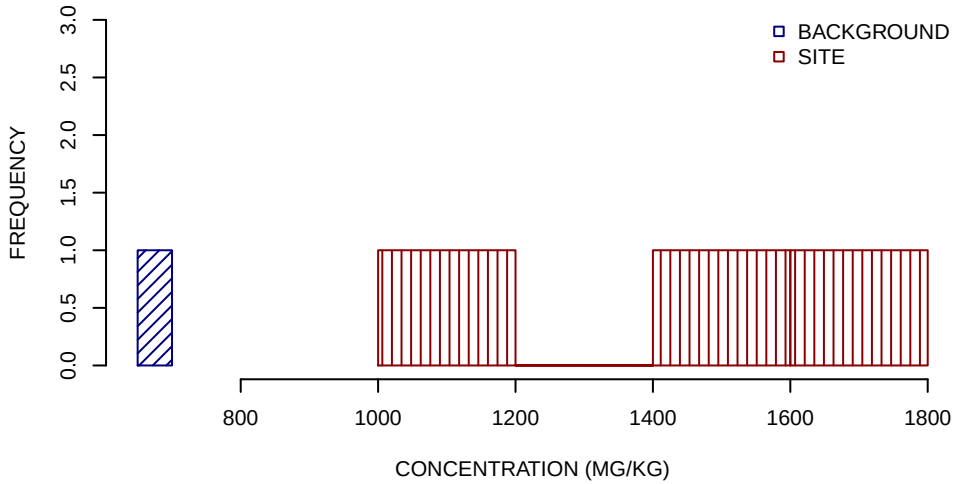


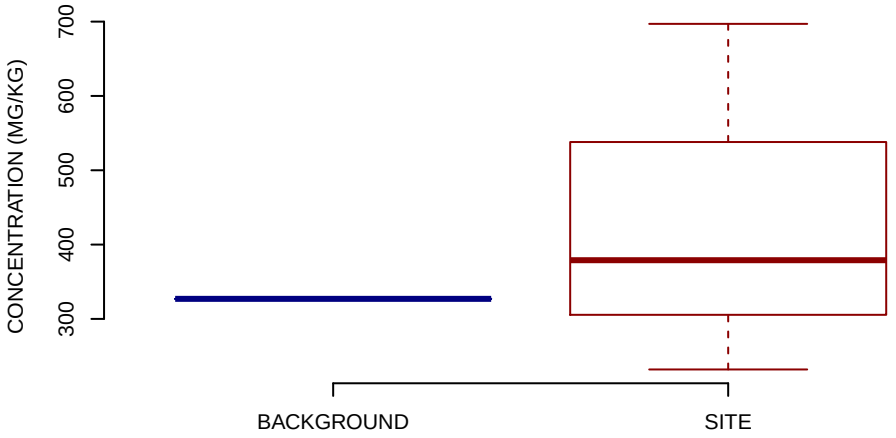
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	650	1100
25TH PERCENTILE	650	1300
MEDIAN	650	1400
MEAN	650	1400
75TH PERCENTILE	650	1600
MAXIMUM	650	1800

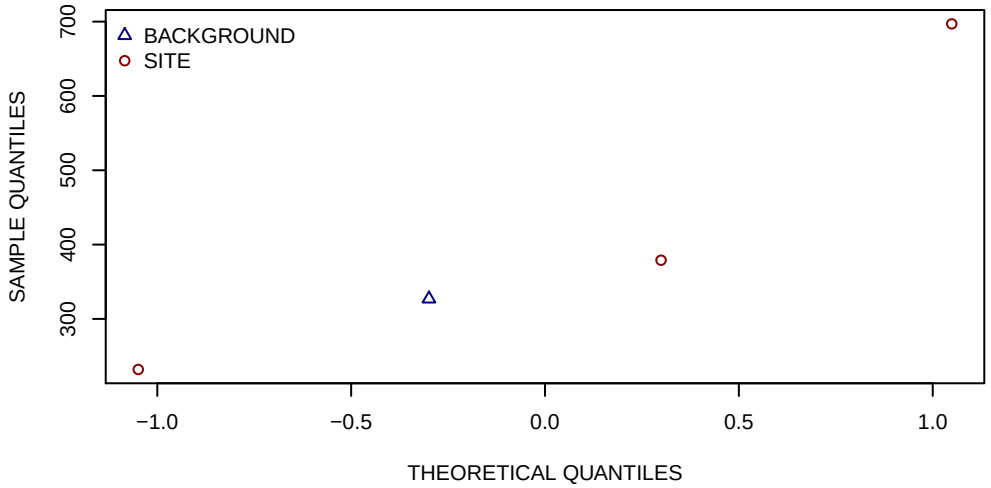
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MANGANESE SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 14 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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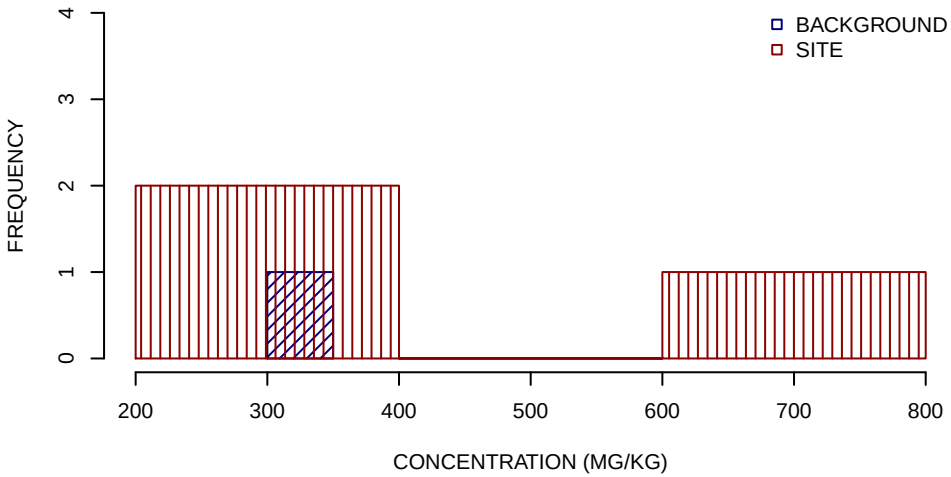


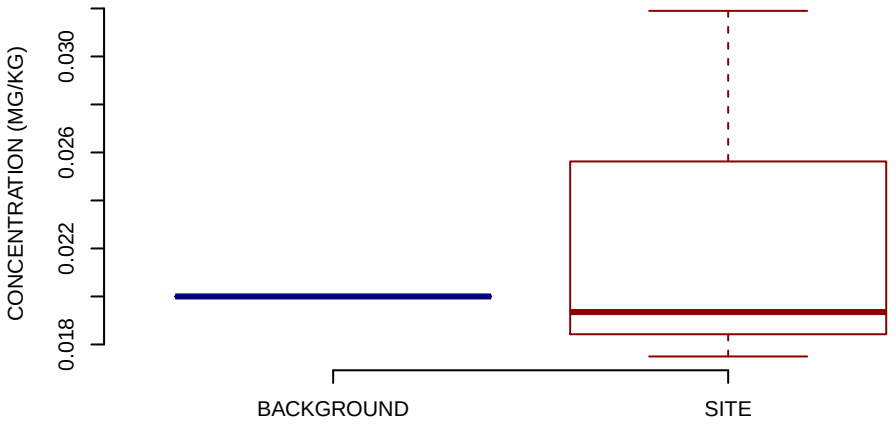
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	330	230
25TH PERCENTILE	330	310
MEDIAN	330	380
MEAN	330	440
75TH PERCENTILE	330	540
MAXIMUM	330	700

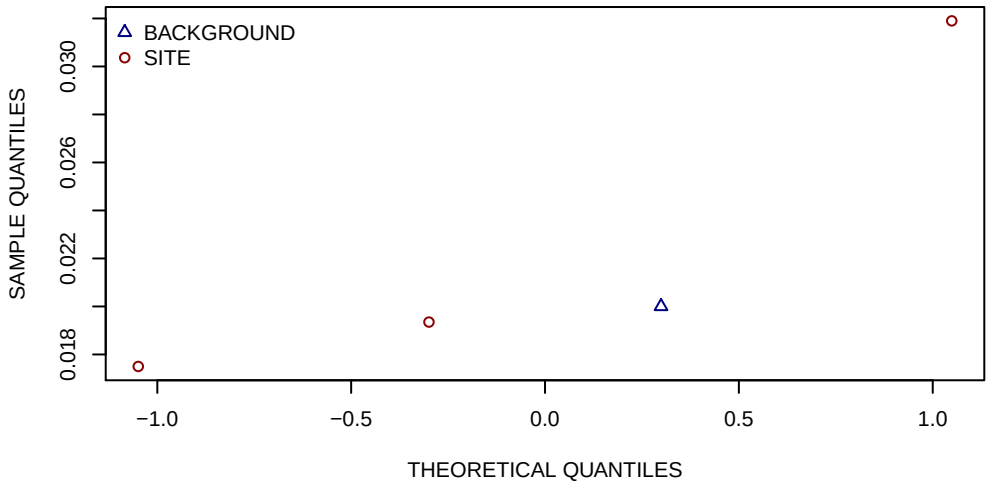
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 15 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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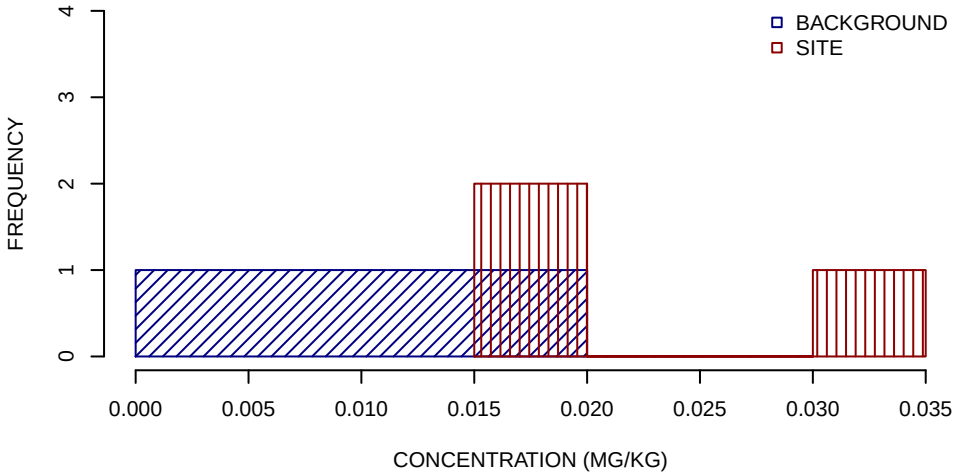


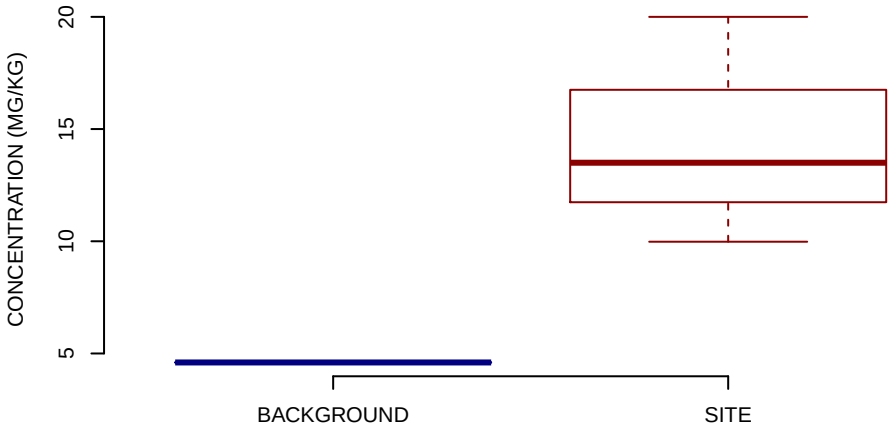
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.02	0.018
25TH PERCENTILE	0.02	0.018
MEDIAN	0.02	0.019
MEAN	0.02	0.023
75TH PERCENTILE	0.02	0.026
MAXIMUM	0.02	0.032

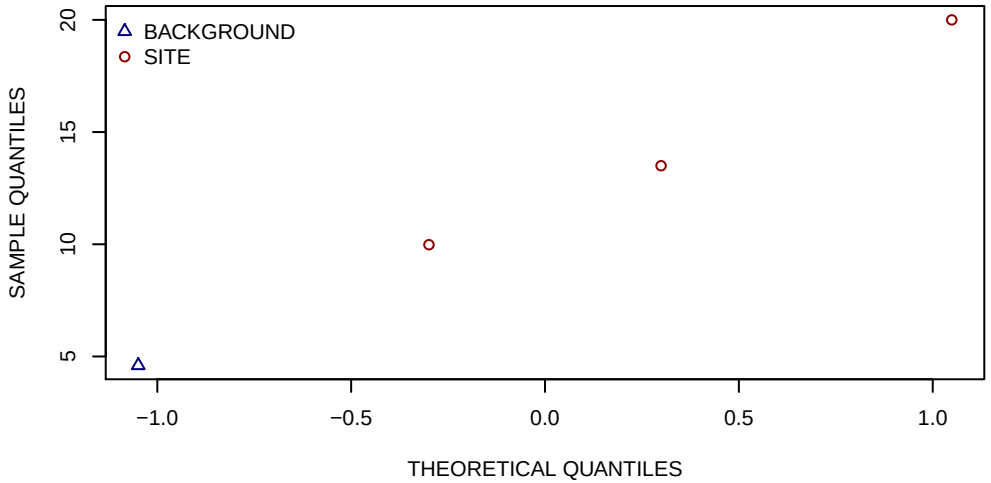
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

NICKEL SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 16 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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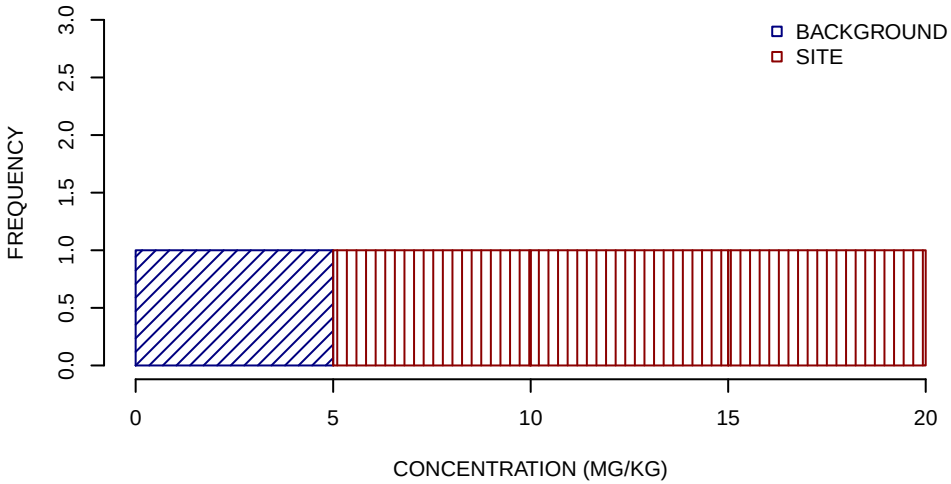


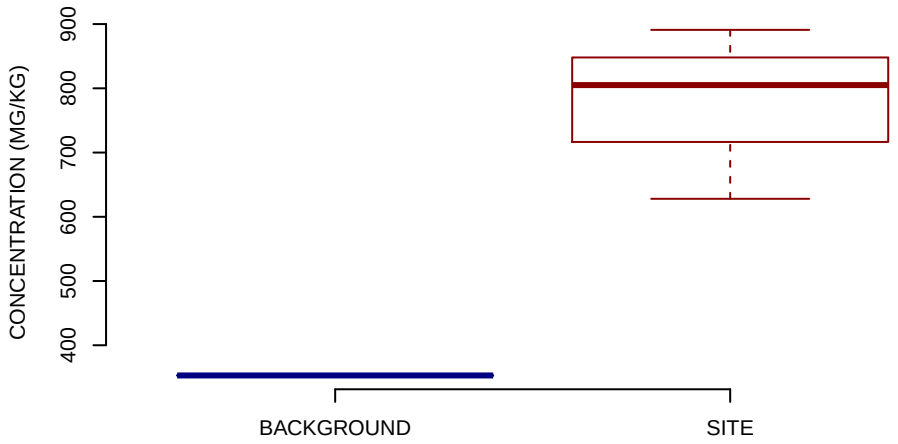
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	4.6	10
25TH PERCENTILE	4.6	12
MEDIAN	4.6	14
MEAN	4.6	14
75TH PERCENTILE	4.6	17
MAXIMUM	4.6	20

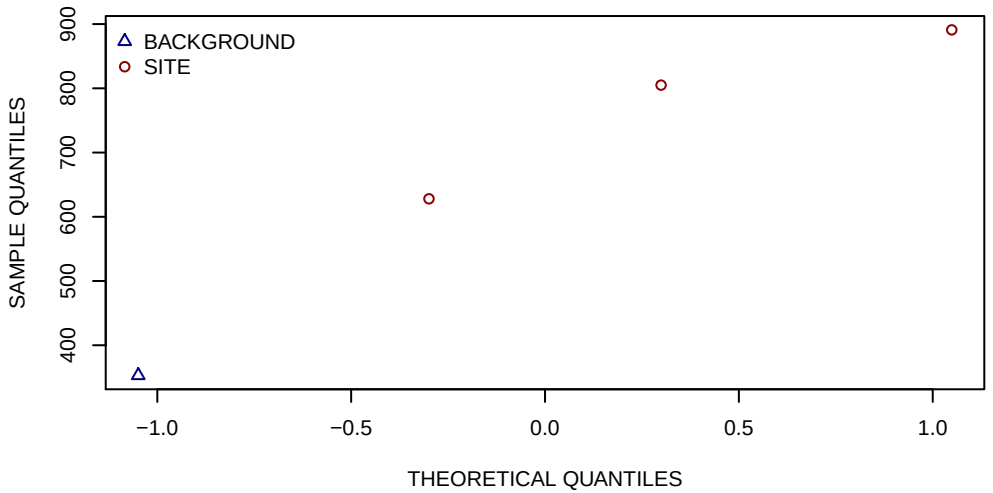
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

POTASSIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 17 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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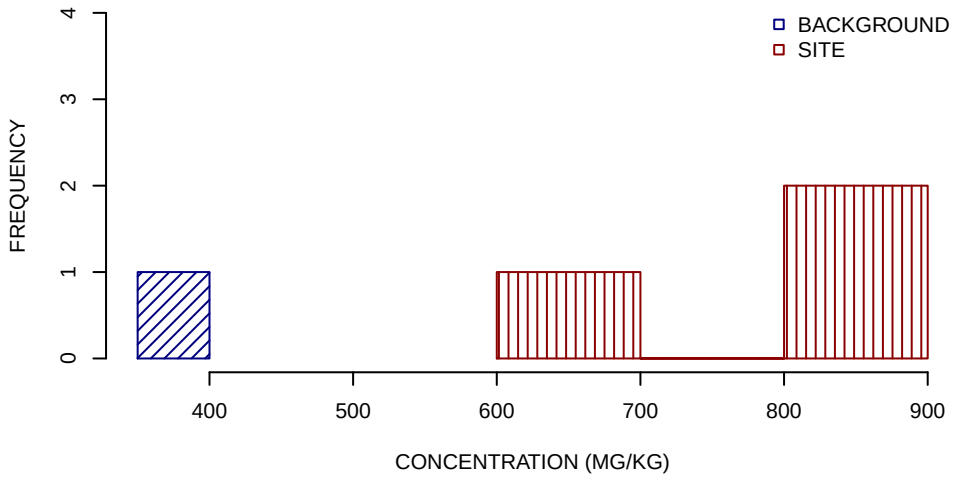


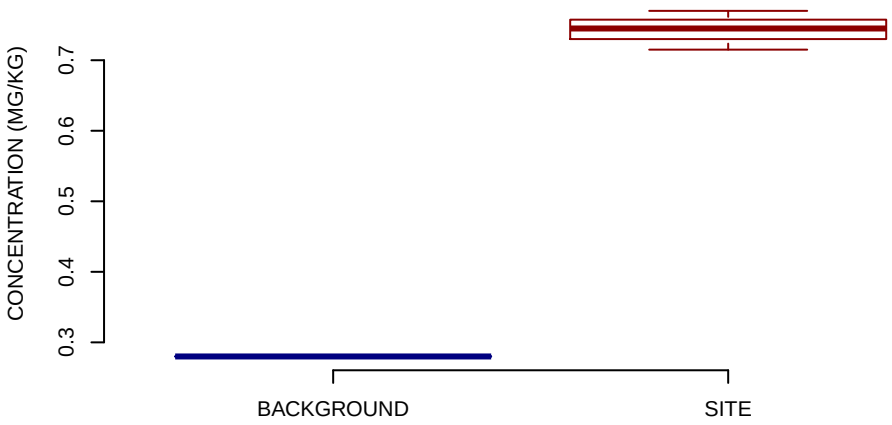
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	350	630
25TH PERCENTILE	350	720
MEDIAN	350	800
MEAN	350	770
75TH PERCENTILE	350	850
MAXIMUM	350	890

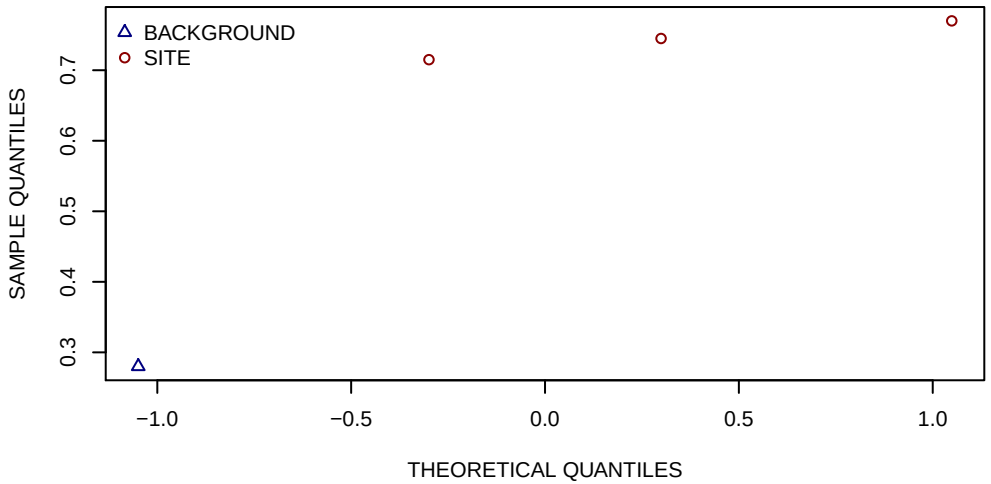
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SELENIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 18 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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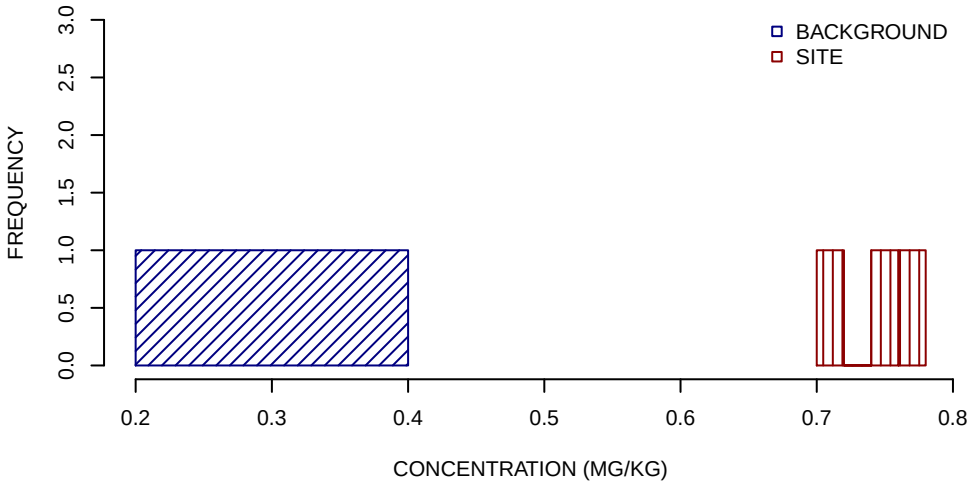


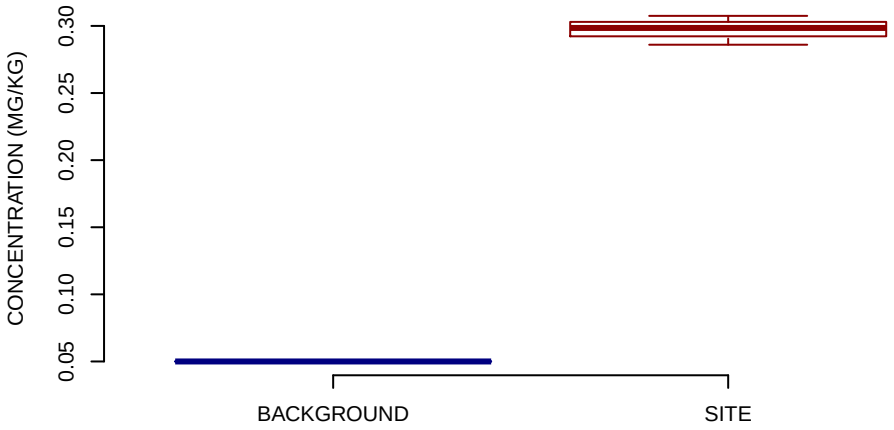
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.28	0.72
25TH PERCENTILE	0.28	0.73
MEDIAN	0.28	0.74
MEAN	0.28	0.74
75TH PERCENTILE	0.28	0.76
MAXIMUM	0.28	0.77

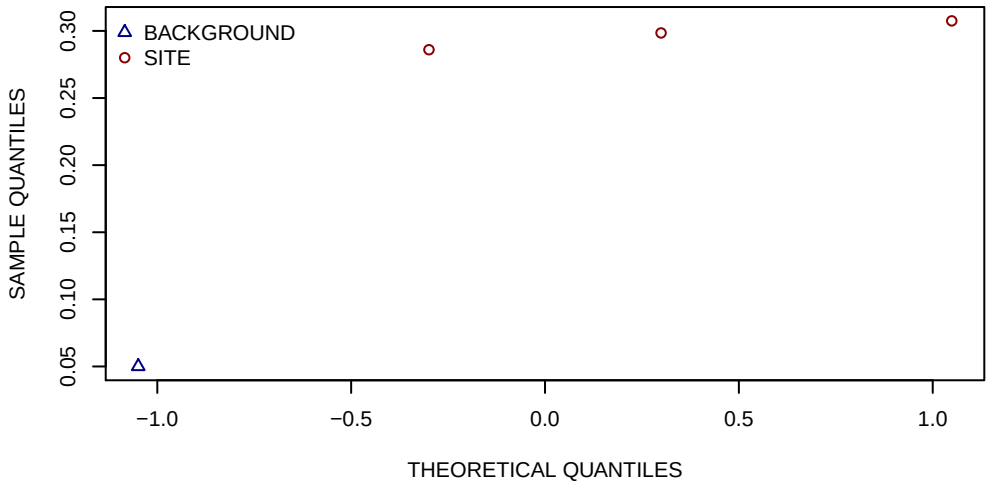
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SILVER SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 19 OF 23

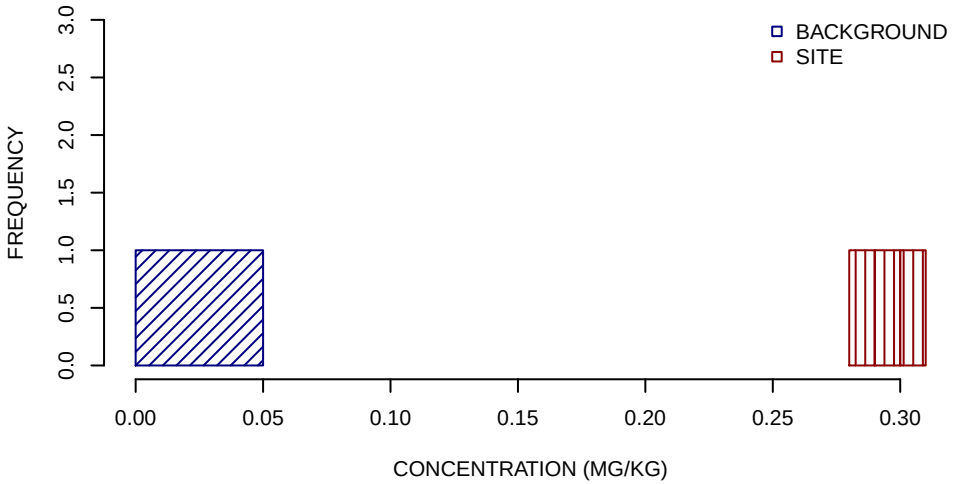
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



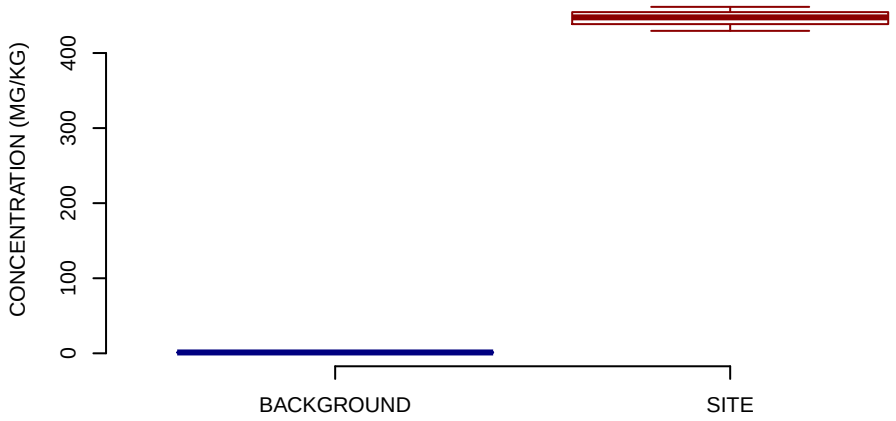
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.05	0.29
25TH PERCENTILE	0.05	0.29
MEDIAN	0.05	0.3
MEAN	0.05	0.3
75TH PERCENTILE	0.05	0.3
MAXIMUM	0.05	0.31

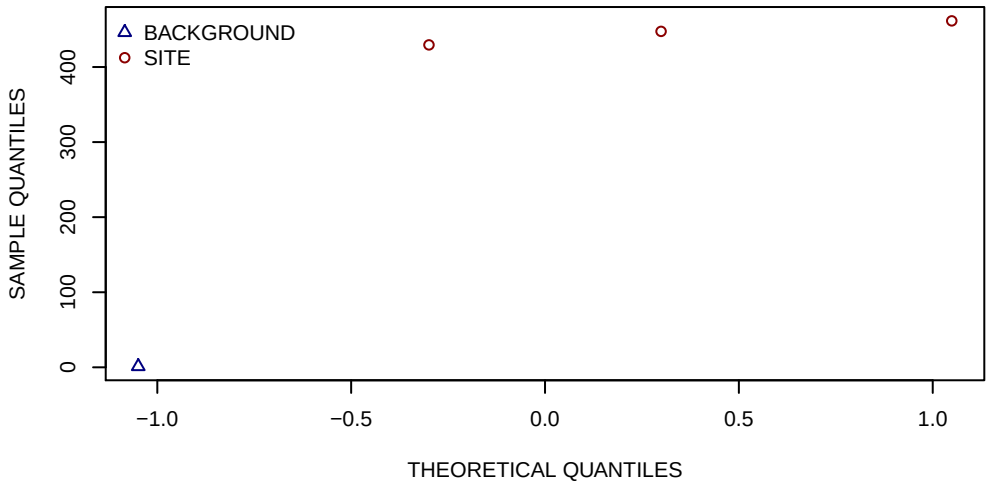
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SODIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 20 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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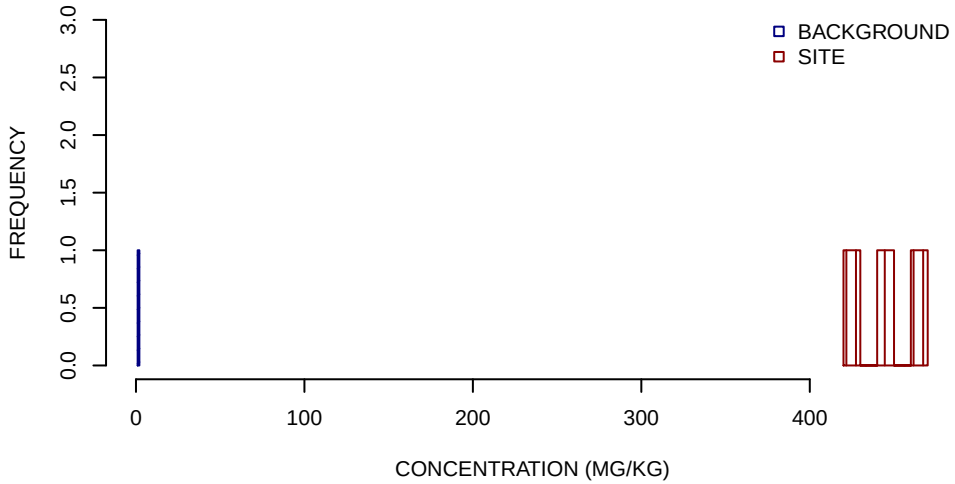


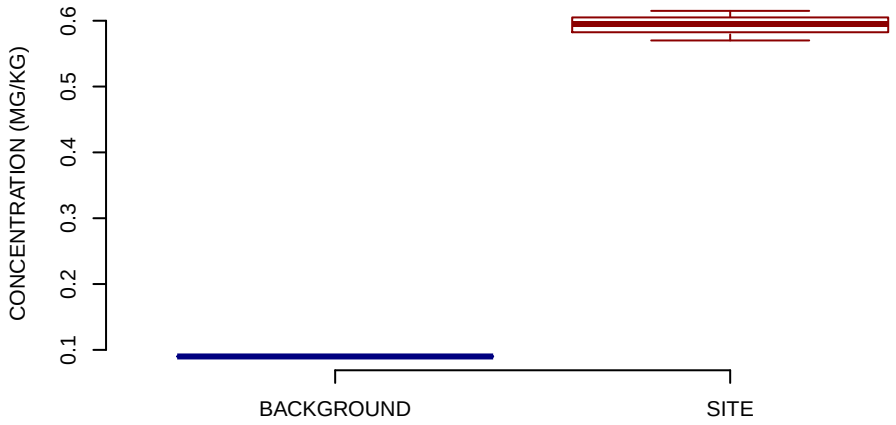
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	1.2	430
25TH PERCENTILE	1.2	440
MEDIAN	1.2	450
MEAN	1.2	450
75TH PERCENTILE	1.2	450
MAXIMUM	1.2	460

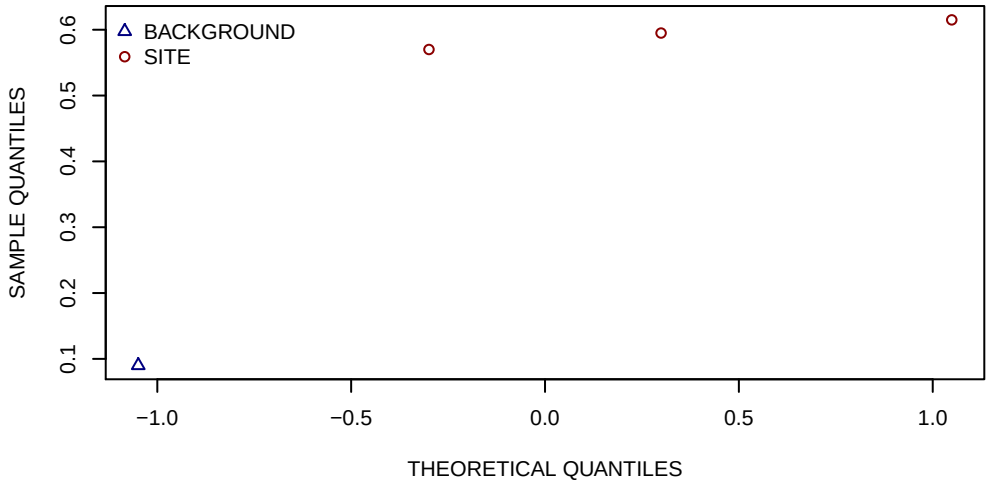
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

THALLIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 21 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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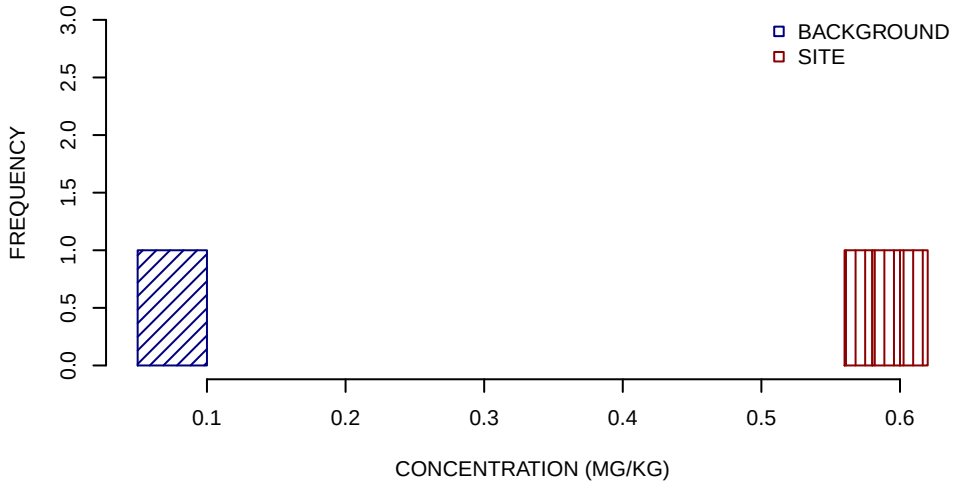


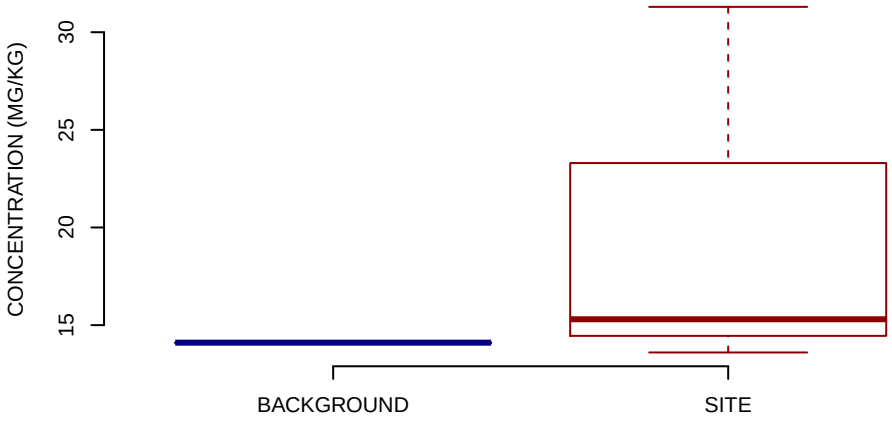
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.09	0.57
25TH PERCENTILE	0.09	0.58
MEDIAN	0.09	0.6
MEAN	0.09	0.59
75TH PERCENTILE	0.09	0.6
MAXIMUM	0.09	0.62

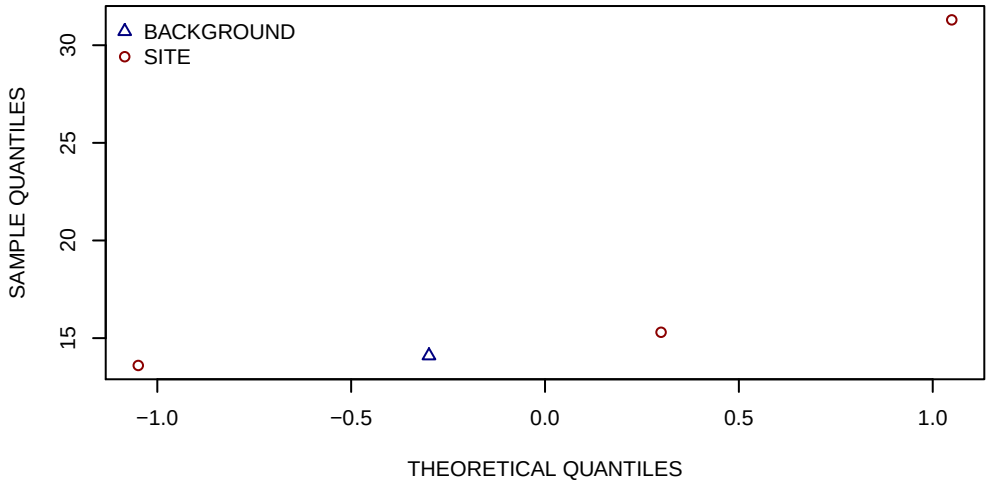
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

VANADIUM SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 22 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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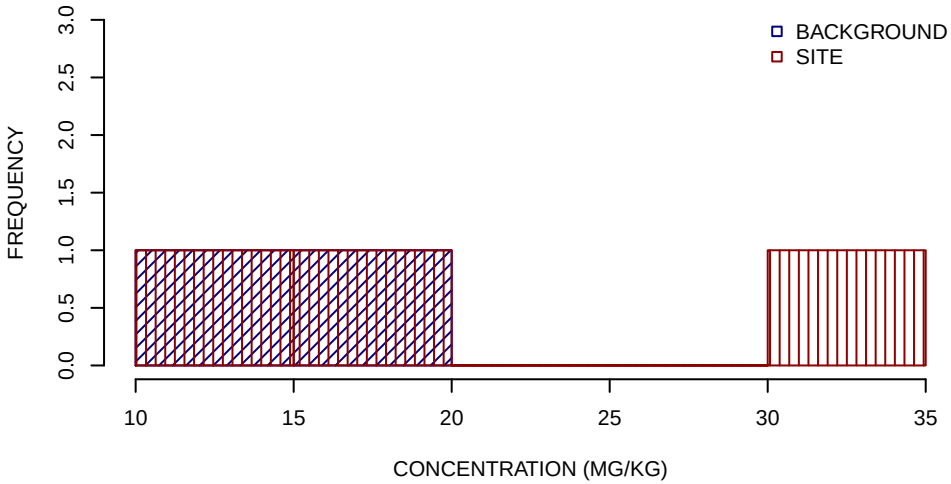


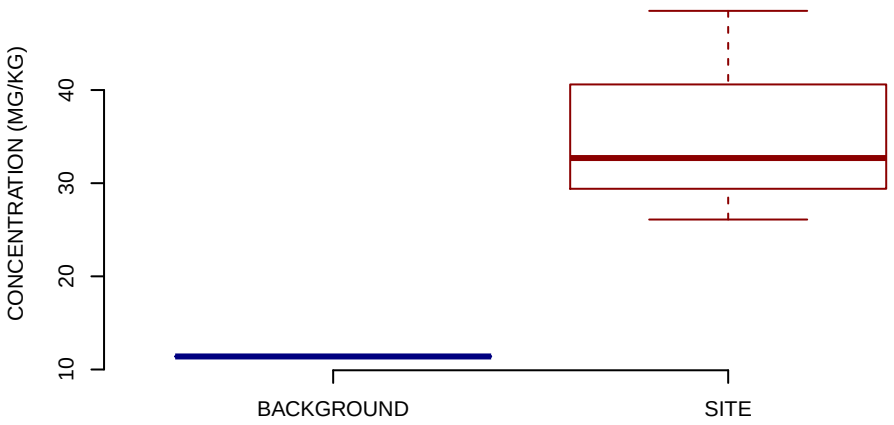
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	14	14
25TH PERCENTILE	14	14
MEDIAN	14	15
MEAN	14	20
75TH PERCENTILE	14	23
MAXIMUM	14	31

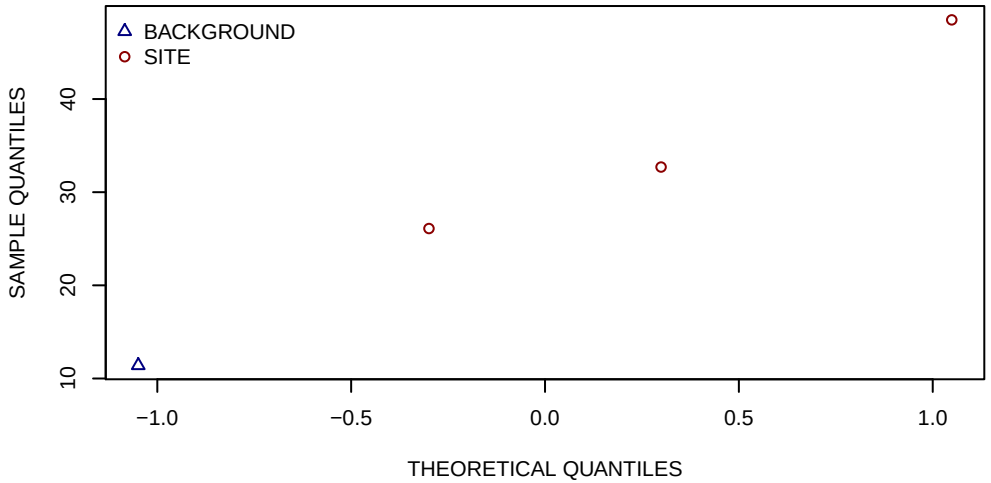
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ZINC SUBSURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 23 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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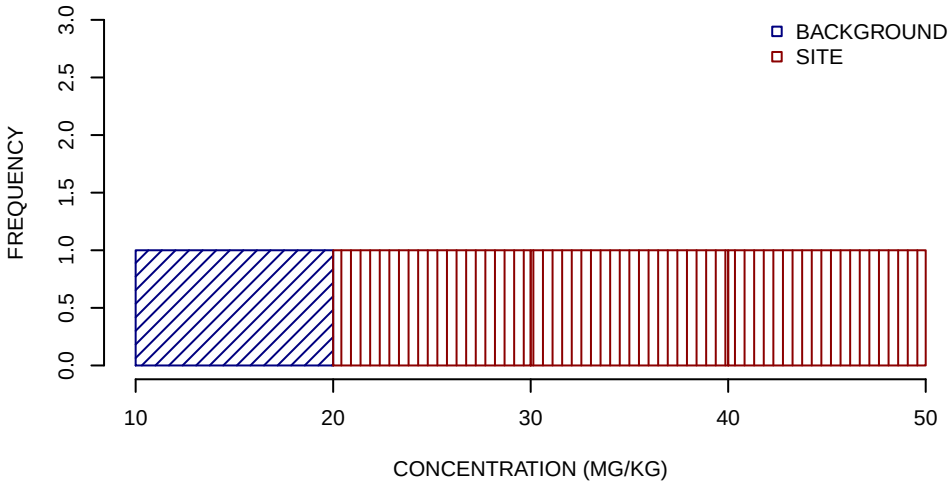


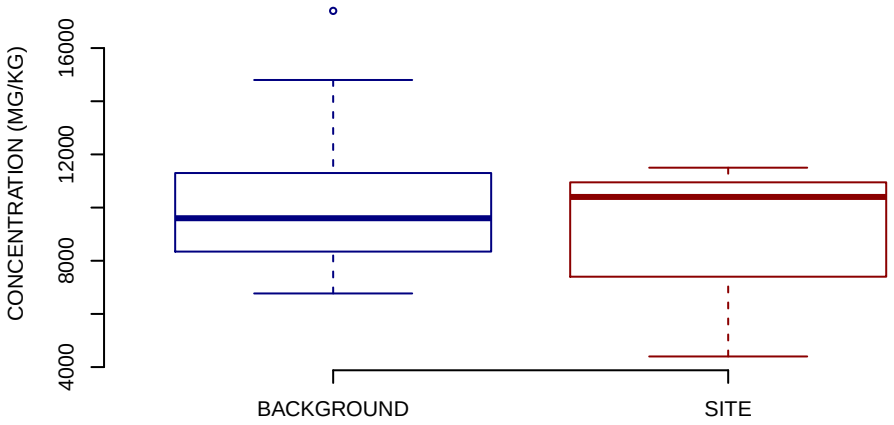
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	11	26
25TH PERCENTILE	11	29
MEDIAN	11	33
MEAN	11	36
75TH PERCENTILE	11	41
MAXIMUM	11	48

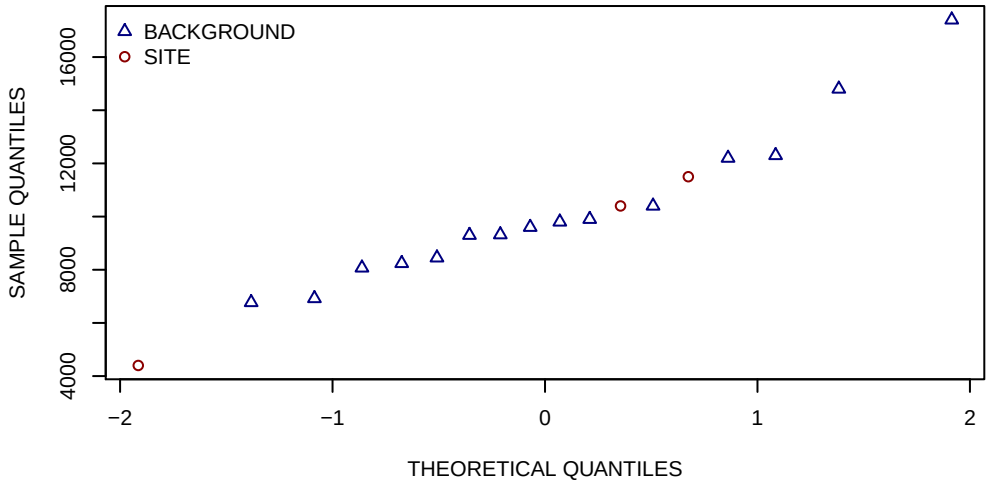
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ALUMINUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 1 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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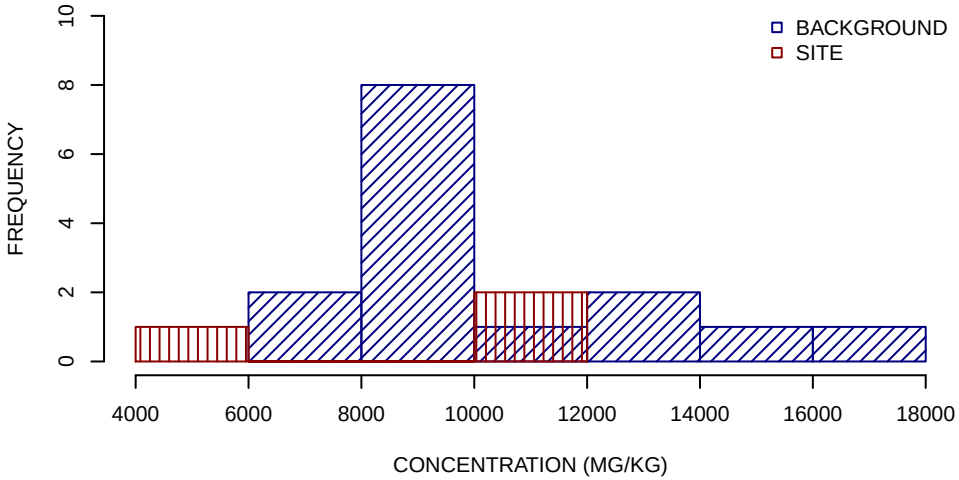


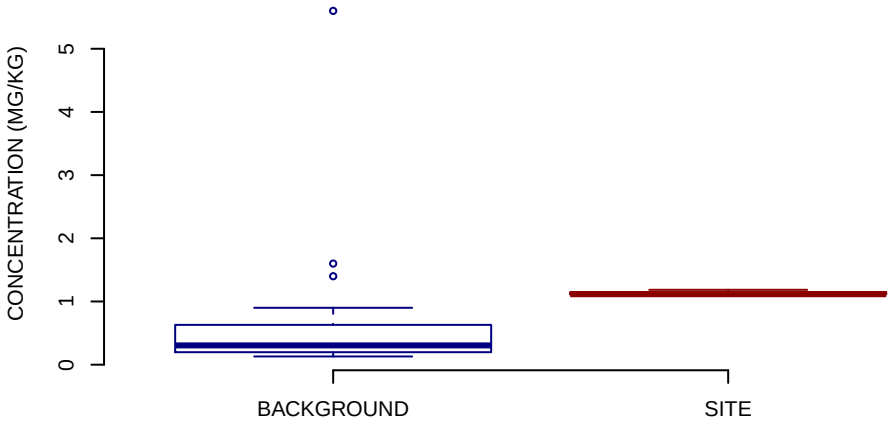
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	6800	4400
25TH PERCENTILE	8300	7400
MEDIAN	9600	10000
MEAN	10000	8800
75TH PERCENTILE	11000	11000
MAXIMUM	17000	12000

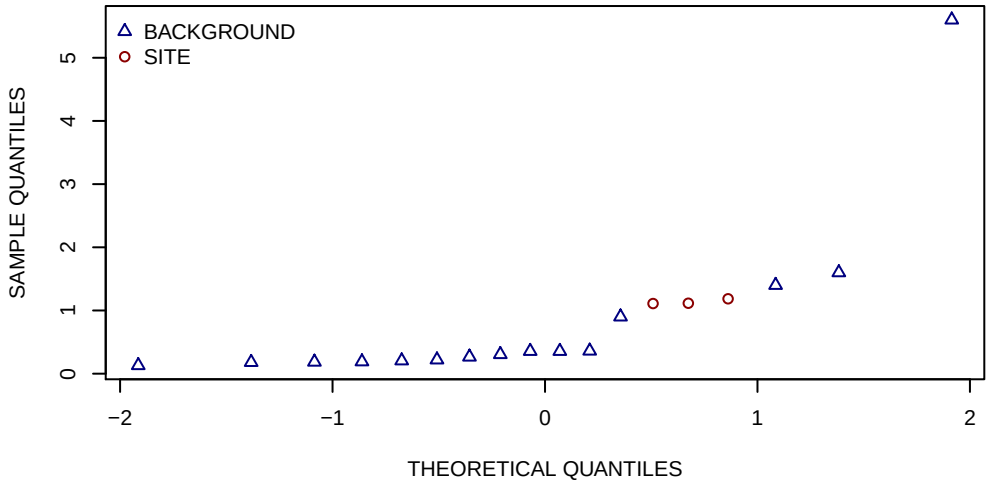
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ANTIMONY SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 2 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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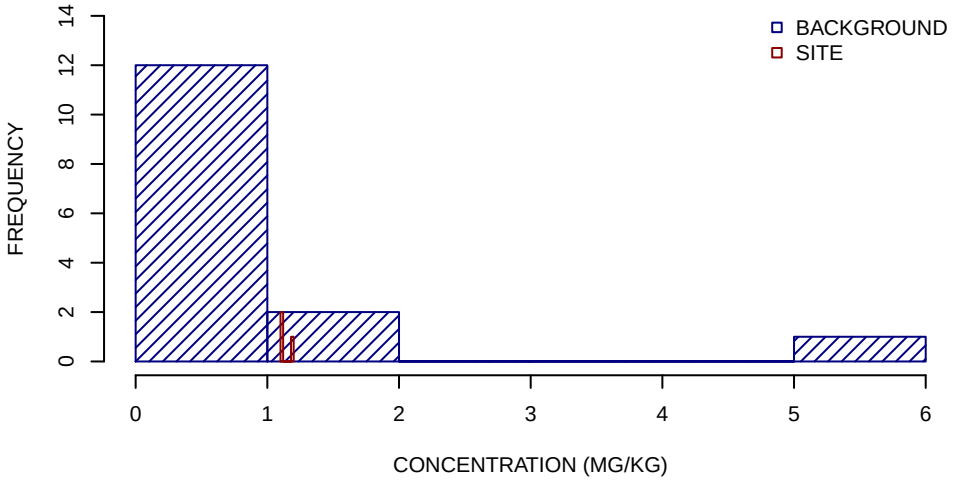


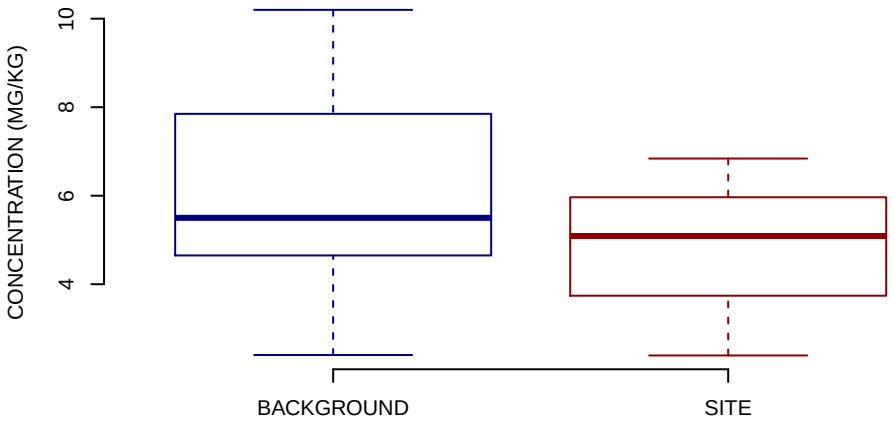
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.13	1.1
25TH PERCENTILE	0.2	1.1
MEDIAN	0.3	1.1
MEAN	0.82	1.1
75TH PERCENTILE	0.63	1.2
MAXIMUM	5.6	1.2

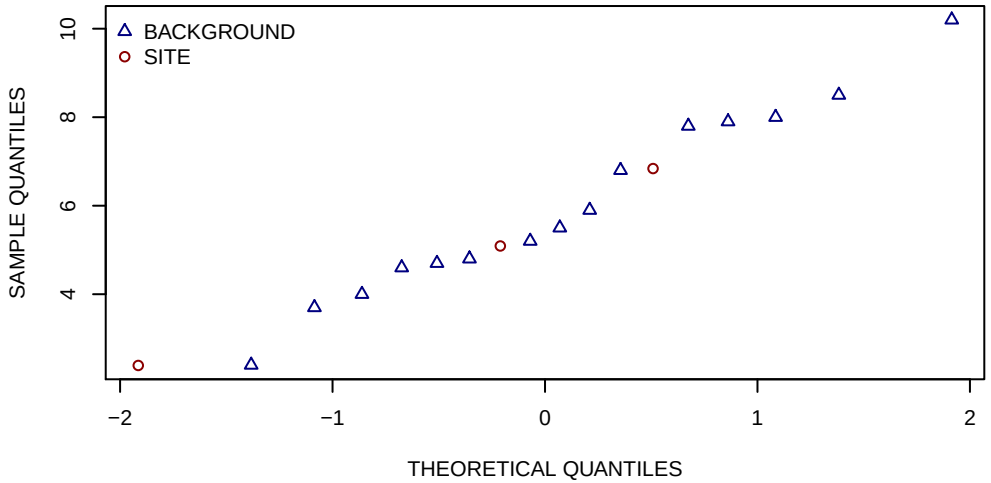
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ARSENIC SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 3 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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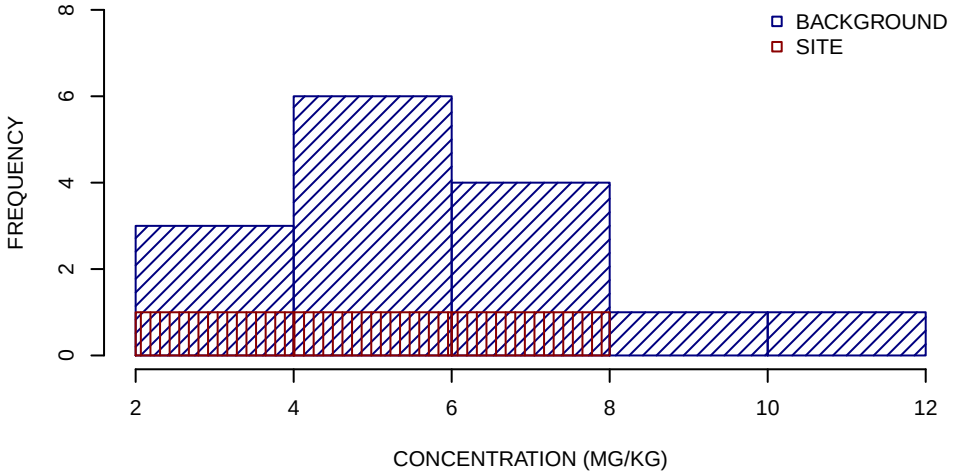


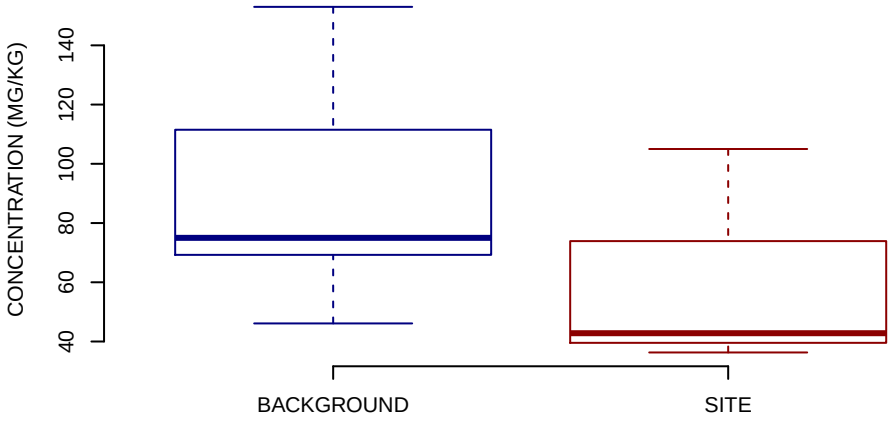
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	2.4	2.4
25TH PERCENTILE	4.6	3.7
MEDIAN	5.5	5.1
MEAN	6	4.8
75TH PERCENTILE	7.8	6
MAXIMUM	10	6.8

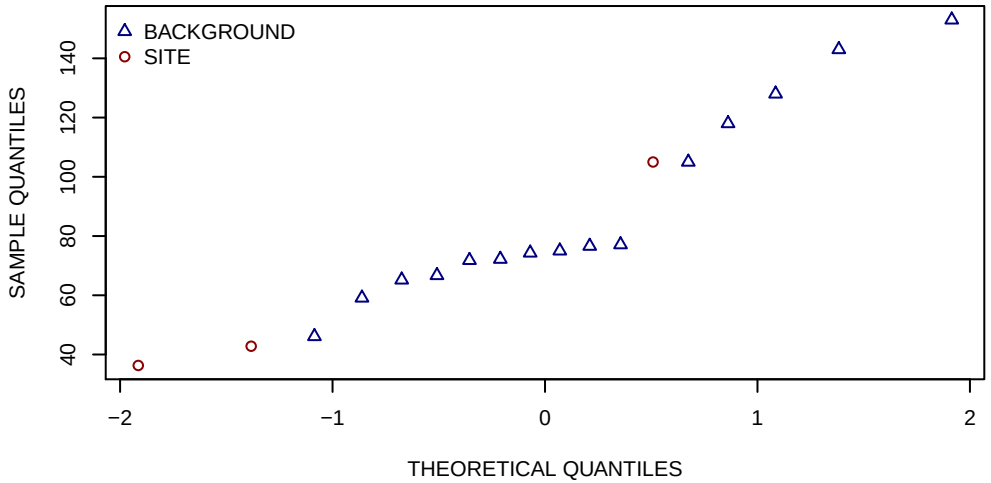
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BARIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 4 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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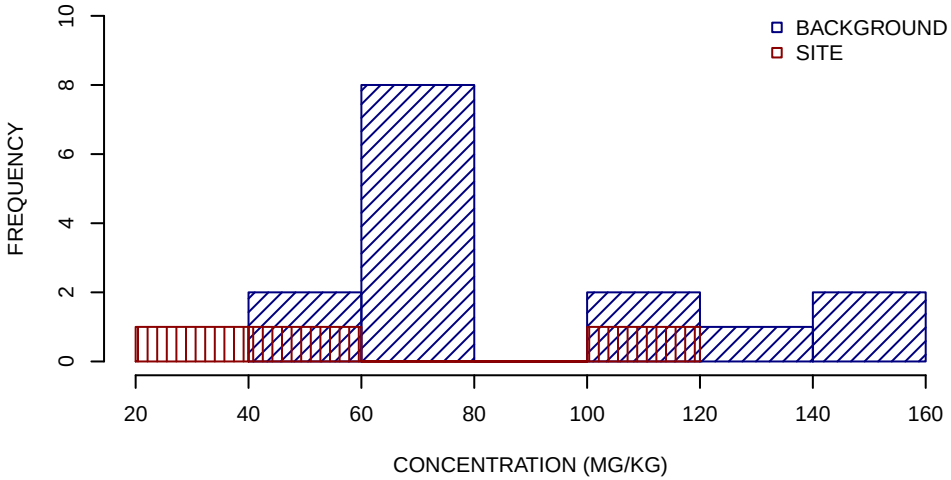


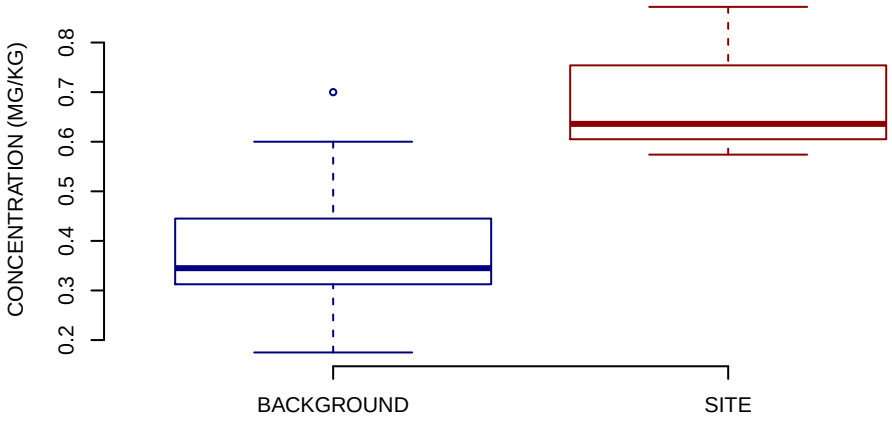
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	46	36
25TH PERCENTILE	69	40
MEDIAN	75	43
MEAN	89	61
75TH PERCENTILE	110	74
MAXIMUM	150	100

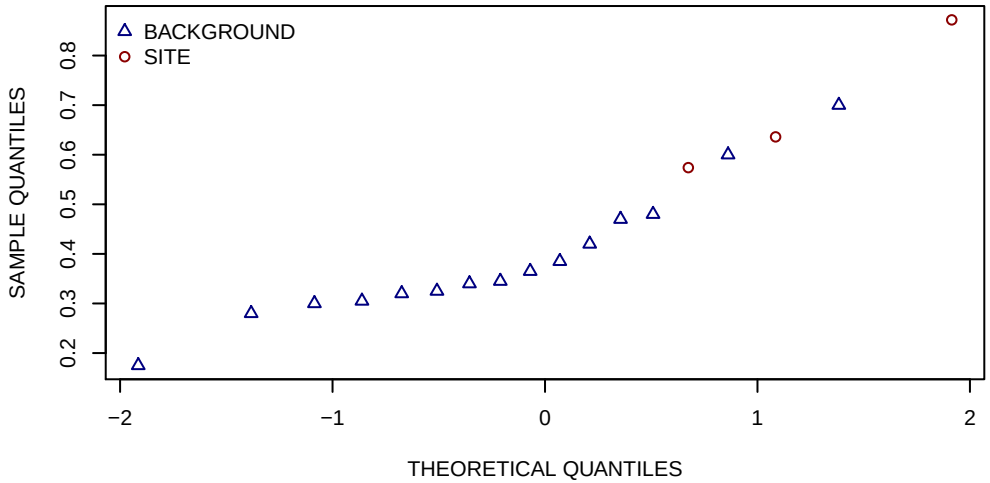
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BERYLLIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 5 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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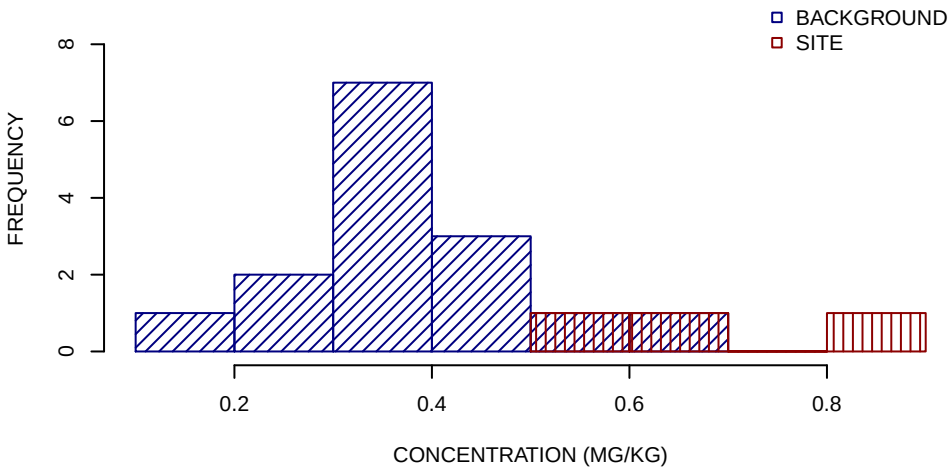


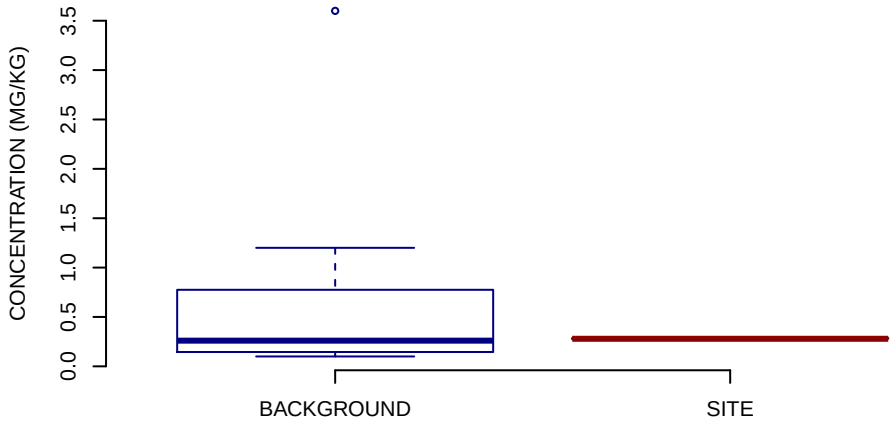
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.18	0.57
25TH PERCENTILE	0.31	0.6
MEDIAN	0.34	0.64
MEAN	0.39	0.69
75TH PERCENTILE	0.44	0.75
MAXIMUM	0.7	0.87

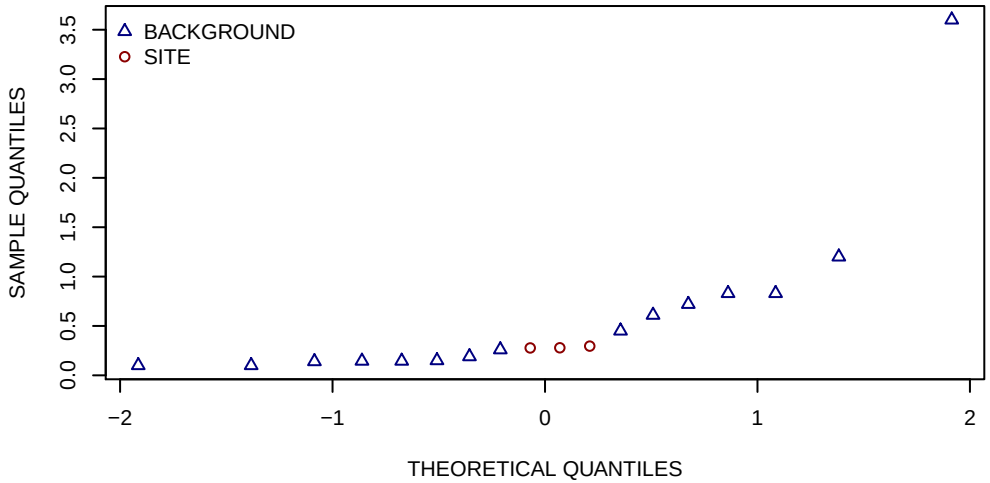
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CADMIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 6 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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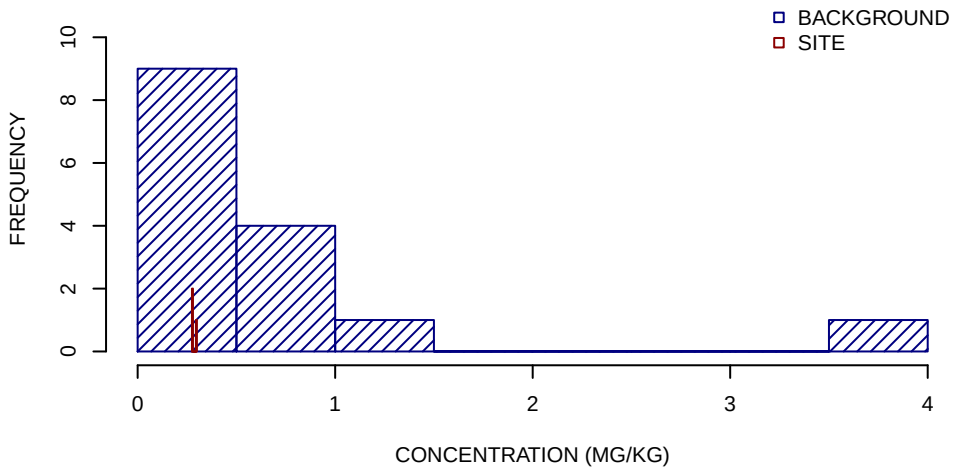


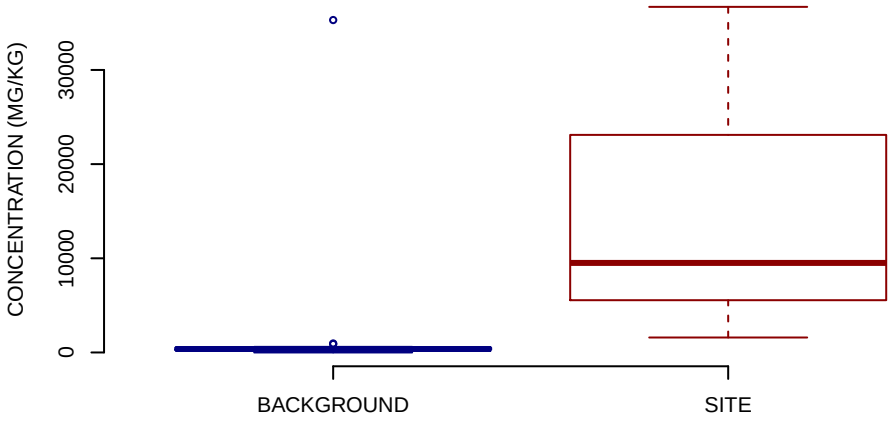
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.1	0.28
25TH PERCENTILE	0.14	0.28
MEDIAN	0.26	0.28
MEAN	0.63	0.28
75TH PERCENTILE	0.78	0.29
MAXIMUM	3.6	0.3

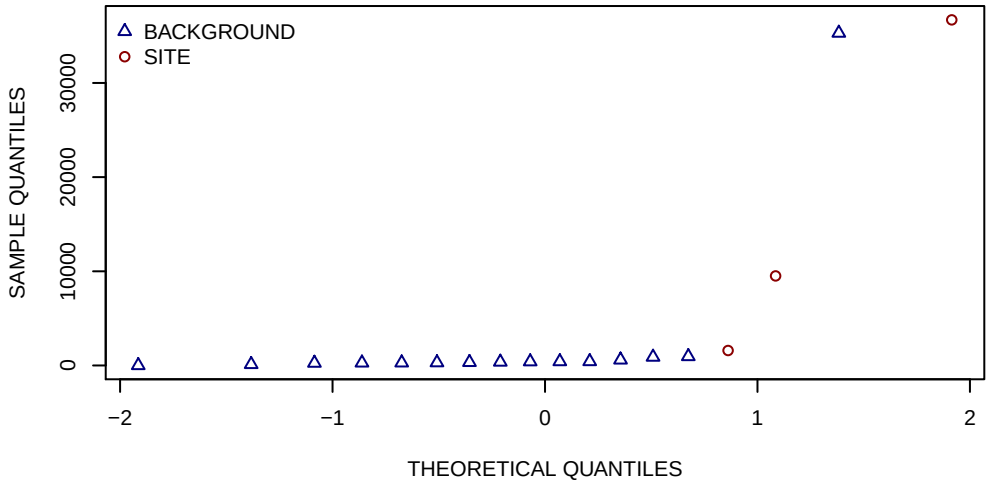
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CALCIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 7 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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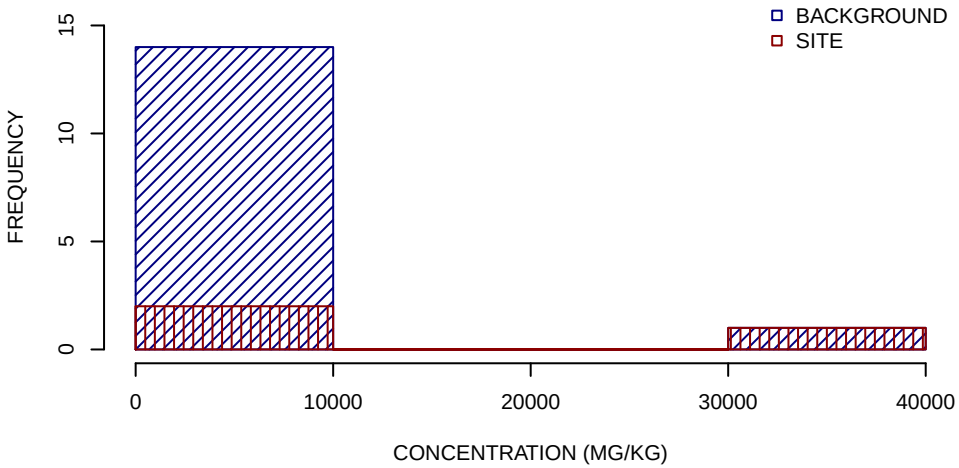


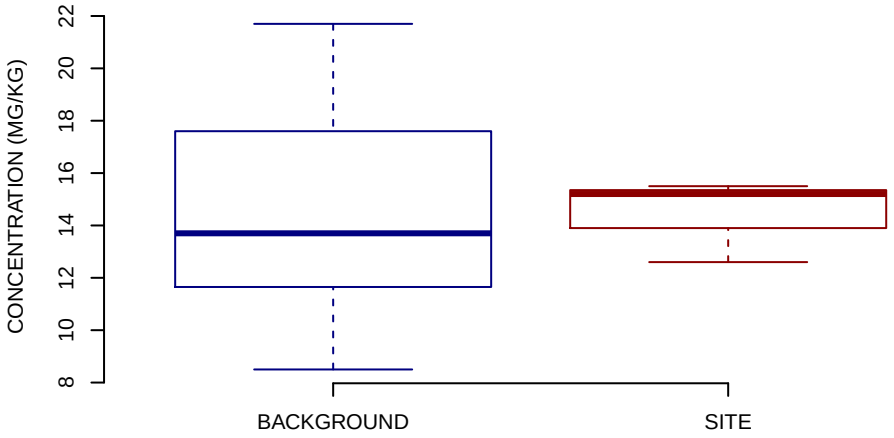
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	2.5	1600
25TH PERCENTILE	280	5600
MEDIAN	370	9500
MEAN	2700	16000
75TH PERCENTILE	510	23000
MAXIMUM	35000	37000

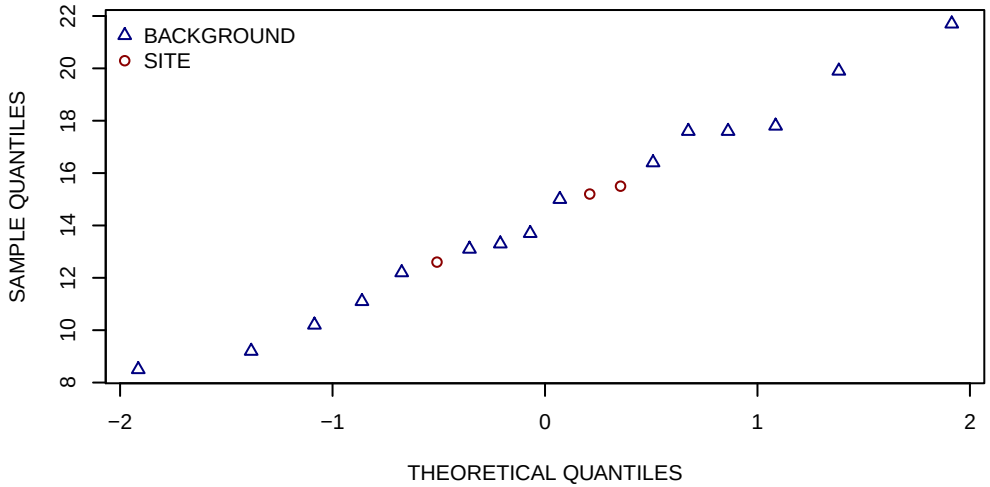
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHROMIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 8 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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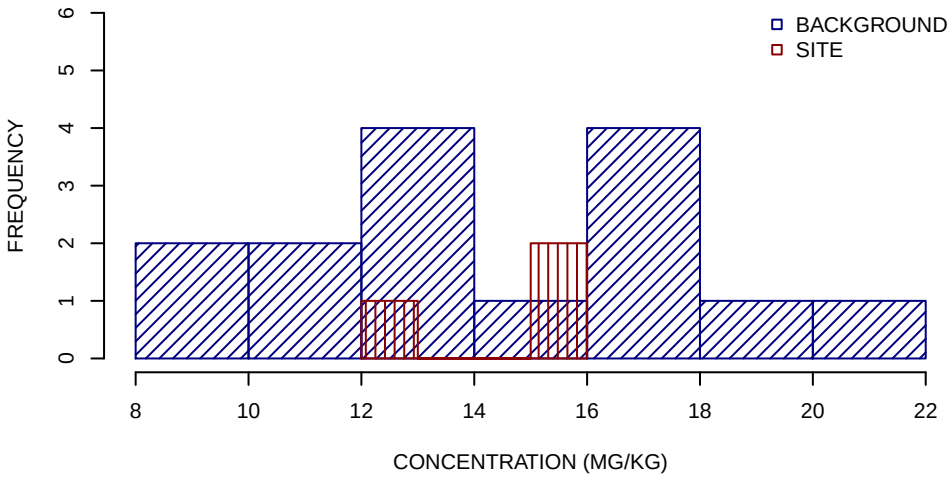


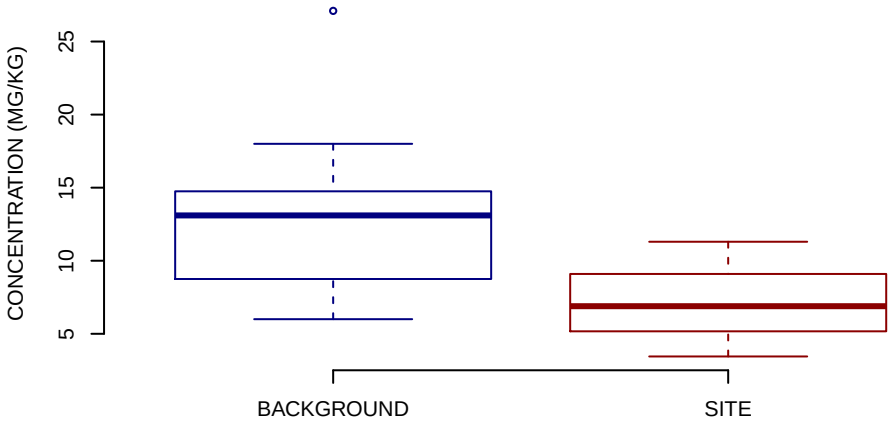
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	8.5	13
25TH PERCENTILE	12	14
MEDIAN	14	15
MEAN	14	14
75TH PERCENTILE	18	15
MAXIMUM	22	16

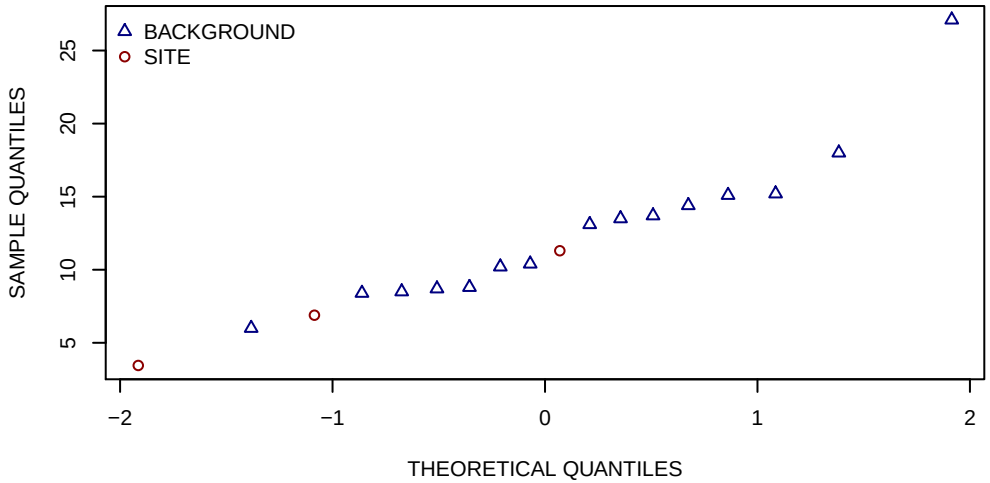
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

COBALT SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 9 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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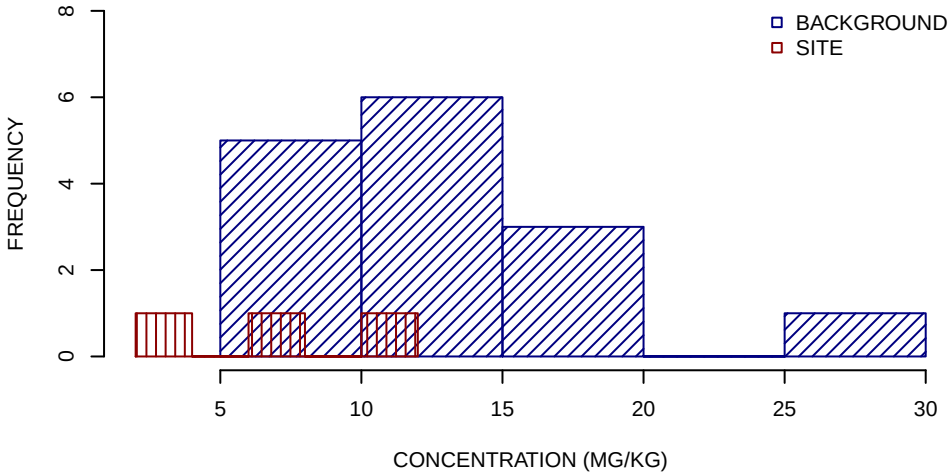


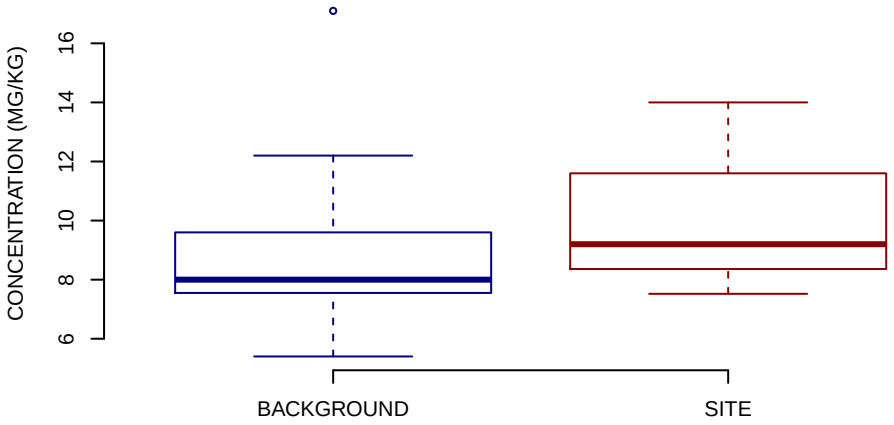
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	6	3.4
25TH PERCENTILE	8.8	5.2
MEDIAN	13	6.9
MEAN	13	7.2
75TH PERCENTILE	15	9.1
MAXIMUM	27	11

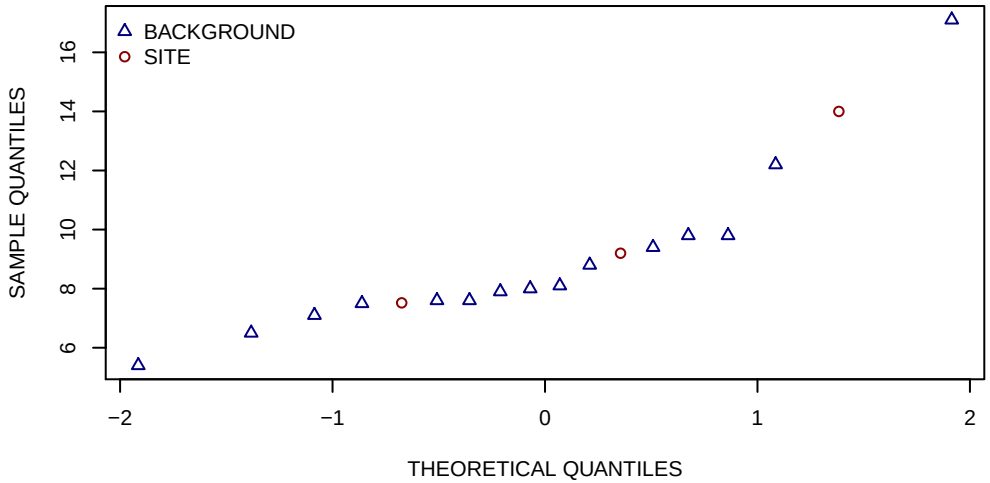
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

COPPER SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 10 OF 23

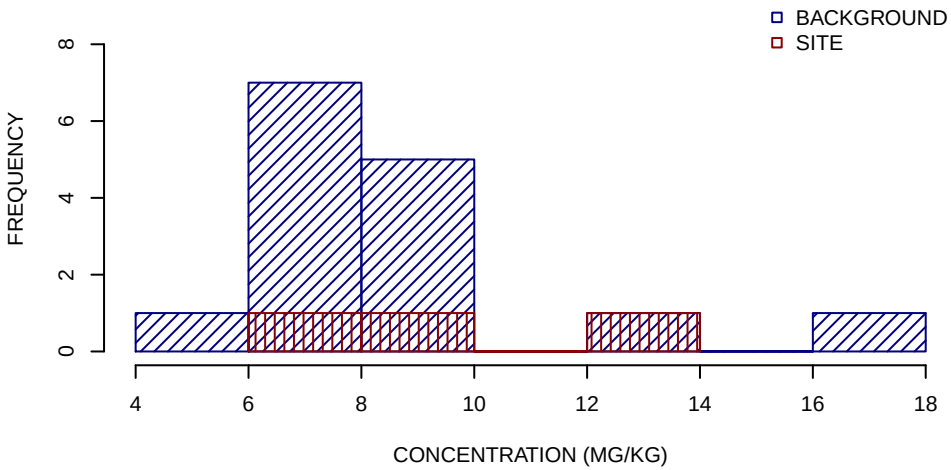
BOXPLOTS



NORMAL Q−Q PLOT



HISTOGRAMS



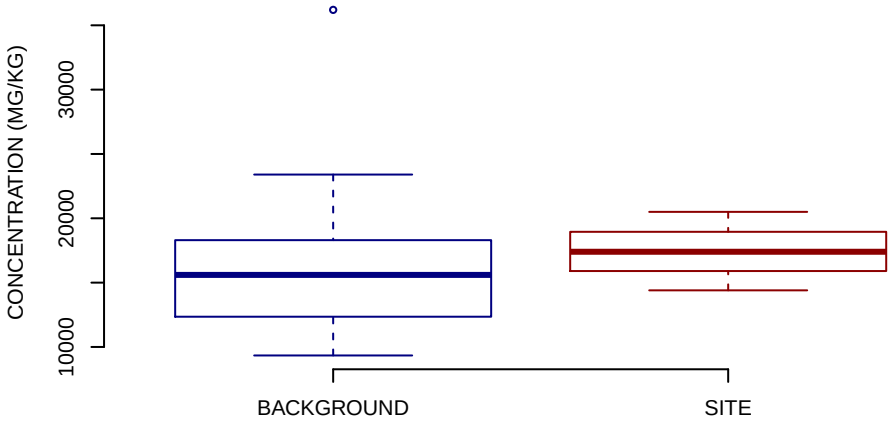
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	5.4	7.5
25TH PERCENTILE	7.6	8.4
MEDIAN	8	9.2
MEAN	8.9	10
75TH PERCENTILE	9.6	12
MAXIMUM	17	14

UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

IRON SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 11 OF 23

BOXPLOTS



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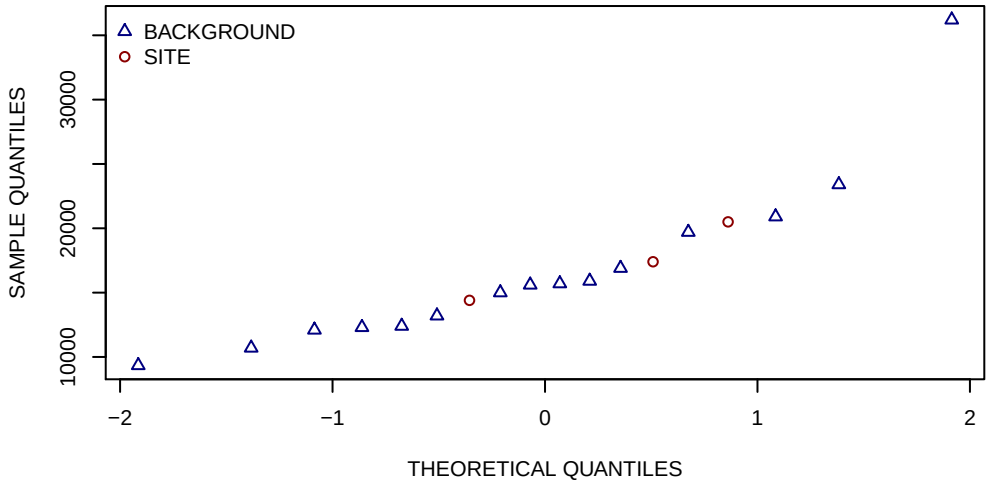

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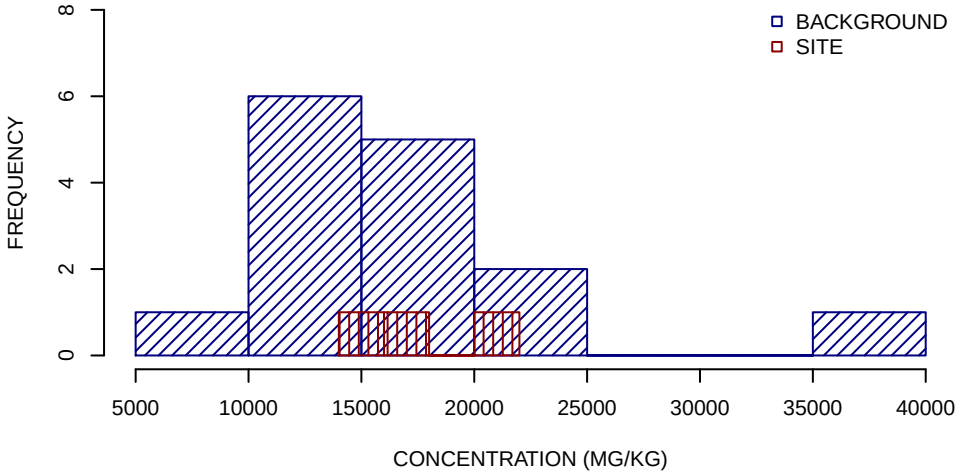


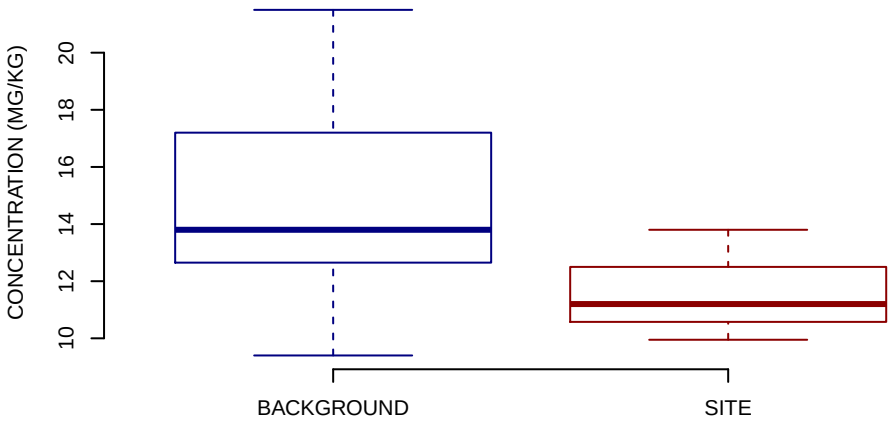
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	9300	14000
25TH PERCENTILE	12000	16000
MEDIAN	16000	17000
MEAN	17000	17000
75TH PERCENTILE	18000	19000
MAXIMUM	36000	20000

UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 12 OF 23

BOXPLOTS



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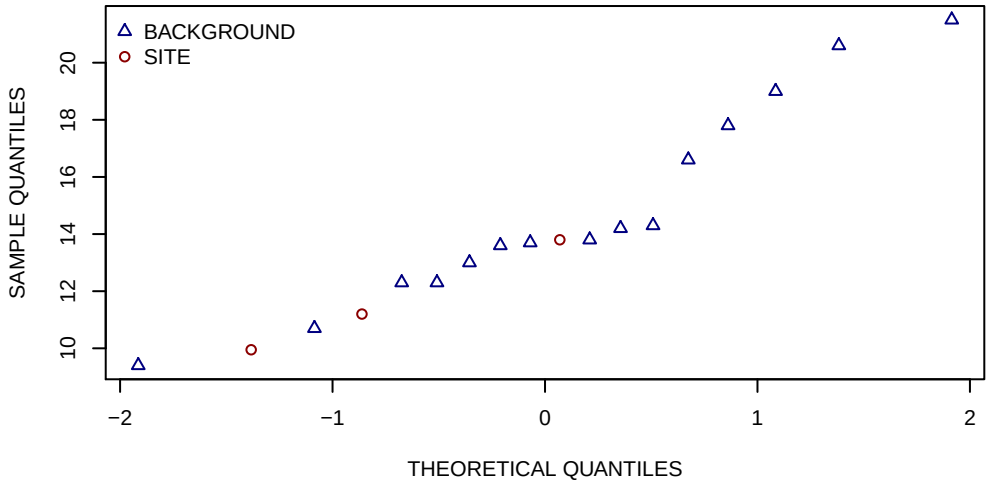

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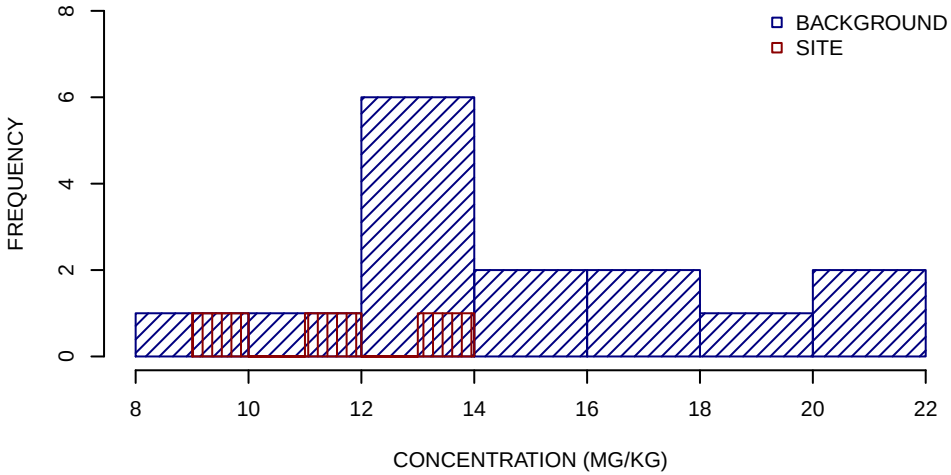


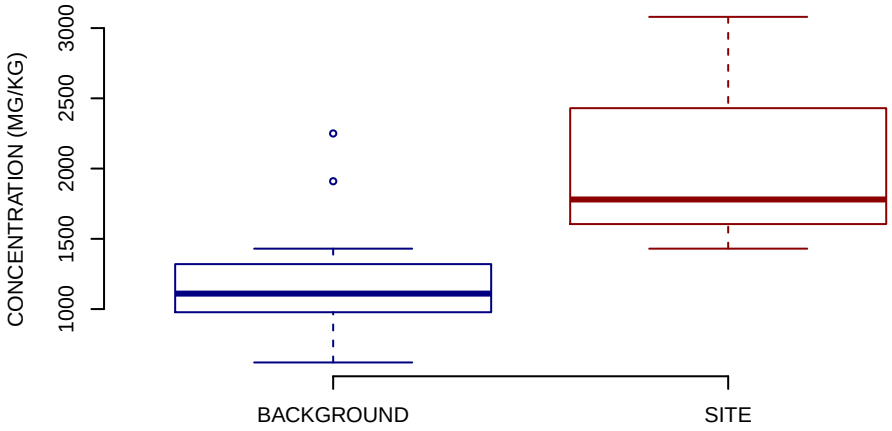
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	9.4	10
25TH PERCENTILE	13	11
MEDIAN	14	11
MEAN	15	12
75TH PERCENTILE	17	12
MAXIMUM	22	14

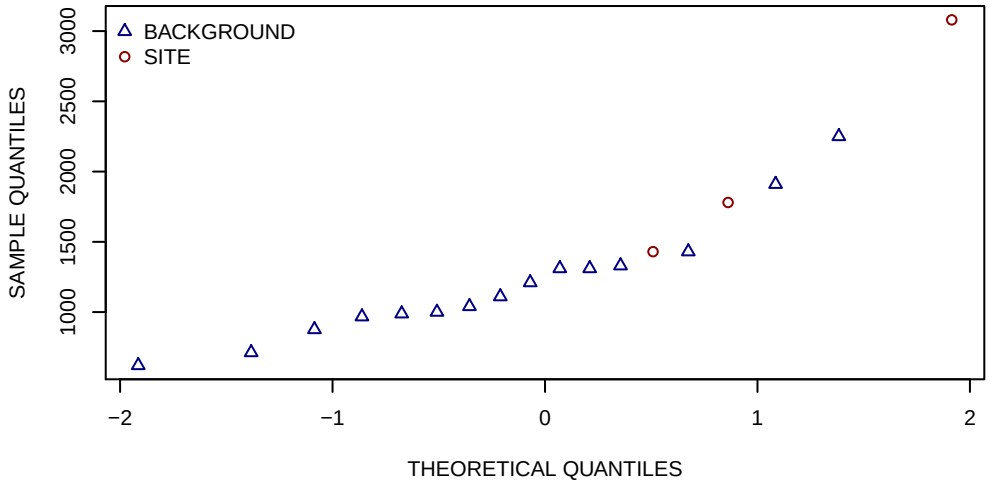
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MAGNESIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 13 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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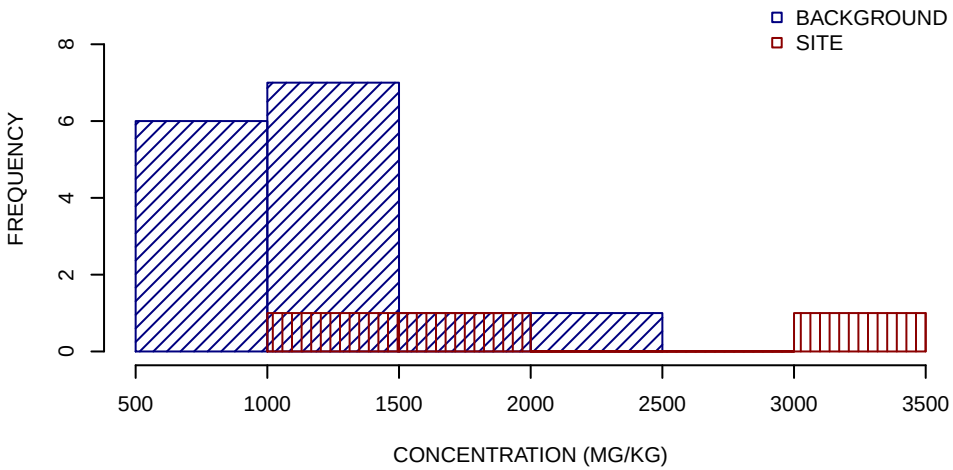


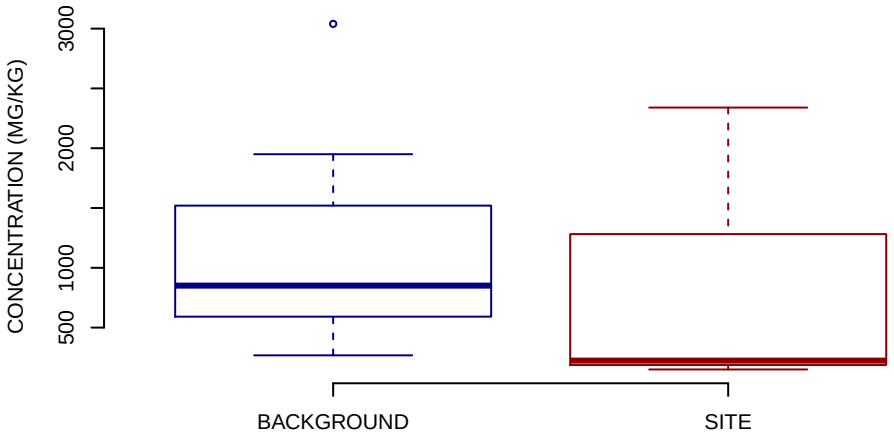
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	620	1400
25TH PERCENTILE	980	1600
MEDIAN	1100	1800
MEAN	1200	2100
75TH PERCENTILE	1300	2400
MAXIMUM	2200	3100

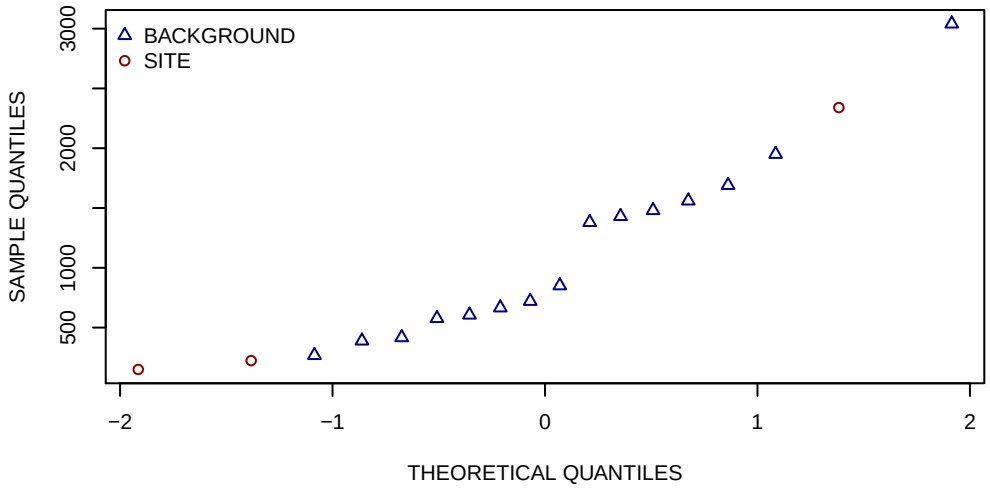
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MANGANESE SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 14 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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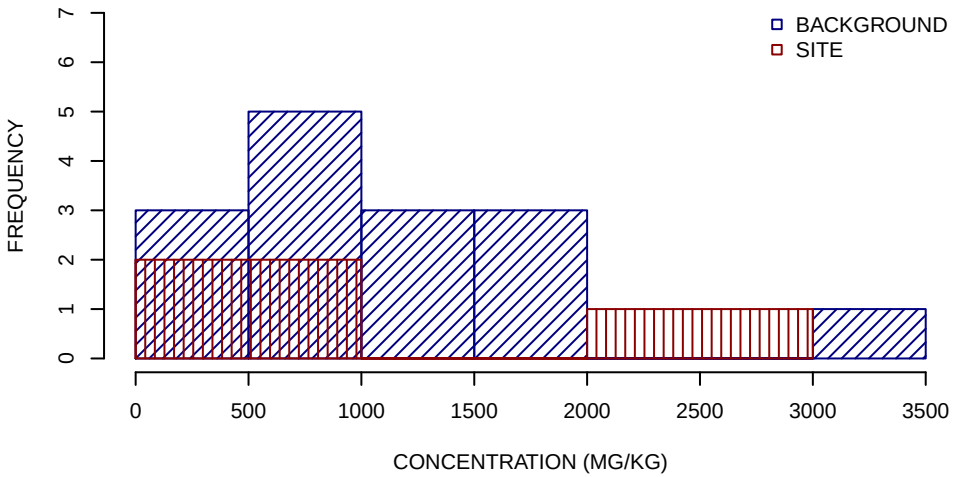


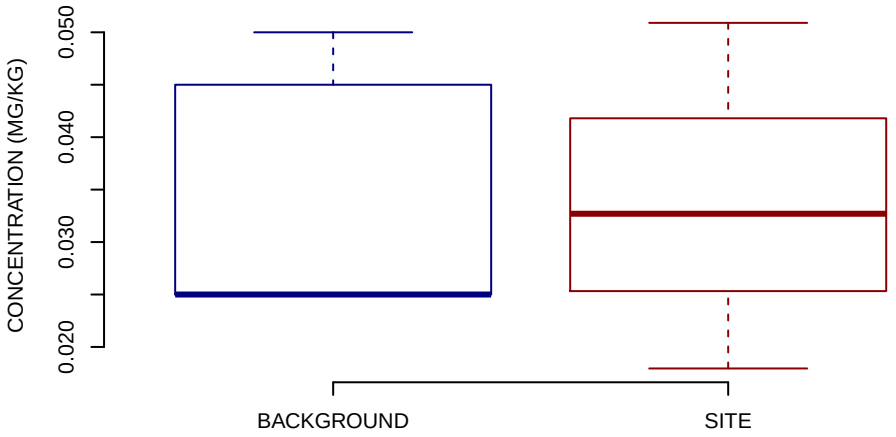
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	270	150
25TH PERCENTILE	590	190
MEDIAN	850	220
MEAN	1100	900
75TH PERCENTILE	1500	1300
MAXIMUM	3000	2300

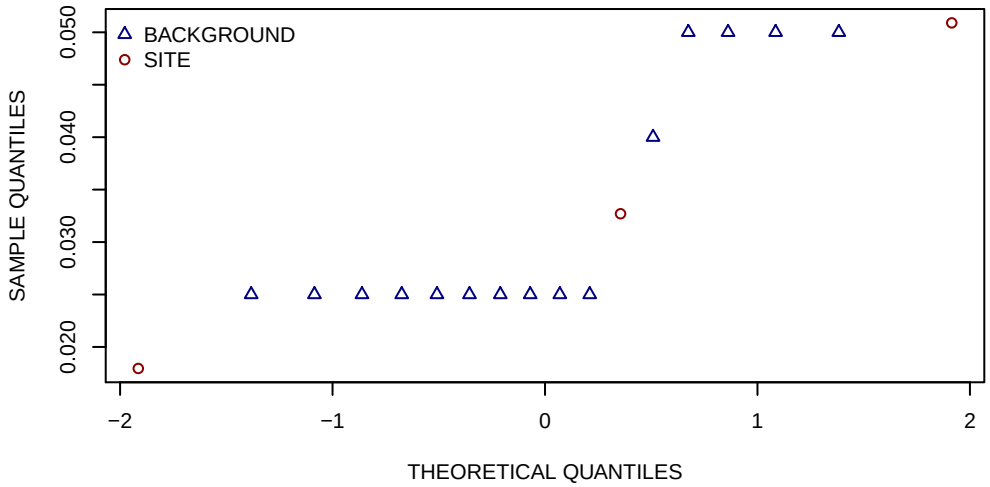
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 15 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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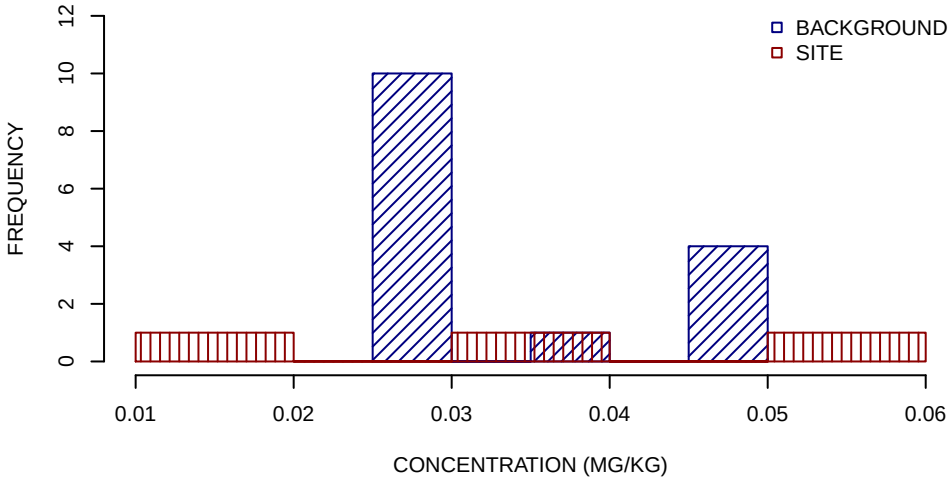


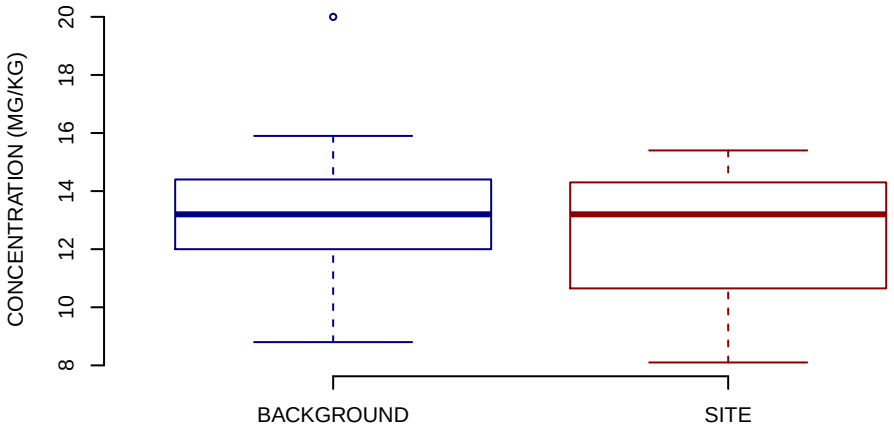
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.025	0.018
25TH PERCENTILE	0.025	0.025
MEDIAN	0.025	0.033
MEAN	0.033	0.034
75TH PERCENTILE	0.045	0.042
MAXIMUM	0.05	0.051

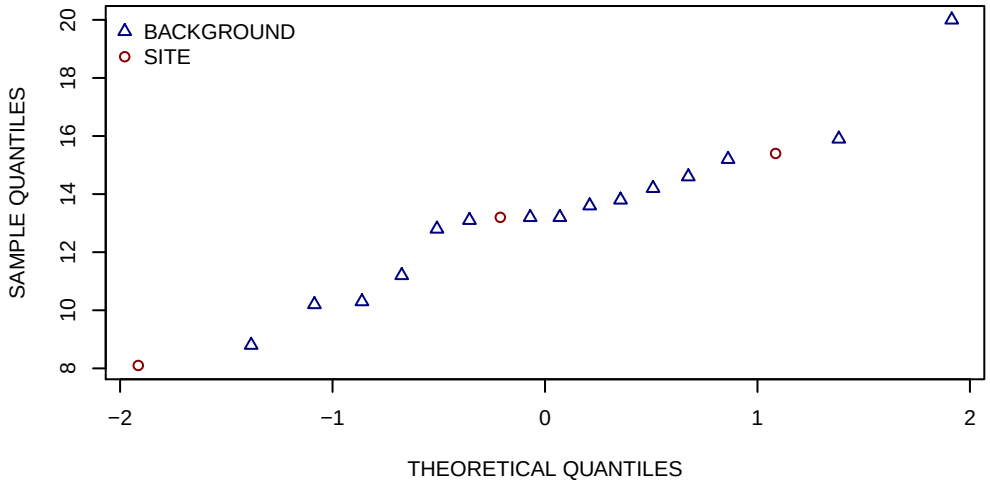
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

NICKEL SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 16 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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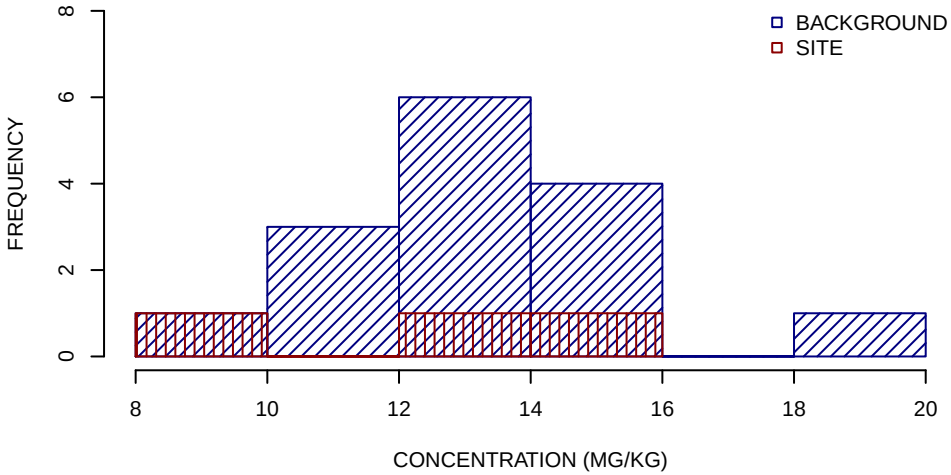


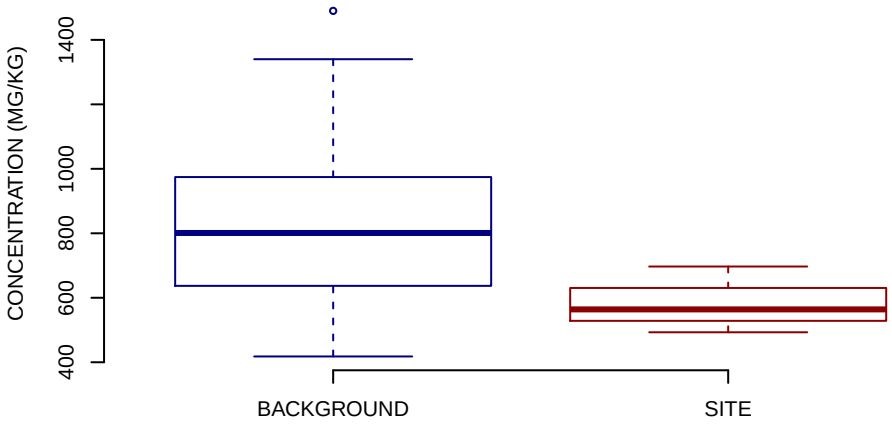
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	8.8	8.1
25TH PERCENTILE	12	11
MEDIAN	13	13
MEAN	13	12
75TH PERCENTILE	14	14
MAXIMUM	20	15

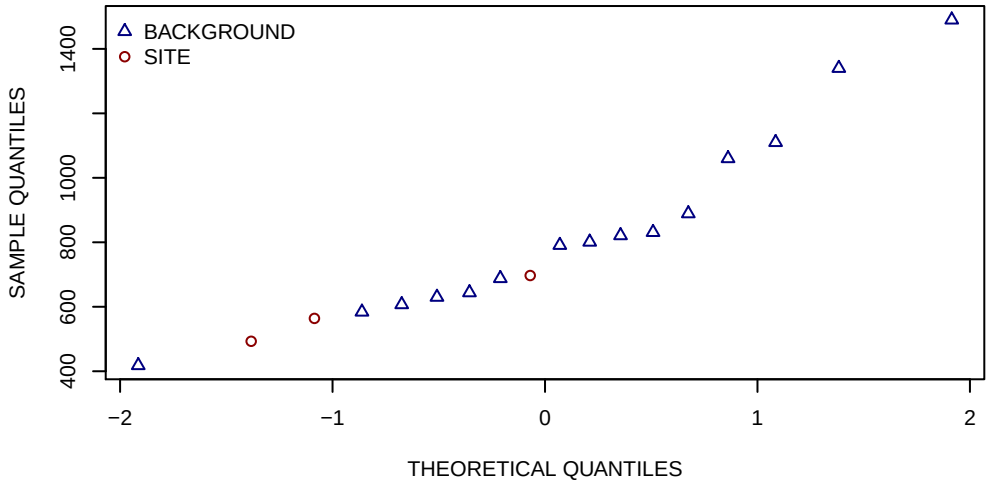
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

POTASSIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 17 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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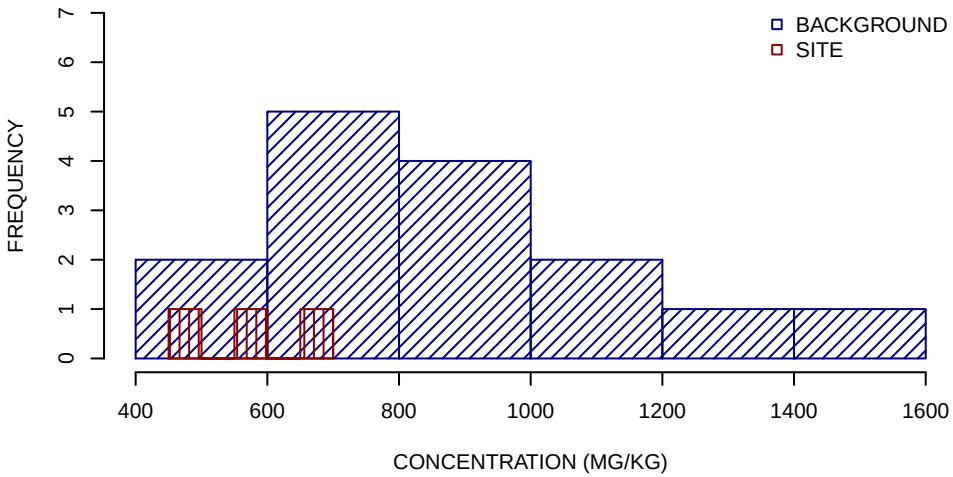


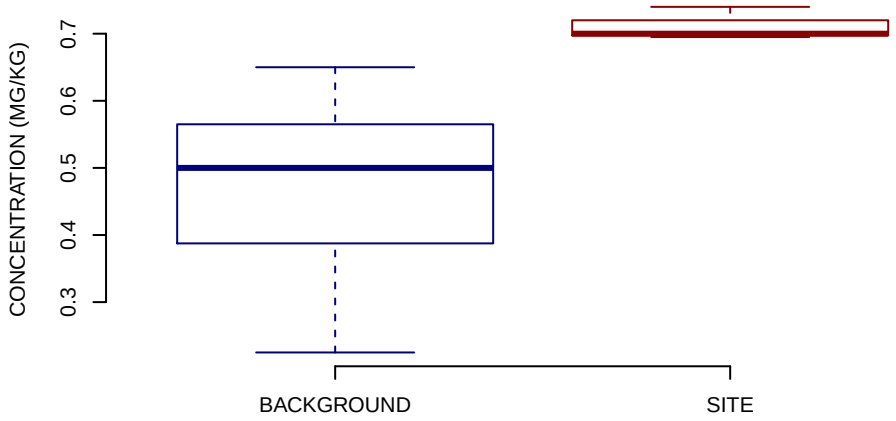
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	420	490
25TH PERCENTILE	640	530
MEDIAN	800	560
MEAN	850	580
75TH PERCENTILE	970	630
MAXIMUM	1500	700

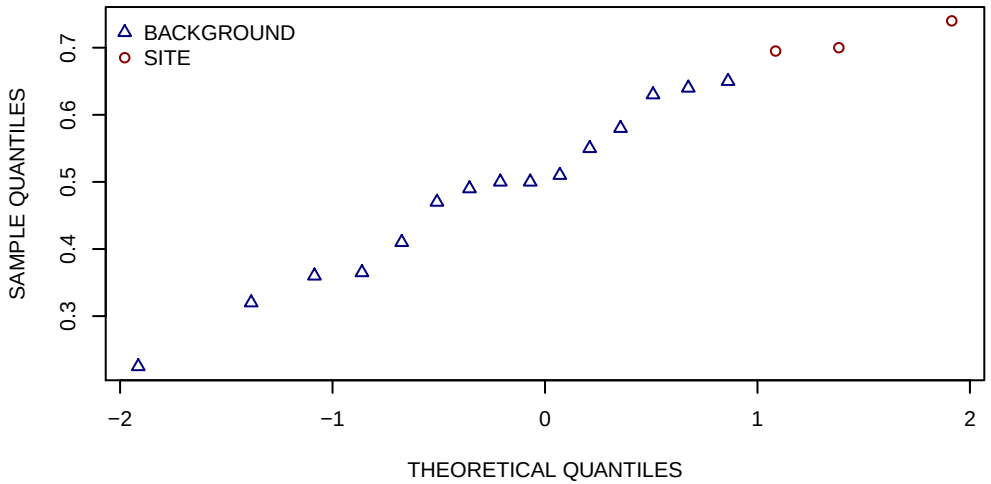
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SELENIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 18 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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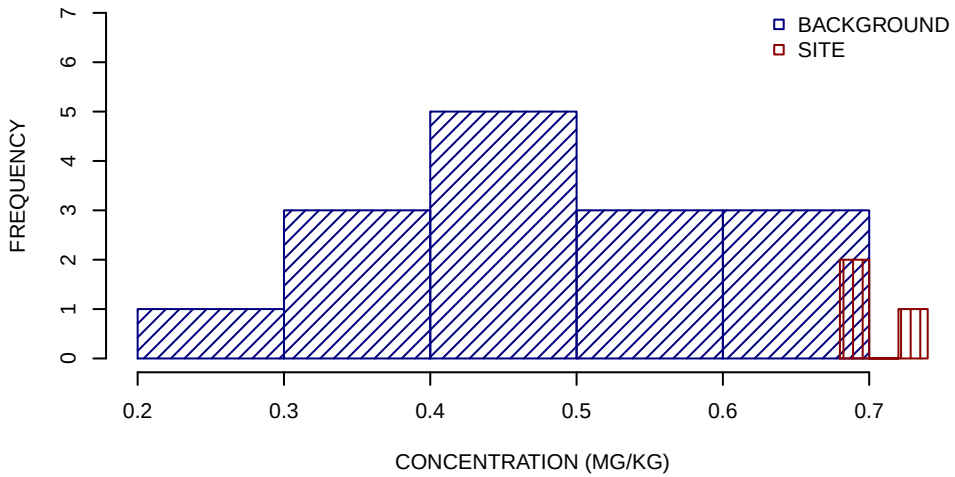


SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.22	0.7
25TH PERCENTILE	0.39	0.7
MEDIAN	0.5	0.7
MEAN	0.48	0.71
75TH PERCENTILE	0.56	0.72
MAXIMUM	0.65	0.74

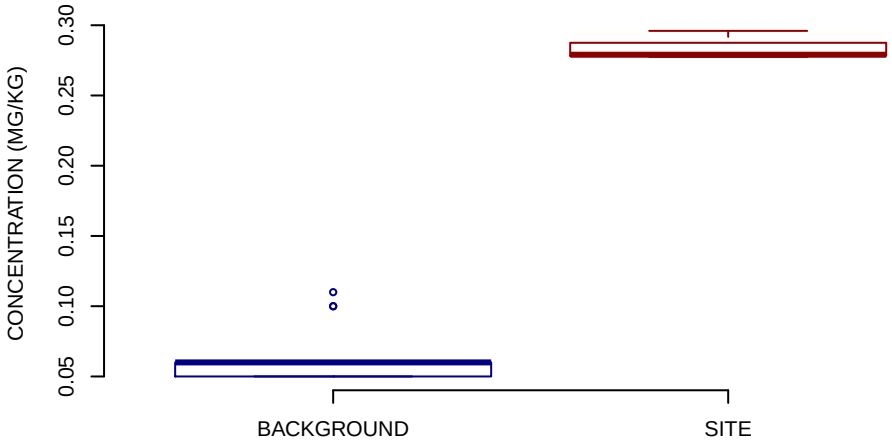
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

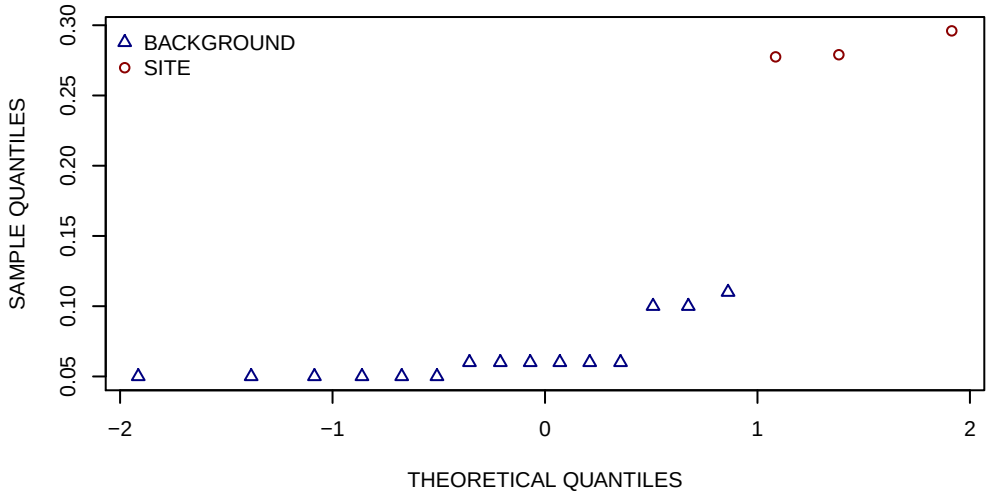
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SILVER SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 19 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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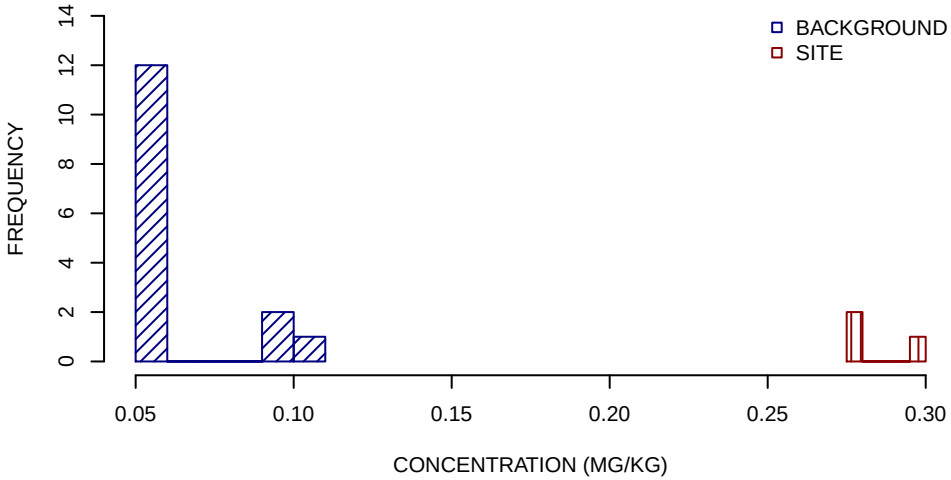


SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.05	0.28
25TH PERCENTILE	0.05	0.28
MEDIAN	0.06	0.28
MEAN	0.065	0.28
75TH PERCENTILE	0.06	0.29
MAXIMUM	0.11	0.3

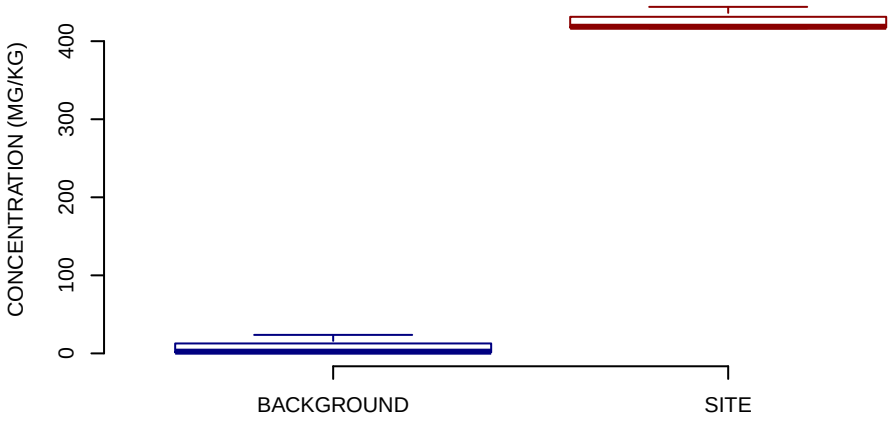
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

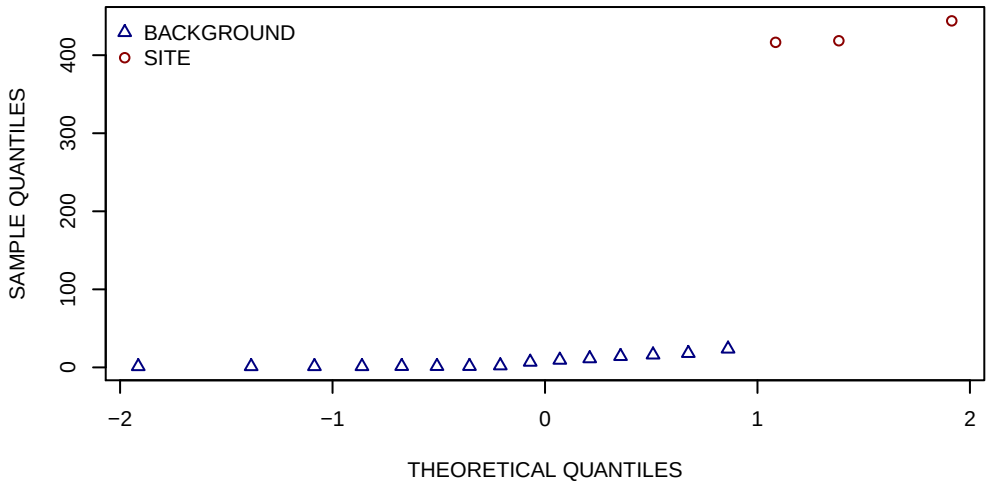
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

SODIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 20 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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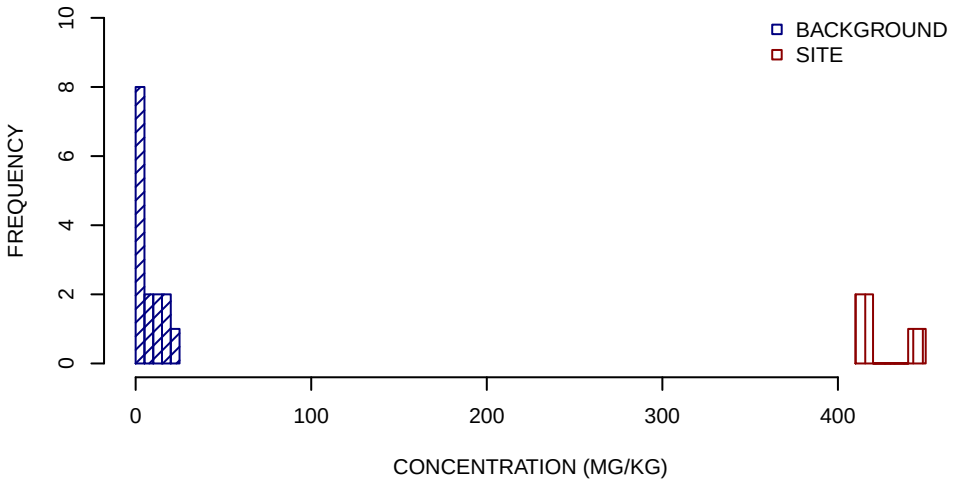


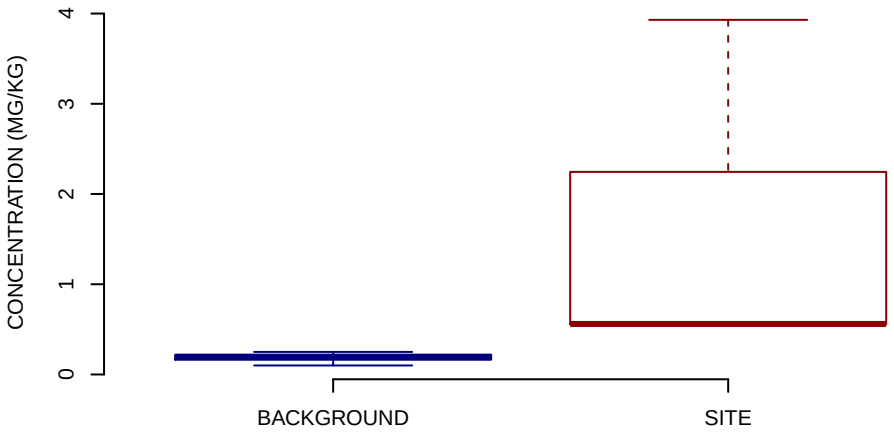
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	1.2	420
25TH PERCENTILE	1.3	420
MEDIAN	2.2	420
MEAN	7.4	430
75TH PERCENTILE	13	430
MAXIMUM	24	440

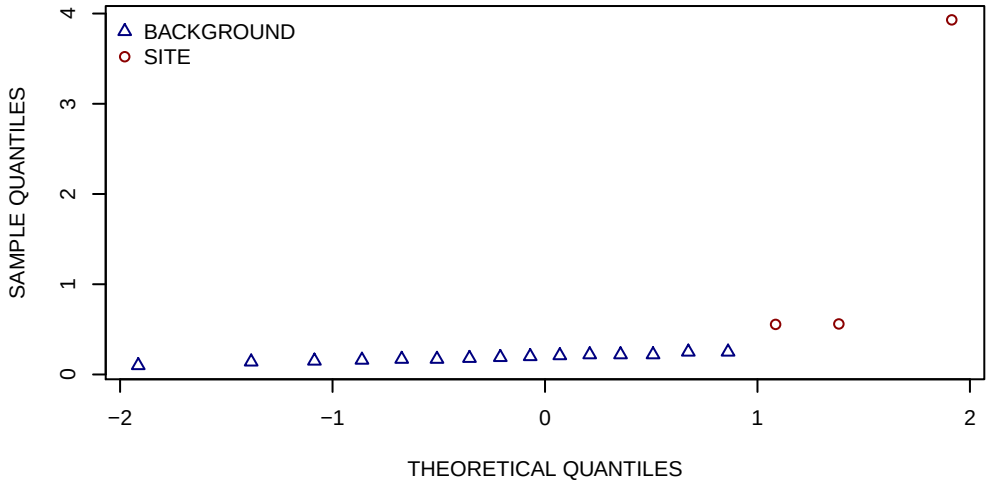
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

THALLIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 21 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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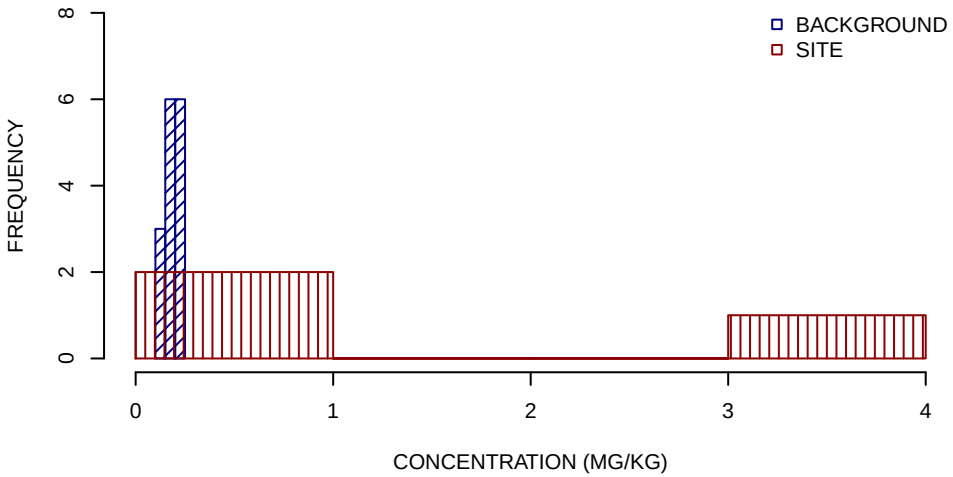


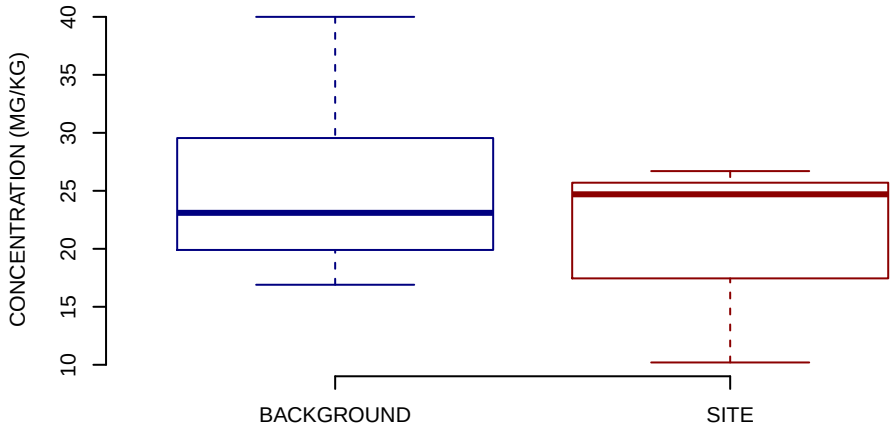
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	0.1	0.56
25TH PERCENTILE	0.16	0.56
MEDIAN	0.19	0.56
MEAN	0.19	1.7
75TH PERCENTILE	0.22	2.2
MAXIMUM	0.25	3.9

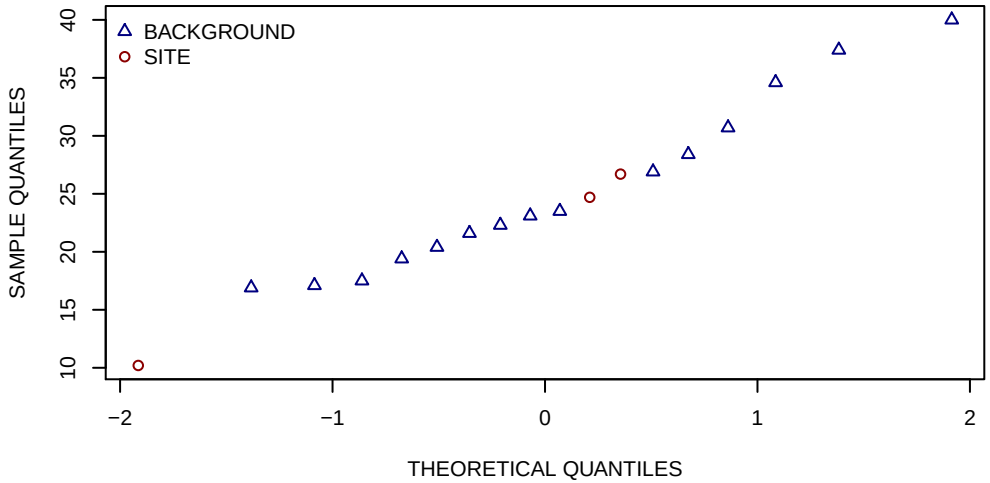
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

VANADIUM SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 22 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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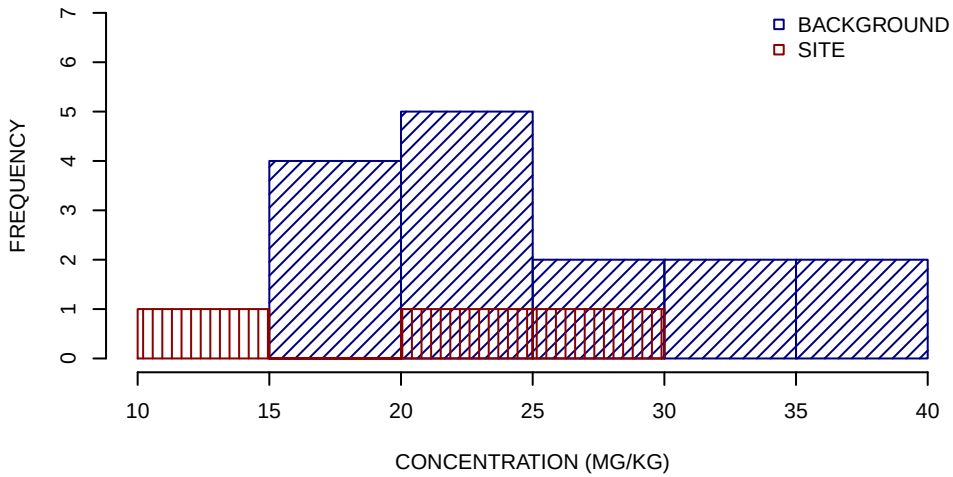


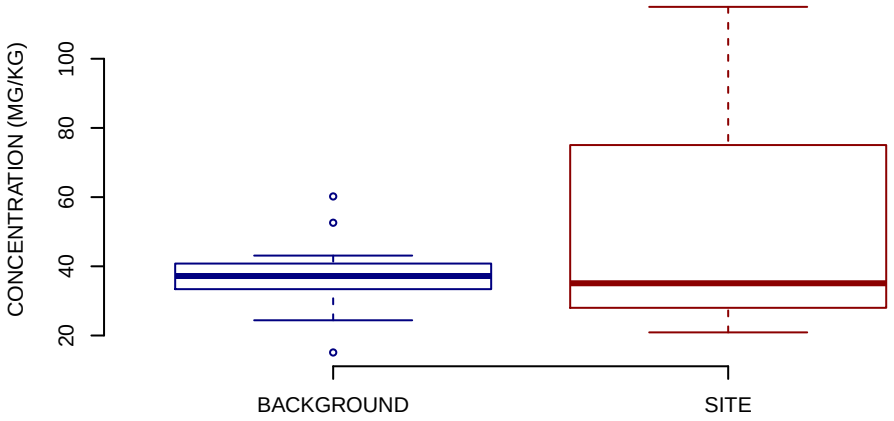
SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	17	10
25TH PERCENTILE	20	17
MEDIAN	23	25
MEAN	25	21
75TH PERCENTILE	30	26
MAXIMUM	40	27

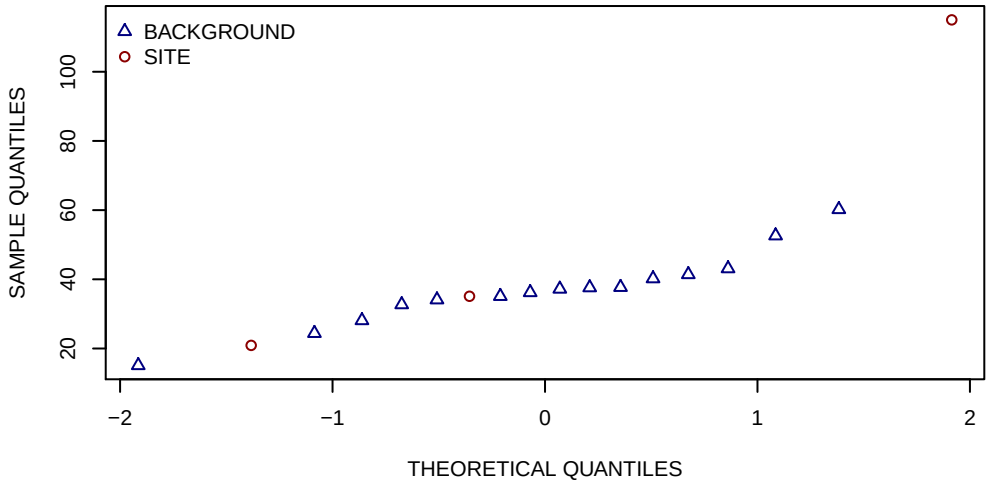
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ZINC SURFACE SOIL GRAPHICAL DISPLAYS − SUBAREA F
SWMU 18
NSA CRANE, CRANE, INDIANA
FIGURE 23 OF 23

BOXPLOTS



NORMAL Q−Q PLOT



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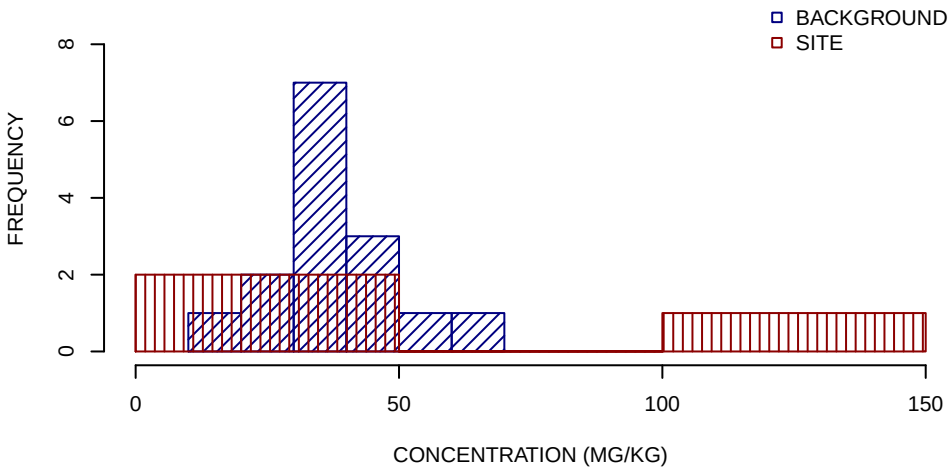

SUMMARY STATISTICS

	BACKGROUND	SITE
MINIMUM	15	21
25TH PERCENTILE	33	28
MEDIAN	37	35
MEAN	37	57
75TH PERCENTILE	41	75
MAXIMUM	60	120

UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

APPENDIX I

SUPPORTING INFORMATION FOR HUMAN HEALTH RISK ASSESSMENT

I.1 Human Health Risk Assessment Methodology
I.2 RAGS Part D Tables 4, 5, and 6
I.3 Subarea B
I.4 Subarea C
I.5 Subarea F
I.6 Boggs Creek
I.7 Sample Calculations

APPENDIX I.1

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

ACRONYM LIST

ACH	Air Changes Per Hour
ADAF	Age Dependent Adjustment Factor
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
Cal EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
EPC	Exposure Point Concentration
EU	Exposure Unit
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IDEM	Indiana Department of Environmental Management
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
NSA	Naval Support Activity
NCEA	National Center for Environmental Assessment
ORNL	Oak Ridge National Laboratory
OSWER	Office of Solid Waste and Emergency Response
PAH	Polynuclear Aromatic Hydrocarbon
PEF	Particulate Emission Factor
PPRTV	Provisional Peer Reviewed Toxicity Value
RAGS	Risk Assessment Guidance for Superfund
RDA	Recommended Daily Allowance
RDI	Recommended Daily Intake
RCRA	Resource Conservation Recovery Act

RfC	Reference Concentration
RfD	Reference Dose
RFI	RCRA Facility Investigation
RISC	Risk Integrated System Closure
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SSL	Soil Screening Level
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TEF	Toxic Equivalency Factor
TRW	Technical Review Workgroup
UCL	Upper 95 Percent Confidence Limit
µg/dL	Microgram per Deciliter
USEPA	U.S. Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VF	Volatilization Factor
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

1.0 INTRODUCTION

This section presents the Human Health Risk Assessment (HHRA) for the Load and Fill Area [Solid Waste Management Unit (SWMU 18)] at Naval Support Activity (NSA) Crane. The objective of the HHRA is to determine whether detected concentrations of chemicals within the study areas pose a significant threat to potential human receptors under current and/or future land use. The potential risks to human receptors were estimated based on the assumption that no actions were taken to control contaminant releases.

The following current United States Environmental Protection Agency (USEPA) and State of Indiana Department of Environmental Management (IDEM) guidance documents were used to develop the framework for the baseline HHRA:

- Conducting Human Health Risk Assessments Under the Environmental Restoration Program (Navy, February 2001).
- Navy Policy on the Use of Background Chemical Levels (Navy, 2004).
- U.S. Navy Human Health Risk Assessment Guidance (Navy, 2008)
- Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989).
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, 1991).
- Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (USEPA, 1993a).
- Exposure Factors Handbook. (USEPA, 1997a).
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002a).
- Guidance for Characterizing Background and Chemical Concentrations in Soil for CERCLA Sites

(USEPA, 2002b).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (USEPA, 2004a).

- Guidelines for Carcinogen Risk Assessment (USEPA, 2005a).

- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (USEPA, 2009a).

- Risk Integrated System of Closure. User's Guide and Technical Resource Guidance Document (IDEM, 2009).

- Remediation Closure Guide. (IDEM, 2012)

The HHRA is structured and reported according to the guidelines of the Risk Assessment Guidance for Superfund (RAGS), Human Health Evaluation Manual, Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments (RAGS Part D) (USEPA, 2001).

An HHRA provides the framework for developing risk information necessary to assist in developing potential remedial alternatives for a site. A HHRA consists of five components: data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis.

Three major aspects of chemical contamination and environmental fate and transport must be considered to evaluate potential risks: (1) contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist; and (3) human receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure. If any one of these factors is absent for a site, the exposure pathway is incomplete, and no potential risks are considered to exist for human receptors.

2.0 DATA EVALUATION

Data evaluation, the first component of a baseline HHRA, is a medium-specific task involving compilation of analytical data as the first step. The second step and main objective of data evaluation is to develop a medium-specific list of chemicals of potential concern (COPCs) that will be used to quantitatively and/or qualitatively determine potential human health risks for site media. COPCs are selected based on a toxicity screen (i.e., a comparison of site contaminant concentrations to conservative toxicity screening values) and a background screen (i.e., a comparison of site concentrations to background concentrations).

2.1 Data Usability

Section 3.0 of the RCRA Facility Investigation (RFI) report presents a discussion of the data usability evaluation. Soil samples collected in 2005 and 2011 and groundwater samples collected during the 2011 investigation were used in this HHRA. Only surface water and sediment samples collected from the drainage ditches and Boggs Creek were used in this HHRA. Surface water and sediments samples collect from with settling basins and sumps were not used in this HHRA since it is unlikely that receptors would have significant exposure to this material.

2.2 Derivation of Screening Criteria

The primary criteria used to identify COPCs are based on USEPA Regional Screening Levels (RSLs) (2012a) and IDEM screening levels (2012). The RSLs were developed and are maintained through a cooperative agreement between Oak Ridge National Laboratory (ORNL) and USEPA's Office of Superfund, and are considered to be USEPA screening criteria. The RSLs are based on exposure pathways for which generally accepted methods, models, and assumptions have been developed (i.e., ingestion, dermal contact, and inhalation) for specific land-use conditions and do not consider ecological receptors. The screening concentrations based on the RSLs correspond to a systemic hazard quotient (HQ) of 0.1 for non-carcinogens or an incremental lifetime cancer risk (ILCR) of 1×10^{-6} for carcinogens. The RSLs for non-carcinogens are based on an HQ of 1, whereas the screening concentrations used in the selection of COPCs were based on an HQ of 0.1 to account for the potential cumulative effects of several chemicals affecting the same target organ or producing the same adverse non-carcinogenic effect.

The IDEM screening levels for soil are based on the USEPA RSLs; however the IDEM screening levels are not necessary the same as the RSLs. The IDEM screening levels for direct contact correspond to systemic HQ of 1 (for noncarcinogens) or an ILCR of 1×10^{-5} (for carcinogens). The USEPA RSLs for

carcinogens corresponds to an ILCR of $1x10^{-6}$. The IDEM screening levels for soil can also be based on the soil saturation limit or capped at 100,000 mg/kg.

Screening Levels for Soil

Screening concentrations based on the following criteria were used to select COPCs for surface soil and subsurface soil:

- USEPA RSLs for Residential Soil (2012a).
- IDEM residential soil screening levels (2012)

Maximum chemical concentrations in soil were also compared to USEPA risk-based soil screening levels (SSLs) for groundwater protection and to IDEM screening levels for migration from soil to groundwater. The SSLs and IDEM screening levels for migration from soil to groundwater were not used for the selection of COPCs for direct contact exposure; however, they do allow qualitative evaluation of the potential for chemical migration from soil to groundwater. Chemicals with concentrations exceeding the SSLs/IDEM default closure levels may potentially migrate from the soil to groundwater in sufficient quantities to pose groundwater quality problems.

The risk-based screening levels used in the COPC selection for soil and sediment are presented in Table 2-1.

Screening levels for Groundwater

Screening levels based on the following criteria were used to select COPCs for groundwater:

- USEPA RSLs for Tapwater (2012a).
- USEPA Maximum Contaminant Levels (MCL) (USEPA, 2012b)
- USEPA Groundwater Screening Levels for Evaluating Vapor Intrusion into Indoor Air from Groundwater (2012c).
- IDEM tap water screening levels for groundwater (2012)
- IDEM residential vapor exposure levels for groundwater (2012)

Table 2-2 presents the screening criteria used for groundwater.

Screening Levels for Surface Water:

Screening levels based on the following criteria were used to select COPCs for surface water:

- USEPA RSLs for Tapwater (2012a).
- USEPA MCLs (USEPA, 2012b)
- IDEM tap water screening levels for groundwater (2012)

In general, the use of tap water screening levels is regarded as a highly conservative approach to COPC selection at the Site because surface water is not used as a potable water source.

Table 2-3 presents the screening criteria used for surface water.

Screening Levels for Sediment

Screening concentrations based on the following criteria were used to select COPCs for sediment:

- USEPA RSLs for Residential Soil (2012a).
- IDEM residential soil screening levels (2012)

The use of residential soil screening levels to select COPCs for sediments is highly conservative since the residential screening criteria assume the receptor is exposed to soil 350 days of the year whereas exposures to sediments will likely occur on a much less frequent basis.

Table 2-4 presents the screening criteria used for sediment.

Essential Nutrients

Per USEPA guidance (1989) “Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above natural occurring levels), and (3) toxic at very high does (i.e., much higher than those that could be associated with contact at the site) need not be considered further in the quantitative risk assessment.” Examples of such chemicals are magnesium, calcium, potassium, and sodium. Based on historical information available for the Site, no unusual use or disposal of these constituents occurred at the site under investigation. Soil concentrations greater than 1,000,000 mg/kg (i.e., pure mineral intake) would be required before receptor intake would exceed recommended daily allowance (RDA) and recommended daily intake (RDI) values. A review of currently available analytical data indicates that such concentrations have not been detected in soil at the Site.

Chemicals without Toxicity Criteria

Risk-based COPC screening levels are not available for some chemicals [e.g., acenaphthylene, benzo(g,h,i)perylene, and phenanthrene). In the COPC screening, acenaphthene was used as a surrogate for acenaphthylene and pyrene was selected as a surrogate for benzo(g,h,i)perylene and phenanthrene.

Screening Levels for Chromium

Chromium speciation was not performed on the soil, groundwater, surface water, and sediment samples collected at the site. Therefore, the screening levels for hexavalent chromium were used for the selection of COPCs.

Background Evaluation

In accordance with Navy policy (Navy, 2004) chemicals present at background concentrations were not retained as COPCs in this HHRA. Background data is only available for soils at NSA Crane, consequently a background comparison was not performed for groundwater, surface water, or sediment. The background evaluation was conducted in accordance with the following Navy guidance:

- Guidance for Environmental Background Analysis, Volume I: Soil. Prepared by Battelle Memorial Institute, Earth Tech, Inc., and Newfields for the Naval Facilities Engineering Command, Washington D.C., April 2002.

In the COPC selection process, if the results of the background evaluation indicated that chemical concentrations detected in Site soils did not exceed background concentrations, that chemical was not selected as a COPC and was not carried through the quantitative risk assessment. However, chemicals present at concentrations exceeding risk-based screening criteria but not selected as COPCs on the basis of background evaluations are further discussed in the risk characterization sections prepared for each SWMU 18 sub-area/site evaluated. The results of the background comparison analysis for surface soil and subsurface soil are presented in Section 5 of the RFI Report.

The elimination of chemicals as site-related COPCs on the basis of background follows Navy Policy on the Use of Background Chemical Levels (Navy, 2004). This document also presents the Navy's interpretation of the USEPA guidance provided in the document titled Role of Background in the CERCLA Cleanup Program (USEPA, 2002c) and details the methodology to be used in evaluating background under the Navy's Environmental Restoration and Base Realignment and Closure (BRAC) programs. Navy policy has been accepted by the USEPA as not contradicting the USEPA guidance (USEPA,

2002c). Navy policy applies to both the screening-level and baseline risk assessments and requires the following:

1. A clear and concise understanding of chemicals released from a site thus ensuring the Navy is focusing on remediating the release.

2. The use of background data in the screening-level risk assessment.

    a. The comparison of site chemical levels to risk-based screening criteria.
    b. The comparison of site chemical levels to background concentrations.
    c. The identification of site-related COPCs based on screening criteria comparisons AND background comparisons. Site-related COPCs are those chemicals with concentrations exceeding risk-based screening criteria AND background concentrations. To the extent possible, site-related COPCs are further evaluated quantitatively in the baseline risk assessment. (Non-site-related COPCs are further discussed in the risk characterization sections of the baseline risk assessments.)

3. The consideration of background in the baseline risk assessment.

    a. The calculation of risk estimates for site-related COPCs only.
    b. The further evaluation of non-site-related COPCs in the risk characterization section only (e.g., the evaluation of chemicals detected at concentrations exceeding screening criteria but less than background concentrations). The Navy considers this evaluation to be consistent with USEPA's Role of Background in the CERCLA Cleanup Program (USEPA, 2002c).

4. The selection of site cleanup remedial goals at levels not less than background levels. Additionally, cleanup levels should not be developed for chemicals not identified as chemicals of concern (COCs). As defined in the Navy guidance, COCs are site-related COPCs found to be the risk drivers in the baseline risk assessment and that may pose unacceptable human or ecological risks.

2.3 Decision Rules for Establishing COPCs

The following decision rules were used to select initial lists of COPCs for SWMU 18:

- A chemical detected in soil was selected as a COPC for soil if any detected chemical concentration exceeded the screening levels for soil and, for inorganics, if the background comparison indicates the site concentrations are statistically greater than the corresponding background concentrations.

- A chemical detected in groundwater was selected as a COPC for groundwater if the maximum detected concentration in any on-site monitoring wells exceeded screening levels for domestic use of a water supply (e.g., the tap water RSLs) or for the migration of VOCs from groundwater to the indoor air of a building.

- A chemical detected in surface water was selected as a COPC for surface water if the maximum detected concentration in a potentially impacted surface water body exceeded the screening level for domestic use of a water supply (e.g., the IDEM residential default closure levels for groundwater).

- A chemical detected in sediment was selected as a COPC for sediment if any detected chemical concentration exceeded the screening levels for residential exposures to soil.

Chemicals detected in any soil at concentrations greater than the screening levels but eliminated as COPCs on the basis of background comparisons are further discussed in the risk characterization section for each of the subareas.

3.0 EXPOSURE ASSESSMENT

This portion of the risk assessment defines and evaluates, quantitatively or qualitatively, the type and magnitude of human exposure to the chemicals present at or migrating from a site. The exposure assessment is designed to depict the physical setting of the site, to identify potentially exposed populations and applicable exposure pathways, to calculate concentrations of COPCs to which receptors might be exposed, and to estimate chemical intakes under the identified exposure scenarios.

Actual or potential exposures at each subarea at SWMU 18 were determined based on the most likely pathways of contaminant release and transport, as well as human activity patterns. A complete exposure pathway has three components: a source of chemicals that can be released to the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor.

3.1 Conceptual Site Model

A conceptual site model (CSM) facilitates consistent and comprehensive evaluation of potential risks to human health by creating a framework for identifying the pathways by which human receptors may come in contact with environmental media contaminated by site activities. A CSM depicts the relationships among the following elements, which are necessary for defining complete exposure pathways:

- Site sources of contamination
- Contaminant release mechanisms and transport/migration pathways
- Exposure routes
- Potential receptors

The elements of the CSM (contaminant source, release mechanisms, transport/migration pathways, exposure routes, and potential receptors) establish the manner and degree to which a potential receptor may be exposed to chemicals present at the site. The degree of risk incurred by a potential receptor varies according to the means of exposure, the duration of exposure, and the specific chemical to which the receptor is exposed.

The CSM for each subarea are presented in the individual sections for each subarea in RFI report and are not presented here. Table 3-1 provides a summary of the potential receptors and exposure pathways evaluated for the subareas at SWMU 18. A discussion of the potential current and future receptors and exposure pathways is presented below.

NSA Crane is an active naval base and will remain active for the foreseeable future. Current site receptors include industrial or construction workers, and adolescent trespasses. However, for purposes of completeness, the baseline risk assessment will consider receptor exposure under residential, industrial, and recreational land use scenarios. Based on current and potential future land use, the following potential receptors may be exposed to contaminated environmental media within the study area:

- **Construction Workers** – A plausible receptor under current or future land use. No construction activities are currently planned for the study area. However, this receptor could be exposed to surface and subsurface soils (incidental ingestion; dermal contact), shallow groundwater (dermal contact), as well as airborne contaminants emanating from these media (inhalation). It should be noted that significant exposures by a construction worker to groundwater is unlikely because if a construction worker were to have prolonged contact with groundwater then he/she would most likely wear protective clothing such as rubber boots and/or hip waders, which would limit the receptor's exposure. In addition, most excavation activities would utilize construction equipment such as a back hoe, which would limit a construction worker's exposure. Also, if significant groundwater was encountered during an excavation of a trench or foundation, the groundwater would most likely be pumped out of the excavation so that the construction activities could be completed.

- **Industrial Worker** – A plausible receptor under current and future land use. This includes adult military or civilian personnel assigned to routine daily work tasks in the SWMU 18 area. This receptor could be exposed to surface soil (incidental ingestion; dermal contact) and air (inhalation). Industrial worker exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions. If this receptor were to work in an on-site structure, this receptor could be exposed to VOCs migrating to the indoor air of a building from contaminated groundwater via vapor intrusion. However, no COPCs were identified for vapor intrusion.

- **Adolescent Trespassers** – A plausible receptor under current or future land use. Although access to the base is controlled, once inside the base, access to the study areas is not limited by any physical constraints. This receptor may be exposed to potentially contaminated surface soil [0 to 2 feet below ground surface (bgs)] (incidental ingestion; dermal contact), air (inhalation), surface water (incidental ingestion; dermal contact), and sediments (incidental ingestion; dermal contact) in the drainage ditches and intermittent streams. However, exposure to surface water is likely to be limited in some areas because of the intermittent nature of the surface water in the streams at the site. Also potential exposures to surface water will be limited to wading because the streams at the sites are not deep enough for swimming. Direct contact with groundwater is not anticipated for this receptor.

Trespasser exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions.

- **Recreational Users (Child and Adult)** – A plausible receptor under future land use. If NSA Crane were to close, the property could be converted to a park. A recreational user may be exposed to potentially contaminated surface soil (0 to 2 feet bgs) (incidental ingestion; dermal contact), air (inhalation), surface water (incidental ingestion; dermal contact), and sediments (incidental ingestion; dermal contact). Exposures to surface water will be limited to wading because the streams at the sites are not deep enough for swimming. Recreational exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions. NSA Crane is not expected to close because principal base operations, the demilitarization of munitions, are critical to the support of the United States Naval fleet.

- **Residents (Child and Adult)** – Given the anticipated future land use for much of SWMU 18 (commercial/industrial), residents are very unlikely future receptors. However, the hypothetical future residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical resident may be exposed to surface soils (incidental ingestion; dermal contract), groundwater (ingestion, dermal contact), surface water (ingestion; dermal contact), air (inhalation), and sediment (incidental ingestion; dermal contact). Also, hypothetical residents could be exposed to VOCs migrating from contaminated groundwater to the indoor air of a home. However, no COPCs were identified for vapor intrusion. Potential exposures to surface water will be limited to wading because the streams at the sites are not deep enough for swimming. Receptor exposure to subsurface soil would only occur if subsurface soil was excavated and deposited on existing surface soil. Although this is an unlikely scenario, it is included in this HHRA for purposes of completeness and to assist the risk managers regarding the need for deed restrictions.

3.2 Central Tendency Exposure versus Reasonable Maximum Exposure

Traditionally, exposures evaluated in the HHRA were based on the concept of a reasonable maximum exposure (RME) only, which is defined as "the maximum exposure that is reasonably expected to occur at a site" (USEPA, December 1989). However, subsequent risk assessment guidance (USEPA, February 1992) indicates the need to address an average case or central tendency exposure (CTE).

To provide a full characterization of potential exposure, both RME and CTE scenarios were evaluated in the HHRA for SWMU 18. The available guidance (USEPA, 1993a) concerning the evaluation of CTE is limited. Therefore, professional judgment was exercised when defining CTE conditions for a particular receptor at a site.

3.3 Exposure Point Concentrations

The exposure point concentration (EPC), which is calculated for COPCs only, is an estimate of the chemical concentration within an exposure unit (EU). The EPC is assumed to be the concentration to which the receptor is exposed and is used to estimate exposure intakes. An EU is the area over which receptor activity is expected to occur.

The following guidelines were used to calculate EPCs:

- If the datasets for surface soil, subsurface soil, groundwater, surface water, and sediment contained five or more samples and at least three detected samples then the 95-percent upper confidence limit (UCL) on the arithmetic mean, which was based on the distribution of the data set, was selected as the EPC. EPCs were calculated following USEPA's Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (December 2002a) and using USEPA's ProUCL software Version 4.1.01 (2010). If ProUCL was unable to calculate an UCL then the maximum detected concentration was used as the EPC.

- If the datasets for surface soil, subsurface soil, groundwater, surface water, and sediment contained four or fewer samples then the maximum detected concentration was used as the EPC.

- Non-detected values were evaluated in accordance with the ProUCL guidance.

3.4 Chemical Intake Estimation

The methodologies and techniques used to estimate exposure intakes are presented in this section. Intakes for the identified potential receptor groups were calculated using current USEPA risk assessment guidance and are presented in the risk assessment spreadsheets. Risk assessment results are presented using USEPA RAGS Part D table format. Assumptions regarding exposure are presented in Tables 3-2 and 3-3 for the RME and CTE scenarios, respectively. The exposure assumptions presented in Table 3-2 and 3-3 are based on current USEPA and IDEM risk assessment guidance.

Non-carcinogenic intakes were estimated using the concept of an average annual exposure. Carcinogenic intakes were calculated as incremental lifetime exposures, which assume a life expectancy of 70 years. The exposure assumptions reflect current USEPA guidance. The majority of the exposure assumptions used to estimate chemical intakes were based on default assumptions described in several USEPA guidance documents (e.g., USEPA December 1989, 1991, 1997a, and 2004a) and IDEM guidance (2009). The following paragraphs discuss the non-default receptor-specific exposure assumptions used in the risk assessment.

3.4.1 Incidental Ingestion of Soil and Sediment

Direct physical contact with soil and sediment may result in the incidental ingestion of chemicals. Chemical intake for the incidental ingestion of soil and sediment is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(IR)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

where:

Intake	=	intake of chemical from soil or sediment (mg/kg/day)
C_s	=	concentration of chemical in soil or sediment (mg/kg)
IR	=	ingestion rate (mg/day)
FI	=	fraction ingested from contaminated source (dimensionless)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
CF	=	conversion factor (1×10^{-6} kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days); for non-carcinogens, AT = ED x 365 days/yr for carcinogens, AT = 70 yr x 365 days/yr

Most of the exposure assumptions used to estimate chemical intakes from incidental ingestion of soil were based on default assumptions described in standard USEPA guidance and are summarized in Tables 3-2 and 3-3. The following paragraphs briefly discuss the non-default receptor-specific exposure assumptions for incidental ingestion of soil that were used in the HHRA.

The selected exposure frequency assumptions consider anticipated receptor activities at SWMU 18. It is assumed that construction workers assigned to future excavation projects at SWMU 18 are exposed to soil for 5 days a week over 30 weeks (150 days a year) for 1 year under the RME scenario. The

exposure frequency for the CTE scenario was assumed to be 50 percent of the RME or 75 days a year. Child and adult recreational users are assumed to be exposed to soil two days a week during the warmer weather months (52 days a year) under the RME scenario and one day a week (26 days a year) under the CTE scenario. The adolescent trespasser is assumed to be exposed to soils on a somewhat less frequent basis (26 and 13 days per year for the RME and CTE case, respectively).

3.4.2 Dermal Contact with Soil and Sediment

Direct physical contact with soil or sediment may result in the dermal absorption of chemicals. Exposure associated with dermal contact with soil or sediment is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(SA)(AF)(ABS)(CF)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	amount of chemical absorbed during contact with soil (mg/kg/day)
C_s	=	concentration of chemical in soil (mg/kg)
SA	=	skin surface area available for contact (cm^2/day)
AF	=	skin adherence factor (mg/cm^2)
ABS	=	absorption factor (dimensionless)
CF	=	conversion factor (1×10^{-6} kg/mg)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
BW	=	body weight (kg)
AT	=	averaging time (days);
		for non-carcinogens, AT = ED x 365 days/year
		for carcinogens, AT = 70 years x 365 days/year

Most of the exposure assumptions used to estimate chemical intakes from dermal contact with soil were based on the default assumptions described in standard USEPA guidance and are summarized in Tables 3-2 and 3-3. The following paragraphs briefly discuss non-default receptor-specific exposure assumptions for dermal contact with soil that were used in the HHRA.

The exposed skin surface areas of the body available for dermal contact with soil were determined on a receptor-specific basis because they correspond with assumed human activities and clothing worn during exposure events. With the exception of the skin surface area recommended for adolescent trespassers, all of the skin surface areas presented in Tables 3-2 and 3-3 are based on USEPA default values. For an adolescent trespasser (7 to 16 years old), it was assumed that 25 percent of the body surface area was

exposed to surface soil and sediment (i.e., 3,280 cm^2). This value represents the 50th-percentile areas presented in Table 4-6 of the Exposure Factors Handbook (USEPA, 1997a).

The same exposure frequencies and durations recommended for the evaluation of incidental ingestion of soil were used to estimate chemical intakes for dermal contact with soil. The soil adherence factors presented are those in Exhibits 3.3 and 3.5 of RAGS Part E. To the extent possible, chemical-specific dermal absorption factors provided in RAGS Part E were used to evaluate the COPCs for soil. However, dermal absorption factors are only available for the short list of chemicals in Exhibit 3-4 of RAGS Part E. In addition, as indicated in RAGS Part E, absorption factors for metals other than arsenic and cadmium have not been developed due to insufficient data to support default values. Therefore, ABS was set equal to zero for these chemicals and risks from dermal absorption of metals other than arsenic and cadmium from soil were not quantified in this risk assessment. The uncertainty associated with the omission of these constituents is discussed in the uncertainty analysis. Tables 3-4 presents the ABS values used in this HHRA.

3.4.3 Inhalation of Air Containing Fugitive Dust/Volatiles Emitted from Soil

Intakes of both particulates and vapors/gases are calculated using the same equation, as follows (USEPA, 2009a):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{AT \times 24\,hrs/day}$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	concentration of chemical in air (mg/m^3)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
AT	=	averaging time (hours);
	=	for non-carcinogens, AT = ED x 365 days/yr
	=	for carcinogens, AT = 70 yr x 365 days/yr

Some of the exposure assumptions used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface and subsurface soil were based on default assumptions described in standard USEPA guidance and are summarized in Tables 3-2 and 3-3. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes were used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface and subsurface soil.

The concentrations of chemicals in air resulting from emissions from soil are developed following procedures presented in USEPA Soil Screening Guidance (2002d). Chemical concentrations in air are calculated as follows:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} + \frac{1}{VF} \right]$$

where:

C_{air}	=	chemical concentration in air (mg/m^3)
C_s	=	chemical concentration in soil (mg/kg)
PEF	=	Particulate emission factor (m^3/kg)
VF	=	volatilization factor (m^3/kg)

No volatile chemicals were retained as COPCs in surface and subsurface soil, therefore the above equation reduces to:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} \right]$$

The particulate emissions factor (PEF) relates the concentration of the chemical in soil to the concentration of dust particles in air. A PEF value of $1.316 \times 10^{+9}$ was used for the HHRA (USEPA, 2002d; IDEM, 2009). Because air emissions resulting from fugitive dust emissions settings will be different than dust emissions generated during construction activities, a separate PEF was used for construction activities. The PEF for construction workers ($1.34 \times 10^{+6}$ m^3/kg) was calculated using the equations presented in the supplemental SSL guidance document (USEPA, 2002d). Sample calculations showing how the PEFs were calculated are presented in Appendix I.7.

3.4.4 Direct/Incidental Ingestion of Groundwater and Incidental Ingestion of Surface Water

Direct ingestion of groundwater is expected to be limited to exposure that would occur under a future hypothetical residential scenario. Incidental ingestion of groundwater by construction workers may occur during excavation activities. In addition, hypothetical residents, recreational users, and trespassers may incidentally ingest surface water while at the SWMU 18. Intakes associated with ingestion of groundwater and surface water were evaluated using the following equation (USEPA, 1989):

$$Intake = \frac{(C_W)(CF)(IR_W)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	intake of chemical from groundwater/surface water (mg/kg/day)
C_w	=	concentration of chemical in groundwater/surface water (mg/L)

CF	=	conversion factor (0.001 mg/µg)
IR_w	=	ingestion rate for groundwater (L/day)
IR_w	=	surface water ingestion rate (L/day) = (CR)(ET)
CR	=	contact rate (L/hr)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (days); for non-carcinogens, AT = ED x 365 days/yr for carcinogens, AT = 70 yrs x 365 days/yr

USEPA standard default exposure assumptions were used to evaluate residential exposures to groundwater. The following paragraphs briefly discuss non-default receptor-specific exposure assumptions for ingestion of groundwater and surface water that were used in the HHRA.

There are no USEPA or RIDEM default exposure assumptions for exposures to groundwater by construction workers. Consequently values were derived based on site-specific information and professional judgment. It was assumed that the construction worker will be exposed to groundwater 4 hours/day for 30 days a year under the RME scenario, and 2 hours/day for 15 days a year under the CTE scenario. A shorter exposure frequency is recommended for a construction worker exposed to groundwater than is recommended for exposure to soil because it is unlikely that a construction worker will have direct contact with groundwater on a daily basis during a construction project. Trespassers, recreational users, and residents were assumed to be exposed to surface water 4 hrs/day under the RME scenario and 2 hrs/day under the CTE scenario. It was assumed that trespassers, recreational users, and hypothetical residents would incidentally ingest 0.01L/hr (USEPA, 2011b) of surface water under the RME and CTE scenarios.

A summary of the receptor-specific input values used to estimate chemical intakes from ingestion of groundwater are presented in Tables 3-2 and 3-3.

3.4.5 Dermal Contact with Groundwater and Surface Water

The same equation was used to estimate intakes for dermal contact with groundwater and surface water. Hypothetical residential receptors were assumed to use groundwater for domestic purposes (e.g., bathing, showering, and dish washing) that can result in dermal exposure. Construction workers could contact groundwater during excavation activities. Trespassers, recreational users, and hypothetical residents may have dermal contact with surface water while wading in the stream at Site. The following

equation was used to assess exposures resulting from dermal contact with groundwater and surface water (USEPA, 2004a):

$$DAD = \frac{(DA_{event})(EV)(ED)(EF)(SA)}{(BW)(AT)}$$

where:

DAD	=	dermally absorbed dose of chemical from water (mg/kg/day)
DA_{event}	=	dermally absorbed dose per event (mg/cm^2-event)
EV	=	event frequency (events/day)
ED	=	exposure duration (yr)
EF	=	exposure frequency (days/yr)
SA	=	skin surface area available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days); for non-carcinogens, AT = ED x 365 days/yr for carcinogens, AT = 70 yrs x 365 days/yr

Most of the exposure assumptions used to estimate chemical intakes from dermal contact with groundwater were based on default assumptions described in standard USEPA guidance and are summarized in Tables 3-2 and 3-3.

Dermal intakes for residents exposed to groundwater assumed total body exposure on a daily basis. For construction workers exposed to groundwater and trespassers, recreational users, and residents exposed to surface water, the exposed surface area of the body available for contact was based on assumed activities and was similar to the assumptions outlined for dermal contact with soil and sediment.

The absorbed dose per event (DA_{event}) was estimated using a non-steady-state approach for organic compounds and a traditional steady-state approach for inorganics. For organics, the following equations apply:

$$\text{If } t_{event} < t^*, \text{ then: } DA_{event} = (2)(K_p)(FA)(C_w)(CF)\left(\sqrt{\frac{6\,\tau\, t_{event}}{\pi}}\right)$$

$$\text{If } t_{event} > t^*, \text{ then: } DA_{event} = (K_p)(FA)(C_w)(CF)\left(\frac{t_{event}}{1+B} + 2\tau\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right)$$

where:

t_{event}	=	duration of event (hour/event)
t*	=	time to reach steady-state conditions (hour)
K_p	=	permeability coefficient from water through skin (cm/hour)

FA	=	chemical-specific fraction absorbed (dimensionless)
C_w	=	concentration of chemical in water (mg/L)
τ	=	lag time (hour)
π	=	Pi (dimensionless; equal to 3.1416)
CF	=	conversion factor (0.001 L/cm^3)
B	=	Dimensionless ratio of the permeability of the stratum corneum relative to the permeability across the viable epidermis (dimensionless)

Values for the chemical-specific parameters (t*, K_p, FA, τ, and B) were obtained from the current dermal guidance (USEPA, 2004a, Exhibit B-3) and are presented in Table 3-4. If published values were not available for a particular compound, they were calculated using equations provided in the USEPA dermal guidance.

The following steady-state equation was used to estimate DA_{event} for inorganics:

$$DA_{event} = (K_p)(C_W)(t_{event})$$

The dermal permeability coefficient (K_p) values recommended in the USEPA dermal guidance (USEPA, 2004a) were used to calculate DA_{event} for inorganic COPCs.

3.4.5 Inhalation of Volatiles in Groundwater

If VOCs are present, groundwater exposure may also result in chemical intake through inhalation if groundwater is used as a domestic water supply or is exposed during construction activities. This exposure route is plausible for residential receptors that may be exposed while showering, bathing, washing dishes, etc. or for construction workers contacting shallow groundwater during excavation activities. For residential receptors, chemical intakes from inhalation exposure while showering due to volatilization of COPCs in groundwater were estimated using a mass transfer model, developed specifically for this exposure route, in combination with an air intake estimation model. The mass transfer model accounts for inhalation during and after a shower while the receptor remains in a closed bathroom. The method used is as follows (USEPA, 1989; Foster and Chrostowski, 1987; USEPA, 2009a):

$$EC = (S)(ET)(K)(EF)(ED)/(AT)(R_a)(CFs)$$

$$K = D_S + \frac{\exp(-R_a \times D_t)}{R_a} - \frac{\exp\left[R_a \times (D_S - D_t)\right]}{R_a}$$

where:

EC	=	exposure concentration (mg/m^3)
S	=	volatile chemical generation rate ($\mu g/m^3$-min-shower)
ET	=	exposure time (hours/day)
K	=	mass-transfer coefficient (min)
EF	=	exposure frequency (showers/yr)
ED	=	exposure duration (yr)
AT	=	averaging time or period of exposure (hours) for non-carcinogens, AT = ED×365 days per year×24 hours per day; for carcinogens, AT = 70 years×365 days per year x24 hours per day
R_a	=	air-exchange rate (min^{-1})
CFs	=	conversion factors ($1x10^{+3}$ µg/mg and 1,440 min/day)
D_S	=	shower duration (min)
D_t	=	total time in bathroom (min)

The estimated volatile chemical generation rate is based on two-phase film theory. The model uses contaminant-specific mass transfer coefficients, Henry's Law Constants, droplet diameter, drop time, viscosity, temperature, etc. A sample calculation is provided in Appendix I.7. The same exposure frequencies and durations used to estimate intake for dermal contact with groundwater were used to evaluate chemical intakes for inhalation of VOCs from domestic groundwater use.

Inhalation exposures for the construction worker were estimated using an air intake estimation model, as follows (USEPA, 2009a):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{(AT)(24hrs/day)}$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	chemical concentration in air (mg/m^3)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yr)
AT	=	averaging time (days) for non-carcinogens, AT = ED×365 days per year for carcinogens, AT = 70 years×365 days per year

Construction workers may be exposed to COPCs that have volatilized from groundwater when an excavation exposes the shallow water table. The same exposure frequencies and times used to estimate intake from dermal contact with groundwater were used to evaluate intake from inhalation of VOCs from groundwater during construction.

No well-established models are available for estimating migration of volatiles from groundwater into a construction or utility trench. To estimate the EPCs for air in a construction trench, the HHRA used an approach suggested by the Virginia Department of Environmental Quality (VDEQ) (2012), which is based on a combination of a vadose zone model (to estimate volatilization of gases from contaminated groundwater into a trench) and a box model (to estimate contaminant dispersion from the air inside the trench to the above-ground atmosphere). The VDEQ methodology is described in the following paragraphs.

The airborne concentration of a contaminant in a trench can be estimated using the following equation:

$$C_{air} = C_{GW} \times VF$$

where:

C_{air}	=	contaminant concentration in air in the trench ($\mu g/m^3$)
C_{GW}	=	concentration of contaminant in groundwater ($\mu g/L$)
VF	=	volatilization factor (L/m^3)

It was assumed that a construction project could excavate to 15 feet bgs or less. If the depth to groundwater at a site is less than 15 feet, the VDEQ model assumes that a worker would encounter groundwater when digging an excavation or trench. The worker would then be directly exposed to the groundwater. The worker would also be exposed to contaminants in the air inside the trench due to volatilization from groundwater pooling in the trench bottom.

The following equation is used to calculate the volatilization factor (VF) for a trench less than 15 feet deep:

$$VF = (Ki \times A \times F \times 10^{-3} \times 10^{4} \times 3{,}600)/(ACH \times V)$$

where:

Ki	=	contaminant's overall mass-transfer coefficient (cm/s)
A	=	trench area (m^2)

F	=	fraction of floor through which contaminant can enter (unitless)
ACH	=	air changes per hour (h^{-1}) = 360 h^{-1}
V	=	trench volume (m^3)
10^{-3}	=	conversion factor (L/cm^3)
10^4	=	conversion factor (cm^2/m^2)
3,600	=	conversion factor (seconds/hour)

Studies of urban canyons suggest that if the ratio of trench width, relative to wind direction and trench depth, is less than or equal to one, a circulation cell(s) will be created in the trench, limiting the degree of gas exchanged with the atmosphere. Thus, measured building ventilation rates lead to an assumption of two air changes per hour (ACH). If the width-to-depth ratio of the trench is greater than one, the air exchange between the trench and above-ground atmosphere is unrestricted, based on the ratio of trench depth to average wind speed, so the ACH is assumed to be 360. The exposure assessment in this HHRA assumes that the width-to-trench depth ratio is greater than one; thus, the ACH is set at 360.
K_i is calculated using the following equation:

$$K_i = 1/\{(1/k_iL) + [(RT)/(H_i\ k_iG)]\}$$

where:

K_i	=	containment's overall mass-transfer coefficient (cm/s)
k_iL	=	liquid-phase mass-transfer coefficient of i (cm/s)
R	=	ideal gas-constant (atm-m^3/mole-°K) = 8.2×10^{-5}
T	=	average system absolute-temperature (°K) (Default = 298°K)
H_i	=	Henry's Law Constant of i (atm-m^3/mole)
k_iG	=	gas-phase mass-transfer coefficient of i (cm/s)

Formulae for calculating k_iL and k_iG are as follows:

$$k_iL = (MWO_2/MW_i)^{0.5}\times(T/298)\times kL,O_2$$

where:

k_iL	=	liquid-phase mass-transfer coefficient of component i (cm/s)
MWO_2	=	molecular weight of oxygen (g/mole)
MW_i	=	molecular weight of component i (g/mole)
kL,O_2	=	liquid-phase mass-transfer coefficient of oxygen at 25°C (cm/s) = 0.002 cm/s

$$k_iG = (MWH_2O/MW_i)^{0.335}\times(T/298)^{1.005\times}kG,H_2O$$

where:

k_iG = gas-phase mass-transfer coefficient of component i (cm/s)

MWH_2O = molecular weight of water (g/mole)

kG,H_2O = gas-phase mass-transfer coefficient of water vapor at 25°C (cm/s) = 0.833 cm/s (USEPA, 1988)

Chemical properties were obtained from the USEPA RSL Table (2012a) and are presented in Table 3-5.

3.4.6 Assessing Cancer Risks from Early Life Exposures

USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b) recommends making adjustments to the toxicity of carcinogenic chemicals that act via the mutagenic mode of action when evaluating early-life exposures. The guidance recommends using age-dependent adjustment factors (ADAFs) combined with age-specific exposure estimates when assessing cancer risks. In the absence of chemical-specific data, the supplement guidance recommends the following default adjustments, which reflect the fact that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before 2 years of age (i.e., spanning a 2-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment.
- For exposures between 2 and 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until their sixteenth birthday), a three-fold adjustment.
- For exposures after turning 16 years of age, no adjustment.

The adjustments were applied using the same method as that used by ORNL in the development of RSLs. Children were evaluated as two age groups, ages 0 to 2 years and ages 2 to 6 years, and adults were evaluated as two age groups, ages 6 to 16, and ages greater than 16 years old. Using this approach, the intakes for child and adult recreational users and hypothetical residents were calculated as follows:

$$Intake_{Child} = Intake_{(ages\ 0-2\ years)} \times 10 + Intake_{(ages\ 2-6\ years)} \times 3$$

$$Intake_{Adult} = Intake_{(ages\ 6-16\ years)} \times 3 + Intake_{(ages > 16\ years)}$$

And the intakes for adolescent trespassers were calculated as follows:

$$Intake_{Adolescent} = Intake_{(age\ 6-16\ years)} \times 3$$

The above approach was used only for those COPCs that are identified as mutagenic in the RSL table (e.g., carcinogenic PAHs and hexavalent chromium). Sample calculations showing how this approach was applied are included in Appendix I.7.

4.0 TOXICITY ASSESSMENT

The toxicity assessment weighs the evidence regarding the potential for exposure to chemicals to produce adverse effects in exposed receptors and, when possible, the assessment estimates the relationship between the exposure to a chemical and the increased likelihood and/or severity of adverse effects. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects are defined for the identified constituents of concern. Quantitative toxicity values determined during this component of the risk assessment are integrated with exposure assessment outputs to characterize the potential occurrence of adverse health effects for each receptor group.

The reference dose (RfD) is the toxicity value used to evaluate noncarcinogenic health effects for ingestion and dermal exposures. The reference concentration (RfC) is used to evaluate noncarcinogenic health effects for inhalation exposures. The RfD and RfC estimate a daily exposure level for a human population that is unlikely to pose an appreciable risk during a portion or for all of a human lifetime. It is based on a review of animal and/or human toxicity data, with adjustments for various data uncertainties. Carcinogenic effects are quantified using the cancer slope factor (CSF) for ingestion and dermal exposures, and using inhalation unit risks (IUR) for inhalation exposure that are plausible upper-bound estimates of the probability of the development of cancer per unit intake of the chemical over a lifetime. These are typically based on dose-response data from human and/or animal studies.

4.1 Toxicity Criteria for Oral and Inhalation Exposures

Oral RfDs and CSFs and inhalation RfCs and IURs used in this HHRA were obtained from the following primary USEPA literature sources (2003):

- Tier 1 - Integrated Risk Information System (IRIS).

- Tier 2 - USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops PPRTVs on a chemical-specific basis when requested by USEPA's Superfund program.

- Tier 3 - Other Toxicity Values – These sources include but are not limited to California Environmental Protection Agency (Cal EPA) toxicity values, Agency for Toxic Substances and Disease Registry (ATSDR) values, and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b).

Although toxicity criteria can be found in several toxicological sources, USEPA's IRIS online database is the preferred source of toxicity values. This database is continuously updated, and the presented values have been verified by USEPA. The toxicity criteria for the constituents selected as COPCs are presented in Tables 4-1 through 4-4.

4.2 Toxicity Criteria for Dermal Exposure

RfDs and CSFs in the scientific literature are typically expressed as "administered" (i.e., not absorbed) doses. Therefore, these values are considered inappropriate for estimating risks associated with dermal exposures. Oral dose response parameters based on administered doses must be adjusted to absorbed doses before they can be compared to estimated dermal exposure intakes.

When oral absorption is essentially complete (i.e., 100 percent), an absorbed dose is equivalent to the administered dose, and therefore no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a chemical is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose; thus, toxicity factors based on absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (2004a) recommends a 50 percent absorption cut-off to reflect the intrinsic variability in analyzing absorption studies. Therefore, the adjustment from administered to absorbed dose was only performed when the chemical specific gastrointestinal absorption efficiency was less than 50 percent. The adjustment from administered to absorbed dose was made using chemical specific gastrointestinal absorption efficiencies published in numerous sources of guidance (e.g., 2004a [the primary reference], IRIS, ATSDR toxicological profiles, etc.), using the following equations:

$$RfD_{dermal} = (RfD_{oral})(ABS_{GI})$$

$$CSF_{dermal} = (CSF_{oral}) \; / \; (ABS_{GI})$$

where:
- ABS_{GI} = absorption efficiency in the gastrointestinal tract
- RfD_{dermal} = RfD for the dermal route of exposure
- RfD_{oral} = RfD for the oral route of exposure
- CSF_{dermal} = CSF for the dermal route of exposure
- CSF_{oral} = CSF of the oral route of exposure

As noted above, the preceding adjustment of the oral toxicity criteria (e.g., RfDs, CSFs) was necessary to allow quantitative evaluation of the dermal route of exposure in the baseline risk assessment. An explanation of this procedure and the need for this procedure are presented in Appendix A of USEPA RAGS Part A.

4.3 Toxicity Values for Construction Workers

Under the guidelines established by the Superfund program, exposures to construction workers of one year or less are classified as subchronic exposures. Risks for noncarcinogenic effects associated with subchronic exposures should incorporate toxicity values for subchronic and not chronic effects. Tables 4-1 and 4-2 display the available subchronic RfDs and RfCs that were used for the construction worker. Uncertainty associated with the lack of subchronic RfCs for many chemicals is discussed in Section 6.3.

4.4 Toxicity Criteria for Carcinogenic Effects of PAHs

Limited toxicity values are available to evaluate the carcinogenic effects from exposure to polycyclic aromatic hydrocarbons (PAHs). The most extensively studied PAH is benzo(a)pyrene, which is classified by the USEPA as a probable human carcinogen. Although CSFs are available for benzo(a)pyrene, insufficient data are available to calculate CSFs for other carcinogenic PAHs. Toxic effects for these chemicals were evaluated using toxic equivalency factors (TEFs) based on the potency of each compound relative to that of benzo(a)pyrene, as presented in current USEPA guidance (USEPA, 1993b). The TEFs are used to convert each individual carcinogenic PAH concentration into an equivalent concentration of benzo(a)pyrene.

Compound	TEF
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenzo(a,h)anthracene	1
Indeno(1,2,3-cd)pyrene	0.1

Carcinogenic PAHs acts via a mutagenic mode of action. USEPA Guidelines for Carcinogen Risk Assessment (2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. No chemical-specific ADAF is available for carcinogenic PAHs; therefore, USEPA's default ADAFs are applied to the carcinogenic intakes for the carcinogenic PAHs. The following default ADAFs were applied: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70.

4.5 Toxicity of Chromium

Toxicity criteria are available for different forms of chromium (trivalent and hexavalent), where the hexavalent form is considered to be more toxic. In the absence of speciating the chromium into its different valence states, it is conservatively assumed that the all the chromium exists in its hexavalent form. Hexavalent chromium has carcinogenic and noncarcinogenic toxicity factors. However, hexavalent chromium is a carcinogen that acts via a mutagenic mode of action. USEPA Guidelines for Carcinogen Risk Assessment (2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. No chemical-specific ADAF is available for hexavalent chromium; therefore, USEPA's default ADAFs are applied to the carcinogenic toxicity factors for hexavalent chromium. The following default ADAFs should be applied: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. Noncarcinogenic effects are evaluated like all noncarcinogens in accordance with USEPA's risk assessment guidance (1989).

4.7 Toxicity Criteria for Thallium

The USEPA RSL for thallium was derived using Provisional Peer Reviewed Toxicity Values. The oral reference dose presented in the RSL table for thallium was developed for the purpose of screening and is not appropriate for quantifying risks. Therefore, the oral reference dose for thallium was not used in this HHRA.

5.0 RISK CHARACTERIZATION

This section provides a characterization of human health risks associated with potential exposures to COPCs at the Site. Potential risks (non-carcinogenic and carcinogenic) for human receptors resulting from exposures outlined in the exposure assessment were quantitatively determined and are discussed in this section. Sections 5.1 and 5.2 outline the methods used to quantitatively estimate the type and magnitude of potential risks for human receptors. The risk characterizations conducted for each SWMU 18 subarea evaluated are presented in the RFI report sections prepared for each subarea.

5.1 Quantitative Analysis for Chemicals

Quantitative estimates of risk for chemicals were calculated according to risk assessment methods outlined in USEPA guidance (USEPA, 1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as ILCRs, based on CSFs and IURs. Non-carcinogenic risk estimates are presented in the form of HQs that are determined through a comparison of intakes with published RfDs and RfCs.

ILCR estimates for ingestion and dermal exposures were generated for each COPC using estimated exposure intakes and published CSFs, as follows:

$$ILCR = (\text{Estimated Exposure Intake})(CSF)$$

If the equation above produces an ILCR greater than 0.01, the following equation is used:

$$ILCR = 1-[\exp(-\text{Estimated Exposure Intake})(CSF)]$$

ILCRs estimates for inhalation exposures were generated for each COPC using estimated exposure concentrations and published IURs, as follows:

$$ILCR = (IUR)(\text{Exposure Concentration})(1000\ \mu g/mg)$$

An ILCR of 1×10^{-6} indicates that the exposed receptor has an one-in-one-million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million people.

Non-carcinogenic risks were assessed using the concept of HQs and hazard indices (HIs). The HQ for a COPC is the ratio of the estimated intake to the RfD and is calculated for ingestion and dermal exposures as follows:

HQ = (Estimated Exposure Intake)/(RfD)

For inhalation exposures, HQ is calculated as follows:

HQ = (Exposure Concentration)/(RfC)

An HI was generated by summing the individual HQs for all COPCs. The HI is not a mathematical prediction of the severity of toxic effects and therefore is not a true "risk"; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

5.2 Comparison of Quantitative Risk Estimates to Benchmarks

To interpret the quantitative risks and to aid risk managers in determining the need for remediation at a site, quantitative risk estimates were compared to typical risk benchmarks. Calculated ILCRs were interpreted using the USEPA's "target range" ($1x10^{-6}$ to $1x10^{-4}$). HIs were evaluated against a benchmark value of 1.0.

USEPA has defined the range of $1x10^{-6}$ to $1x10^{-4}$ as the ILCR "target risk range" for most hazardous waste facilities addressed under CERCLA and RCRA. IDEM has defined this same risk range for the nondefault evaluation under their RISC program. Individual or cumulative ILCRs greater than $1x10^{-4}$ will typically not be considered as protective of human health and ILCRs less than $1x10^{-6}$ will typically be regarded as protective. Risk management decisions are necessary when the ILCR is within the $1x10^{-4}$ to $1x10^{-6}$ cancer risk range.

An HI exceeding unity (1) indicates that there may be potential noncarcinogenic health risks associated with exposure. If an HI exceeds unity, a segregation of target organ effects associated with exposure to COPCs is typically performed. Only those chemicals that affect the same target organ(s) or exhibit similar critical effect(s) are regarded as truly additive. Consequently, it may be possible for a cumulative HI to exceed 1, but no adverse health effects are anticipated if the COPCs do not affect the same target organ or exhibit the same critical effect.

6.0 UNCERTAINTY ANALYSIS

Uncertainty is associated with all aspects of the HHRA. This section presents a generic summary of these uncertainties and discusses how they might affect the final risk numbers. A more detailed discussion of uncertainty is provided in each of the site-specific risk assessment sections.

Uncertainty in the selection of COPCs is related to the current status of the predictive databases, the grouping of samples, the numbers, types, and distributions of samples, and the procedures used to include or exclude constituents as COPCs. Uncertainty associated with the exposure assessment includes the values used as input variables for a given intake route or scenario, the assumptions made to determine exposure point concentrations, and the predictions regarding future land use and population characteristics. Uncertainty in the toxicity assessment includes the quality of the existing toxicity data needed to support dose-response relationships and the weight-of-evidence used to determine the carcinogenicity of COPCs. Uncertainty in risk characterization includes that associated with exposure to multiple chemicals and the cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment process.

Whereas there are various sources of uncertainty, the direction of uncertainty can be influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose-response relationships. Throughout the entire risk assessment, assumptions are biased toward a margin of safety so that the final calculated risks are overestimated.

Generally, risk assessments carry two types of uncertainty: measurement and informational uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements. For example, this type of uncertainty is associated with analytical data collected for each site. The risk assessment reflects the accumulated variances of the individual values used.

Informational uncertainty stems from inadequate availability of information needed to complete the toxicity and exposure assessments. Often, this gap is significant, such as the absence of information on the effects of human exposure to low doses of a chemical, on the biological mechanism of action of a chemical, or the behavior of a chemical in soil.

Once the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Reliance on results from a risk assessment without consideration of uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to account for uncertainties in the development of exposure assumptions, conservative estimates must be made to ensure that the particular assumptions made are protective of sensitive subpopulations or the maximum exposed individuals. If a number of conservative assumptions are combined in an exposure

model, the resulting calculations can propagate the uncertainties associated with those assumptions, thereby producing a much larger uncertainty for the final results. This uncertainty is biased toward over predicting both carcinogenic and noncarcinogenic risks. Thus, both the results of the risk assessment and the uncertainties associated with those results must be considered when making risk management decisions.

This interpretation is especially relevant when the risks exceed the point of departure for defining "acceptable" risk. For example, when risks calculated using a high degree of uncertainty are less than an acceptable risk level (i.e., $1x10^{-6}$ to $1x10^{-4}$), the interpretation of no significant risk is typically straightforward. However, when risks calculated using a high degree of uncertainty exceed an acceptable risk level (i.e., $1x10^{-4}$); a conclusion can be difficult unless uncertainty is considered.

6.1 UNCERTAINTY IN DATA EVALUATION

The most significant issues related to uncertainty in the data evaluation is the usability of the existing database, COPC screening levels used, the absence of screening levels for a few chemicals detected in site media, and the lack of background screening. A brief discussion of each of these issues is provided in this section.

Usability of Existing Databases

All the data used in the HHRA were validated as discussed in Section 3.0 of the RFI report. The qualification of data during the formal data validation process is not expected to compromise the results of the baseline human health risk assessment. Analytical data qualified as estimated were utilized, even though the reported positive concentrations or sample-specific quantitation limits may be somewhat imprecise. The use of estimated data adds to the uncertainty associated with the risk assessment; however, the associated uncertainty is expected to be negligible compared to the other uncertainties inherent in the risk evaluation process (i.e., uncertainties with land uses, exposure scenarios, toxicological criteria, etc.). Because all data have been validated, the uncertainty in the calculated risks associated with the data is minimal.

COPC Screening Levels

The use of risk-based screening values based on conservative land-use scenarios (i.e., residential land use for soil and ingestion of tap water for groundwater) corresponding to ILCRs of 10^{-6} and HIs of 0.1 ensured that all the significant contributors to risk from the site were evaluated. The elimination of chemicals present at concentrations that correspond to ILCRs less than 10^{-6} and HIs less than 0.1 should

not affect the final conclusions of the risk assessment because those chemicals are not expected to cause a potential health concern at the detected concentrations.

Chemicals without Established Screening Levels

Risk-based screening levels are currently not available for some constituents detected at the Site [e.g., acenaphthylene, benzo(g,h,i)perylene, and phenanthrene,]. For COPC screening, acenaphthene was used as a surrogate for acenaphthylene and pyrene was selected as a surrogate for benzo(g,h,i)perylene and phenanthrene. Applying toxicity values for one compound to another compound increases the uncertainty in the risk assessment both in regard to the selection of COPCs and the calculated risks. The direction of the uncertainty is not known.

6.2 Uncertainty in the Exposure Assessment

Uncertainty in the exposure assessment arises because of the methods used to calculate exposure point concentrations, the determination of land use conditions, the selection of receptors and scenarios, the estimation of exposure point concentrations, and the selection of exposure parameters. Each of these is discussed below.

Land Use

The current land use patterns at NSA Crane are well established, thereby limiting the uncertainty associated with land use assumptions. Land use at SWMU 18 is currently limited and is expected to be limited in the future, as long as NSA remains open (industrial workers and construction workers are the only current and likely future receptors). To be conservative, risks to potential and future recreational users, and hypothetical residents were estimated for the site.

Exposure Point Concentrations

Uncertainty is associated with the use of 95-percent UCLs on the mean concentration as EPCs. As a result of using 95-percent UCLs, the estimations of potential risk for the RME scenario were most likely overstated because UCLs represent the upper limit that potential receptors would be exposed to over the entire exposure period. In some cases (because the UCL was greater than the maximum concentration), the maximum concentration was used as the EPC. Use of the maximum concentration tends to overestimate potential risks because receptors are assumed to be exposed continuously to the maximum concentration for the entire exposure period.

EPCs for construction workers hypothetically exposed to VOCs migrating from shallow groundwater to air were estimated using a VDEQ model for exposure of construction workers to vapors accumulating in an

excavation trench. Site-specific parameters such as groundwater concentrations were used in the model. However, it was necessary to use model default values for most of the other input parameters. The use of model default values tended to increase the uncertainty in the calculated risks. The direction of the uncertainty was not known, although the model default values are generally conservative and tend to overestimate air concentrations.

Exposure Routes and Receptor Identification

The determination of various receptor groups and exposure routes of potential concern was based on current land use observed at the site and the anticipated future land use. Therefore, the uncertainty associated with the selection of exposure routes and potential receptors is minimal because they are considered to be well defined.

Exposure Parameters

Each exposure factor (for RME and CTE scenarios) selected for use in the risk assessment has some associated uncertainty. Generally, exposure factors are based on surveys of physiological parameters and lifestyle profiles across the United States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimation of exposure, in most cases, the USEPA guidelines (USEPA, 1991 and 1993a) on the RME receptor were used, which generally specify the use of the 95th percentile for most parameters. Therefore, the selected values for the RME receptor represent the upper bound of the observed or expected habits of the majority of the population.

Generally, the uncertainty can be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical analyses on human population characteristics. Often, the database used to summarize a particular exposure parameter (i.e., body weight) is quite large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report are selected from a distribution of possible values, including USEPA guidance (1991 and 1993b) and dermal guidance (USEPA, 1997a and 2004a). For the RME scenario, the value representing the 95th percentile is generally selected for each parameter to ensure that the assessment bounds the actual risks from a postulated exposure. This risk number is used in risk management decisions but does not indicate what a more average or typical exposure might be or what risk range might be expected for individuals in the exposed population.

To address these issues, USEPA (1992) has suggested the use of the CTE receptor, whose intake variables are often set at approximately the 50th percentile of the distribution. The risks for this receptor seek to incorporate the range of uncertainty associated with various intake assumptions. Some of the parameters presented in this risk assessment were estimated using professional judgment, although USEPA does provide limited guidance for the CTE evaluation (USEPA, 1993a).

6.3 Uncertainty in the Toxicological Evaluation

Uncertainties associated with the toxicity assessment (determination of RfDs and CSFs and use of available criteria) are presented in this section.

Derivation of Toxicity Criteria

Uncertainty associated with the toxicity assessment is associated with hazard assessment and dose-response evaluations for the COPCs. The hazard assessment deals with characterizing the nature and strength of the evidence of causation or the likelihood that a chemical that induces adverse effects in animals will also induce adverse effects in humans. Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination, using the USEPA methods. Positive animal cancer test data suggest that humans contain tissue(s) that may manifest a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans.

Uncertainty in hazard assessment arises from the nature and quality of the animal and human data. Uncertainty is reduced when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose related; when pharmacokinetic data indicate a similar fate in humans and animals; when postulated mechanisms of toxicity are similar for humans and animals; and when the chemical of concern is structurally similar to other chemicals for which the toxicity is more completely characterized.

Uncertainty in the dose-response evaluation includes the determination of a CSF for the carcinogenic assessment. Uncertainty is introduced from interspecies (animal to human) extrapolation, which, in the absence of quantitative pharmacokinetic or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate. Uncertainty also results from intraspecies variation. Most toxicity experiments are performed with animals that are very similar in age and genotype, so intragroup biological variation is minimal, but the human population of concern may reflect a great deal of heterogeneity, including unusual sensitivity or tolerance to the COPC. Even toxicity data from human occupational exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly (the "healthy worker effect") and those not unusually sensitive to the chemical are likely to be occupationally exposed. Finally, uncertainty arises from the quality of the key study from which the

quantitative estimate is derived and the database. For cancer effects, the uncertainty associated with dose-response factors is mitigated by assuming the 95 percent upper bound for the slope factor. Another source of uncertainty in carcinogenic assessment is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multistage model, which is used in nearly all quantitative estimations of human risk from animal data, is based on a nonthreshold assumption of carcinogenesis. Evidence suggests, however, that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are noncarcinogenic. Therefore, the use of the linearized multistage model is conservative for chemicals that exhibit a threshold for carcinogenicity.

Uncertainty Associated with Evaluation of the Dermal Exposure Pathway

According to RAGS Part E (, July 2004a), risks for dermal absorption of chemicals in soil are quantitatively evaluated for arsenic, cadmium, chlordane, 2,4-dichlorophenoxyacetic acid, DDT, TCDD (and other dioxins), gamma-BHC, PAHs, PCBs, pentachlorophenol, and SVOCs only because of the limited information guidance available to evaluate dermal exposure to other constituents. Therefore, risks from dermal exposure to metals and VOCs in soil (except for arsenic) were not quantified in the risk assessment. Consequently, potential risks may have been underestimated by excluding these constituents from the dermal risk assessment calculations.

Use of Chronic Toxicity Values for Construction Workers

Under the guidelines established by the Superfund program, exposures to construction workers of one year or less are classified as subchronic exposures. Risks for noncarcinogenic effects associated with subchronic exposures should incorporate toxicity values for subchronic and not chronic effects. Subchronic toxicity values are not as widely available as chronic values. Subchronic toxicity values used in this HHRA were obtained from USEPA's PPRTV internet site if available. Also ATSDR Minimal Risk Levels (MRLs) were used as subchronic toxicity values when PPRTV values were not available. Chronic toxicity values were used when subchronic toxicity values were not available. Using chronic toxicity criteria to evaluate subchronic exposures for construction workers tends to overestimate potential noncarcinogenic risks.

6.4 Uncertainty in the Risk Characterization

Uncertainty in risk characterization resulted from assumptions made regarding additivity of effects from exposure to multiple COPCs from various exposure routes. High uncertainty exists when summing noncancer risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Even when compounds affect the same target

organs, they may have different mechanisms of action or differ in their fate in the body, so additivity may not have been an appropriate assumption. However, the assumption of additivity was considered acceptable because in most cases it represented a conservative estimate of risk.

Risks to any individual may also have been overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may have been exposed via all pathways considered.

Also, the risk characterization did not consider antagonistic or synergistic effects. Little or no information was available to determine the potential for antagonism or synergism for the COPCs. Because chemical-specific interactions could not be predicted, the likelihood for risks to be over predicted or under predicted could not be defined, but the methodology used was based on current USEPA guidance.

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TABLE 2-1

SCREENING CRITERIA USED IN SELECTION OF COPCS - SOIL
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS No.	Chemical	USEPA Regional Screening Levels[1]		Indiana Department of Environmental Management[2]	
		Adjusted Direct Contact Residential	Protection of Groundwater	Residential	Migration to Groundwater
Volatile Organic Compounds (mg/kg)					
78-93-3	2-Butanone	2,800 N	20	28,000 S	21 N
67-64-1	Acetone	6,100 N	48	85,000 N	49 N
71-43-2	Benzene	1.1 C	0.004	15 C	0.051 M
110-82-7	Cyclohexane	700 N	260	120 S	270 N
100-41-4	Ethylbenzene	5.4 C	0.03	76 C	16 M
108-87-2	Methyl Cyclohexane	NA	NA	NA	NA
75-09-2	Methylene Chloride	36 N[3]	0.05	150 C	0.025 M
108-88-3	Toluene	500 N	11.8	820 S	14 M
1330-20-7	Total Xylenes	63 N	3.8	260 S	200 M
79-01-6	Trichloroethene	0.44 N[3]	0.0032	6.2 N	0.036 M
Semivolatile Organic Compounds (mg/kg)					
91-57-6	2-Methylnaphthalene	31 N	2.8	370 S	2.8 N
83-32-9	Acenaphthene	340 N	82	4,800 N	82 N
208-96-8	Acenaphthylene	340 N[4]	82 [4]	NA	NA
120-12-7	Anthracene	1,700 N	840	24,000 N	860 N
56-55-3	Benzo(a)anthracene	0.15 C	0.2	2.1 C	2.1 C
50-32-8	Benzo(a)pyrene	0.015 C	0.07	0.21 C	4.7 M
205-99-2	Benzo(b)fluoranthene	0.15 C	0.7	2.1 C	7 C
191-24-2	Benzo(g,h,i)perylene	170 N[5]	190 [5]	NA	NA
207-08-9	Benzo(k)fluoranthene	1.5 C	7	21 C	68 C
218-01-9	Chrysene	15 C	22	210 C	210 C
206-44-0	Fluoranthene	230 N	1,400	3,200 N	1,400 N
193-39-5	Indeno(1,2,3-cd)pyrene	0.15 C	2.4	2.1 C	23 C
91-20-3	Naphthalene	3.6 C	0.0094	50 C	0.092 C
85-01-8	Phenanthrene	170 N[5]	190 [5]	NA	NA
129-00-0	Pyrene	170 N	190	2,400 N	190 N
Explosives (mg/kg)					
99-35-4	1,3,5-Trinitrobenzene	220 N	34	3,100 N	33 N
99-65-0	1,3-Dinitrobenzene	0.61 N	0.028	8.5 N	0.027 N
118-96-7	2,4,6-Trinitrotoluene	3.6 N[4]	0.26	50 N	0.89 N
121-14-2	2,4-Dinitrotoluene	1.6 C	0.0056	22 C	0.054 C
Explosives (mg/kg) (Continued)					
98-95-3	Nitrobenzene	4.8 C	0.00158	67 C	0.016 C
121-82-4	RDX	5.6 C	0.0046	78 C	0.046 C
479-45-8	Tetryl	24 N	11.8	340 N	12 N
Polychlorinated Biphenyls (mg/kg)					
12674-11-2	Aroclor-1016	0.39 N	1.84	5.5 N	2.1 N
11096-82-5	Aroclor-1260	0.22 C	0.48	3.1 C	4.8 C
Metals (mg/kg)					
7429-90-5	Aluminum	7,700 N	460,000	100,000 L	1,000,000 R
7440-38-2	Arsenic	0.39 C	0.026	5.5 C	5.9 M
7440-39-3	Barium	1,500 N	2,400	21,000 N	1,700 M
7440-41-7	Beryllium	16 N	260	220 N	63 M
7440-43-9	Cadmium	7 N	10.4	98 N	7.5 M
7440-70-2	Calcium	NA	NA	NA	NA
7440-47-3	Chromium	0.29 C[6]	0.0118 [6]	4.1 C[6]	0.12 C[6]
7440-48-4	Cobalt	2.3 N	4.2	32 N	4.3 N
7440-50-8	Copper	310 N	440	4,300 N	920 M

TABLE 2-1

SCREENING CRITERIA USED IN SELECTION OF COPCS - SOIL
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS No.	Chemical	USEPA Regional Screening Levels[1]		Indiana Department of Environmental Management[2]	
		Adjusted Direct Contact Residential	Protection of Groundwater	Residential	Migration to Groundwater
Metals (mg/kg) (Continued)					
7439-89-6	Iron	5,500 N	5,400	77,000 N	5,600 N
7439-92-1	Lead	400	280 [7]	400	270 M
7439-95-4	Magnesium	NA	NA	NA	NA
7439-96-5	Manganese	180 N	420	2,500 N	420 N
7439-97-6	Mercury	2.3 N[8]	0.66	32 N[8]	2.1 M
7440-02-0	Nickel	150 N	400	2,100 N	17,000 N
7440-09-7	Potassium	NA	NA	NA	NA
7440-28-0	Thallium	0.078 N	0.22	1.1 N	2.9 M
7440-62-2	Vanadium	39 N	1,560	NA	NA
7440-66-6	Zinc	2,300 N	5,800	32,000 N	NA
Total Petroleum Hydrocarbons (mg/kg)					
- -	DRO (C08-C28)	NA	NA	3,100	230
- -	DRO (C08-C34)	NA	NA	3,100	230

Notes:

1 - USEPA Regional Screening Level (RSL), May 2012. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$. The noncarcinogenic values are the RSL divided by 10 to correspond to a Target Hazard Quotient of 0.1. Protection of groundwater values are risk-based SSLs and have been multiplied by 20 to represent a dilution attenuation factor of 20.
2 - IDEM Closure Guide, March 22,2012.
3 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
4 - Value is for acenaphthene.
5 - Value is for pyrene.
6 - Value is for hexavalent chromium.
7 - Value is MCL based soil screening level.
8 - Value is for mercuric chloride (and other mercury salts).

C - Carcinogenic.
CAS = Chemical Abstract Service.
IDEM = Indiana Department of Environmental Management.
M - Maximum contaminant level.
mg/kg = Milligram per kilogram.
N - Noncarcinogenic.
R = Capped at 1,000,000 mg/kg.
S = Soil saturation limit.
SSL = Soil screening level.
ug/kg = Microgram per kilogram.
USEPA = United States Environmental Protection Agency.

TABLE 2-2

SCREENING CRITERIA USED IN SELECTION OF COPCS - GROUNDWATER
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS No.	Parameter	Adjusted USEPA Regional Screening Level[1] Tap Water	USEPA Maximum Contaminant Level[2]	Adjusted USEPA Groundwater Volatilization Criteria[3]	IDEM Groundwater[4]	
					Tap Water	Vapor Exposure
Volatile Organic Compounds (ug/L)						
71-43-2	Benzene	0.039 C	5	1.4 C	5 M	24 C
74-87-3	Chloromethane	19 N	NA	26 N	190 N	NA
108-88-3	Toluene	86 N	1,000	1,900 N	1,000 M	NA
Metals (ug/L)						
7440-38-2	Arsenic	0.045 C	10	NA	10 M	NA
7440-39-3	Barium	290 N	2,000	NA	2,000 M	NA
7440-43-9	Cadmium	0.69 N	5	NA	5 M	NA
7440-47-3	Chromium	0.031 C[5]	100 [6]	NA	0.031 M[5]	NA
7782-49-2	Selenium	7.8 N	50	NA	50 M	NA

1 - USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May, 2012. [Cancer benchmark value = 1E-06, Hazard index (HI) = 0.1].
2 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
3 - USEPA Vapor Intrusion Screening Level (VISL) Calculator, Version 2.0. May 2012 RSLs. Values correspond to a target cancer risk level of 1E-6 or HI = 0.1 and an attenuation factor of 0.001.
4 - IDEM Closure Guide, March 22,2012.
5 - Values are for hexavalent chromium.
6 - Value is for total chromium.

C = Carcinogenic.
CAS = Chemical Abstract Service.
M = Maximum Contaminant Level.
N = Noncarcinogenic.
SDWA = Safe Water Drinking Act.
ug/L = Microgram per liter.
USEPA = United States Environmental Protection Agency.

TABLE 2-3

SCREENING CRITERIA USED IN SELECTION OF COPCS - SURFACE WATER
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS No.	Parameter	Adjusted USEPA Regional Screening Level[1] Tap Water	USEPA Maximum Contaminant Level[2]	IDEM Groundwater Residential[3]
Explosives (ug/L)				
88-72-2	2-Nitrotoluene	0.27 C	NA	2.7 C
19406-51-0	4-Amino-2,6-Dinitrotoluene	3 N	NA	30 N
2691-41-0	HMX	78 N	NA	780 N
121-82-4	RDX	0.61 C	NA	6.1 C
Metals (ug/L)				
7429-90-5	Aluminum	1,600 N	NA	16,000 N
7440-39-3	Barium	290 N	2,000	2,000 M
7440-43-9	Cadmium	0.69 N	5	5 M
7440-70-2	Calcium	NA	NA	NA
7440-47-3	Chromium	0.031 C[4]	100	100 M
7440-50-8	Copper	62 N	1,300 [5]	1,300 M
7439-89-6	Iron	1,100 N	NA	11,000 N
7439-92-1	Lead	15	15 [5]	15 M
7439-95-4	Magnesium	NA	NA	NA
7439-96-5	Manganese	32 N	NA	320 N
7440-02-0	Nickel	30 N	NA	300 N
7440-09-7	Potassium	NA	NA	NA
7440-23-5	Sodium	NA	NA	NA
7440-66-6	Zinc	470 N	NA	4,700 N
Miscellaneous Parameters (mg/L)				
- -	Ammonia-N	NA	NA	NA

1 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November, 2011. [Cancer benchmark value = 1E-06, Hazard index (HI) = 0.1].
2 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
3 - IDEM Closure Guide, March 22,2012.
4 - Values are for hexavalent chromium.
5 - The MCL for this parameter is actually a treatment technique. The SDWA action level (at the tap) has been presented.

C = Carcinogenic.
CAS = Chemical Abstract Service.
M = Maximum Contaminant Level.
N = Noncarcinogenic.
SDWA = Safe Water Drinking Act.
ug/L = Microgram per liter.
USEPA = United States Environmental Protection Agency.

TABLE 2-4

SCREENING CRITERIA USED IN SELECTION OF COPCS - SEDIMENT
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

CAS No,	Chemical	Adjusted USEPA RSL Direct Contact Residential[1]	IDEM Soil Direct[2]
Semivolatile Organic Compounds (mg/kg)			
91-57-6	2-Methylnaphthalene	31 N	370 S
83-32-9	Acenaphthene	340 N	4,800 N
208-96-8	Acenaphthylene	340 N[3]	NA
120-12-7	Anthracene	1,700 N	24,000 N
56-55-3	Benzo(a)anthracene	0.15 C	2.1 C
50-32-8	Benzo(a)pyrene	0.015 C	0.21 C
205-99-2	Benzo(b)fluoranthene	0.15 C	2.1 C
191-24-2	Benzo(g,h,i)perylene	170 N[4]	NA
207-08-9	Benzo(k)fluoranthene	1.5 C	21 C
218-01-9	Chrysene	15 C	210 C
53-70-3	Dibenzo(a,h)anthracene	0.015 C	0.21 C
206-44-0	Fluoranthene	230 N	3,200 N
193-39-5	Indeno(1,2,3-cd)pyrene	0.15 C	2.1 C
85-01-8	Phenanthrene	170 N[4]	NA
129-00-0	Pyrene	170 N	2,400 N
Explosives (mg/kg)			
121-82-4	RDX	5.6 C	78 C
479-45-8	Tetryl	24 N	340 N
Metals (mg/kg)			
7429-90-5	Aluminum	7,700 N	100,000 L
7440-38-2	Arsenic	0.39 C	5.5 C
7440-39-3	Barium	1,500 N	21,000 N
7440-41-7	Beryllium	16 N	220 N
7440-43-9	Cadmium	7 N	98 N
7440-70-2	Calcium	NA	NA
7440-47-3	Chromium	0.29 C[5]	4.1 C[5]
7440-48-4	Cobalt	2.3 N	32 N
7440-50-8	Copper	310 N	4,300 N
7439-89-6	Iron	5,500 N	77,000 N
7439-92-1	Lead	400	400
7439-95-4	Magnesium	NA	NA
7439-96-5	Manganese	180 N	2,500 N
7439-97-6	Mercury	2.3 N[6]	3.1 S
7440-02-0	Nickel	150 N	2,100 N
7440-09-7	Potassium	NA	NA
7440-28-0	Thallium	0.078 N	1.1 N
7440-62-2	Vanadium	39 N	NA
7440-66-6	Zinc	2,300 N	32,000 N
Total Petroleum Hydrocarbons (mg/kg)			
- -	DRO (C08-C28)	NA	3,100
- -	DRO (C08-C34)	NA	3,100

TABLE 2-4

SCREENING CRITERIA USED IN SELECTION OF COPCS - SEDIMENT
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Notes:

1 - USEPA Regional Screening Level (RSL), May 2012. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$. The noncarcinogenic values are the RSL divided by 10 to correspond to a Target Hazard Quotient of 0.1.
2 - IDEM Closure Guide, March 22,2012.
3 - Value is for acenaphthene
4 - Value is for pyrene.
5 - Value is for hexavalent chromium.
6 - Value is for mercuric chloride (and other mercury salts).

C - Carcinogenic.
CAS = Chemical Abstract Service.
IDEM = Indiana Department of Environmental Management.
L = Capped at 100,000 mg/kg.
mg/kg = Milligram per kilogram.
N - Noncarcinogenic.
S = Soil saturation limit.
USEPA = United States Environmental Protection Agency.

TABLE 3-1

RECEPTORS AND EXPOSURE ROUTES FOR QUANTITATIVE EVALUATION
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA

Receptors	Exposure Routes
Construction Workers (current/future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust emissions • Groundwater dermal contact (during excavation) • Groundwater inhalation of volatile organics (during excavation)
Industrial Worker (current/future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust emissions
Adolescent Trespassers (6 to 17 years) (current/future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust emissions • Surface water/sediment dermal contact • Surface water/sediment incidental ingestion
Small Child (0 to 6 years) and Adult Recreational Users (future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust emissions • Surface water/sediment dermal contact • Surface water/sediment incidental ingestion
Residents (Adult/Children) (future land use)	• Soil incidental ingestion • Soil dermal contact • Inhalation of air/dust emissions • Ingestion of groundwater • Groundwater dermal contact (showering/bathing) • Inhalation of volatiles in groundwater (showering/bathing) • Surface water/sediment dermal contact • Surface water/sediment incidental ingestion

TABLE 3-2

SUMMARY OF EXPOSURE INPUT PARAMETERS - REASONABLE MAXIMUM EXPOSURES
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA

Parameter Code	Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	On-Site Child Resident	On-Site Adult Resident
All Exposures								
C_{soil}	Exposure concentration for soil (mg/kg)	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
ED	Exposure Duration (years)	1[2]	25[3]	10[4]	6[3]	24[3]	6[3]	24[3]
BW	Body Weight (kg)	70[5]	70[3]	43[5]	15[3]	70[3]	15[3]	70[3]
AT-N	Averaging Time (Non-Cancer) (days)	365[5]	9,125[5]	3,650[5]	2,190[5]	8,760[5]	2,190[5]	8,760[5]
AT-C	Averaging Time (Cancer) (days)	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]
Incidental Ingestion/Dermal Contact with Soil								
IR	Ingestion Rate (mg/day)	330[6]	100[3]	100[3]	200[3]	100[3]	200[3]	100[3]
EF	Exposure Frequency (days/year)	150[7]	250[3]	26[8]	52[9]	52[9]	350[3]	350[3]
FI	Fraction Ingested (unitless)	1[6]	1[3]	1[3]	0.5[2]	0.5[2]	1[3]	1[3]
SA	Skin Surface Available for Contact (cm^2)	3,300[6]	3,300[10]	3,280[11]	2,800[10]	5,700[10]	2,800[10]	5,700[10]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.3[6]	0.2[10]	0.2[10]	0.2[10]	0.07[10]	0.2[10]	0.07[10]
ABS	Absorption Factor (unitless)	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil								
C_{air}	Exposure concentration for air (mg/m^3)	calculated[6]	calculated[6]	calculated[6]	calculated[6]	calculated[6]	calculated[6]	calculated[6]
ET	Exposure Time (hours/day)	8[6]	8[6]	4[2]	4[2]	4[2]	24[6]	24[6]
EF	Exposure Frequency (days/year)	150[7]	250[3]	26[8]	52[9]	52[9]	350[3]	350[3]
PEF	Particulate Emission Factor (m^3/kg)	1.34E+06[6]	1.316E+09[6,12]	1.316E+09[6,12]	1.316E+09[6,12]	1.316E+09[6,12]	1.316E+09[6,12]	1.316E+09[6,12]
Ingestion/Dermal Contact with Groundwater								
C_{gw}	Exposure concentration for groundwater (ug/L)	95% UCL[1]	NA	NA	NA	NA	95% UCL[1]	95% UCL[1]
IR	Ingestion Rate (L/day)	NA	NA	NA	NA	NA	1.5[18]	2[5]
EF	Exposure Frequency (days/year)	30[13]	NA	NA	NA	NA	350[3]	350[3]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	4[13]	NA	NA	NA	NA	1[10]	0.58[10]
EV	Event Frequency (events/day)	1[13]	NA	NA	NA	NA	1[2]	1[2]
SA	Skin Surface Available for Contact (cm^2)	3,300[6]	NA	NA	NA	NA	6,600[10]	18,000[10]
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	chemical-specific[10]	NA	NA	NA	NA	chemical-specific[10]	chemical-specific[10]
Inhalation of Volatile Emissions from Groundwater								
C_{air}	Exposure concentration for air (mg/m^3)	calculated[15]	NA	NA	NA	NA	Calculated[16]	Calculated[16]
ET	Exposure Time (hours/day)	4[2]	NA	NA	NA	NA	NA	NA
EF	Exposure Frequency (days/year)	30[8]	NA	NA	NA	NA	350[3]	350[3]
VF	Volatilization Factor (L/m^3)	calculated[15]	NA	NA	NA	NA	NA	NA

TABLE 3-2

SUMMARY OF EXPOSURE INPUT PARAMETERS - REASONABLE MAXIMUM EXPOSURES
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA

Parameter Code	Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	On-Site Child Resident	On-Site Adult Resident
Ingestion/Dermal Contact with Surface Water								
C_{sw}	Exposure concentration for surface water (ug/L)	NA	NA	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
CR	Contact Rate (L/hr)	NA	NA	0.01[17]	0.01[17]	0.01[17]	0.01[17]	0.01[17]
EF	Exposure Frequency (days/year)	NA	NA	26[8]	52[9]	52[9]	52[9]	52[9]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	NA	NA	4[2]	4[2]	4[2]	4[2]	4[2]
EV	Event Frequency (events/day)	NA	NA	1[2]	1[2]	1[2]	1[2]	1[2]
SA	Skin Surface Available for Contact (cm^2)	NA	NA	3,280[11]	2,800[10]	5,700[10]	2,800[10]	5,700[10]
CF	Conversion Factor (L/m^3)	NA	NA	1E-03	1E-03	1E-03	1E-03	1E-03
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	NA	NA	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
Incidental Ingestion/Dermal Contact with Sediment								
C_{sed}	Exposure concentration for sediment (mg/kg)	NA	NA	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
IR	Ingestion Rate (mg/day)	NA	NA	100[3]	200[3]	100[3]	200[3]	100[3]
EF	Exposure Frequency (days/year)	NA	NA	26[8]	52[9]	52[9]	52[9]	52[9]
FI	Fraction Ingested (unitless)	NA	NA	1[5]	0.5[2]	0.5[2]	0.5[2]	0.5[2]
SA	Skin Surface Available for Contact (cm^2)	NA	NA	3,280[11]	2,800[10]	5,700[10]	2,800[10]	5,700[10]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	NA	NA	0.2[10]	0.2[10]	0.07[10]	0.2[10]	0.07[10]
ABS	Absorption Factor (unitless)	NA	NA	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF	Conversion Factor (kg/mg)	NA	NA	1E-06	1E-06	1E-06	1E-06	1E-06

Notes:

1 - USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional judgment.
3 - USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.
4 - Adolescents ages 7 to 16 years old.
5 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
6 - USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
7 - Assumes a 30 week construction project over one year.
8 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.
9 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.
10 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
11 - Assume 25 percent of total body surface area is exposed, USEPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
12 - IDEM RISC Technical Guide – January 31, 2006 Appendix 1 (Revised May 1, 2009).
13 - Professional judgment. Assumes construction workers are only exposed to groundwater water during part of the construction project.
14 - Assume 50 percent of total body surface area is exposed, USEPA, 2004.
15 - VDEQ February 2012. Virginia Department of Environmental Quality (VDEQ, online - http://www.deq.state.va.us/vrprisk/homepage.html).
16 - Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.
17 - USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.
18 - USEPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

TABLE 3-3

SUMMARY OF EXPOSURE INPUT PARAMETERS - CENTRAL TENDENCY EXPOSURES
SWMU 18 – LOAD AND FILL AREA
NSA CRANE
CRANE INDIANA

Parameter Code	Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	On-Site Child Resident	On-Site Adult Resident
All Exposures								
C_{soil}	Exposure concentration for soil (mg/kg)	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
ED	Exposure Duration (years)	1[2]	9[3]	10[4]	2[3]	7[3]	2[3]	7[3]
BW	Body Weight (kg)	70[5]	70[3]	43[3]	15[3]	70[3]	15[3]	70[3]
AT-N	Averaging Time (Non-Cancer) (days)	365[5]	3,285[5]	3,650[5]	730[5]	2,555[5]	730[5]	2,555[5]
AT-C	Averaging Time (Cancer) (days)	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]	25,550[5]
Incidental Ingestion/Dermal Contact with Soil								
IR	Ingestion Rate (mg/day)	165[6]	50[3]	50[3]	100[3]	50[3]	100[3]	50[3]
EF	Exposure Frequency (days/year)	75[6]	219[3]	13[7]	26[8]	26[8]	234[3]	234[3]
FI	Fraction Ingested (unitless)	1[9]	1[3]	1[3]	0.5[2]	0.5[2]	1[3]	1[3]
SA	Skin Surface Available for Contact (cm^2)	3,300[9]	3,300[10]	3,280[11]	2,800[10]	5,700[10]	2,800[10]	5,700[10]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.1[10]	0.02[10]	0.04[10]	0.04[10]	0.01[10]	0.04[10]	0.01[10]
ABS	Absorption Factor (unitless)	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil								
C_{air}	Exposure concentration for air (mg/m^3)	calculated[9]	calculated[9]	calculated[9]	calculated[9]	calculated[9]	calculated[9]	calculated[9]
ET	Exposure Time (hours/day)	8[12]	8[12]	2[6]	2[6]	2[6]	24[9]	24[9]
EF	Exposure Frequency (days/year)	75[6]	219[3]	13[7]	26[8]	26[8]	234[3]	234[3]
PEF	Particulate Emission Factor (m^3/kg)	1.34E+06[9]	1.316E+09[9,13]	1.316E+09[9,13]	1.316E+09[9,13]	1.316E+09[9,13]	1.316E+09[9,13]	1.316E+09[9,13]
Ingestion/Dermal Contact with Groundwater								
C_{gw}	Exposure concentration for groundwater (ug/L)	95% UCL[1]	NA	NA	NA	NA	95% UCL[1]	95% UCL[1]
IR	Ingestion Rate (L/day)	NA	NA	NA	NA	NA	1.5[14]	2[5]
EF	Exposure Frequency (days/year)	15[6]	NA	NA	NA	NA	234[3]	234[3]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	4[6]	NA	NA	NA	NA	0.33[10]	0.25[10]
EV	Event Frequency (events/day)	1[2]	NA	NA	NA	NA	1[2]	1[2]
SA	Skin Surface Available for Contact (cm^2)	3,300[9]	NA	NA	NA	NA	6,600[10]	18,000[10]
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	chemical-specific[10]	NA	NA	NA	NA	chemical-specific[10]	chemical-specific[10]
Inhalation of Volatile Emissions from Groundwater								
C_{air}	Exposure concentration for air (mg/m^3)	calculated[15]	NA	NA	NA	NA	Calculated[16]	Calculated[16]
ET	Exposure Time (hours/day)	4[6]	NA	NA	NA	NA	NA	NA
EF	Exposure Frequency (days/year)	15[6]	NA	NA	NA	NA	350[3]	350[3]
VF	Volatilization Factor (L/m^3)	calculated[15]	NA	NA	NA	NA	NA	NA

TABLE 3-3

SUMMARY OF EXPOSURE INPUT PARAMETERS - CENTRAL TENDENCY EXPOSURES
SWMU 18 – LOAD AND FILL AREA
NSA CRANE
CRANE INDIANA

Parameter Code	Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	On-Site Child Resident	On-Site Adult Resident
Ingestion/Dermal Contact with Surface Water								
C_{sw}	Exposure concentration for surface water (ug/L)	NA	NA	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
CR	Contact Rate (L/hr)	NA	NA	0.01[17]	0.01[17]	0.01[17]	0.01[17]	0.01[17]
EF	Exposure Frequency (days/year)	NA	NA	13[7]	26[8]	26[8]	26[8]	26[8]
ET/t_{event}	Exposure Time (hours/day)/ Event Duration (hours/event)	NA	NA	2[6]	2[6]	2[6]	2[6]	2[6]
EV	Event Frequency (events/day)	NA	NA	1[2]	1[2]	1[2]	1[2]	1[2]
SA	Skin Surface Available for Contact (cm^2)	NA	NA	3,280[11]	2,800[10]	5,700[10]	2,800[10]	5,700[10]
CF	Conversion Factor (L/m^3)	NA	NA	1E-03	1E-03	1E-03	1E-03	1E-03
	Kp (cm/hour), t* (hour/event), τ (hour), and B (unitless)	NA	NA	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
Incidental Ingestion/Dermal Contact with Sediment								
C_{sed}	Exposure concentration for sediment (mg/kg)	NA	NA	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]	95% UCL[1]
IR	Ingestion Rate (mg/day)	NA	NA	50[3]	100[3]	50[3]	100[3]	50[3]
EF	Exposure Frequency (days/year)	NA	NA	13[7]	26[8]	26[8]	26[8]	26[8]
FI	Fraction Ingested (unitless)	NA	NA	1[5]	0.5[2]	0.5[2]	0.5[2]	0.5[2]
SA	Skin Surface Available for Contact (cm^2)	NA	NA	3,280[11]	2,800[10]	5,700[10]	2,800[10]	5,700[10]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	NA	NA	0.04[10]	0.04[10]	0.01[10]	0.04[10]	0.01[10]
ABS	Absorption Factor (unitless)	NA	NA	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]	chemical-specific[10]
CF	Conversion Factor (kg/mg)	NA	NA	1E-06	1E-06	1E-06	1E-06	1E-06

Notes:
1 - USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional judgment.
3 - USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
4 - Adolescents ages 7 to 16 years old.
5 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
6 - Central tendency exposure is assumed to be one-half the reasonable maximum exposure value.
7 - Assume 1 day a week in warm weather months for RME and every other week for CTE.
8 - Assume 2 days a week in warm weather months for RME and one day a week for CTE.
9 - U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
10 - US EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
11 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
12 - Assume an 8-hour work shift.
13 - IDEM RISC Technical Guide – January 31, 2006 Appendix 1 (Revised May 1, 2009).
14 - Assume that head, arms, hands, lower legs, and feet are exposed (USEPA, 1997).
15 - VDEQ February 2012. Virginia Department of Environmental Quality (VDEQ, online - http://www.deq.state.va.us/vrprisk/homepage.html).
16 - Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.
17 - Assume 50 percent of total body surface area is exposed, USEPA, 2004.

TABLE 3-4
INTERMEDIATE VARIABLES FOR CALCULATING DA(EVENT)
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern	Media	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Volatile Organic Compounds												
Benzene	Groundwater	0	1	1.5E-02	cm/hr	(1)	hr	2.9E-01	hr	7.0E-01	hr	5.1E-02
Semivolatile Organic Compounds												
Benzo(a)pyrene	Soil, Sediment	0.13	NA(1)	NA(1)	cm/hr	(1)	hr	NA(1)	hr	NA(1)	hr	NA(2)
Benzo(b)fluoranthene	Soil, Sediment	0.13	NA(1)	NA(1)	cm/hr	(1)	hr	NA(1)	hr	NA(1)	hr	NA(2)
Dibenzo(a,h)anthracene	Soil, Sediment	0.13	NA(1)	NA(1)	cm/hr	(1)	hr	NA(1)	hr	NA(1)	hr	NA(2)
Explosives												
RDX	Soil, Surface Water	0.015	1	3.4E-04	cm/hr	(1)	hr	1.8E+00	hr	4.4E+00	hr	1.9E-03
Inorganics												
Arsenic	Soil, Groundwater, Sediment	0.03	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Barium	Soil	0	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Cadmium	Soil, Groundwater	0.001	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Chromium VI	Soil, Groundwater, Surface Water, Sediment	0	1	2.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Cobalt	Soil, Sediment	0	1	4.0E-04	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Iron	Soil, Sediment	0	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Manganese	Soil, Sediment	0	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Thallium	Soil, Sediment	0	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA

Notes:
All values from EPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, July 2004.
1 - See Tables 3-2 and 3-3 for values for T(event).
2 - RAGS Part E recommends not attempting to quantify risk because contaminants are outside the effective predictive domain of the model.
FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
T(event) = Event Duration
Tau = Lag Time
T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis
NA = Not applicable.

TABLE 3-5
CHEMICAL PROPERTIES FOR VOLATILIZATION FROM SOIL/GROUNDWATER TO OUTDOOR AIR MODELS
SMWU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Molecular Weight (g/mole)	Organic Carbon Partition Coefficient (cm^3/g)	Air Diffusivity (cm^2/sec)	Water Diffusivity (cm^2/sec)	Solubility Limit (mg/L)	Henry's Law Constant	
						(Dimensionless)	($atm\text{-}m^3/mol$)
Benzene	7.81E+01	1.46E+02	8.95E-02	1.03E-05	1.79E+03	2.27E-01	5.55E-03

Source:
USEPA 2012: USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May.

TABLE 4-1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 18 - LOAD AND FILL AREA
NSA 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(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds										
Benzene	Subchronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Blood	100/1	PPRTV	9/29/2009
	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Blood	300/1	IRIS	11/26/2012
Semivolatile Organic Compounds										
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives										
RDX	Chronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Prostate	100/1	IRIS	11/26/2012
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	11/26/2012
Barium	Subchronic	2.0E-01	mg/kg/day	0.07	1.4E-02	mg/kg/day	Kidney	300/1	ATSDR	8/2007
	Chronic	2.0E-01	mg/kg/day	0.07	1.4E-02	mg/kg/day	Kidney	300/1	IRIS	11/26/2012
Cadmium	Chronic	5.0E-04	mg/kg/day	0.05	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	11/26/2012
Chromium[3]	Subchronic	2.0E-02	mg/kg/day	0.025	5.0E-04	mg/kg/day	None Reported	100/3	HEAST	9/97
	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	None Reported	300/3	IRIS	11/26/2012
Cobalt	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	300/1	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	8/25/2008
Iron	Subchronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
Manganese[4]	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	Central Nervous System	1	IRIS	11/26/2012
Thallium[5]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Values are for hexavalent chromium.

4 - Adjusted IRIS value in accordance with IRIS.

5 - Toxicity criteria used to derive the RSLs is only suitable for screening and is not to be used for quantifying risks.

Definitions:

CVS = Cardiovascular system

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not Available.

ATSDR = Agency for Toxic Substances and Disease Registry.

PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE 4-2

NON-CANCER TOXICITY DATA -- INHALATION
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds									
Benzene	Subchronic	8.0E-02	mg/m3	2.3E-02	(mg/kg/day)	Blood	100/1	PPRTV	9/29/2009
	Chronic	3.0E-02	mg/m3	8.6E-03	(mg/kg/day)	Blood	300/1	IRIS	11/26/2012
Semivolatile Organic Compounds									
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives									
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics									
Arsenic	Chronic	1.5E-05	mg/m3	4.3E-06	(mg/kg/day)	Skin, Cardiovascular System	NA	Cal EPA	9/2009
Barium	Subchronic	5.0E-03	mg/m3	1.4E-03	(mg/kg/day)	Fetotoxicity	100	HEAST	7/1997
	Chronic	5.0E-04	mg/m3	1.4E-04	(mg/kg/day)	Fetotoxicity	1000	HEAST	7/1997
Cadmium	Chronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Kidney, Respiratory	NA	Cal EPA	9/2009
Chromium[2]	Chronic	1.0E-04	mg/m3	2.9E-05	(mg/kg/day)	Respiratory	300/1	IRIS	11/26/2012
Cobalt	Subchronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Respiratory	100/1	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m3	1.7E-06	(mg/kg/day)	Respiratory	300/1	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	Central Nervous System	1000/1	IRIS	11/26/2012
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg

2 - Values are for hexavalent chromium.

Definitions:

IRIS = Integrated Risk Information System

NA = Not Applicable

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

HEAST = Health Effects Assessment Summary Tables

PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE 4-3

CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 18 - LOAD AND FILL AREA
NSA 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(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Benzene	5.5E-02	$(mg/kg/day)^{-1}$	1	5.5E-02	$(mg/kg/day)^{-1}$	Known/likely human carcinogen	IRIS	11/26/2012
Semivolatile Organic Compounds								
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	11/26/2012
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Explosives								
RDX	1.1E-01	$(mg/kg/day)^{-1}$	1	1.1E-01	$(mg/kg/day)^{-1}$	C (Possible human carcinogen)	IRIS	11/26/2012
Inorganics								
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / human carcinogen	IRIS	11/26/2012
Barium	NA	NA	NA	NA	NA	Not likely to be carcinogenic to humans	IRIS	11/26/2012
Cadmium	NA	NA	NA	NA	NA	B1 /Known/likely human carcinogen.	IRIS	11/26/2012
Chromium[3,4]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	Carcinogenic potential cannot be determined (Oral route)	NJDEP	4/8/2009
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	11/26/2012
Thallium	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.

3 - Carcinogenic PAHs and hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

4 - Values are for hexavalent chromium.

IRIS = Integrated Risk Information System.

NA = Not Available.

NJDEP = New Jersey Department of Environmental Protection.

USEPA(1) = USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, July 1993, EPA/600/R-93/089.

TABLE 4-4

CANCER TOXICITY DATA -- INHALATION
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds							
Benzene	7.8E-06	$(ug/m^3)^{-1}$	2.7E-02	$(mg/kg/day)^{-1}$	Known/likely human carcinogen	IRIS	11/26/2012
Semivolatile Organic Compounds							
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Explosives							
RDX	NA	NA	NA	NA	C (Possible human carcinogen)	IRIS	11/26/2012
Inorganics							
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	11/26/2012
Barium	NA	NA	NA	NA	Carcinogenic potential cannot be determined	IRIS	11/26/2012
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	6.3E+00	$(mg/kg/day)^{-1}$	B1 /Known/likely human carcinogen.	IRIS	11/26/2012
Chromium[2,3]	8.4E-02	$(ug/m^3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	Known/likely human carcinogen (Inhalation route)	IRIS	11/26/2012
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	11/26/2012
Thallium	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Carcinogenic PAHs and hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

3 - Values are for hexavalent chromium.

Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

PPRTV = Provisional Peer Reviewed Toxicity Value.

APPENDIX I.2

RAGS PART D TABLES 4, 5, AND 6

RAGS Part D Table 4

Values Used For Daily Intake Calculations

LIST OF TABLES
RAGS PART D TABLE 4
VALUES USED FOR DAILY INTAKE CALCULATIONS

Table No.	
	Reasonable Maximum Exposures
4.1.RME	Construction Workers Exposed to Surface Soil/Subsurface Soil
4.2.RME	Construction Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.3.RME	Construction Workers Exposed to Groundwater
4.4.RME	Construction Workers Exposed to Volatile Emissions from Groundwater
4.5.RME	Industrial Workers Exposed to Surface Soil/Subsurface Soil
4.6.RME	Industrial Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.7.RME	Adolescent Trespassers Exposed to Surface Soil/Subsurface Soil
4.8.RME	Adolescent Trespassers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.9.RME	Adolescent Trespassers Exposed to Surface Water
4.10.RME	Adolescent Trespassers Exposed to Sediment
4.11.RME	Child Recreational Users Exposed to Surface Soil/Subsurface Soil
4.12.RME	Child Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.13.RME	Child Recreational Users Exposed to Surface Water
4.14.RME	Child Recreational Users Exposed to Sediment
4.15.RME	Adult Recreational Users Exposed to Surface Soil/Subsurface Soil
4.16.RME	Adult Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.17.RME	Adult Recreational Users Exposed to Surface Water
4.18.RME	Adult Recreational Users Exposed to Sediment
4.19.RME	Child Residents Exposed to Surface Soil/Subsurface Soil
4.20.RME	Child Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.21.RME	Child Residents Exposed to Groundwater
4.22.RME	Child Residents Exposed to Volatile Emissions While Showering
4.23.RME	Child Residents Exposed to Vapor Intrusion
4.24.RME	Child Residents Exposed to Surface Water
4.25.RME	Child Residents Exposed to Sediment
4.26.RME	Adult Residents Exposed to Surface Soil/Subsurface Soil
4.27.RME	Adult Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.28.RME	Adult Residents Exposed to Groundwater
4.29.RME	Adult Residents Exposed to Volatile Emissions While Showering
4.30.RME	Adult Residents Exposed to Vapor Intrusion
4.31.RME	Adult Residents Exposed to Surface Water
4.32.RME	Adult Residents Exposed to Sediment
	Central Tendency Exposures
4.1.CTE	Construction Workers Exposed to Surface Soil/Subsurface Soil
4.2.CTE	Construction Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.3.CTE	Construction Workers Exposed to Groundwater
4.4.CTE	Construction Workers Exposed to Volatile Emissions from Groundwater
4.5.CTE	Industrial Workers Exposed to Surface Soil/Subsurface Soil
4.6.CTE	Industrial Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.7.CTE	Adolescent Trespassers Exposed to Surface Soil/Subsurface Soil
4.8.CTE	Adolescent Trespassers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.9.CTE	Adolescent Trespassers Exposed to Surface Water
4.10.CTE	Adolescent Trespassers Exposed to Sediment
4.11.CTE	Child Recreational Users Exposed to Surface Soil/Subsurface Soil
4.12.CTE	Child Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.13.CTE	Child Recreational Users Exposed to Surface Water
4.14.CTE	Child Recreational Users Exposed to Sediment
4.15.CTE	Adult Recreational Users Exposed to Surface Soil/Subsurface Soil
4.16.CTE	Adult Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.17.CTE	Adult Recreational Users Exposed to Surface Water
4.18.CTE	Adult Recreational Users Exposed to Sediment
4.19.CTE	Child Residents Exposed to Surface Soil/Subsurface Soil
4.20.CTE	Child Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.21.CTE	Child Residents Exposed to Groundwater
4.22.CTE	Child Residents Exposed to Volatile Emissions While Showering
4.23.CTE	Child Residents Exposed to Vapor Intrusion
4.24.CTE	Child Residents Exposed to Surface Water
4.25.CTE	Child Residents Exposed to Sediment
4.26.CTE	Adult Residents Exposed to Surface Soil/Subsurface Soil
4.27.CTE	Adult Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.28.CTE	Adult Residents Exposed to Groundwater
4.29.CTE	Adult Residents Exposed to Volatile Emissions While Showering
4.30.CTE	Adult Residents Exposed to Vapor Intrusion
4.31.CTE	Adult Residents Exposed to Surface Water
4.32.CTE	Adult Residents Exposed to Sediment

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	330	mg/day	USEPA, 2002b	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assumes a 30 week construction project over one year.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.77E-08 Cancer Dermal Intake = 8.30E-08

Noncancer Ingestion Intake = 1.94E-06 Noncancer Dermal Intake = 5.81E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.34E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	14.31	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment. Assumes a 30 week construction project over one year.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-03 Noncancer Inhalation Intake = 1.37E-01

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Workers	Adult	SWMU 18	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	30	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

1 - Professional judgment. Assumes construction workers are only exposed to groundwater water during part of the contruction project.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Dermal Intake = 5.54E-02 Noncancer Dermal Intake = 3.87E+00

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	VDEQ, 2004	Exposure Concentration (mg/m^3) =
				CW	Chemical concentration in water.	Max or 95% UCL	ug/L	USEPA, 2002	
				CF	Conversion Factor	0.001	mg/ug	--	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				ET	Exposure Time	4	hours/day	(1)	
				EF	Exposure Frequency	30	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	CA = CW x CF x VF
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				VF	Volatilization Factor	Calculated	(mg/m3)/(mg/L)	VDEQ, 2004	

Notes:

1 - Professional judgment.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

VDEQ February 2012. Virginia Department of Environmental Quality (VDEQ, online - http://www.deq.state.va.us/vrprisk/homepage.html).

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-07 Noncancer Inhalation Intake = 1.37E-05

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	25	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	25	years	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.
USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.
USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.49E-07 Cancer Dermal Intake = 2.31E-06

Noncancer Ingestion Intake = 9.78E-07 Noncancer Dermal Intake = 6.46E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	25	years	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 8.15E-02 Noncancer Inhalation Intake = 2.28E-01

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3280	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - Older child from age 6 to 17.

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.37E-08 Cancer Dermal Intake = 1.55E-07

Noncancer Ingestion Intake = 1.66E-07 Noncancer Dermal Intake = 1.09E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespassers	Adolescent	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	26	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - Older child from age 6 to 17.

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.70E-03 Noncancer Inhalation Intake = 1.19E-02

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SURFACE WATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(1)	BW x AT
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3,280	cm2	(3)	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	

Notes:

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.16E-08 Cancer Dermal Intake = 9.54E-01

Noncancer Ingestion Intake = 8.14E-08 Noncancer Dermal Intake = 6.68E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADOLESCENT TRESPASSERS - SEDIMENT

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CSx IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	3,280	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	

Notes:

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 7.27E-09 Cancer Dermal Intake = 9.54E-08

Noncancer Ingestion Intake = 5.09E-08 Noncancer Dermal Intake = 6.68E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	

Notes:

1 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 8.14E-08 Cancer Dermal Intake (Age 0 - 6) = 4.56E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 2.71E-08 Cancer Dermal Intake (Age 0 - 2) = 1.52E-07

Cancer Ingestion Intake (Age 2 - 6) = 5.43E-08 Cancer Dermal Intake (Age 2 - 6) = 3.04E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-07 Noncancer Dermal Intake = 5.32E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Child	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 2.04E-03 Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 6.78E-04

Cancer Inhalation Intake (Age 2 - 6) = 1.36E-03

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hr	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(2)	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(2)	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 3.26E-08 Cancer Dermal Intake (Age 0 - 6) = 2.28E+00

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.09E-08 Cancer Dermal Intake (Age 0 - 2) = 7.60E-01

Cancer Ingestion Intake (Age 2 - 6) = 2.17E-08 Cancer Dermal Intake (Age 2 - 6) = 1.52E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 3.80E-07 Noncancer Dermal Intake = 2.66E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.14.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SEDIMENT

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Assume two days a week in warm weather months for RME and one day a week for CTE.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 8.14E-08 Cancer Dermal Intake (Age 0 - 6) = 4.56E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 2.71E-08 Cancer Dermal Intake (Age 0 - 2) = 1.52E-07

Cancer Ingestion Intake (Age 2 - 6) = 5.43E-08 Cancer Dermal Intake (Age 2 - 6) = 3.04E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-07 Noncancer Dermal Intake = 5.32E-06

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.15.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	9,070	cm2	(4)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume that head, arms, hands, lower legs, and feet are exposed, USEPA, 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 3.49E-08 Cancer Dermal Intake (Age 6 - 30) = 4.43E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.45E-08 Cancer Dermal Intake (Age 6 - 16) = 1.85E-07

Cancer Ingestion Intake Age 16 - 30) = 2.04E-08 Cancer Dermal Intake (Age 16 - 30) = 2.58E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.02E-07 Noncancer Dermal Intake = 1.29E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.16.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 8.14E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 3.39E-03

Cancer Inhalation Intake (Age 16 - 30) = 4.75E-03

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.17.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SURFACE WATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	$\frac{CW \times CF \times CR \times ET \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	52	events/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	$\frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 2.79E-08 Cancer Dermal Intake (Age 6 - 30) = 3.98E+00

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.16E-08 Cancer Dermal Intake (Age 6 - 16) = 1.66E+00

Cancer Ingestion Intake (Age 16 - 30) = 1.63E-08 Cancer Dermal Intake (Age 16 - 30) = 2.32E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 8.14E-08 Noncancer Dermal Intake = 1.16E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.18.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SEDIMENT
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CSx IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 3.49E-08 Cancer Dermal Intake (Age 6 - 30) = 2.78E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.45E-08 Cancer Dermal Intake (Age 6 - 16) = 1.16E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.04E-08 Cancer Dermal Intake (Age 16 - 30) = 1.62E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.02E-07 Noncancer Dermal Intake = 8.12E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.19.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.20.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.92E+00

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.21.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - GROUNDWATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Child	SWMU 18	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	1	L/day	USEPA, 1991	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Residents	Child	SWMU 18	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	1	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	6,600	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1994	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 5.48E-06 Cancer Dermal Intake Time (Age 0 - 6) = 3.62E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.83E-06 Cancer Dermal Intake (Age 0 - 2) = 1.21E+01

Cancer Ingestion Intake (Age 2 - 6) = 3.65E-06 Cancer Dermal Intake (Age 2 - 6) = 2.41E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 6.39E-05 Noncancer Dermal Intake = 4.22E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.22.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - INHALATION OF VOLATILES FROM GROUNDWATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Child	SWMU 18	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster&Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Masss Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	350	showers/year	U.S. EPA, 1991	$\frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 4 - 6)	4	years	(1), USEPA, 1989, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	30	min	U.S. EPA, 2004	
				Dt	Total Time in Bathroom	60	min	Professional judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Noncancer)	2190	days	U.S. EPA ,1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED)/(AT x Ra x CF)

Non-Mutagenic Chemicals		Noncarcinogenic Chemicals	
Cancer Inhalation Intake (Age 6 - 30) =	3.42E-03	Noncancer Inhalation Intake =	4.00E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) =	1.14E-03
Cancer Inhalation Intake n (Age 4 - 6) =	2.28E-03

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.23.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURES - INHALATION OF INDOOR AIR

FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Child	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2004	Exposure Concentration (mg/m3) =
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	24	hours/day	USEPA, 1991	AT x 24 hours/day
				EF	Exposure Frequency	350	days/year	U.S. EPA, 1991	
				ED	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED	Exposure Duration (Age 6 - 16)	14	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Part B: Development of Risk-based Preliminary Remediation Goals. OSWER Directive 9285.7-01B.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: User's Guide For Evaluating Subsurface Vapor Intrusion Into Buildings

Unit Intake Calculations

Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Carcinogenic Chemicals	Noncarcinogenic Chemicals
Cancer Inhalation Intake = 1.37E-01	Noncancer Inhalation Intake = 9.59E-01
Cancer Inhalation Intake = 1.92E-01	

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.24.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hr	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(2)	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(2)	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 3.26E-08 Cancer Dermal Intake (Age 0 - 6) = 2.28E+00

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.09E-08 Cancer Dermal Intake (Age 0 - 2) = 7.60E-01

Cancer Ingestion Intake (Age 2 - 6) = 2.17E-08 Cancer Dermal Intake (Age 2 - 6) = 1.52E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 3.80E-07 Noncancer Dermal Intake = 2.66E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.25.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SEDIMENT
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Assume two days a week in warm weather months for RME and one day a week for CTE.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 8.14E-08 Cancer Dermal Intake (Age 0 - 6) = 4.56E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 2.71E-08 Cancer Dermal Intake (Age 0 - 2) = 1.52E-07

Cancer Ingestion Intake (Age 2 - 6) = 5.43E-08 Cancer Dermal Intake (Age 2 - 6) = 3.04E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-07 Noncancer Dermal Intake = 5.32E-06

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.26.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.27.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.28.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - GROUNDWATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	SWMU 18	CGW	Chemical Concentration in Groundwater	95% UCL or Max	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	2	L/day	USEPA, 1991	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Residents	Adult	SWMU 18	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	DAevent x EV x EF x ED x SA
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	BW x AT
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	For inorganics
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	
				tevent	Duration of event	0.58	hr/event	USEPA, 2004	For organics if tevent <= t*
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				SA	Skin Surface Available for Contact	18,000	cm2	USEPA, 2004	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1994	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 9.39E-06 Cancer Dermal Intake (Age 6 - 30) = 8.45E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 3.91E-06 Cancer Dermal Intake (Age 6 - 16) = 3.52E+01

Cancer Ingestion Intake (Age 16 - 30) = 5.48E-06 Cancer Dermal Intake (Age 16 - 30) = 4.93E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.74E-05 Noncancer Dermal Intake = 2.47E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.29.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - INHALATION OF VOLATILES FROM GROUNDWATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	SWMU 18	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster&Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Masss Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	350	showers/year	U.S. EPA, 1991	$\frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	30	min	U.S. EPA, 2004	
				Dt	Total Time in Bathroom	60	min	Professional judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Noncancer)	8760	days	U.S. EPA ,1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED)/(AT x Ra x CF)

Non-Mutagenic Chemicals		Noncarcinogenic Chemicals	
Cancer Inhalation Intake (Age 6 - 30) =	1.37E-02	Noncancer Inhalation Intake =	4.00E-02

Mutagenic Chemicals	
Cancer Inhalation Intake (Age 6 - 16) =	5.71E-03
Cancer Inhalation Intake (Age 16 - 30) =	7.99E-03

TABLE 4.30.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURES - INHALATION OF INDOOR AIR

FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2004	Exposure Concentration (mg/m3) =
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	24	hours/day	USEPA, 1991	AT x 24 hours/day
				EF	Exposure Frequency	350	days/year	U.S. EPA, 1991	
				ED	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED	Exposure Duration (Age 6 - 16)	14	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Part B: Development of Risk-based Preliminary Remediation Goals. OSWER Directive 9285.7-01B.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: User's Guide For Evaluating Subsurface Vapor Intrusion Into Buildings

Unit Intake Calculations

Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Carcinogenic Chemicals	Noncarcinogenic Chemicals
Cancer Inhalation Intake = 1.37E-01	Noncancer Inhalation Intake = 9.59E-01
Cancer Inhalation Intake = 1.92E-01	

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.31.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	4	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	52	events/year	(1)	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	52	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 2.79E-08 Cancer Dermal Intake (Age 6 - 30) = 3.98E+00

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.16E-08 Cancer Dermal Intake (Age 6 - 16) = 1.66E+00

Cancer Ingestion Intake (Age 16 - 30) = 1.63E-08 Cancer Dermal Intake (Age 16 - 30) = 2.32E+00

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 8.14E-08 Noncancer Dermal Intake = 1.16E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.32.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SEDIMENT
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CSx IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 3.49E-08 Cancer Dermal Intake (Age 6 - 30) = 2.78E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.45E-08 Cancer Dermal Intake (Age 6 - 16) = 1.16E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.04E-08 Cancer Dermal Intake (Age 16 - 30) = 1.62E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.02E-07 Noncancer Dermal Intake = 8.12E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	165	mg/day	(1)	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.1	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 6.92E-09 Cancer Dermal Intake = 1.38E-08

Noncancer Ingestion Intake = 4.84E-07 Noncancer Dermal Intake = 9.69E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.34E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	14.31	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 9.78E-04 Noncancer Inhalation Intake = 6.85E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - GROUNDWATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Workers	Adult	SWMU 18	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA / BW x AT
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	15	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Dermal Intake = 2.77E-02 Noncancer Dermal Intake = 1.94E+00

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - GROUNDWATER TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	VDEQ, 2004	Exposure Concentration (mg/m^3) =
				CW	Chemical concentration in water.	Max or 95% UCL	ug/L	USEPA, 2002	
				CF	Conversion Factor	0.001	mg/ug	--	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				ET	Exposure Time	2	hours/day	(1)	
				EF	Exposure Frequency	15	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	CA = CW x CF x VF
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				VF	Volatilization Factor	Calculated	(mg/m3)/(mg/L)	VDEQ, 2004	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

VDEQ February 2012. Virginia Department of Environmental Quality (VDEQ, online - http://www.deq.state.va.us/vrprisk/homepage.html).

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 4.89E-08 Noncancer Inhalation Intake = 3.42E-06

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.02	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.
USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)
Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 5.51E-08 Cancer Dermal Intake = 7.27E-08
Noncancer Ingestion Intake = 4.29E-07 Noncancer Dermal Intake = 5.66E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor
Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose
Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	219	days/year	USEPA, 1993	
				ED	Exposure Duration	9	years	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA 2008	

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 2.57E-02 Noncancer Inhalation Intake = 2.00E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADOLESCENT TRESPASSERS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CSs x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	13	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	5300	cm2	(3)	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	13	days/year	(1)	
				ED	Exposure Duration	10	years	(2)	
				BW	Body Weight	43	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3650	days	USEPA, 1989	

Notes:

For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - Older child from age 6 to 17.

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 5.92E-09 Cancer Dermal Intake = 2.51E-08

Noncancer Ingestion Intake = 4.14E-08 Noncancer Dermal Intake = 1.76E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADOLESCENT TRESPASSERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespassers	Adolescent	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	2	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	13	days/year	(2)	
				ED	Exposure Duration	10	years	(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at	68.18	g/m2-s per	USEPA, 2002a	
					center of source	Chemical-specific	kg/m3		

Notes:

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - Older child from age 6 to 17.

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 4.24E-04 Noncancer Inhalation Intake = 2.97E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADOLESCENT TRESPASSERS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	26	events/year	(1)	BW x AT
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3,280	cm2	(3)	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1993	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	

Notes:

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

3 - Assume 25 percent of total body surface area is exposed, U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.91E-09 Cancer Dermal Intake = 4.77E-01

Noncancer Ingestion Intake = 2.04E-08 Noncancer Dermal Intake = 3.34E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADOLESCENT TRESPASSERS - SEDIMENT

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	13	days/year	(1)	
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	
Dermal	Trespassers	Adolescent	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	13	days/year	(1)	
				ED	Exposure Duration	10	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	USEPA, 1989	

Notes:

1 - Assume one day a week in warm weather months for reasonable maximum exposure and every other week for central tendency exposure.

2 - For chemicals that act via the mutagenic mode of action the intake will be multiplied by the appropriate age-dependent adjustment factor in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 1.82E-09 Cancer Dermal Intake = 1.42E-08

Noncancer Ingestion Intake = 1.27E-08 Noncancer Dermal Intake = 9.97E-08

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.11.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CSs x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 6.78E-09 Cancer Dermal Intake = 1.52E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.39E-09 Cancer Dermal Intake (Age 0 - 2) = 7.60E-09

Cancer Ingestion Intake (Age 2 - 6) = 3.39E-09 Cancer Dermal Intake (Age 2 - 6) = 7.60E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.37E-07 Noncancer Dermal Intake = 5.32E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Child	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	2	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	26	days/year	(2)	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.70E-04 Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 8.48E-05

Cancer Inhalation Intake (Age 2 - 6) = 8.48E-05

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hr	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	$\frac{CW \times CF \times CR \times ET \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	26	events/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	$\frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(2)	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	$2 \times \tau + (1 + 3B + 3B^2)/(1+B^2)$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for RME and one day a week for CTE.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.71E-09 Cancer Dermal Intake = 3.80E-01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.36E-09 Cancer Dermal Intake (Age 0 - 2) = 1.90E-01

Cancer Ingestion Intake (Age 2 - 6) = 1.36E-09 Cancer Dermal Intake (Age 2 - 6) = 1.90E-01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-08 Noncancer Dermal Intake = 1.33E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.14.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SEDIMENT

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	(1)	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Recreational User	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Assume two days a week in warm weather months for RME and one day a week for CTE.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 6.78E-09 Cancer Dermal Intake = 1.52E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.39E-09 Cancer Dermal Intake (Age 0 - 2) = 7.60E-09

Cancer Ingestion Intake (Age 2 - 6) = 3.39E-09 Cancer Dermal Intake (Age 2 - 6) = 7.60E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.37E-07 Noncancer Dermal Intake = 5.32E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.15.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume that head, arms, hands, lower legs, and feet are exposed, USEPA, 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.54E-09 Cancer Dermal Intake = 5.80E-09

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 7.27E-10 Cancer Dermal Intake (Age 6 - 16) = 1.66E-09

Cancer Ingestion Intake Age 16 - 30) = 1.82E-09 Cancer Dermal Intake (Age 16 - 30) = 4.14E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.54E-08 Noncancer Dermal Intake = 5.80E-08

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.16.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	2	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 5.94E-04

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.70E-04

Cancer Inhalation Intake (Age 16 - 30) = 4.24E-04

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.17.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	$\frac{CW \times CF \times CR \times ET \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	26	events/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	$\frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	$2 \times \tau + (1 + 3B + 3B^2)/(1+B^2)$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.04E-09 Cancer Dermal Intake = 1.66E-01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 5.81E-10 Cancer Dermal Intake (Age 6 - 16) = 1.66E-01

Cancer Ingestion Intake (Age 16 - 30) = 1.45E-09 Cancer Dermal Intake (Age 16 - 30) = 4.14E-01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.04E-08 Noncancer Dermal Intake = 5.80E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.18.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SEDIMENT

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Recreational User	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.54E-09 Cancer Dermal Intake = 5.80E-09

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 7.27E-10 Cancer Dermal Intake (Age 6 - 16) = 1.66E-09

Cancer Ingestion Intake (Age 16 - 30) = 1.82E-09 Cancer Dermal Intake (Age 16 - 30) = 4.14E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.54E-08 Noncancer Dermal Intake = 5.80E-08

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.19.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 1994: USEPA Region I Risk Updates, August 1994.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.22E-07 Cancer Dermal Intake = 1.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 6.11E-08 Cancer Dermal Intake (Age 0 - 2) = 6.84E-08

Cancer Ingestion Intake (Age 2 - 6) = 6.11E-08 Cancer Dermal Intake (Age 2 - 6) = 6.84E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.27E-06 Noncancer Dermal Intake = 4.79E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.20.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1993	CA x ET x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1993	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA, 2002a	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.83E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 9.16E-03

Cancer Inhalation Intake (Age 2 - 6) = 9.16E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.21.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - GROUNDWATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Child	SWMU 18	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	0.66	L/day	USEPA, 1997	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1993	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Residents	Child	SWMU 18	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	0.33	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	6,600	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1993	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.42E-06 Cancer Dermal Intake = 2.42E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 8.06E-07 Cancer Dermal Intake (Age 0 - 2) = 8.06E+00

Cancer Ingestion Intake (Age 2 - 6) = 1.61E-06 Cancer Dermal Intake (Age 2 - 6) = 1.61E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.82E-05 Noncancer Dermal Intake = 2.82E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.22.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE - CHILD RESIDENTS - INHALATION OF VOLATILES FROM GROUNDWATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Child	SWMU 18	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster & Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Masss Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	234	showers/year	U.S. EPA, 1993	$\frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 4 - 6)	1	years	(1), USEPA, 1989, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	10	min	U.S. EPA, 2004	
				Dt	Total Time in Bathroom	15	min	Professional Judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Noncancer)	730	days	U.S. EPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED)/(AT x Ra x CF)

Non-Mutagenic Chemicals		Noncarcinogenic Chemicals	
Cancer Inhalation Intake =	7.63E-04	Noncancer Inhalation Intake =	2.67E-02
Mutagenic Chemicals			
Cancer Inhalation Intake (Age 0 - 2) =	3.82E-04		
Cancer Inhalation Intake n (Age 4 - 6) =	3.82E-04		

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.23.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INHALATION OF INDOOR AIR

FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Child	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2004	Exposure Concentration (mg/m3) =
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	24	hours/day	USEPA, 1991	AT x 24 hours/day
				EF	Exposure Frequency	234	days/year	U.S. EPA, 1993	
				ED	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED	Exposure Duration (Age 6 - 16)	5	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Part B: Development of Risk-based Preliminary Remediation Goals. OSWER Directive 9285.7-01B.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: User's Guide For Evaluating Subsurface Vapor Intrusion Into Buildings

Unit Intake Calculations

Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Carcinogenic Chemicals	Noncarcinogenic Chemicals
Cancer Inhalation Intake = 1.83E-02	Noncancer Inhalation Intake = 6.41E-01
Cancer Inhalation Intake = 4.58E-02	

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.24.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hr	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	CW x CF x CR x ET x EF x ED
				EF	Exposure Frequency	26	events/year	(2)	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(2)	For organics if tevent > t*
				ED1	Exposure Duration (Age 0 - 2)	1	years	(3), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	1	years	(3), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	$2 x \tau +(1 + 3B + 3B^2)/(1+B^2)$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for RME and one day a week for CTE.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.71E-09 Cancer Dermal Intake = 3.80E-01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.36E-09 Cancer Dermal Intake (Age 0 - 2) = 1.90E-01

Cancer Ingestion Intake (Age 2 - 6) = 1.36E-09 Cancer Dermal Intake (Age 2 - 6) = 1.90E-01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-08 Noncancer Dermal Intake = 1.33E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.25.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SEDIMENT
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	(1)	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	

Notes:

1 - Assume two days a week in warm weather months for RME and one day a week for CTE.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 6.78E-09 Cancer Dermal Intake = 1.52E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.39E-09 Cancer Dermal Intake (Age 0 - 2) = 7.60E-09

Cancer Ingestion Intake (Age 2 - 6) = 3.39E-09 Cancer Dermal Intake (Age 2 - 6) = 7.60E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.37E-07 Noncancer Dermal Intake = 5.32E-07

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.26.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1993	BW x AT
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 18	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 4.58E-08 Cancer Dermal Intake = 5.22E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.31E-08 Cancer Dermal Intake (Age 6 - 16) = 1.49E-08

Cancer Ingestion Intake (Age 16 - 30) = 3.27E-08 Cancer Dermal Intake (Age 16 - 30) = 3.73E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.58E-07 Noncancer Dermal Intake = 5.22E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.27.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS TO AIR

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	SWMU 18	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1993	$\frac{CA \times ET \times EF \times ED}{AT \times 24\ hours/day}$
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.32E+09	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	68.18	g/m2-s per kg/m3	USEPA 2008	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 6.41E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.83E-02

Cancer Inhalation Intake (Age 16 - 30) = 4.58E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.28.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - GROUNDWATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	SWMU 18	CGW	Chemical Concentration in Groundwater	95% UCL or Max	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	1.4	L/day	USEPA, 1993	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1993	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Residents	Adult	SWMU 18	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	0.25	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	18,000	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.28E-06 Cancer Dermal Intake = 2.47E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 3.66E-07 Cancer Dermal Intake (Age 6 - 16) = 7.05E+00

Cancer Ingestion Intake (Age 16 - 30) = 9.16E-07 Cancer Dermal Intake (Age 16 - 30) = 1.76E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 2.47E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.29.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - INHALATION OF VOLATILES FROM GROUNDWATER

NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	SWMU 18	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster & Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Masss Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	234	showers/year	U.S. EPA, 1993	$\frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	10	min	U.S. EPA, 2004	
				Dt	Total Time in Bathroom	15	min	Professional Judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Noncancer)	2555	days	U.S. EPA, 1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED)/(AT x Ra x CF)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 2.67E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 2.67E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 7.63E-04

Cancer Inhalation Intake (Age 16 - 30) = 1.91E-03

TABLE 4.30.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INHALATION OF INDOOR AIR

FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current
Medium: Air
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	Site 16	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2004	Exposure Concentration (mg/m3) =
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	24	hours/day	USEPA, 1991	AT x 24 hours/day
				EF	Exposure Frequency	234	days/year	U.S. EPA, 1993	
				ED	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED	Exposure Duration (Age 6 - 16)	5	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Part B: Development of Risk-based Preliminary Remediation Goals. OSWER Directive 9285.7-01B.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: User's Guide For Evaluating Subsurface Vapor Intrusion Into Buildings

Unit Intake Calculations

Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Carcinogenic Chemicals	Noncarcinogenic Chemicals
Cancer Inhalation Intake = 1.83E-02	Noncancer Inhalation Intake = 6.41E-01
Cancer Inhalation Intake = 4.58E-02	

Cancer risk from inhalation = Air concentration x Cancer Inhalation Intake x Inhalation Unit Risk

Hazard Index from inhalation = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.31.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SURFACE WATER
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 18	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CR	Contact Rate	0.01	L/hour	USEPA, 2011	
				CF	Conversion factor	0.001	mg/ug	- -	
				ET	Exposure Time	2	hours/event	(1)	$\frac{CW \times CF \times CR \times ET \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	26	events/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 18	DAevent	Absorbed dose per event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Water	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	$\frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	2	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	26	days/year	(1)	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	$2 \times \tau + (1 + 3B + 3B^2)/(1+B^2)$
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Table 3-93. Value is upper confidence limit for fishing.

Unit Intake Calculations

Ingestion Intake = (CR x CF x ET x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.04E-09 Cancer Dermal Intake = 1.66E-01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 5.81E-10 Cancer Dermal Intake (Age 6 - 16) = 1.66E-01

Cancer Ingestion Intake (Age 16 - 30) = 1.45E-09 Cancer Dermal Intake (Age 16 - 30) = 4.14E-01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.04E-08 Noncancer Dermal Intake = 5.80E+00

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.32.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SEDIMENT
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	
Dermal	Resident	Adult	SWMU 18	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,555	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.54E-09 Cancer Dermal Intake = 5.80E-09

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 7.27E-10 Cancer Dermal Intake (Age 6 - 16) = 1.66E-09

Cancer Ingestion Intake (Age 16 - 30) = 1.82E-09 Cancer Dermal Intake (Age 16 - 30) = 4.14E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.54E-08 Noncancer Dermal Intake = 5.80E-08

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

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NON-CANCER TOXICITY DATA

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5-1 Non-Cancer Toxicity Data - Oral/Dermal
5-2 Non-Cancer Toxicity Data - Inhalation

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 18 - LOAD AND FILL AREA
NSA 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(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds										
Benzene	Subchronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Blood	100/1	PPRTV	9/29/2009
	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Blood	300/1	IRIS	11/26/2012
Semivolatile Organic Compounds										
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives										
RDX	Chronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Prostate	100/1	IRIS	11/26/2012
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	11/26/2012
Barium	Subchronic	2.0E-01	mg/kg/day	0.07	1.4E-02	mg/kg/day	Kidney	300/1	ATSDR	8/2007
	Chronic	2.0E-01	mg/kg/day	0.07	1.4E-02	mg/kg/day	Kidney	300/1	IRIS	11/26/2012
Cadmium	Chronic	5.0E-04	mg/kg/day	0.05	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	11/26/2012
Chromium[3]	Subchronic	2.0E-02	mg/kg/day	0.025	5.0E-04	mg/kg/day	None Reported	100/3	HEAST	9/97
	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	None Reported	300/3	IRIS	11/26/2012
Cobalt	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	300/1	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	8/25/2008
Iron	Subchronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	Gastrointestinal System	1.5	PPRTV	9/11/2006
Manganese[4]	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	Central Nervous System	1	IRIS	11/26/2012
Thallium[5]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Values are for hexavalent chromium.

4 - Adjusted IRIS value in accordance with IRIS.

5 - Toxicity criteria used to derive the RSLs is only suitable for screening and is not to be used for quantifying risks.

Definitions:

CVS = Cardiovascular system

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not Available.

ATSDR = Agency for Toxic Substances and Disease Registry.

PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds									
Benzene	Subchronic	8.0E-02	mg/m3	2.3E-02	(mg/kg/day)	Blood	100/1	PPRTV	9/29/2009
	Chronic	3.0E-02	mg/m3	8.6E-03	(mg/kg/day)	Blood	300/1	IRIS	11/26/2012
Semivolatile Organic Compounds									
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives									
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics									
Arsenic	Chronic	1.5E-05	mg/m3	4.3E-06	(mg/kg/day)	Skin, Cardiovascular System	NA	Cal EPA	9/2009
Barium	Subchronic	5.0E-03	mg/m3	1.4E-03	(mg/kg/day)	Fetotoxicity	100	HEAST	7/1997
	Chronic	5.0E-04	mg/m3	1.4E-04	(mg/kg/day)	Fetotoxicity	1000	HEAST	7/1997
Cadmium	Chronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Kidney, Respiratory	NA	Cal EPA	9/2009
Chromium[2]	Chronic	1.0E-04	mg/m3	2.9E-05	(mg/kg/day)	Respiratory	300/1	IRIS	11/26/2012
Cobalt	Subchronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Respiratory	100/1	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m3	1.7E-06	(mg/kg/day)	Respiratory	300/1	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	Central Nervous System	1000/1	IRIS	11/26/2012
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg
2 - Values are for hexavalent chromium.

Definitions:
IRIS = Integrated Risk Information System
NA = Not Applicable
Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.
HEAST = Health Effects Assessment Summary Tables
PPRTV = Provisional Peer Reviewed Toxicity Value.

RAGS Part D Table 6

Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 6
CANCER TOXICITY DATA

Table No.

6-1 Cancer Toxicity Data - Oral/Dermal
6-2 Cancer Toxicity Data - Inhalation

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
SWMU 18 - LOAD AND FILL AREA
NSA 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(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Benzene	5.5E-02	$(mg/kg/day)^{-1}$	1	5.5E-02	$(mg/kg/day)^{-1}$	Known/likely human carcinogen	IRIS	11/26/2012
Semivolatile Organic Compounds								
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	11/26/2012
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Explosives								
RDX	1.1E-01	$(mg/kg/day)^{-1}$	1	1.1E-01	$(mg/kg/day)^{-1}$	C (Possible human carcinogen)	IRIS	11/26/2012
Inorganics								
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / human carcinogen	IRIS	11/26/2012
Barium	NA	NA	NA	NA	NA	Not likely to be carcinogenic to humans	IRIS	11/26/2012
Cadmium	NA	NA	NA	NA	NA	B1 /Known/likely human carcinogen.	IRIS	11/26/2012
Chromium[3,4]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	Carcinogenic potential cannot be determined (Oral route)	NJDEP	4/8/2009
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	11/26/2012
Thallium	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.

3 - Carcinogenic PAHs and hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

4 - Values are for hexavalent chromium.

IRIS = Integrated Risk Information System.

NA = Not Available.

NJDEP = New Jersey Department of Environmental Protection.

USEPA(1) = USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, July 1993, EPA/600/R-93/089.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds							
Benzene	7.8E-06	$(ug/m^3)^{-1}$	2.7E-02	$(mg/kg/day)^{-1}$	Known/likely human carcinogen	IRIS	11/26/2012
Semivolatile Organic Compounds							
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Explosives							
RDX	NA	NA	NA	NA	C (Possible human carcinogen)	IRIS	11/26/2012
Inorganics							
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	11/26/2012
Barium	NA	NA	NA	NA	Carcinogenic potential cannot be determined	IRIS	11/26/2012
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	6.3E+00	$(mg/kg/day)^{-1}$	B1 /Known/likely human carcinogen.	IRIS	11/26/2012
Chromium[2,3]	8.4E-02	$(ug/m^3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	Known/likely human carcinogen (Inhalation route)	IRIS	11/26/2012
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	11/26/2012
Thallium	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Carcinogenic PAHs and hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

3 - Values are for hexavalent chromium.

Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

PPRTV = Provisional Peer Reviewed Toxicity Value.

APPENDIX I.3

SUBAREA B

I.3.1 Samples Used in Risk Assessment
I.3.2 RAGS Part D Tables

APPENDIX I.3.1

SAMPLES USED IN RISK ASSESSMENT

TABLE 1
SAMPLES USED IN THE HUMAN HEALTH RISH ASSESSMENT

Surface Soil	Subsurface Soil
18BSB0010002	18BSB0010608
18BSB0020002	18BSB0020507
18BSB0030002	18BSB0030203
18BSB0040002	
18BSB0050002	
18BSB0060002	
18BSS0010002	
18BSS0020002	
18BSS0030002	
18BSS0040002	
18BCP0010002	
18BCP0020002	
18BCP0030002	

APPENDIX I.3.2

RAGS PART D TABLES

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

LIST OF TABLES

RAGS PART D TABLE 2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

2.1 Surface Soil - Direct Contact

2.2 Surface Soil - Migration From Soil to Groundwater

2.3 Subsurface Soil - Direct Contact

2.4 Subsurface Soil - Migration From Soil to Groundwater

TABLE 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea B	**PCBs**													
	11096-82-5	Aroclor-1260	0.00168 J	0.039 J	mg/kg	18BCP0020002	3/3	-	0.039	NA	0.22 C	3.1 C	No	BSL
	Explosives													
	99-35-4	1,3,5-Trinitrobenzene	0.0261 J	0.0261 J	mg/kg	18BSB0050002	1/10	0.0381 - 0.04	0.0261	NA	220 N	3,100 N	No	BSL
	99-65-0	1,3-Dinitrobenzene	0.0833 J	0.0833 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0833	NA	0.61 N	8.5 N	No	BSL
	118-96-7	2,4,6-Trinitrotoluene	0.0559 J	0.0559 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0559	NA	3.6 N[8]	50 N	No	BSL
	121-14-2	2,4-Dinitrotoluene	0.0436 J	0.0436 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0436	NA	1.6 C	22 C	No	BSL
	98-95-3	Nitrobenzene	0.0227 J	0.054 J	mg/kg	18BSB0040002	2/10	0.0381 - 0.04	0.054	NA	4.8 C	67 C	No	BSL
	121-82-4	RDX	0.0356 J	0.0356 J	mg/kg	18BSB0020002	1/10	0.0381 - 0.04	0.0356	NA	5.6 C	78 C	No	BSL
	479-45-8	Tetryl	0.0537 J	0.0537 J	mg/kg	18BSB0020002	1/10	0.0381 - 0.04	0.0537	NA	24 N	340 N	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Background data is only available for inorganics.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - Value is for total PCBs.
8 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

Associated Samples
18BSB0010002
18BSB0020002
18BSB0030002
18BSB0040002
18BSB0050002
18BSB0060002
18BSS0010002
18BSS0020002
18BSS0030002
18BSS0040002
18BCP0010002
18BCP0020002
18BCP0030002

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	USEPA RSL Protection of Groundwater[4]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea B	**PCBs**													
	11096-82-5	Aroclor-1260	0.00168 J	0.039 J	mg/kg	18BCP0020002	3/3	-	0.039	NA	0.48	4.8 C	No	BSL
	Explosives													
	99-35-4	1,3,5-Trinitrobenzene	0.0261 J	0.0261 J	mg/kg	18BSB0050002	1/10	0.0381 - 0.04	0.0261	NA	34	33 N	No	BSL
	99-65-0	**1,3-Dinitrobenzene**	0.0833 J	0.0833 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0833	NA	**0.028**	**0.027 N**	**Yes**	ASL
	118-96-7	2,4,6-Trinitrotoluene	0.0559 J	0.0559 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0559	NA	0.26	0.89 N	No	BSL
	121-14-2	**2,4-Dinitrotoluene**	0.0436 J	0.0436 J	mg/kg	18BSB0040002	1/10	0.0381 - 0.04	0.0436	NA	**0.0056**	0.054 C	**Yes**	ASL
	98-95-3	**Nitrobenzene**	0.0227 J	0.054 J	mg/kg	18BSB0040002	2/10	0.0381 - 0.04	0.054	NA	**0.00158**	**0.016 C**	**Yes**	ASL
	121-82-4	**RDX**	0.0356 J	0.0356 J	mg/kg	18BSB0020002	1/10	0.0381 - 0.04	0.0356	NA	**0.0046**	0.046 C	**Yes**	ASL
	479-45-8	Tetryl	0.0537 J	0.0537 J	mg/kg	18BSB0020002	1/10	0.0381 - 0.04	0.0537	NA	11.8	12 N	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Background data is only available for inorganics.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - Value is for total PCBs.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18BSB0010002
18BSB0020002
18BSB0030002
18BSB0040002
18BSB0050002
18BSB0060002
18BSS0010002
18BSS0020002
18BSS0030002
18BSS0040002
18BCP0010002
18BCP0020002
18BCP0030002

Definitions:
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea B	**Explosives**													
	121-82-4	RDX	0.0238 J	0.0238 J	mg/kg	18BSB0010608	1/3	0.0385 - 0.04	0.0238	NA	5.6 C	78 C	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Background data is only available for inorganics.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18BSB0010608
18BSB0020507
18BSB0030203

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	USEPA RSL Protection of Groundwater[4]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea B	**Explosives**													
	121-82-4	**RDX**	0.0238 J	0.0238 J	mg/kg	18BSB0010608	1/3	0.0385 - 0.04	0.0238	NA	**0.0046**	0.046 C	**Yes**	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Background data is only available for inorganics.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18BSB0010608
18BSB0020507
18BSB0030203

Definitions:
COPC = Chemical Of Potential Concern
J = Estimated value
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

APPENDIX I.4

SUBAREA C

I.4.1 Samples Used in Risk Assessment
I.4.2 RAGS Part D Tables
I.4.3 ProUCL Outputs
I.4.4 RAGS Part D Tables for Chemicals Present at Naturally Occurring Levels

APPENDIX I.4.1

SAMPLES USED IN RISK ASSESSMENT

TABLE 1
SAMPLES USED IN THE HUMAN HEALTH RISH ASSESSMENT

Surface Soil	Subsurface Soil	Sediment
18CSB0010002	18CMWT0030204	18CSD0010006
18CSB0020002	18CSB0010204	18CSD0020006
18CSB0030002	18CSB0020507	
18CSB0040002	18CSB0040507	
18CSB0050002	18CSB0060203	
18CSB0060002	18CSB0070406	
18CSB0070002	18CSB0080305	
18CSB0080002	18CSB0090204	
18CSB009_0002		
18CSB0090002		
18CSS0010002		
18CCP0010002		

APPENDIX I.4.2

RAGS PART D TABLES

RAGS Part D Table 1

Selection of Exposure Pathways

TABLE 1

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA
PAGE 1 OF 4

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	Subarea C	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Trespassers may contact surface soil while at the site.
		Air	Subarea C	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during work activities.
				Trespassers	Adolescent	Inhalation	Quant	Trespassers may be exposed to fugitive dust and volatile emissions while at the site.
	Subsurface Soil	Subsurface Soil	Subarea C	Construction Workers	Adult	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
				Industrial Worker	Adult	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
				Trespassers	Adolescent	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
		Air	Subarea C	Construction Workers	Adult	Inhalation	None	No COPCs were identified for subsurface soil.
				Industrial Worker	Adult	Inhalation	None	No COPCs were identified for subsurface soil.
				Trespassers	Adolescent	Inhalation	Quant	No COPCs were identified for subsurface soil.
	Groundwater	Groundwater	Subarea C	Construction Workers	Adult	Ingestion Dermal	None Quant	Construction workers may have contact with groundwater during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	None	Industrial workers are not exposed to groundwater.
				Trespassers	Adolescent	Ingestion Dermal	None None	Current trespassers are not exposed to groundwater.
		Air	Subarea C	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to chemicals which have volatilized from groundwater.
				Industrial Worker	Adult	Inhalation	None	Industrial workers are not exposed to be exposed to COPCs that have volatilized from groundwater.
				Trespassers	Adolescent	Inhalation	None	Trespassers are not exposed to COPCs that have volatilized from groundwater.
			Vapor Intrusion	Industrial Worker	Adult	Inhalation	None	No COPCs were identified for vapor intrusion.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA
PAGE 2 OF 4

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 Water	Surface Water	Subarea C	Construction Workers	Adult	Ingestion Dermal	None None	No chemicals were detected in surface water.
				Industrial Worker	Adult	Ingestion Dermal	None None	No chemicals were detected in surface water.
				Trespassers	Adolescent	Ingestion Dermal	None None	No chemicals were detected in surface water.
	Sediment	Sediment	Subarea C	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not exposed to sediment.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not exposed to sediment.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Current trespassers may be exposed to sediment while at the site.
Future	Surface Soil	Surface Soil	Subarea C	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	
		Air	Subarea C	Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
	Subsurface Soil	Subsurface Soil	Subarea C	Recreational Users	Child	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
					Adult	Ingestion Dermal	None None	
				Residents	Child	Ingestion Dermal	None None	No COPCs were identified for subsurface soil.
					Adult	Ingestion Dermal	None None	
		Air	Subarea C	Recreational Users	Child	Inhalation	None	No COPCs were identified for subsurface soil.
					Adult	Inhalation	None	

TABLE 1

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA
PAGE 3 OF 4

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Subsurface Soil	Air	Subarea C	Residents	Child	Inhalation	None	No COPCs were identified for subsurface soil.
					Adult	Inhalation	None	
	Groundwater	Groundwater	Subarea C	Recreational Users	Child	Ingestion Dermal	None None	Recreational users are not expected to be exposed to groundwater.
					Adult	Ingestion Dermal	None None	
				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	
		Air	Subarea C	Recreational Users	Child	Inhalation	None	Recreational users are not expected to be exposed to groundwater.
					Adult	Inhalation	None	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
			Vapor Intrusion	Residents	Child	Inhalation	None	No COPCs were identified for vapor intrusion.
					Adult	Inhalation	None	
	Surface Water	Surface Water	Subarea C	Recreational Users	Child	Ingestion Dermal	None None	No chemicals were detected in surface water.
					Adult	Ingestion Dermal	None None	
				Residents	Child	Ingestion Dermal	None None	No chemicals were detected in surface water.
					Adult	Ingestion Dermal	None None	
	Sediment	Sediment	Subarea C	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to sediment while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	

TABLE 1

SELECTION OF EXPOSURE PATHWAYS - SUBAREA C
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA
PAGE 4 OF 4

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway

Notes:
Qual - Qualitative.
Quant - Quantitative.
COPCs - Chemicals of potential concern.

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

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RAGS PART D TABLE 2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

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2.1 Surface Soil - Direct Contact
2.2 Surface Soil - Migration From Soil to Groundwater
2.3 Subsurface Soil - Direct Contact
2.4 Subsurface Soil - Migration From Soil to Groundwater
2.5 Groundwater - Direct Contact
2.6 Groundwater - Vapor Intrusion
2.7 Sediment - Direct Contact

TABLE 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea C	**Volatile Organic Compounds**													
	78-93-3	2-Butanone	0.0074 J	0.0218 J	mg/kg	18CSS0010002	2/7	0.00454 - 0.00607	0.0218	NA	2,800 N	28,000 S	No	BSL
	67-64-1	Acetone	0.00535 J	0.152 J	mg/kg	18CSS0010002	7/7	-	0.152	NA	6,100 N	85,000 N	No	BSL
	71-43-2	Benzene	0.00125 J	0.00125 J	mg/kg	18CSB0070002	1/10	0.00227 - 0.00462	0.00125	NA	1.1 C	15 C	No	BSL
	100-41-4	Ethylbenzene	0.0014 J	0.0014 J	mg/kg	18CSB0070002	1/10	0.00227 - 0.00462	0.0014	NA	5.4 C	76 C	No	BSL
	75-09-2	Methylene Chloride	0.0266	0.0371	mg/kg	18CSB0090002	3/7	0.00454 - 0.0473	0.0371	NA	36 N[7]	150 C	No	BSL
	108-88-3	Toluene	0.00096 J	0.00344 J	mg/kg	18CSB0070002	2/10	0.00227 - 0.00462	0.00344	NA	500 N	820 S	No	BSL
	1330-20-7	Total Xylenes	0.00233 J	0.00233 J	mg/kg	18CSB0070002	1/10	0.00242 - 0.0091	0.00233	NA	63 N	260 S	No	BSL
	79-01-6	Trichloroethene	0.00216 J	0.00216 J	mg/kg	18CSB0060002	1/7	0.00227 - 0.00303	0.00216	NA	0.44 N[7]	6 N	No	BSL
	Polycyclic Aromatic Hydrocarbons													
	91-57-6	2-Methylnaphthalene	0.0514	0.0514	mg/kg	18CSB0070002	1/3	0.00393 - 0.00395	0.0514	NA	31 N	370 S	No	BSL
	208-96-8	Acenaphthylene	0.0125	0.0125	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.0125	NA	340 N[8]	NA	No	BSL
	205-99-2	Benzo(b)fluoranthene	0.00611 J	0.00611 J	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.00611	NA	0.15 C	2 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	0.00855	0.0666	mg/kg	18CSB0010002	2/3	0.00395 - 0.00395	0.0666	NA	170 N[9]	NA	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.011	0.011	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.011	NA	0.15 C	2 C	No	BSL
	91-20-3	Naphthalene	0.0109	0.0109	mg/kg	18CSB0070002	1/3	0.00393 - 0.00395	0.0109	NA	3.6 C	50 C	No	BSL
	85-01-8	Phenanthrene	0.00242 J	0.0128	mg/kg	18CSB0070002	2/3	0.00393 - 0.00393	0.0128	NA	170 N[9]	NA	No	BSL
	129-00-0	Pyrene	0.00307 J	0.00779 J	mg/kg	18CSB0010002	2/3	0.00395 - 0.00395	0.00779	NA	170 N	2,400 N	No	BSL
	PCBs													
	11096-82-5	Aroclor-1260	0.0185 J	0.0185 J	mg/kg	18CCP0010002	1/1	-	0.0185	NA	0.22 C	3 C	No	BSL
	Metals													
	7440-38-2	Arsenic	2.42 J	19.6	mg/kg	18CSS0010002	7/7	-	19.6	No	**0.39 C**	**6 C**	No	BKG
	7440-39-3	**Barium**	36.4	1,940	mg/kg	18CSB009_0002	7/7	-	1940	Yes	**1,500 N**	21,000 N	**Yes**	ASL
	7440-43-9	Cadmium	0.561 J	1.21 J	mg/kg	18CSB0050002	2/7	0.559 - 0.626	1.21	No	7 N	98 N	No	BSL, BKG
	7440-47-3	**Chromium**	14.6	97.5	mg/kg	18CSB0050002	7/7	-	97.5	Yes	**0.29 C**	**4 C**	**Yes**	ASL
	7439-92-1	Lead	7.09	117	mg/kg	18CSB0050002	7/7	-	117	Yes	400	400	No	BSL
	7439-97-6	Mercury	0.0383 J	0.0383 J	mg/kg	18CSS0010002	1/7	0.032 - 0.0409	0.0383	No	2.3 N[12]	32 N[12]	No	BSL, BKG
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	8.75	183	mg/kg	18CSB0010002	3/3	-	183	NA	NA	3,100	No	BSL
	- -	DRO (C08-C34)	23.8	224	mg/kg	18CSB0010002	3/3	-	224	NA	NA	3,100	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
8 - Value is for acenaphthene.
9 - Value is for pyrene.
10 - Value is for total PCBs.
11 - Value is for hexavalent chromium.
12 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level

Associated Samples

18CSB0010002	18CSB0070002
18CSB0020002	18CSB0080002
18CSB0030002	18CSB009_0002
18CSB0040002	18CSB0090002
18CSB0050002	18CSS0010002
18CSB0060002	18CCP0010002

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	USEPA RSL Protection of Groundwater[4]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea C	**Volatile Organic Compounds**													
	78-93-3	2-Butanone	0.0074 J	0.0218 J	mg/kg	18CSS0010002	2/7	0.00454 - 0.00607	0.0218	NA	20	21 N	No	BSL
	67-64-1	Acetone	0.00535 J	0.152 J	mg/kg	18CSS0010002	7/7	-	0.152	NA	48	49 N	No	BSL
	71-43-2	Benzene	0.00125 J	0.00125 J	mg/kg	18CSB0070002	1/10	0.00227 - 0.00462	0.00125	NA	0.004	0.051 M	No	BSL
	100-41-4	Ethylbenzene	0.0014 J	0.0014 J	mg/kg	18CSB0070002	1/10	0.00227 - 0.00462	0.0014	NA	0.03	16 M	No	BSL
	75-09-2	**Methylene Chloride**	0.0266	0.0371	mg/kg	18CSB0090002	3/7	0.00454 - 0.0473	0.0371	NA	0.05	**0.025 M**	**Yes**	ASL
	108-88-3	Toluene	0.00096 J	0.00344 J	mg/kg	18CSB0070002	2/10	0.00227 - 0.00462	0.00344	NA	11.8	14 M	No	BSL
	1330-20-7	Total Xylenes	0.00233 J	0.00233 J	mg/kg	18CSB0070002	1/10	0.00242 - 0.0091	0.00233	NA	3.8	200 M	No	BSL
	79-01-6	Trichloroethene	0.00216 J	0.00216 J	mg/kg	18CSB0060002	1/7	0.00227 - 0.00303	0.00216	NA	0.0032	0.036 M	No	BSL
	Polycyclic Aromatic Hydrocarbons													
	91-57-6	2-Methylnaphthalene	0.0514	0.0514	mg/kg	18CSB0070002	1/3	0.00393 - 0.00395	0.0514	NA	2.8	2.8 N	No	BSL
	208-96-8	Acenaphthylene	0.0125	0.0125	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.0125	NA	82 [7]	NA	No	BSL
	205-99-2	Benzo(b)fluoranthene	0.00611 J	0.00611 J	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.00611	NA	0.7	7 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	0.00855	0.0666	mg/kg	18CSB0010002	2/3	0.00395 - 0.00395	0.0666	NA	190 [8]	NA	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.011	0.011	mg/kg	18CSB0010002	1/3	0.00387 - 0.00395	0.011	NA	2.4	23 C	No	BSL
	91-20-3	**Naphthalene**	0.0109	0.0109	mg/kg	18CSB0070002	1/3	0.00393 - 0.00395	0.0109	NA	**0.0094**	0.092 C	**Yes**	ASL
	85-01-8	Phenanthrene	0.00242 J	0.0128	mg/kg	18CSB0070002	2/3	0.00393 - 0.00393	0.0128	NA	190 [8]	NA	No	BSL
	129-00-0	Pyrene	0.00307 J	0.00779 J	mg/kg	18CSB0010002	2/3	0.00395 - 0.00395	0.00779	NA	190	190 N	No	BSL
	PCBs													
	11096-82-5	Aroclor-1260	0.0185 J	0.0185 J	mg/kg	18CCP0010002	1/1	-	0.0185	NA	0.48	4.8 C	No	BSL
	Metals													
	7440-38-2	Arsenic	2.42 J	19.6	mg/kg	18CSS0010002	7/7	-	19.6	No	**0.026**	**5.9 M**	No	BKG
	7440-39-3	**Barium**	36.4	1940	mg/kg	18CSB009_0002	7/7	-	1940	Yes	2400	**1,700 M**	**Yes**	ASL
	7440-43-9	Cadmium	0.561 J	1.21 J	mg/kg	18CSB0050002	2/7	0.559 - 0.626	1.21	No	10.4	7.5 M	No	BSL, BKG
	7440-47-3	**Chromium**	14.6	97.5	mg/kg	18CSB0050002	7/7	-	97.5	Yes	**0.0118 [9]**	**0.12 C**	**Yes**	ASL
	7439-92-1	Lead	7.09	117	mg/kg	18CSB0050002	7/7	-	117	Yes	280 [10]	270 M	No	BSL
	7439-97-6	Mercury	0.0383 J	0.0383 J	mg/kg	18CSS0010002	1/7	0.032 - 0.0409	0.0383	No	0.66	2.1 M	No	BSL, BKG
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	8.75	183	mg/kg	18CSB0010002	3/3	-	183	NA	NA	230	No	BSL
	- -	DRO (C08-C34)	23.8	224	mg/kg	18CSB0010002	3/3	-	224	NA	NA	230	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Value is for acenaphthene.
8 - Value is for pyrene.
9 - Value is for hexavalent chromium.
10 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level

Associated Samples

18CSB0010002	18CSB0070002
18CSB0020002	18CSB0080002
18CSB0030002	18CSB009_0002
18CSB0040002	18CSB0090002
18CSB0050002	18CSS0010002
18CSB0060002	18CCP0010002

TABLE 2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea C	**Volatile Organic Compounds**													
	78-93-3	2-Butanone	0.00425 J	0.0407	mg/kg	18CSB0080305	2/5	0.00465 - 0.00707	0.0407	NA	2,800 N	28,000 S	No	BSL
	67-64-1	Acetone	0.00604 J	0.161 J	mg/kg	18CSB0080305	5/5	-	0.161	NA	6,100 N	85,000 N	No	BSL
	71-43-2	Benzene	0.00045 J	0.00045 J	mg/kg	18CSB0070406	1/8	0.0021 - 0.118	0.00045	NA	1.1 C	15 C	No	BSL
	110-82-7	Cyclohexane	0.00441 J	0.00441 J	mg/kg	18CSB0080305	1/5	0.0021 - 0.00353	0.00441	NA	700 N	120 S	No	BSL
	100-41-4	Ethylbenzene	0.00138 J	0.00138 J	mg/kg	18CSB0070406	1/8	0.0021 - 0.118	0.00138	NA	5.4 C	76 C	No	BSL
	108-87-2	Methyl Cyclohexane	0.00173 J	0.00531 J	mg/kg	18CSB0080305	2/5	0.0021 - 0.00353	0.00531	NA	NA	NA	No	NTX
	75-09-2	Methylene Chloride	0.0152	0.0152	mg/kg	18CMWT0030204	1/5	0.00419 - 0.0193	0.0152	NA	36 N[7]	150 C	No	BSL
	108-88-3	Toluene	0.00139 J	0.00205 J	mg/kg	18CSB0080305	2/8	0.0021 - 0.118	0.00205	NA	500 N	820 S	No	BSL
	1330-20-7	Total Xylenes	0.00356 J	0.00356 J	mg/kg	18CSB0070406	1/8	0.00296 - 0.118	0.00356	NA	63 N	260 S	No	BSL
	79-01-6	Trichloroethene	0.00837	0.00837	mg/kg	18CSB0060203	1/5	0.0021 - 0.00353	0.00837	NA	0.44 N[7]	6.2 N	No	BSL
	Polycyclic Aromatic Hydrocarbons													
	83-32-9	Acenaphthene	0.00266 J	0.00266 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00266	NA	340 N	4,800 N	No	BSL
	208-96-8	Acenaphthylene	0.0103	0.0103	mg/kg	18CSB0010204	1/3	0.00399 - 0.00476	0.0103	NA	340 N[8]	NA	No	BSL
	120-12-7	Anthracene	0.00247 J	0.00247 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00247	NA	1,700 N	24,000 N	No	BSL
	50-32-8	Benzo(a)pyrene	0.00445 J	0.00445 J	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.00445	NA	0.015 C	0.21 C	No	BSL
	205-99-2	Benzo(b)fluoranthene	0.00257 J	0.00596 J	mg/kg	18CSB0070406	2/3	0.00476 - 0.00476	0.00596	NA	0.15 C	2.1 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	0.0122	0.0122	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.0122	NA	170 N[9]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	0.00275 J	0.00275 J	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.00275	NA	1.5 C	21 C	No	BSL
	206-44-0	Fluoranthene	0.00897 J	0.00897 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00897	NA	230 N	3,200 N	No	BSL
	86-73-7	Fluorene	0.0158	0.0158	mg/kg	18CSB0010204	1/3	0.00399 - 0.00476	0.0158	NA	230 N	3,200 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.00429 J	0.0101	mg/kg	18CSB0070406	2/3	0.00476 - 0.00476	0.0101	NA	0.15 C	2.1 C	No	BSL
	85-01-8	Phenanthrene	0.0118	2.21	mg/kg	18CSB0070406	3/3	-	2.21	NA	170 N[9]	NA	No	BSL
	129-00-0	Pyrene	0.00731 J	0.109	mg/kg	18CSB0070406	3/3	-	0.109	NA	170 N	2,400 N	No	BSL
	Metals													
	7440-38-2	Arsenic	4.35	8.55	mg/kg	18CMWT0030204	5/5	-	8.55	No	**0.39 C**	**5.5 C**	No	BKG
	7440-39-3	Barium	41.8	253	mg/kg	18CSB0090204	5/5	-	253	Yes	1,500 N	21,000 N	No	BSL
	7440-43-9	Cadmium	0.438 J	0.438 J	mg/kg	18CSB0080305	1/5	0.113 - 0.584	0.438	No	7 N	98 N	No	BSL, BKG
	7440-47-3	Chromium	9.45	25.9	mg/kg	18CSB0060203	5/5	-	25.9	No	**0.29 C**	**4.1 C**	No	BKG
	7439-92-1	Lead	5.35	17.2	mg/kg	18CSB0080305	5/5	-	17.2	No	400	400	No	BSL, BKG
	7439-97-6	Mercury	0.0179 J	0.193	mg/kg	18CSB0080305	2/5	0.0282 - 0.0419	0.193	No	2.3 N[11]	32 N[11]	No	BSL, BKG
	Petroleum Hydrocarbons													
	- -	**DRO (C08-C28)**	437	4,010	mg/kg	18CSB0070406	2/3	9.45 - 9.45	4010	NA	NA	**3,100**	**Yes**	ASL
	- -	**DRO (C08-C34)**	35.5	4,030	mg/kg	18CSB0070406	3/3	-	4030	NA	NA	**3,100**	**Yes**	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Ten percent of the noncarcinogenic value is less than the carcinogenic value, therefore the noncarcinogenic value is presented.
8 - Value is for acenaphthene.
9 - Value is for pyrene.
10 - Value is for hexavalent chromium.
11 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NTX = No toxicity criteria available

Associated Samples

18CMWT0030204	18CSB0060203
18CSB0010204	18CSB0070406
18CSB0020507	18CSB0080305
18CSB0040507	18CSB0090204

TABLE 2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	USEPA RSL Protection of Groundwater[4]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea C	**Volatile Organic Compounds**													
	78-93-3	2-Butanone	0.00425 J	0.0407	mg/kg	18CSB0080305	2/5	0.00465 - 0.00707	0.0407	NA	20	21 N	No	BSL
	67-64-1	Acetone	0.00604 J	0.161 J	mg/kg	18CSB0080305	5/5	-	0.161	NA	48	49 N	No	BSL
	71-43-2	Benzene	0.00045 J	0.00045 J	mg/kg	18CSB0070406	1/8	0.0021 - 0.118	0.00045	NA	0.004	0.051 M	No	BSL
	110-82-7	Cyclohexane	0.00441 J	0.00441 J	mg/kg	18CSB0080305	1/5	0.0021 - 0.00353	0.00441	NA	260	270 N	No	BSL
	100-41-4	Ethylbenzene	0.00138 J	0.00138 J	mg/kg	18CSB0070406	1/8	0.0021 - 0.118	0.00138	NA	0.03	16 M	No	BSL
	108-87-2	Methyl Cyclohexane	0.00173 J	0.00531 J	mg/kg	18CSB0080305	2/5	0.0021 - 0.00353	0.00531	NA	NA	NA	No	NTX
	75-09-2	Methylene Chloride	0.0152	0.0152	mg/kg	18CMWT0030204	1/5	0.00419 - 0.0193	0.0152	NA	0.05	0.025 M	No	BSL
	108-88-3	Toluene	0.00139 J	0.00205 J	mg/kg	18CSB0080305	2/8	0.0021 - 0.118	0.00205	NA	11.8	14 M	No	BSL
	1330-20-7	Total Xylenes	0.00356 J	0.00356 J	mg/kg	18CSB0070406	1/8	0.00296 - 0.118	0.00356	NA	3.8	200 M	No	BSL
	79-01-6	**Trichloroethene**	0.00837	0.00837	mg/kg	18CSB0060203	1/5	0.0021 - 0.00353	0.00837	NA	**0.0032**	0.036 M	**Yes**	ASL
	Polycyclic Aromatic Hydrocarbons													
	83-32-9	Acenaphthene	0.00266 J	0.00266 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00266	NA	82	82 N	No	BSL
	208-96-8	Acenaphthylene	0.0103	0.0103	mg/kg	18CSB0010204	1/3	0.00399 - 0.00476	0.0103	NA	82 [7]	NA	No	BSL
	120-12-7	Anthracene	0.00247 J	0.00247 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00247	NA	840	860 N	No	BSL
	50-32-8	Benzo(a)pyrene	0.00445 J	0.00445 J	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.00445	NA	0.07	4.7 M	No	BSL
	205-99-2	Benzo(b)fluoranthene	0.00257 J	0.00596 J	mg/kg	18CSB0070406	2/3	0.00476 - 0.00476	0.00596	NA	0.7	7 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	0.0122	0.0122	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.0122	NA	190 [8]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	0.00275 J	0.00275 J	mg/kg	18CSB0070406	1/3	0.00373 - 0.00476	0.00275	NA	7	68 C	No	BSL
	206-44-0	Fluoranthene	0.00897 J	0.00897 J	mg/kg	18CSB0040507	1/3	0.00373 - 0.00399	0.00897	NA	1,400	1400 N	No	BSL
	86-73-7	Fluorene	0.0158	0.0158	mg/kg	18CSB0010204	1/3	0.00399 - 0.00476	0.0158	NA	80	81 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.00429 J	0.0101	mg/kg	18CSB0070406	2/3	0.00476 - 0.00476	0.0101	NA	2.4	23 C	No	BSL
	85-01-8	Phenanthrene	0.0118	2.21	mg/kg	18CSB0070406	3/3	-	2.21	NA	190 [8]	NA	No	BSL
	129-00-0	Pyrene	0.00731 J	0.109	mg/kg	18CSB0070406	3/3	-	0.109	NA	190	190 N	No	BSL
	Metals													
	7440-38-2	Arsenic	4.35	8.55	mg/kg	18CMWT0030204	5/5	-	8.55	No	**0.026**	**5.9 M**	No	BKG
	7440-39-3	Barium	41.8	253	mg/kg	18CSB0090204	5/5	-	253	Yes	2,400	1700 M	No	BSL
	7440-43-9	Cadmium	0.438 J	0.438 J	mg/kg	18CSB0080305	1/5	0.113 - 0.584	0.438	No	10.4	7.5 M	No	BSL, BKG
	7440-47-3	Chromium	9.45	25.9	mg/kg	18CSB0060203	5/5	-	25.9	No	**0.0118** [9]	**0.12 C**	No	BKG
	7439-92-1	Lead	5.35	17.2	mg/kg	18CSB0080305	5/5	-	17.2	No	280 [10]	270 M	No	BSL, BKG
	7439-97-6	Mercury	0.0179 J	0.193	mg/kg	18CSB0080305	2/5	0.0282 - 0.0419	0.193	No	0.66	2.1 M	No	BSL, BKG
	Petroleum Hydrocarbons													
	- -	**DRO (C08-C28)**	437	4,010	mg/kg	18CSB0070406	2/3	9.45 - 9.45	4,010	NA	NA	**230**	**Yes**	ASL
	- -	**DRO (C08-C34)**	35.5	4,030	mg/kg	18CSB0070406	3/3	-	4,030	NA	NA	**230**	**Yes**	ASL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Value is for acenaphthene.
8 - Value is for pyrene.
9 - Value is for hexavalent chromium.
10 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

18CMWT0030204	18CSB0060203
18CSB0010204	18CSB0070406
18CSB0020507	18CSB0080305
18CSB0040507	18CSB0090204

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NTX = No toxicity criteria available

TABLE 2.5
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH GROUNDWATER - AREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Range of Background Concentrations[3]	Adjusted USEPA RSL Tapwater[4]	USEPA MCL[5]	IDEM Groundwater Residential[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Subarea C	**Volatile Organic Compounds**														
	71-43-2	**Benzene**	0.286 J	0.286 J	ug/L	18CGWT002	1/3	0.5 - 0.5	0.286	NA	**0.039 C**	5	5 M	**Yes**	ASL
	74-87-3	Chloromethane	1.93 J	1.93 J	ug/L	18CGWT003	1/3	0.5 - 0.5	1.93	NA	19 N	NA	190 N	No	BSL
	108-88-3	Toluene	0.4 J	0.4 J	ug/L	18CGWT002	1/3	0.5 - 0.5	0.4	NA	86 N	1,000	1000 M	No	BSL
	Metals (Total)														
	7440-38-2	**Arsenic**	1.79 J	1.79 J	ug/L	18CGWT001	1/3	1.5 - 1.5	1.79	1.24 - 1.28	**0.045 C**	10	10 M	**Yes**	ASL
	7440-39-3	Barium	14 J	33.7	ug/L	18CGWT002	3/3	-	33.7	8.57 - 61.4	290 N	2,000	2000 M	No	BSL
	7440-43-9	**Cadmium**	0.898 J	0.898 J	ug/L	18CGWT002	1/3	0.5 - 1	0.898	NA	**0.69 N**	5	5 M	**Yes**	ASL
	7440-47-3	**Chromium**	1.6 J	1.6 J	ug/L	18CGWT002	1/3	1 - 2	1.6	1.18	**0.031 C[8]**	100 [9]	**0.31 C[8]**	**Yes**	ASL
	7782-49-2	Selenium	1.81 J	1.81 J	ug/L	18CGWT003	1/3	1.25 - 2.5	1.81	NA	7.8 N	50	50 M	No	BSL
	Metals (Filtered)														
	7440-38-2	**Arsenic**	1.62 J	1.71 J	ug/L	18CGWT003	2/2	-	1.71	NA	**0.045 C**	10	10 M	**Yes**	ASL
	7440-39-3	Barium	14.3	36.4	ug/L	18CGWT003	2/2	-	36.4	38	290 N	2,000	2000 M	No	BSL
	7440-47-3	**Chromium**	2.94	4.1 J	ug/L	18CGWT003	2/2	-	4.1	NA	**0.031 C[8]**	100 [9]	**0.31 C[8]**	**Yes**	ASL
	7439-92-1	Lead	1.83	1.83	ug/L	18CGWT003	1/2	0.75 - 0.75	1.83	NA	15	15 [10]	15 M	No	BSL
	7782-49-2	Selenium	1.66	1.66	ug/L	18CGWT003	1/2	1.25 - 1.25	1.66	NA	7.8 N	50	50 M	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Data is for monitoring wells 08MWT008 (upgradient) and 08MWT012 (cross gradient).
4 - USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2012. RSLs for carcinogens correspond to an integrated lifetime cancer risk (ILCR) of 1E-06; adjusted RSLs for noncarcinogens correspond to a hazard quotient (HQ) of 0.1.
5 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
4 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Values are for hexavalent chromium.
9 - Value is for total chromium.
10 - The MCL for this parameter is actually a treatment technique. The SDWA action level (at the tap) has been presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18CGWT001
18CGWT002
18CGWT003

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical Of Potential Concern
M = Maximum Contaminant Level
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level.

For elimination as a COPC:
BSL = Below COPC Screening Level

TABLE 2.6
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - VAPOR INTRUSION - AREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Range of Background Concentrations[3]	USEPA Groundwater Volatilization Criterion[4]	IDEM Vapor Exposure[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea C	**Volatile Organic Compounds**													
	71-43-2	Benzene	0.286 J	0.286 J	ug/L	18CGWT002	1/3	0.5 - 0.5	0.286	NA	1.4 C	24 C	No	BSL
	74-87-3	Chloromethane	1.93 J	1.93 J	ug/L	18CGWT003	1/3	0.5 - 0.5	1.93	NA	26 N	NA	No	BSL
	108-88-3	Toluene	0.4 J	0.4 J	ug/L	18CGWT002	1/3	0.5 - 0.5	0.4	NA	NA	NA	No	NTX
	Metals (Total)													
	7440-38-2	Arsenic	1.79 J	1.79 J	ug/L	18CGWT001	1/3	1.5 - 1.5	1.79	1.24 - 1.28	NA	NA	No	NTX
	7440-39-3	Barium	14 J	33.7	ug/L	18CGWT002	3/3	-	33.7	8.57 - 61.4	NA	NA	No	NTX
	7440-43-9	Cadmium	0.898 J	0.898 J	ug/L	18CGWT002	1/3	0.5 - 1	0.898	NA	NA	NA	No	NTX
	7440-47-3	Chromium	1.6 J	1.6 J	ug/L	18CGWT002	1/3	1 - 2	1.6	1.18	NA	NA	No	NTX
	7782-49-2	Selenium	1.81 J	1.81 J	ug/L	18CGWT003	1/3	1.25 - 2.5	1.81	NA	NA	NA	No	NTX
	Metals (Filtered)													
	7440-38-2	Arsenic	1.62 J	1.71 J	ug/L	18CGWT003	2/2	-	1.71	NA	NA	NA	No	NTX
	7440-39-3	Barium	14.3	36.4	ug/L	18CGWT003	2/2	-	36.4	38	NA	NA	No	NTX
	7440-47-3	Chromium	2.94	4.1 J	ug/L	18CGWT003	2/2	-	4.1	NA	NA	NA	No	NTX
	7439-92-1	Lead	1.83	1.83	ug/L	18CGWT003	1/2	0.75 - 0.75	1.83	NA	NA	NA	No	NTX
	7782-49-2	Selenium	1.66	1.66	ug/L	18CGWT003	1/2	1.25 - 1.25	1.66	NA	NA	NA	No	NTX

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - Data is for monitoring wells 08MWT008 (upgradient) and 08MWT012 (cross gradient).
4 - USEPA's Vapor Intrusion Screening Level (VISL) calculator (USEPA, March 2012). Values correspond to a target cancer risk level of 1E-06 or HQ = 0.1 and an attenuation factor of 0.001.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18CGWT001
18CGWT002
18CGWT003

Definitions:
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BSL = Below COPC Screening Level
NTX = No toxicity criteria

TABLE 2.7
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SEDIMENT - SUBAREA C
SMWU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea C	**Polycyclic Aromatic Hydrocarbons**													
	91-57-6	2-Methylnaphthalene	0.0081 J	0.0081 J	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0081	NA	31 N	370 S	No	BSL
	83-32-9	Acenaphthene	0.00336 J	0.00336 J	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.00336	NA	340 N	4,800 N	No	BSL
	208-96-8	Acenaphthylene	0.0367	0.0367	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0367	NA	340 N[7]	NA	No	BSL
	120-12-7	Anthracene	0.0167	0.0167	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0167	NA	1,700 N	24,000 N	No	BSL
	56-55-3	Benzo(a)anthracene	0.0903	0.0903	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0903	NA	0.15 C	2.1 C	No	BSL
	50-32-8	**Benzo(a)pyrene**	0.004 J	0.17	mg/kg	18CSD0020006	2/2	-	0.17	NA	**0.015 C**	0.21 C	**Yes**	ASL
	205-99-2	**Benzo(b)fluoranthene**	0.00734 J	0.217	mg/kg	18CSD0020006	2/2	-	0.217	NA	**0.15 C**	2.1 C	**Yes**	ASL
	191-24-2	Benzo(g,h,i)perylene	0.00505 J	0.143	mg/kg	18CSD0020006	2/2	-	0.143	NA	170 N[8]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	0.00314 J	0.0829	mg/kg	18CSD0020006	2/2	-	0.0829	NA	1.5 C	21 C	No	BSL
	218-01-9	Chrysene	0.145	0.145	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.145	NA	15 C	210 C	No	BSL
	53-70-3	**Dibenzo(a,h)anthracene**	0.0385	0.0385	mg/kg	18CSD0020006	1/2	0.00419 - 0.00419	0.0385	NA	**0.015 C**	0.21 C	**Yes**	ASL
	206-44-0	Fluoranthene	0.00513 J	0.0302	mg/kg	18CSD0020006	2/2	-	0.0302	NA	230 N	3,200 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.00501 J	0.141	mg/kg	18CSD0020006	2/2	-	0.141	NA	0.15 C	2.1 C	No	BSL
	85-01-8	Phenanthrene	0.00251 J	0.0162	mg/kg	18CSD0020006	2/2	-	0.0162	NA	170 N[8]	NA	No	BSL
	129-00-0	Pyrene	0.0049 J	0.0358	mg/kg	18CSD0020006	2/2	-	0.0358	NA	170 N	2,400 N	No	BSL
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	41.4	49.8	mg/kg	18CSD0020006	2/2	-	49.8	NA	NA	3,100	No	BSL
	- -	DRO (C08-C34)	68.8	91.7	mg/kg	18CSD0020006	2/2	-	91.7	NA	NA	3,100	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - No background data is available for sediment.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
2 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - Value is for acenaphthene.
8 - Value is for pyrene.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18CSD0010006
18CSD0020006

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level

For elimination as a COPC:
BSL = Below COPC Screening Level

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

3.1.RME	Surface Soil
3.2.RME	Subsurface Soil
3.3.RME	Sediment

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Area C	Barium	mg/kg	340	1,500 (NP)	1,940	1,500	mg/kg	95% Chebyshev(Mean, Sd) UCL	ProUCL 4.1.00
	Chromium	mg/kg	34.1	64.4 (G)	97.5	64.4	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.00

NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Area C	Benzene	ug/L	0.262	(1)	0.286 J	0.286	ug/L	Maximum Detected Concentration	(1)
	Arsenic	ug/L	1.1	(1)	1.79 J	1.79	ug/L	Maximum Detected Concentration	(1)
	Cadmium	ug/L	0.549	(1)	0.898 J	0.898	ug/L	Maximum Detected Concentration	(1)
	Chromium	ug/L	1.03	(1)	1.6 J	1.6	ug/L	Maximum Detected Concentration	(1)

G - Gamma distribution.
N - Normal distribution.
NP = Nonparametric distribution.

1 - There are less than five samples. Reliable statistics cannot be computed. The Maximum concentration was used as the EPC.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Area C	Benzo(a)pyrene	mg/kg	(1)	(1)	0.17	0.17	mg/kg	Maximum Detected Concentration	(1)
	Benzo(b)fluoranthene	mg/kg	(1)	(1)	0.217	0.217	mg/kg	Maximum Detected Concentration	(1)
	Dibenzo(a,h)anthracene	mg/kg	(1)	(1)	0.0385	0.0385	mg/kg	Maximum Detected Concentration	(1)

N = Normal
NP = Non-parametric

1 - There are only two samples. Reliable statistics cannot be computed. The Maximum concentration was used as the EPC.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	Reasonable Maximum Exposures
7.1.RME	Construction Workers
7.2.RME	Industrial Workers
7.3.RME	Adolescent Trespassers
7.4.RME	Child Recreational Users
7.5.RME	Adult Recreational Users
7.6.RME	Child Residents
7.7.RME	Adult Residents
	Central Tendency Exposures
7.1.CTE	Construction Workers
7.2.CTE	Industrial Workers
7.3.CTE	Adolescent Trespassers
7.4.CTE	Child Recreational Users
7.5.CTE	Adult Recreational Users
7.6.CTE	Child Residents
7.7.CTE	Adult Residents

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	4.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.01
				Chromium	64.4	mg/kg	1.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.9E-07	1.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
			Exp. Route Total								8.9E-07					0.06
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									8.9E-07					0.06
	Exposure Medium Total										8.9E-07					0.06
	Air	Subarea C	Inhalation	Barium	0.001	mg/m^3	2.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-04	(mg/m^3)	5.0E-03	(mg/m^3)	0.03
				Chromium	4.8E-5	mg/m^3	9.4E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	7.9E-06	6.6E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.07
			Exp. Route Total								7.9E-06					0.10
		Exposure Point Total									7.9E-06					0.10
	Exposure Medium Total										7.9E-06					0.10
Medium Total											8.8E-06					0.2
Groundwater	Groundwater	Subarea C	Dermal	Benzene	0.286	ug/L	1.0E-09	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	5.7E-11	7.3E-08	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.000007
				Arsenic	1.79	ug/L	4.0E-10	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.9E-10	2.8E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00009
				Cadmium	0.898	ug/L	2.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0006
				Chromium	1.60	ug/L	7.1E-10	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.4E-08	5.0E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0007
			Exp. Route Total								1.5E-08					0.001
		Exposure Point Total									1.5E-08					0.001
	Exposure Medium Total										1.5E-08					0.001
	Air	Subarea C	Inhalation	Benzene	1.2E-5	mg/m^3	2.3E-09	(mg/m^3)	7.8E-06	$(ug/m^3)^{-1}$	1.8E-11	1.6E-07	(mg/m^3)	8.0E-02	(mg/m^3)	0.000002
				Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-05	(mg/m^3)	--
				Cadmium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Chromium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
			Exp. Route Total								1.8E-11					0.000002
		Exposure Point Total									1.8E-11					0.000002
	Exposure Medium Total										1.8E-11					0.000002
Medium Total											1.5E-08					0.001
										Total of Receptor Risks Across All Media	8.8E-06			Total of Receptor Hazards Across All Media		0.2

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	5.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.007
				Chromium	64.4	mg/kg	2.3E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.1E-05	6.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
			Exp. Route Total								1.1E-05					0.03
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									1.1E-05					0.03
	Exposure Medium Total										1.1E-05					0.03
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	9.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-07	(mg/m^3)	5.0E-04	(mg/m^3)	0.0005
				Chromium	4.9E-8	mg/m^3	4.0E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.4E-07	1.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
			Exp. Route Total								3.4E-07					0.0006
		Exposure Point Total									3.4E-07					0.0006
	Exposure Medium Total										3.4E-07					0.0006
Medium Total											1.2E-05					0.03

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	3.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.001
				Chromium	64.4	mg/kg	4.6E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.3E-06	1.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
			Exp. Route Total								2.3E-06					0.005
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									2.3E-06					0.005
	Exposure Medium Total										2.3E-06					0.005
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	1.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-08	(mg/m^3)	5.0E-04	(mg/m^3)	0.00003
				Chromium	4.9E-8	mg/m^3	2.5E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.1E-08	5.8E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000006
			Exp. Route Total								2.1E-08					0.00003
		Exposure Point Total									2.1E-08					0.00003
	Exposure Medium Total										2.1E-08					0.00003
Medium Total											2.3E-06					0.005
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	3.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-08	8.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	8.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-09	2.0E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.7E-08					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	6.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-08	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	8.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.9E-09	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.3E-08					--
		Exposure Point Total									9.9E-08					--
	Exposure Medium Total										9.9E-08					--
Medium Total											9.9E-08					--
										Total of Receptor Risks Across All Media	2.4E-06			Total of Receptor Hazards Across All Media		0.005

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.007
				Chromium	64.4	mg/kg	2.8E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-05	6.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
			Exp. Route Total								1.4E-05					0.03
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									1.4E-05					0.03
	Exposure Medium Total										1.4E-05					0.03
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	2.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-08	(mg/m^3)	5.0E-04	(mg/m^3)	0.00005
				Chromium	4.9E-8	mg/m^3	5.3E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.5E-08	1.2E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00001
			Exp. Route Total								4.5E-08					0.00007
		Exposure Point Total									4.5E-08					0.00007
	Exposure Medium Total										4.5E-08					0.00007
Medium Total											1.4E-05					0.03
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	7.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.4E-07	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	9.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.3E-07					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	5.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	6.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.0E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.9E-08	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.3E-07					--
		Exposure Point Total									1.3E-06					--
	Exposure Medium Total										1.3E-06					--
Medium Total											1.3E-06					--
										Total of Receptor Risks Across All Media	1.5E-05			Total of Receptor Hazards Across All Media		0.03

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	5.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0008
				Chromium	64.4	mg/kg	4.1E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.1E-06	6.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
			Exp. Route Total								2.1E-06					0.003
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									2.1E-06					0.003
	Exposure Medium Total										2.1E-06					0.003
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	9.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-08	(mg/m^3)	5.0E-04	(mg/m^3)	0.00005
				Chromium	4.9E-8	mg/m^3	7.3E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	6.1E-08	1.2E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00001
			Exp. Route Total								6.1E-08					0.00007
		Exposure Point Total									6.1E-08					0.00007
	Exposure Medium Total										6.1E-08					0.00007
Medium Total											2.1E-06					0.003
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.9E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	2.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-08	3.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-07					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-08	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-08	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-07					--
		Exposure Point Total									2.2E-07					--
	Exposure Medium Total										2.2E-07					--
Medium Total											2.2E-07					--
										Total of Receptor Risks Across All Media	2.3E-06			Total of Receptor Hazards Across All Media		0.003

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	1.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-02	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.10
				Chromium	64.4	mg/kg	3.8E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.9E-04	8.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.3
			Exp. Route Total								1.9E-04					0.4
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									1.9E-04					0.4
	Exposure Medium Total										1.9E-04					0.4
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	9.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	5.0E-04	(mg/m^3)	0.002
				Chromium	4.9E-8	mg/m^3	2.1E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.8E-06	4.7E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0005
			Exp. Route Total								1.8E-06					0.003
		Exposure Point Total									1.8E-06					0.003
	Exposure Medium Total										1.8E-06					0.003
Medium Total											1.9E-04					0.4
Groundwater	Groundwater	Subarea C	Ingestion	Benzene	0.286	ug/L	1.6E-06	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	8.6E-08	1.8E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.005
				Arsenic	1.79	ug/L	9.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	0.898	ug/L	4.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.1
				Chromium	1.60	ug/L	4.7E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.3E-05	1.0E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.03
			Exp. Route Total								3.8E-05					0.5
			Dermal	Benzene	0.286	ug/L	2.4E-07	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	1.3E-08	2.8E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0007
				Arsenic	1.79	ug/L	6.5E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.7E-08	7.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Cadmium	0.898	ug/L	3.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Chromium	1.60	ug/L	6.2E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.2E-05	1.4E-06	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.02
			Exp. Route Total								1.2E-05					0.04
		Exposure Point Total									5.1E-05					0.6
	Exposure Medium Total										5.1E-05					0.6
	Air	Subarea C	Inhalation	Benzene	5.6E-4	mg/m^3	1.9E-06	(mg/m^3)	7.8E-06	$(ug/m^3)^{-1}$	1.5E-08	2.2E-05	(mg/m^3)	3.0E-02	(mg/m^3)	0.0007
				Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Cadmium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Chromium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
			Exp. Route Total								1.5E-08					0.0007
		Exposure Point Total									1.5E-08					0.0007
	Exposure Medium Total										1.5E-08					0.0007
Medium Total											5.1E-05					0.6
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	7.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.4E-07	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	9.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.3E-07					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	5.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	6.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.0E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.9E-08	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.3E-07					--
		Exposure Point Total									1.3E-06					--
	Exposure Medium Total										1.3E-06					--
Medium Total											1.3E-06					--
										Total of Receptor Risks Across All Media	2.4E-04			Total of Receptor Hazards Across All Media		0.9

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	7.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.01
				Chromium	64.4	mg/kg	5.5E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.8E-05	8.8E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.03
			Exp. Route Total								2.8E-05					0.04
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									2.8E-05					0.04
	Exposure Medium Total										2.8E-05					0.04
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	3.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	5.0E-04	(mg/m^3)	0.002
				Chromium	4.9E-8	mg/m^3	2.9E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.5E-06	4.7E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0005
			Exp. Route Total								2.5E-06					0.003
		Exposure Point Total									2.5E-06					0.003
	Exposure Medium Total										2.5E-06					0.003
Medium Total											3.0E-05					0.04
Groundwater	Groundwater	Subarea C	Ingestion	Benzene	0.286	ug/L	2.7E-06	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	1.5E-07	7.8E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Arsenic	1.79	ug/L	1.7E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.5E-05	4.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	0.898	ug/L	8.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.05
				Chromium	1.60	ug/L	2.8E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-05	4.4E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
			Exp. Route Total								3.9E-05					0.2
			Dermal	Benzene	0.286	ug/L	4.1E-07	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	2.2E-08	1.2E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0003
				Arsenic	1.79	ug/L	8.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-07	2.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Cadmium	0.898	ug/L	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.005
				Chromium	1.60	ug/L	2.9E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	5.8E-06	4.6E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.006
			Exp. Route Total								5.9E-06					0.01
		Exposure Point Total									4.5E-05					0.2
	Exposure Medium Total										4.5E-05					0.2
	Air	Subarea C	Inhalation	Benzene	5.6E-4	mg/m^3	7.6E-06	(mg/m^3)	7.8E-06	$(ug/m^3)^{-1}$	6.0E-08	2.2E-05	(mg/m^3)	3.0E-02	(mg/m^3)	0.0007
				Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Cadmium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Chromium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
			Exp. Route Total								6.0E-08					0.0007
		Exposure Point Total									6.0E-08					0.0007
	Exposure Medium Total										6.0E-08					0.0007
Medium Total											4.5E-05					0.2
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.9E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	2.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-08	3.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-07					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-08	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-08	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-07					--
		Exposure Point Total									2.2E-07					--
	Exposure Medium Total										2.2E-07					--
Medium Total											2.2E-07					--
										Total of Receptor Risks Across All Media	7.6E-05				Total of Receptor Hazards Across All Media	0.3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.004
				Chromium	64.4	mg/kg	4.5E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.2E-07	3.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
			Exp. Route Total								2.2E-07					0.01
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									2.2E-07					0.01
	Exposure Medium Total										2.2E-07					0.01
	Air	Subarea C	Inhalation	Barium	0.001	mg/m^3	1.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.7E-05	(mg/m^3)	5.0E-03	(mg/m^3)	0.02
				Chromium	4.8E-5	mg/m^3	4.7E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.0E-06	3.3E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.03
			Exp. Route Total								4.0E-06					0.05
		Exposure Point Total									4.0E-06					0.05
	Exposure Medium Total										4.0E-06					0.05
Medium Total											4.2E-06					0.06
Groundwater	Groundwater	Subarea C	Dermal	Benzene	0.286	ug/L	3.0E-10	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	1.6E-11	2.1E-08	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.000002
				Arsenic	1.79	ug/L	9.9E-11	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-10	6.9E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00002
				Cadmium	0.898	ug/L	5.0E-11	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0001
				Chromium	1.60	ug/L	1.8E-10	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	3.5E-09	1.2E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0002
			Exp. Route Total								3.7E-09					0.0003
		Exposure Point Total									3.7E-09					0.0003
	Exposure Medium Total										3.7E-09					0.0003
	Air	Subarea C	Inhalation	Benzene	1.2E-5	mg/m^3	5.8E-10	(mg/m^3)	7.8E-06	$(ug/m^3)^{-1}$	4.5E-12	4.1E-08	(mg/m^3)	8.0E-02	(mg/m^3)	5.1E-7
				Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-05	(mg/m^3)	--
				Cadmium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Chromium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
			Exp. Route Total								4.5E-12					5.1E-7
		Exposure Point Total									4.5E-12					5.1E-7
	Exposure Medium Total										4.5E-12					5.1E-7
Medium Total											3.7E-09					0.0003
										Total of Receptor Risks Across All Media	4.2E-06			Total of Receptor Hazards Across All Media		0.06

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	8.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.003
				Chromium	64.4	mg/kg	3.5E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.8E-06	2.8E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.009
			Exp. Route Total								1.8E-06					0.01
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									1.8E-06					0.01
	Exposure Medium Total										1.8E-06					0.01
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	2.9E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.3E-07	(mg/m^3)	5.0E-04	(mg/m^3)	0.0005
				Chromium	4.9E-8	mg/m^3	1.3E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.1E-07	9.8E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00010
			Exp. Route Total								1.1E-07					0.0006
		Exposure Point Total									1.1E-07					0.0006
	Exposure Medium Total										1.1E-07					0.0006
Medium Total											1.9E-06					0.01

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	8.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0003
				Chromium	64.4	mg/kg	1.1E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.7E-07	2.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0009
			Exp. Route Total								5.7E-07					0.001
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									5.7E-07					0.001
	Exposure Medium Total										5.7E-07					0.001
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	4.8E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-09	(mg/m^3)	5.0E-04	(mg/m^3)	0.000007
				Chromium	4.9E-8	mg/m^3	6.2E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	5.2E-09	1.5E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
			Exp. Route Total								5.2E-09					0.000008
		Exposure Point Total									5.2E-09					0.000008
	Exposure Medium Total										5.2E-09					0.000008
Medium Total											5.8E-07					0.001
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	9.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-09	2.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	1.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-10	2.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	2.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-09	4.9E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.2E-09					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	9.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.9E-09	2.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	1.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.8E-10	2.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	2.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-09	5.0E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.3E-09					--
		Exposure Point Total									1.8E-08					--
	Exposure Medium Total										1.8E-08					--
Medium Total											1.8E-08					--
										Total of Receptor Risks Across All Media	6.0E-07			Total of Receptor Hazards Across All Media		0.001

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.002
				Chromium	64.4	mg/kg	2.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-06	1.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
			Exp. Route Total								1.4E-06					0.007
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									1.4E-06					0.007
	Exposure Medium Total										1.4E-06					0.007
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	1.9E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-09	(mg/m^3)	5.0E-04	(mg/m^3)	0.00001
				Chromium	4.9E-8	mg/m^3	5.4E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.5E-09	2.9E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000003
			Exp. Route Total								4.5E-09					0.00002
		Exposure Point Total									4.5E-09					0.00002
	Exposure Medium Total										4.5E-09					0.00002
Medium Total											1.4E-06					0.007
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	7.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-08	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	9.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-09	5.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	9.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.4E-08					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	2.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-08	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	2.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	4.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-09	2.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.2E-08					--
		Exposure Point Total									9.6E-08					--
	Exposure Medium Total										9.6E-08					--
Medium Total											9.6E-08					--
										Total of Receptor Risks Across All Media	1.5E-06			Total of Receptor Hazards Across All Media		0.007

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-05	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.0002
				Chromium	64.4	mg/kg	2.6E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.3E-07	1.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0005
			Exp. Route Total								1.3E-07					0.0007
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									1.3E-07					0.0007
	Exposure Medium Total										1.3E-07					0.0007
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	6.8E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-09	(mg/m^3)	5.0E-04	(mg/m^3)	0.00001
				Chromium	4.9E-8	mg/m^3	4.6E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.8E-09	2.9E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000003
			Exp. Route Total								3.8E-09					0.00002
		Exposure Point Total									3.8E-09					0.00002
	Exposure Medium Total										3.8E-09					0.00002
Medium Total											1.3E-07					0.0008
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	6.8E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-09	4.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	8.7E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.3E-10	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.5E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-09	9.8E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.7E-09					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	2.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-09	1.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	2.6E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-10	1.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	4.6E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-10	2.9E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-09					--
		Exposure Point Total									8.7E-09					--
	Exposure Medium Total										8.7E-09					--
Medium Total											8.7E-09					--
										Total of Receptor Risks Across All Media	1.4E-07			Total of Receptor Hazards Across All Media		0.0008

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	1.8E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-03	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.03
				Chromium	64.4	mg/kg	5.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.6E-05	2.8E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.09
			Exp. Route Total								2.6E-05					0.1
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									2.6E-05					0.1
	Exposure Medium Total										2.6E-05					0.1
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	2.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-07	(mg/m^3)	5.0E-04	(mg/m^3)	0.001
				Chromium	4.9E-8	mg/m^3	5.8E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.9E-07	3.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0003
			Exp. Route Total								4.9E-07					0.002
		Exposure Point Total									4.9E-07					0.002
	Exposure Medium Total										4.9E-07					0.002
Medium Total											2.6E-05					0.1
Groundwater	Groundwater	Subarea C	Ingestion	Benzene	0.286	ug/L	6.9E-07	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	3.8E-08	8.1E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Arsenic	1.79	ug/L	4.3E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.5E-06	5.0E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	0.898	ug/L	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.05
				Chromium	1.60	ug/L	2.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.0E-05	4.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
			Exp. Route Total								1.7E-05					0.2
			Dermal	Benzene	0.286	ug/L	8.8E-08	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	4.9E-09	1.0E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0003
				Arsenic	1.79	ug/L	1.4E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-08	1.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Cadmium	0.898	ug/L	7.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Chromium	1.60	ug/L	1.4E-07	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	2.7E-06	3.0E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.004
			Exp. Route Total								2.7E-06					0.008
		Exposure Point Total									2.0E-05					0.2
	Exposure Medium Total										2.0E-05					0.2
	Air	Subarea C	Inhalation	Benzene	5.4E-5	mg/m^3	4.1E-08	(mg/m^3)	7.8E-06	$(ug/m^3)^{-1}$	3.2E-10	1.4E-06	(mg/m^3)	3.0E-02	(mg/m^3)	0.00005
				Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Cadmium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Chromium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
			Exp. Route Total								3.2E-10					0.00005
		Exposure Point Total									3.2E-10					0.00005
	Exposure Medium Total										3.2E-10					0.00005
Medium Total											2.0E-05					0.2
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	7.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-08	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	9.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-09	5.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	9.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.4E-08					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	2.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-08	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	2.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	4.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-09	2.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.2E-08					--
		Exposure Point Total									9.6E-08					--
	Exposure Medium Total										9.6E-08					--
Medium Total											9.6E-08					--
										Total of Receptor Risks Across All Media	4.6E-05			Total of Receptor Hazards Across All Media		0.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Barium	1,500	mg/kg	6.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.9E-04	(mg/kg/day)	2.0E-01	(mg/kg/day)	0.003
				Chromium	64.4	mg/kg	4.6E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.3E-06	2.9E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.010
			Exp. Route Total								2.3E-06					0.01
			Dermal	Barium	1,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.4E-02	(mg/kg/day)	--
				Chromium	64.4	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									2.3E-06					0.01
	Exposure Medium Total										2.3E-06					0.01
	Air	Subarea C	Inhalation	Barium	1.1E-6	mg/m^3	7.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-07	(mg/m^3)	5.0E-04	(mg/m^3)	0.001
				Chromium	4.9E-8	mg/m^3	4.9E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.1E-07	3.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0003
			Exp. Route Total								4.1E-07					0.002
		Exposure Point Total									4.1E-07					0.002
	Exposure Medium Total										4.1E-07					0.002
Medium Total											2.7E-06					0.02
Groundwater	Groundwater	Subarea C	Ingestion	Benzene	0.286	ug/L	3.7E-07	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	2.0E-08	3.7E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0009
				Arsenic	1.79	ug/L	2.3E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.4E-06	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	0.898	ug/L	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.02
				Chromium	1.60	ug/L	3.2E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.6E-06	2.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.007
			Exp. Route Total								5.1E-06					0.1
			Dermal	Benzene	0.286	ug/L	7.8E-08	(mg/kg/day)	5.5E-02	$(mg/kg/day)^{-1}$	4.3E-09	7.8E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0002
				Arsenic	1.79	ug/L	1.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-08	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Cadmium	0.898	ug/L	5.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Chromium	1.60	ug/L	3.1E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	6.2E-07	2.0E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.003
			Exp. Route Total								6.4E-07					0.005
		Exposure Point Total									5.7E-06					0.1
	Exposure Medium Total										5.7E-06					0.1
	Air	Subarea C	Inhalation	Benzene	5.4E-5	mg/m^3	1.4E-07	(mg/m^3)	7.8E-06	$(ug/m^3)^{-1}$	1.1E-09	1.4E-06	(mg/m^3)	3.0E-02	(mg/m^3)	0.00005
				Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Cadmium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Chromium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.0E-04	(mg/m^3)	--
			Exp. Route Total								1.1E-09					0.00005
		Exposure Point Total									1.1E-09					0.00005
	Exposure Medium Total										1.1E-09					0.00005
Medium Total											5.7E-06					0.1
Sediment	Sediment	Subarea C	Ingestion	Benzo(a)pyrene	0.170	mg/kg	6.8E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-09	4.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	8.7E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.3E-10	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	1.5E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-09	9.8E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.7E-09					--
			Dermal	Benzo(a)pyrene	0.170	mg/kg	2.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-09	1.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.217	mg/kg	2.6E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-10	1.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.039	mg/kg	4.6E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-10	2.9E-10	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-09					--
		Exposure Point Total									8.7E-09					--
	Exposure Medium Total										8.7E-09					--
Medium Total											8.7E-09					--
										Total of Receptor Risks Across All Media	8.5E-06				Total of Receptor Hazards Across All Media	0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

Reasonable Maximum Exposures

9.1.RME Construction Workers
9.2.RME Industrial Workers
9.3.RME Adolescent Trespassers
9.4.RME Child Recreational Users
9.5.RME Adult Recreational Users
9.6.RME Lifelong Recreational Users
9.7.RME Child Residents
9.8.RME Adult Residents
9.9.RME Lifelong Residents

Central Tendency Exposures

9.1.CTE Construction Workers
9.2.CTE Industrial Workers
9.3.CTE Adolescent Trespassers
9.4.CTE Child Recreational Users
9.5.CTE Adult Recreational Users
9.6.CTE Lifelong Recreational Users
9.7.CTE Child Residents
9.8.CTE Adult Residents
9.9.CTE Lifelong Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.01	--	--	0.01
			Chromium	9E-07	--	- -	--	9E-07	None Reported	0.04	--	--	0.04
			Chemical Total	9E-07	--	- -	--	9E-07		0.06	--	--	0.06
		Exposure Point Total						9E-07					0.06
	Exposure Medium Total							9E-07					0.06
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.03	--	0.03
			Chromium	--	8E-06	--	--	8E-06	Respiratory	--	0.07	--	0.07
			Chemical Total	--	8E-06	--	--	8E-06		- -	0.10	- -	0.10
		Exposure Point Total						8E-06					0.10
	Exposure Medium Total							8E-06					0.10
Medium Total								9E-06					0.2
Groundwater	Groundwater	Subarea C	Benzene	- -	--	6E-11	--	6E-11	Blood	--	--	0.000007	0.000007
			Arsenic	- -	--	6E-10	--	6E-10	Skin, CVS	--	--	0.00009	0.00009
			Cadmium	- -	--	- -	--	- -	Kidney	--	--	0.0006	0.0006
			Chromium	- -	--	1E-08	--	1E-08	None Reported	--	--	0.0007	0.0007
			Chemical Total	- -	--	1E-08	--	1E-08		--	--	0.001	0.001
		Exposure Point Total						1E-08					0.001
	Exposure Medium Total							1E-08					0.001
	Air	Subarea C	Benzene	--	2E-11	--	--	2E-11	Blood	--	0.000002	--	0.000002
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Cadmium	--	- -	--	--	- -	NA	--	--	--	--
			Chromium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	0.000002	- -	0.000002
		Exposure Point Total						2E-11					0.000002
	Exposure Medium Total							2E-11					0.000002
Medium Total								1E-08					0.001
Receptor Total							Receptor Risk Total	9E-06				Receptor HI Total	0.2

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.007	--	--	0.007
			Chromium	1E-05	--	- -	--	1E-05	None Reported	0.02	--	--	0.02
			Chemical Total	1E-05	--	- -	--	1E-05		0.03	--	--	0.03
		Exposure Point Total						1E-05					0.03
	Exposure Medium Total							1E-05					0.03
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.0005	--	0.0005
			Chromium	--	3E-07	--	--	3E-07	Respiratory	--	0.0001	--	0.0001
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.0006	- -	0.0006
		Exposure Point Total						3E-07					0.0006
	Exposure Medium Total							3E-07					0.0006
Medium Total								1E-05					0.03

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.001	--	--	0.001
			Chromium	2E-06	--	- -	--	2E-06	None Reported	0.004	--	--	0.004
			Chemical Total	2E-06	--	- -	--	2E-06		0.005	--	--	0.005
		Exposure Point Total						2E-06					0.005
	Exposure Medium Total							2E-06					0.005
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.00003	--	0.00003
			Chromium	--	2E-08	--	--	2E-08	Respiratory	--	0.000006	--	0.000006
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.00003	- -	0.00003
		Exposure Point Total						2E-08					0.00003
	Exposure Medium Total							2E-08					0.00003
Medium Total								2E-06					0.005
Sediment	Sediment	Subarea C	Benzo(a)pyrene	3E-08	--	5E-08	--	7E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	3E-09	--	6E-09	--	9E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	6E-09	--	1E-08	--	2E-08	NA	--	--	--	--
			Chemical Total	4E-08	--	6E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
Medium Total								1E-07					--
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.005

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.007	--	--	0.007
			Chromium	1E-05	--	- -	--	1E-05	None Reported	0.02	--	--	0.02
			Chemical Total	1E-05	--	- -	--	1E-05		0.03	--	--	0.03
		Exposure Point Total						1E-05					0.03
	Exposure Medium Total							1E-05					0.03
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.00005	--	0.00005
			Chromium	--	4E-08	--	--	4E-08	Respiratory	--	0.00001	--	0.00001
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.00007	- -	0.00007
		Exposure Point Total						4E-08					0.00007
	Exposure Medium Total							4E-08					0.00007
Medium Total								1E-05					0.03
Sediment	Sediment	Subarea C	Benzo(a)pyrene	5E-07	--	4E-07	--	9E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	7E-08	--	5E-08	--	1E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-07	--	9E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	7E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
Medium Total								1E-06					--
Receptor Total							Receptor Risk Total	2E-05				Receptor HI Total	0.03

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.0008	--	--	0.0008
			Chromium	2E-06	--	- -	--	2E-06	None Reported	0.002	--	--	0.002
			Chemical Total	2E-06	--	- -	--	2E-06		0.003	--	--	0.003
		Exposure Point Total						2E-06					0.003
	Exposure Medium Total							2E-06					0.003
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.00005	--	0.00005
			Chromium	--	6E-08	--	--	6E-08	Respiratory	--	0.00001	--	0.00001
			Chemical Total	--	6E-08	--	--	6E-08		- -	0.00007	- -	0.00007
		Exposure Point Total						6E-08					0.00007
	Exposure Medium Total							6E-08					0.00007
Medium Total								2E-06					0.003
Sediment	Sediment	Subarea C	Benzo(a)pyrene	8E-08	--	8E-08	--	2E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	1E-08	--	2E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	2E-08	--	4E-08	NA	--	--	--	--
			Chemical Total	1E-07	--	1E-07	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.003

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -					
			Chromium	2E-05	--	- -	--	2E-05					
			Chemical Total	2E-05	--	- -	--	2E-05					
		Exposure Point Total						2E-05					
	Exposure Medium Total							2E-05					
	Air	Subarea C	Barium	--	- -	--	--	- -					
			Chromium	--	1E-07	--	--	1E-07					
			Chemical Total	--	1E-07	--	--	1E-07					
		Exposure Point Total						1E-07					
	Exposure Medium Total							1E-07					
Medium Total								2E-05					
Sediment	Sediment	Subarea C	Benzo(a)pyrene	6E-07	--	5E-07	--	1E-06					
			Benzo(b)fluoranthene	8E-08	--	6E-08	--	1E-07					
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	2E-07					
			Chemical Total	8E-07	--	6E-07	--	1E-06					
		Exposure Point Total						1E-06					
	Exposure Medium Total							1E-06					
Medium Total								1E-06					
Receptor Total							Receptor Risk Total	2E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.10	--	--	0.10
			Chromium	2E-04	--	- -	--	2E-04	None Reported	0.3	--	--	0.3
			Chemical Total	2E-04	--	- -	--	2E-04		0.4	--	--	0.4
		Exposure Point Total						2E-04					0.4
	Exposure Medium Total							2E-04					0.4
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.002	--	0.002
			Chromium	--	2E-06	--	--	2E-06	Respiratory	--	0.0005	--	0.0005
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.003	- -	0.003
		Exposure Point Total						2E-06					0.003
	Exposure Medium Total							2E-06					0.003
Medium Total								2E-04					0.4
Groundwater	Groundwater	Subarea C	Benzene	9E-08	--	1E-08	--	1E-07	Blood	0.005	--	0.0007	0.005
			Arsenic	1E-05	--	1E-07	--	1E-05	Skin, CVS	0.4	--	0.003	0.4
			Cadmium	- -	--	- -	--	- -	Kidney	0.1	--	0.02	0.1
			Chromium	2E-05	--	1E-05	--	4E-05	None Reported	0.03	--	0.02	0.05
			Chemical Total	4E-05	--	1E-05	--	5E-05		0.5	--	0.04	0.6
		Exposure Point Total						5E-05					0.6
	Exposure Medium Total							5E-05					0.6
	Air	Subarea C	Benzene	--	1E-08	--	--	1E-08	Blood	--	0.0007	--	0.0007
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Cadmium	--	- -	--	--	- -	NA	--	--	--	--
			Chromium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						1E-08					0.0007
	Exposure Medium Total							1E-08					0.0007
Medium Total								5E-05					0.6
Sediment	Sediment	Subarea C	Benzo(a)pyrene	5E-07	--	4E-07	--	9E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	7E-08	--	5E-08	--	1E-07	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-07	--	9E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	7E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
Medium Total								1E-06					--
Receptor Total							Receptor Risk Total	2E-04				Receptor HI Total	0.9

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.01	--	--	0.01
			Chromium	3E-05	--	- -	--	3E-05	None Reported	0.03	--	--	0.03
			Chemical Total	3E-05	--	- -	--	3E-05		0.04	--	--	0.04
		Exposure Point Total						3E-05					0.04
	Exposure Medium Total							3E-05					0.04
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.002	--	0.002
			Chromium	--	2E-06	--	--	2E-06	Respiratory	--	0.0005	--	0.0005
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.003	- -	0.003
		Exposure Point Total						2E-06					0.003
	Exposure Medium Total							2E-06					0.003
Medium Total								3E-05					0.04
Groundwater	Groundwater	Subarea C	Benzene	1E-07	--	2E-08	--	2E-07	Blood	0.002	--	0.0003	0.002
			Arsenic	3E-05	--	1E-07	--	3E-05	Skin, CVS	0.2	--	0.0009	0.2
			Cadmium	- -	--	- -	--	- -	Kidney	0.05	--	0.005	0.05
			Chromium	1E-05	--	6E-06	--	2E-05	None Reported	0.01	--	0.006	0.02
			Chemical Total	4E-05	--	6E-06	--	5E-05		0.2	--	0.01	0.2
		Exposure Point Total						5E-05					0.2
	Exposure Medium Total							5E-05					0.2
	Air	Subarea C	Benzene	--	6E-08	--	--	6E-08	Blood	--	0.0007	--	0.0007
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Cadmium	--	- -	--	--	- -	NA	--	--	--	--
			Chromium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Chemical Total	--	6E-08	--	--	6E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						6E-08					0.0007
	Exposure Medium Total							6E-08					0.0007
Medium Total								5E-05					0.2
Sediment	Sediment	Subarea C	Benzo(a)pyrene	8E-08	--	8E-08	--	2E-07	NA	--	--	--	--
			Benzo(b)fluoranthene	1E-08	--	1E-08	--	2E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-08	--	2E-08	--	4E-08	NA	--	--	--	--
			Chemical Total	1E-07	--	1E-07	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	8E-05				Receptor HI Total	0.3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -					
			Chromium	2E-04	--	- -	--	2E-04					
			Chemical Total	2E-04	--	- -	--	2E-04					
		Exposure Point Total						2E-04					
	Exposure Medium Total							2E-04					
	Air	Subarea C	Barium	--	- -	--	--	- -					
			Chromium	--	4E-06	--	--	4E-06					
			Chemical Total	--	4E-06	--	--	4E-06					
		Exposure Point Total						4E-06					
	Exposure Medium Total							4E-06					
Medium Total								2E-04					
Groundwater	Groundwater	Subarea C	Benzene	2E-07	--	4E-08	--	3E-07					
			Arsenic	4E-05	--	2E-07	--	4E-05					
			Cadmium	- -	--	- -	--	- -					
			Chromium	4E-05	--	2E-05	--	6E-05					
			Chemical Total	8E-05	--	2E-05	--	1E-04					
		Exposure Point Total						1E-04					
	Exposure Medium Total							1E-04					
	Air	Subarea C	Benzene	--	7E-08	--	--	7E-08					
			Arsenic	--	- -	--	--	- -					
			Cadmium	--	- -	--	--	- -					
			Chromium	--	- -	--	--	- -					
			Chemical Total	--	7E-08	--	--	7E-08					
		Exposure Point Total						7E-08					
	Exposure Medium Total							7E-08					
Medium Total								1E-04					
Sediment	Sediment	Subarea C	Benzo(a)pyrene	6E-07	--	5E-07	--	1E-06					
			Benzo(b)fluoranthene	8E-08	--	6E-08	--	1E-07					
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	2E-07					
			Chemical Total	8E-07	--	6E-07	--	1E-06					
		Exposure Point Total						1E-06					
	Exposure Medium Total							1E-06					
Medium Total								1E-06					
Receptor Total							Receptor Risk Total	3E-04					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.004	--	--	0.004
			Chromium	2E-07	--	- -	--	2E-07	None Reported	0.01	--	--	0.01
			Chemical Total	2E-07	--	- -	--	2E-07		0.01	--	--	0.01
		Exposure Point Total						2E-07					0.01
	Exposure Medium Total							2E-07					0.01
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.02	--	0.02
			Chromium	--	4E-06	--	--	4E-06	Respiratory	--	0.03	--	0.03
			Chemical Total	--	4E-06	--	--	4E-06		- -	0.05	- -	0.05
		Exposure Point Total						4E-06					0.05
	Exposure Medium Total							4E-06					0.05
Medium Total								4E-06					0.06
Groundwater	Groundwater	Subarea C	Benzene	- -	--	2E-11	--	2E-11	Blood	--	--	0.000002	0.000002
			Arsenic	- -	--	1E-10	--	1E-10	Skin, CVS	--	--	0.00002	0.00002
			Cadmium	- -	--	- -	--	- -	Kidney	--	--	0.0001	0.0001
			Chromium	- -	--	4E-09	--	4E-09	None Reported	--	--	0.0002	0.0002
			Chemical Total	- -	--	4E-09	--	4E-09		--	--	0.0003	0.0003
		Exposure Point Total						4E-09					0.0003
	Exposure Medium Total							4E-09					0.0003
	Air	Subarea C	Benzene	--	5E-12	--	--	5E-12	Blood	--	0.0000005	--	0.0000005
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Cadmium	--	- -	--	--	- -	NA	--	--	--	--
			Chromium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Chemical Total	--	5E-12	--	--	5E-12		- -	0.0000005	- -	0.0000005
		Exposure Point Total						5E-12					0.0000005
	Exposure Medium Total							5E-12					0.0000005
Medium Total								4E-09					0.0003
Receptor Total							Receptor Risk Total	4E-06				Receptor HI Total	0.06

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.003	--	--	0.003
			Chromium	2E-06	--	- -	--	2E-06	None Reported	0.009	--	--	0.009
			Chemical Total	2E-06	--	- -	--	2E-06		0.01	--	--	0.01
		Exposure Point Total						2E-06					0.01
	Exposure Medium Total							2E-06					0.01
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.0005	--	0.0005
			Chromium	--	1E-07	--	--	1E-07	Respiratory	--	0.00010	--	0.00010
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.0006	- -	0.0006
		Exposure Point Total						1E-07					0.0006
	Exposure Medium Total							1E-07					0.0006
Medium Total								2E-06					0.01

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.0003	--	--	0.0003
			Chromium	6E-07	--	- -	--	6E-07	None Reported	0.0009	--	--	0.0009
			Chemical Total	6E-07	--	- -	--	6E-07		0.001	--	--	0.001
		Exposure Point Total						6E-07					0.001
	Exposure Medium Total							6E-07					0.001
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.000007	--	0.000007
			Chromium	--	5E-09	--	--	5E-09	Respiratory	--	0.000001	--	0.000001
			Chemical Total	--	5E-09	--	--	5E-09		- -	0.000008	- -	0.000008
		Exposure Point Total						5E-09					0.000008
	Exposure Medium Total							5E-09					0.000008
Medium Total								6E-07					0.001
Sediment	Sediment	Subarea C	Benzo(a)pyrene	7E-09	--	7E-09	--	1E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	9E-10	--	9E-10	--	2E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2E-09	--	2E-09	--	3E-09	NA	--	--	--	--
			Chemical Total	9E-09	--	9E-09	--	2E-08		--	--	--	--
		Exposure Point Total						2E-08					--
	Exposure Medium Total							2E-08					--
Medium Total								2E-08					--
Receptor Total							Receptor Risk Total	6E-07				Receptor HI Total	0.001

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.002	--	--	0.002
			Chromium	1E-06	--	- -	--	1E-06	None Reported	0.005	--	--	0.005
			Chemical Total	1E-06	--	- -	--	1E-06		0.007	--	--	0.007
		Exposure Point Total						1E-06					0.007
	Exposure Medium Total							1E-06					0.007
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.00001	--	0.00001
			Chromium	--	5E-09	--	--	5E-09	Respiratory	--	0.000003	--	0.000003
			Chemical Total	--	5E-09	--	--	5E-09		- -	0.00002	- -	0.00002
		Exposure Point Total						5E-09					0.00002
	Exposure Medium Total							5E-09					0.00002
Medium Total								1E-06					0.007
Sediment	Sediment	Subarea C	Benzo(a)pyrene	5E-08	--	2E-08	--	7E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	7E-09	--	2E-09	--	9E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-08	--	4E-09	--	2E-08	NA	--	--	--	--
			Chemical Total	7E-08	--	2E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
Medium Total								1E-07					--
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.007

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.0002	--	--	0.0002
			Chromium	1E-07	--	- -	--	1E-07	None Reported	0.0005	--	--	0.0005
			Chemical Total	1E-07	--	- -	--	1E-07		0.0007	--	--	0.0007
		Exposure Point Total						1E-07					0.0007
	Exposure Medium Total							1E-07					0.0007
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.00001	--	0.00001
			Chromium	--	4E-09	--	--	4E-09	Respiratory	--	0.000003	--	0.000003
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.00002	- -	0.00002
		Exposure Point Total						4E-09					0.00002
	Exposure Medium Total							4E-09					0.00002
Medium Total								1E-07					0.0008
Sediment	Sediment	Subarea C	Benzo(a)pyrene	5E-09	--	1E-09	--	6E-09	NA	--	--	--	--
			Benzo(b)fluoranthene	6E-10	--	2E-10	--	8E-10	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-09	--	3E-10	--	1E-09	NA	--	--	--	--
			Chemical Total	7E-09	--	2E-09	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Medium Total								9E-09					--
Receptor Total							Receptor Risk Total	1E-07				Receptor HI Total	0.0008

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -					
			Chromium	2E-06	--	- -	--	2E-06					
			Chemical Total	2E-06	--	- -	--	2E-06					
		Exposure Point Total						2E-06					
	Exposure Medium Total							2E-06					
	Air	Subarea C	Barium	--	- -	--	--	- -					
			Chromium	--	8E-09	--	--	8E-09					
			Chemical Total	--	8E-09	--	--	8E-09					
		Exposure Point Total						8E-09					
	Exposure Medium Total							8E-09					
Medium Total								2E-06					
Sediment	Sediment	Subarea C	Benzo(a)pyrene	6E-08	--	2E-08	--	8E-08					
			Benzo(b)fluoranthene	8E-09	--	2E-09	--	1E-08					
			Dibenzo(a,h)anthracene	1E-08	--	4E-09	--	2E-08					
			Chemical Total	8E-08	--	2E-08	--	1E-07					
		Exposure Point Total						1E-07					
	Exposure Medium Total							1E-07					
Medium Total								1E-07					
Receptor Total							Receptor Risk Total	2E-06					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.03	--	--	0.03
			Chromium	3E-05	--	- -	--	3E-05	None Reported	0.09	--	--	0.09
			Chemical Total	3E-05	--	- -	--	3E-05		0.1	--	--	0.1
		Exposure Point Total						3E-05					0.1
	Exposure Medium Total							3E-05					0.1
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.001	--	0.001
			Chromium	--	5E-07	--	--	5E-07	Respiratory	--	0.0003	--	0.0003
			Chemical Total	--	5E-07	--	--	5E-07		- -	0.002	- -	0.002
		Exposure Point Total						5E-07					0.002
	Exposure Medium Total							5E-07					0.002
Medium Total								3E-05					0.1
Groundwater	Groundwater	Subarea C	Benzene	4E-08	--	5E-09	--	4E-08	Blood	0.002	--	0.0003	0.002
			Arsenic	6E-06	--	2E-08	--	7E-06	Skin, CVS	0.2	--	0.0006	0.2
			Cadmium	- -	--	- -	--	- -	Kidney	0.05	--	0.003	0.05
			Chromium	1E-05	--	3E-06	--	1E-05	None Reported	0.02	--	0.004	0.02
			Chemical Total	2E-05	--	3E-06	--	2E-05		0.2	--	0.008	0.2
		Exposure Point Total						2E-05					0.2
	Exposure Medium Total							2E-05					0.2
	Air	Subarea C	Benzene	--	3E-10	--	--	3E-10	Blood	--	0.00005	--	0.00005
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Cadmium	--	- -	--	--	- -	NA	--	--	--	--
			Chromium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00005	- -	0.00005
		Exposure Point Total						3E-10					0.00005
	Exposure Medium Total							3E-10					0.00005
Medium Total								2E-05					0.2
Sediment	Sediment	Subarea C	Benzo(a)pyrene	5E-08	--	2E-08	--	7E-08	NA	--	--	--	--
			Benzo(b)fluoranthene	7E-09	--	2E-09	--	9E-09	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-08	--	4E-09	--	2E-08	NA	--	--	--	--
			Chemical Total	7E-08	--	2E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
Medium Total								1E-07					--
Receptor Total							Receptor Risk Total	5E-05				Receptor HI Total	0.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -	Kidney	0.003	--	--	0.003
			Chromium	2E-06	--	- -	--	2E-06	None Reported	0.010	--	--	0.010
			Chemical Total	2E-06	--	- -	--	2E-06		0.01	--	--	0.01
		Exposure Point Total						2E-06					0.01
	Exposure Medium Total							2E-06					0.01
	Air	Subarea C	Barium	--	- -	--	--	- -	Fetotoxicity	--	0.001	--	0.001
			Chromium	--	4E-07	--	--	4E-07	Respiratory	--	0.0003	--	0.0003
			Chemical Total	--	4E-07	--	--	4E-07		- -	0.002	- -	0.002
		Exposure Point Total						4E-07					0.002
	Exposure Medium Total							4E-07					0.002
Medium Total								3E-06					0.02
Groundwater	Groundwater	Subarea C	Benzene	2E-08	--	4E-09	--	2E-08	Blood	0.0009	--	0.0002	0.001
			Arsenic	3E-06	--	2E-08	--	3E-06	Skin, CVS	0.08	--	0.0004	0.08
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.002	0.03
			Chromium	2E-06	--	6E-07	--	2E-06	None Reported	0.007	--	0.003	0.009
			Chemical Total	5E-06	--	6E-07	--	6E-06		0.1	--	0.005	0.1
		Exposure Point Total						6E-06					0.1
	Exposure Medium Total							6E-06					0.1
	Air	Subarea C	Benzene	--	1E-09	--	--	1E-09	Blood	--	0.00005	--	0.00005
			Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Cadmium	--	- -	--	--	- -	NA	--	--	--	--
			Chromium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.00005	- -	0.00005
		Exposure Point Total						1E-09					0.00005
	Exposure Medium Total							1E-09					0.00005
Medium Total								6E-06					0.1
Sediment	Sediment	Subarea C	Benzo(a)pyrene	5E-09	--	1E-09	--	6E-09	NA	--	--	--	--
			Benzo(b)fluoranthene	6E-10	--	2E-10	--	8E-10	NA	--	--	--	--
			Dibenzo(a,h)anthracene	1E-09	--	3E-10	--	1E-09	NA	--	--	--	--
			Chemical Total	7E-09	--	2E-09	--	9E-09		--	--	--	--
		Exposure Point Total						9E-09					--
	Exposure Medium Total							9E-09					--
Medium Total								9E-09					--
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Barium	- -	--	- -	--	- -					
			Chromium	3E-05	--	- -	--	3E-05					
			Chemical Total	3E-05	--	- -	--	3E-05					
		Exposure Point Total						3E-05					
	Exposure Medium Total							3E-05					
	Air	Subarea C	Barium	--	- -	--	--	- -					
			Chromium	--	9E-07	--	--	9E-07					
			Chemical Total	--	9E-07	--	--	9E-07					
		Exposure Point Total						9E-07					
	Exposure Medium Total							9E-07					
Medium Total								3E-05					
Groundwater	Groundwater	Subarea C	Benzene	6E-08	--	9E-09	--	7E-08					
			Arsenic	1E-05	--	4E-08	--	1E-05					
			Cadmium	- -	--	- -	--	- -					
			Chromium	1E-05	--	3E-06	--	2E-05					
			Chemical Total	2E-05	--	3E-06	--	3E-05					
		Exposure Point Total						3E-05					
	Exposure Medium Total							3E-05					
	Air	Subarea C	Benzene	--	1E-09	--	--	1E-09					
			Arsenic	--	- -	--	--	- -					
			Cadmium	--	- -	--	--	- -					
			Chromium	--	- -	--	--	- -					
			Chemical Total	--	1E-09	--	--	1E-09					
		Exposure Point Total						1E-09					
	Exposure Medium Total							1E-09					
Medium Total								3E-05					
Sediment	Sediment	Subarea C	Benzo(a)pyrene	6E-08	--	2E-08	--	8E-08					
			Benzo(b)fluoranthene	8E-09	--	2E-09	--	1E-08					
			Dibenzo(a,h)anthracene	1E-08	--	4E-09	--	2E-08					
			Chemical Total	8E-08	--	2E-08	--	1E-07					
		Exposure Point Total						1E-07					
	Exposure Medium Total							1E-07					
Medium Total								1E-07					
Receptor Total							Receptor Risk Total	5E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX I.4.3

PROUCL PRINTOUTS

SURFACE SOIL

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	C:\Work Folders\Projects\Crane\SWMU 18\EPCs\ProUCL Data - Surface Soil Area C.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Number of Missing Values	4		

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.42	Minimum of Log Data	0.884
Maximum	19.6	Maximum of Log Data	2.976
Mean	7.449	Mean of log Data	1.81
Median	5.73	SD of log Data	0.652
SD	5.732		
Std. Error of Mean	2.167		
Coefficient of Variation	0.77		
Skewness	2.005		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.769	Shapiro Wilk Test Statistic	0.949
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	11.66	95% H-UCL	15.86
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15.18
95% Adjusted-CLT UCL (Chen-1995)	12.77	97.5% Chebyshev (MVUE) UCL	18.6
95% Modified-t UCL (Johnson-1978)	11.93	99% Chebyshev (MVUE) UCL	25.3
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.625	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	4.585		
MLE of Mean	7.449		
MLE of Standard Deviation	5.844		
nu star	22.75		
Approximate Chi Square Value (.05)	12.9	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	11.01
Adjusted Chi Square Value	10.73	95% Jackknife UCL	11.66
		95% Standard Bootstrap UCL	10.69
Anderson-Darling Test Statistic	0.437	95% Bootstrap-t UCL	20.06
Anderson-Darling 5% Critical Value	0.713	95% Hall's Bootstrap UCL	31.52
Kolmogorov-Smirnov Test Statistic	0.271	95% Percentile Bootstrap UCL	11.07
Kolmogorov-Smirnov 5% Critical Value	0.314	95% BCA Bootstrap UCL	12.51
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	16.89
		97.5% Chebyshev(Mean, Sd) UCL	20.98
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	29.01
95% Approximate Gamma UCL	13.13		
95% Adjusted Gamma UCL	15.79		
Potential UCL to Use		Use 95% Approximate Gamma UCL	13.13

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

BARIUM

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Number of Missing Values	4		

Raw Statistics		Log-transformed Statistics	
Minimum	36.4	Minimum of Log Data	3.595
Maximum	1940	Maximum of Log Data	7.57
Mean	340.1	Mean of log Data	4.679
Median	69.2	SD of log Data	1.351
SD	706.3		
Std. Error of Mean	266.9		
Coefficient of Variation	2.076		
Skewness	2.634		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.496	Shapiro Wilk Test Statistic	0.76
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	858.9	95% H-UCL	3633
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	706
95% Adjusted-CLT UCL (Chen-1995)	1063	97.5% Chebyshev (MVUE) UCL	916
95% Modified-t UCL (Johnson-1978)	903.1	99% Chebyshev (MVUE) UCL	1328

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.407	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	836.5		
MLE of Mean	340.1		
MLE of Standard Deviation	533.4		
nu star	5.693		
Approximate Chi Square Value (.05)	1.485	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	779.2
Adjusted Chi Square Value	0.932	95% Jackknife UCL	858.9
		95% Standard Bootstrap UCL	749.3
Anderson-Darling Test Statistic	1.288	95% Bootstrap-t UCL	8867
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	5362
Kolmogorov-Smirnov Test Statistic	0.412	95% Percentile Bootstrap UCL	863.1
Kolmogorov-Smirnov 5% Critical Value	0.326	95% BCA Bootstrap UCL	888.6
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1504
		97.5% Chebyshev(Mean, Sd) UCL	2007
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2996
95% Approximate Gamma UCL	1304		
95% Adjusted Gamma UCL	2079		
Potential UCL to Use		Use 95% Hall's Bootstrap UCL	5362

Recommended UCL exceeds the maximum observation
In Case Bootstrap t and/or Hall's Bootstrap yields an unreasonably large UCL value, use 97.5% or 99% Chebyshev (Mean, Sd) UCL
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

CHROMIUM

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Number of Missing Values	4		

Raw Statistics		Log-transformed Statistics	
Minimum	14.6	Minimum of Log Data	2.681
Maximum	97.5	Maximum of Log Data	4.58
Mean	34.1	Mean of log Data	3.282
Median	19.7	SD of log Data	0.702
SD	30.21		
Std. Error of Mean	11.42		
Coefficient of Variation	0.886		
Skewness	1.991		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.849
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	56.29	95% H-UCL	78.43
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	70.8
95% Adjusted-CLT UCL (Chen-1995)	62.06	97.5% Chebyshev (MVUE) UCL	87.29
95% Modified-t UCL (Johnson-1978)	57.72	99% Chebyshev (MVUE) UCL	119.7

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.336	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	25.53		
MLE of Mean	34.1		
MLE of Standard Deviation	29.51		
nu star	18.7		
Approximate Chi Square Value (.05)	9.897	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	52.88
Adjusted Chi Square Value	8.038	95% Jackknife UCL	56.29
		95% Standard Bootstrap UCL	51.12
Anderson-Darling Test Statistic	0.674	95% Bootstrap-t UCL	121.1
Anderson-Darling 5% Critical Value	0.714	95% Hall's Bootstrap UCL	140.9
Kolmogorov-Smirnov Test Statistic	0.264	95% Percentile Bootstrap UCL	53.09
Kolmogorov-Smirnov 5% Critical Value	0.315	95% BCA Bootstrap UCL	60.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	83.87
		97.5% Chebyshev(Mean, Sd) UCL	105.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	147.7
95% Approximate Gamma UCL	64.42		
95% Adjusted Gamma UCL	79.32		
Potential UCL to Use		Use 95% Approximate Gamma UCL	64.42

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

SUBSURFACE SOIL

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	C:\Work Folders\Projects\Crane\SWMU 18\EPCs\ProUCL Data - Subsurface Soil Area C.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5
Number of Missing Values	3		

Raw Statistics		**Log-transformed Statistics**	
Minimum	4.35	Minimum of Log Data	1.47
Maximum	8.55	Maximum of Log Data	2.146
Mean	6.504	Mean of log Data	1.845
Median	6.62	SD of log Data	0.268
SD	1.662		
Std. Error of Mean	0.743		
Coefficient of Variation	0.255		
Skewness	-0.132		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.985	Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8.088	95% H-UCL	8.958
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9.897
95% Adjusted-CLT UCL (Chen-1995)	7.679	97.5% Chebyshev (MVUE) UCL	11.36
95% Modified-t UCL (Johnson-1978)	8.081	99% Chebyshev (MVUE) UCL	14.24
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.408	**Data appear Normal at 5% Significance Level**	
Theta Star	0.878		
MLE of Mean	6.504		
MLE of Standard Deviation	2.39		
nu star	74.08		
Approximate Chi Square Value (.05)	55.26	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	7.726
Adjusted Chi Square Value	48.22	95% Jackknife UCL	8.088
		95% Standard Bootstrap UCL	7.589
Anderson-Darling Test Statistic	0.198	95% Bootstrap-t UCL	8.023
Anderson-Darling 5% Critical Value	0.679	95% Hall's Bootstrap UCL	7.694
Kolmogorov-Smirnov Test Statistic	0.167	95% Percentile Bootstrap UCL	7.578
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL	7.544
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.743
		97.5% Chebyshev(Mean, Sd) UCL	11.14
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	13.9
95% Approximate Gamma UCL	8.719		
95% Adjusted Gamma UCL	9.992		
Potential UCL to Use		Use 95% Student's-t UCL	8.088

ARSENIC (Continued)
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.
Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

CHROMIUM

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5
Number of Missing Values	3		

Raw Statistics		Log-transformed Statistics	
Minimum	9.45	Minimum of Log Data	2.246
Maximum	25.9	Maximum of Log Data	3.254
Mean	18.23	Mean of log Data	2.847
Median	20	SD of log Data	0.391
SD	6.295		
Std. Error of Mean	2.815		
Coefficient of Variation	0.345		
Skewness	-0.4		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.975	Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	24.23	95% H-UCL	31.09
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	32.19
95% Adjusted-CLT UCL (Chen-1995)	22.32	97.5% Chebyshev (MVUE) UCL	38.2
95% Modified-t UCL (Johnson-1978)	24.15	99% Chebyshev (MVUE) UCL	50

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.768	**Data appear Normal at 5% Significance Level**	
Theta Star	4.839		
MLE of Mean	18.23		
MLE of Standard Deviation	9.392		
nu star	37.68		
Approximate Chi Square Value (.05)	24.62	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	22.86
Adjusted Chi Square Value	20.13	95% Jackknife UCL	24.23
		95% Standard Bootstrap UCL	22.46
Anderson-Darling Test Statistic	0.277	95% Bootstrap-t UCL	23.92
Anderson-Darling 5% Critical Value	0.679	95% Hall's Bootstrap UCL	22.02
Kolmogorov-Smirnov Test Statistic	0.253	95% Percentile Bootstrap UCL	22.5
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL	21.78
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	30.5
		97.5% Chebyshev(Mean, Sd) UCL	35.81
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	46.24
95% Approximate Gamma UCL	27.9		
95% Adjusted Gamma UCL	34.11		
Potential UCL to Use		Use 95% Student's-t UCL	24.23

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

APPENDIX I.4.4

RAGS PART D TABLES FOR CHEMICALS
PRESENT AT NATURALLY OCCURRING LEVELS

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

3.1.RME Surface Soil
3.2.RME Subsurface Soil

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Area C	Arsenic	mg/kg	7.45	13.1 (G)	19.6	13.1	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.00

NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Area C	Arsenic	mg/kg	6.5	8.1 (N)	8.55	8.1	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Chromium	mg/kg	18.2	24.2 (N)	25.9	24.2	mg/kg	95% Student's-t UCL	ProUCL 4.1.00

NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	Reasonable Maximum Exposures
7.1.RME	Construction Workers
7.2.RME	Industrial Workers
7.3.RME	Adolescent Trespassers
7.4.RME	Child Recreational Users
7.5.RME	Adult Recreational Users
7.6.RME	Child Residents
7.7.RME	Adult Residents
	Central Tendency Exposures
7.1.CTE	Construction Workers
7.2.CTE	Industrial Workers
7.3.CTE	Adolescent Trespassers
7.4.CTE	Child Recreational Users
7.5.CTE	Adult Recreational Users
7.6.CTE	Child Residents
7.7.CTE	Adult Residents

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	3.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.4E-07	2.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
			Exp. Route Total								5.4E-07					0.08
			Dermal	Arsenic	13.1	mg/kg	3.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.9E-08	2.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
			Exp. Route Total								4.9E-08					0.008
		Exposure Point Total									5.9E-07					0.09
	Exposure Medium Total										5.9E-07					0.09
	Air	Subarea C	Inhalation	Arsenic	9.8E-6	mg/m^3	1.9E-08	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.2E-08	1.3E-06	(mg/m^3)	1.0E-05	(mg/m^3)	0.1
			Exp. Route Total								8.2E-08					0.1
		Exposure Point Total									8.2E-08					0.1
	Exposure Medium Total										8.2E-08					0.1
Medium Total											6.8E-07					0.2
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	2.2E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.4E-07	1.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				Chromium	24.2	mg/kg	6.7E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.3E-07	4.7E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
			Exp. Route Total								6.7E-07					0.07
			Dermal	Arsenic	8.10	mg/kg	2.0E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.0E-08	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								3.0E-08					0.005
		Exposure Point Total									7.0E-07					0.07
	Exposure Medium Total										7.0E-07					0.07
	Air	Subarea C	Inhalation	Arsenic	6.0E-6	mg/m^3	1.2E-08	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	5.1E-08	8.3E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.08
				Chromium	1.8E-5	mg/m^3	3.5E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.0E-06	2.5E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.02
			Exp. Route Total								3.0E-06					0.1
		Exposure Point Total									3.0E-06					0.1
	Exposure Medium Total										3.0E-06					0.1
Medium Total											3.7E-06					0.2

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	4.6E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.9E-06	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								6.9E-06					0.04
			Dermal	Arsenic	13.1	mg/kg	9.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-06	2.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
			Exp. Route Total								1.4E-06					0.008
		Exposure Point Total									8.2E-06					0.05
	Exposure Medium Total										8.2E-06					0.05
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	8.1E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.5E-09	2.3E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0002
			Exp. Route Total								3.5E-09					0.0002
		Exposure Point Total									3.5E-09					0.0002
	Exposure Medium Total										3.5E-09					0.0002
Medium Total											8.2E-06					0.05
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	2.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-06	7.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium	24.2	mg/kg	8.5E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.2E-06	2.4E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.008
			Exp. Route Total								8.5E-06					0.03
			Dermal	Arsenic	8.10	mg/kg	5.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.4E-07	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								8.4E-07					0.005
		Exposure Point Total									9.3E-06					0.04
	Exposure Medium Total										9.3E-06					0.04
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	5.0E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.2E-09	1.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00009
				Chromium	1.8E-8	mg/m^3	1.5E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.3E-07	4.2E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00004
			Exp. Route Total								1.3E-07					0.0001
		Exposure Point Total									1.3E-07					0.0001
	Exposure Medium Total										1.3E-07					0.0001
Medium Total											9.4E-06					0.04

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	3.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.7E-07	2.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
			Exp. Route Total								4.7E-07					0.007
			Dermal	Arsenic	13.1	mg/kg	6.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.2E-08	4.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								9.2E-08					0.001
		Exposure Point Total									5.6E-07					0.009
	Exposure Medium Total										5.6E-07					0.009
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	1.7E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.3E-11	1.2E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000008
			Exp. Route Total								7.3E-11					0.000008
		Exposure Point Total									7.3E-11					0.000008
	Exposure Medium Total										7.3E-11					0.000008
Medium Total											5.6E-07					0.009
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	1.9E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.9E-07	1.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	24.2	mg/kg	1.7E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.6E-07	4.0E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
			Exp. Route Total								1.1E-06					0.006
			Dermal	Arsenic	8.10	mg/kg	3.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.7E-08	2.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								5.7E-08					0.0009
		Exposure Point Total									1.2E-06					0.007
	Exposure Medium Total										1.2E-06					0.007
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	1.0E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.5E-11	7.3E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000005
				Chromium	1.8E-8	mg/m^3	9.4E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	7.9E-09	2.2E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000002
			Exp. Route Total								7.9E-09					0.000007
		Exposure Point Total									7.9E-09					0.000007
	Exposure Medium Total										7.9E-09					0.000007
Medium Total											1.2E-06					0.007

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	1.1E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-06	1.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								1.6E-06					0.04
			Dermal	Arsenic	13.1	mg/kg	1.8E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.7E-07	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
			Exp. Route Total								2.7E-07					0.007
		Exposure Point Total									1.9E-06					0.05
	Exposure Medium Total										1.9E-06					0.05
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	2.0E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.7E-11	2.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00002
			Exp. Route Total								8.7E-11					0.00002
		Exposure Point Total									8.7E-11					0.00002
	Exposure Medium Total										8.7E-11					0.00002
Medium Total											1.9E-06					0.05
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	6.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.9E-07	7.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium	24.2	mg/kg	1.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.3E-06	2.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.008
			Exp. Route Total								6.2E-06					0.03
			Dermal	Arsenic	8.10	mg/kg	1.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-07	1.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								1.7E-07					0.004
		Exposure Point Total									6.4E-06					0.04
	Exposure Medium Total										6.4E-06					0.04
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	1.3E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	5.4E-11	1.5E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000010
				Chromium	1.8E-8	mg/m^3	2.0E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.7E-08	4.4E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000004
			Exp. Route Total								1.7E-08					0.00001
		Exposure Point Total									1.7E-08					0.00001
	Exposure Medium Total										1.7E-08					0.00001
Medium Total											6.4E-06					0.04

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	4.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.9E-07	1.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
			Exp. Route Total								6.9E-07					0.004
			Dermal	Arsenic	13.1	mg/kg	1.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-07	5.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								2.6E-07					0.002
		Exposure Point Total									9.5E-07					0.006
	Exposure Medium Total										9.5E-07					0.006
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	4.1E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.7E-10	1.2E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000008
			Exp. Route Total								1.7E-10					0.000008
		Exposure Point Total									1.7E-10					0.000008
	Exposure Medium Total										1.7E-10					0.000008
Medium Total											9.5E-07					0.006
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	2.8E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-07	8.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium	24.2	mg/kg	1.5E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.7E-07	2.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0008
			Exp. Route Total								1.2E-06					0.004
			Dermal	Arsenic	8.10	mg/kg	1.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-07	3.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								1.6E-07					0.001
		Exposure Point Total									1.4E-06					0.005
	Exposure Medium Total										1.4E-06					0.005
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	2.5E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.1E-10	7.3E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000005
				Chromium	1.8E-8	mg/m^3	1.4E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.2E-08	2.2E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000002
			Exp. Route Total								1.2E-08					0.000007
		Exposure Point Total									1.2E-08					0.000007
	Exposure Medium Total										1.2E-08					0.000007
Medium Total											1.4E-06					0.005

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	1.4E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-05	1.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.6
			Exp. Route Total								2.2E-05					0.6
			Dermal	Arsenic	13.1	mg/kg	1.2E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
			Exp. Route Total								1.8E-06					0.05
		Exposure Point Total									2.3E-05					0.6
	Exposure Medium Total										2.3E-05					0.6
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	8.2E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.5E-09	9.5E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
			Exp. Route Total								3.5E-09					0.0006
		Exposure Point Total									3.5E-09					0.0006
	Exposure Medium Total										3.5E-09					0.0006
Medium Total											2.3E-05					0.6
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	8.9E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-05	1.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Chromium	24.2	mg/kg	1.4E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.1E-05	3.1E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.1
			Exp. Route Total								8.4E-05					0.4
			Dermal	Arsenic	8.10	mg/kg	7.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	8.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								1.1E-06					0.03
		Exposure Point Total									8.5E-05					0.5
	Exposure Medium Total										8.5E-05					0.5
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	5.1E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.2E-09	5.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
				Chromium	1.8E-8	mg/m^3	8.1E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	6.8E-07	1.8E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0002
			Exp. Route Total								6.8E-07					0.0006
		Exposure Point Total									6.8E-07					0.0006
	Exposure Medium Total										6.8E-07					0.0006
Medium Total											8.6E-05					0.5

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	6.2E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.2E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
			Exp. Route Total								9.2E-06					0.06
			Dermal	Arsenic	13.1	mg/kg	7.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
			Exp. Route Total								1.1E-06					0.007
		Exposure Point Total									1.0E-05					0.07
	Exposure Medium Total										1.0E-05					0.07
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	3.3E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.4E-08	9.5E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
			Exp. Route Total								1.4E-08					0.0006
		Exposure Point Total									1.4E-08					0.0006
	Exposure Medium Total										1.4E-08					0.0006
Medium Total											1.0E-05					0.07
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	3.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.7E-06	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Chromium	24.2	mg/kg	2.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.0E-05	3.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
			Exp. Route Total								1.6E-05					0.05
			Dermal	Arsenic	8.10	mg/kg	4.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.8E-07	1.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								6.8E-07					0.004
		Exposure Point Total									1.7E-05					0.05
	Exposure Medium Total										1.7E-05					0.05
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	2.0E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.7E-09	5.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
				Chromium	1.8E-8	mg/m^3	1.1E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	9.3E-07	1.8E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0002
			Exp. Route Total								9.4E-07					0.0006
		Exposure Point Total									9.4E-07					0.0006
	Exposure Medium Total										9.4E-07					0.0006
Medium Total											1.8E-05					0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	9.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-07	6.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								1.4E-07					0.02
			Dermal	Arsenic	13.1	mg/kg	5.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.2E-09	3.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								8.2E-09					0.001
		Exposure Point Total									1.4E-07					0.02
	Exposure Medium Total										1.4E-07					0.02
	Air	Subarea C	Inhalation	Arsenic	9.8E-6	mg/m^3	9.6E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.1E-08	6.7E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.07
			Exp. Route Total								4.1E-08					0.07
		Exposure Point Total									4.1E-08					0.07
	Exposure Medium Total										4.1E-08					0.07
Medium Total											1.9E-07					0.09
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	5.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.4E-08	3.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium	24.2	mg/kg	1.7E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.4E-08	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
			Exp. Route Total								1.7E-07					0.02
			Dermal	Arsenic	8.10	mg/kg	3.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.0E-09	2.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								5.0E-09					0.0008
		Exposure Point Total									1.7E-07					0.02
	Exposure Medium Total										1.7E-07					0.02
	Air	Subarea C	Inhalation	Arsenic	6.0E-6	mg/m^3	5.9E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.5E-08	4.1E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.04
				Chromium	1.8E-5	mg/m^3	1.8E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.5E-06	1.2E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.01
			Exp. Route Total								1.5E-06					0.05
		Exposure Point Total									1.5E-06					0.05
	Exposure Medium Total										1.5E-06					0.05
Medium Total											1.7E-06					0.07

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	7.2E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	5.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								1.1E-06					0.02
			Dermal	Arsenic	13.1	mg/kg	2.9E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.3E-08	2.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
			Exp. Route Total								4.3E-08					0.0007
		Exposure Point Total									1.1E-06					0.02
	Exposure Medium Total										1.1E-06					0.02
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	2.6E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.1E-09	2.0E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0001
			Exp. Route Total								1.1E-09					0.0001
		Exposure Point Total									1.1E-09					0.0001
	Exposure Medium Total										1.1E-09					0.0001
Medium Total											1.1E-06					0.02
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	4.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.7E-07	3.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium	24.2	mg/kg	1.3E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.7E-07	1.0E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
			Exp. Route Total								1.3E-06					0.02
			Dermal	Arsenic	8.10	mg/kg	1.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.7E-08	1.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0005
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								2.7E-08					0.0005
		Exposure Point Total									1.4E-06					0.02
	Exposure Medium Total										1.4E-06					0.02
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	1.6E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	6.8E-10	1.2E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00008
				Chromium	1.8E-8	mg/m^3	4.7E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.0E-08	3.7E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00004
			Exp. Route Total								4.0E-08					0.0001
		Exposure Point Total									4.0E-08					0.0001
	Exposure Medium Total										4.0E-08					0.0001
Medium Total											1.4E-06					0.02

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	7.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-07	5.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								1.2E-07					0.002
			Dermal	Arsenic	13.1	mg/kg	9.9E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-08	6.9E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
			Exp. Route Total								1.5E-08					0.0002
		Exposure Point Total									1.3E-07					0.002
	Exposure Medium Total										1.3E-07					0.002
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	4.2E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.8E-11	3.0E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
			Exp. Route Total								1.8E-11					0.000002
		Exposure Point Total									1.8E-11					0.000002
	Exposure Medium Total										1.8E-11					0.000002
Medium Total											1.3E-07					0.002
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	4.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.2E-08	3.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium	24.2	mg/kg	4.3E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.1E-07	1.0E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
			Exp. Route Total								2.9E-07					0.001
			Dermal	Arsenic	8.10	mg/kg	6.1E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.1E-09	4.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								9.1E-09					0.0001
		Exposure Point Total									3.0E-07					0.002
	Exposure Medium Total										3.0E-07					0.002
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	2.6E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.1E-11	1.8E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000001
				Chromium	1.8E-8	mg/m^3	2.3E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.0E-09	5.5E-11	(mg/m^3)	1.0E-04	(mg/m^3)	5.5E-7
			Exp. Route Total								2.0E-09					0.000002
		Exposure Point Total									2.0E-09					0.000002
	Exposure Medium Total										2.0E-09					0.000002
Medium Total											3.0E-07					0.002

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	8.9E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-07	3.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
			Exp. Route Total								1.3E-07					0.01
			Dermal	Arsenic	13.1	mg/kg	6.0E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.0E-09	2.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
			Exp. Route Total								9.0E-09					0.0007
		Exposure Point Total									1.4E-07					0.01
	Exposure Medium Total										1.4E-07					0.01
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	1.7E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.3E-12	5.9E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
			Exp. Route Total								7.3E-12					0.000004
		Exposure Point Total									7.3E-12					0.000004
	Exposure Medium Total										7.3E-12					0.000004
Medium Total											1.4E-07					0.01
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	5.5E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.2E-08	1.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Chromium	24.2	mg/kg	1.1E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.3E-07	5.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
			Exp. Route Total								6.2E-07					0.008
			Dermal	Arsenic	8.10	mg/kg	3.7E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.5E-09	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								5.5E-09					0.0004
		Exposure Point Total									6.2E-07					0.009
	Exposure Medium Total										6.2E-07					0.009
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	1.0E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.5E-12	3.7E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Chromium	1.8E-8	mg/m^3	2.0E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.7E-09	1.1E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
			Exp. Route Total								1.7E-09					0.000004
		Exposure Point Total									1.7E-09					0.000004
	Exposure Medium Total										1.7E-09					0.000004
Medium Total											6.2E-07					0.009

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	3.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.0E-08	3.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
			Exp. Route Total								5.0E-08					0.001
			Dermal	Arsenic	13.1	mg/kg	2.3E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.4E-09	2.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
			Exp. Route Total								3.4E-09					0.00008
		Exposure Point Total									5.3E-08					0.001
	Exposure Medium Total										5.3E-08					0.001
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	5.9E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.5E-11	5.9E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
			Exp. Route Total								2.5E-11					0.000004
		Exposure Point Total									2.5E-11					0.000004
	Exposure Medium Total										2.5E-11					0.000004
Medium Total											5.3E-08					0.001
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	2.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.1E-08	2.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				Chromium	24.2	mg/kg	9.7E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.8E-08	6.2E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
			Exp. Route Total								7.9E-08					0.0009
			Dermal	Arsenic	8.10	mg/kg	1.4E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-09	1.4E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00005
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								2.1E-09					0.00005
		Exposure Point Total									8.1E-08					0.0009
	Exposure Medium Total										8.1E-08					0.0009
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	3.7E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.6E-11	3.7E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Chromium	1.8E-8	mg/m^3	1.7E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.4E-09	1.1E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
			Exp. Route Total								1.5E-09					0.000004
		Exposure Point Total									1.5E-09					0.000004
	Exposure Medium Total										1.5E-09					0.000004
Medium Total											8.3E-08					0.0009

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	1.6E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.4E-06	5.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
			Exp. Route Total								2.4E-06					0.2
			Dermal	Arsenic	13.1	mg/kg	5.4E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.1E-08	1.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
			Exp. Route Total								8.1E-08					0.006
		Exposure Point Total									2.5E-06					0.2
	Exposure Medium Total										2.5E-06					0.2
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	1.8E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.8E-10	6.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
			Exp. Route Total								7.8E-10					0.0004
		Exposure Point Total									7.8E-10					0.0004
	Exposure Medium Total										7.8E-10					0.0004
Medium Total											2.5E-06					0.2
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	9.9E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-06	3.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Chromium	24.2	mg/kg	1.9E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	9.6E-06	1.0E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.03
			Exp. Route Total								1.1E-05					0.1
			Dermal	Arsenic	8.10	mg/kg	3.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.0E-08	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								5.0E-08					0.004
		Exposure Point Total									1.1E-05					0.2
	Exposure Medium Total										1.1E-05					0.2
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	1.1E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.8E-10	3.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Chromium	1.8E-8	mg/m^3	2.2E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.8E-07	1.2E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
			Exp. Route Total								1.8E-07					0.0004
		Exposure Point Total									1.8E-07					0.0004
	Exposure Medium Total										1.8E-07					0.0004
Medium Total											1.1E-05					0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Subarea C	Ingestion	Arsenic	13.1	mg/kg	6.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.0E-07	6.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								9.0E-07					0.02
			Dermal	Arsenic	13.1	mg/kg	2.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.1E-08	2.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
			Exp. Route Total								3.1E-08					0.0007
		Exposure Point Total									9.3E-07					0.02
	Exposure Medium Total										9.3E-07					0.02
	Air	Subarea C	Inhalation	Arsenic	1.0E-8	mg/m^3	6.4E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.7E-09	6.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
			Exp. Route Total								2.7E-09					0.0004
		Exposure Point Total									2.7E-09					0.0004
	Exposure Medium Total										2.7E-09					0.0004
Medium Total											9.3E-07					0.02
Subsurface Soil	Subsurface Soil	Subarea C	Ingestion	Arsenic	8.10	mg/kg	3.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.6E-07	3.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium	24.2	mg/kg	1.7E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.7E-07	1.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
			Exp. Route Total								1.4E-06					0.02
			Dermal	Arsenic	8.10	mg/kg	1.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.9E-08	1.3E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium	24.2	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
			Exp. Route Total								1.9E-08					0.0004
		Exposure Point Total									1.4E-06					0.02
	Exposure Medium Total										1.4E-06					0.02
	Air	Subarea C	Inhalation	Arsenic	6.2E-9	mg/m^3	3.9E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.7E-09	3.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Chromium	1.8E-8	mg/m^3	1.9E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.6E-07	1.2E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
			Exp. Route Total								1.6E-07					0.0004
		Exposure Point Total									1.6E-07					0.0004
	Exposure Medium Total										1.6E-07					0.0004
Medium Total											1.6E-06					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

Reasonable Maximum Exposures

9.1.RME Construction Workers
9.2.RME Industrial Workers
9.3.RME Adolescent Trespassers
9.4.RME Child Recreational Users
9.5.RME Adult Recreational Users
9.6.RME Lifelong Recreational Users
9.7.RME Child Residents
9.8.RME Adult Residents
9.9.RME Lifelong Residents

Central Tendency Exposures

9.1.CTE Construction Workers
9.2.CTE Industrial Workers
9.3.CTE Adolescent Trespassers
9.4.CTE Child Recreational Users
9.5.CTE Adult Recreational Users
9.6.CTE Lifelong Recreational Users
9.7.CTE Child Residents
9.8.CTE Adult Residents
9.9.CTE Lifelong Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	5E-07	--	5E-08	--	6E-07	Skin, CVS	0.08	--	0.008	0.09
			Chemical Total	5E-07	--	5E-08	--	6E-07		0.08	--	0.008	0.09
		Exposure Point Total						6E-07					0.09
	Exposure Medium Total							6E-07					0.09
	Air	Subarea C	Arsenic	--	8E-08	--	--	8E-08	NA	--	0.1	--	0.1
			Chemical Total	--	8E-08	--	--	8E-08		- -	0.1	- -	0.1
		Exposure Point Total						8E-08					0.1
	Exposure Medium Total							8E-08					0.1
Medium Total								7E-07					0.2
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	3E-07	--	3E-08	--	4E-07	Skin, CVS	0.05	--	0.005	0.06
			Chromium	3E-07	--	- -	--	3E-07	None Reported	0.02	--	--	0.02
			Chemical Total	7E-07	--	3E-08	--	7E-07		0.07	--	0.005	0.07
		Exposure Point Total						7E-07					0.07
	Exposure Medium Total							7E-07					0.07
	Air	Subarea C	Arsenic	--	5E-08	--	--	5E-08	NA	--	0.08	--	0.08
			Chromium	--	3E-06	--	--	3E-06	Respiratory	--	0.02	--	0.02
			Chemical Total	--	3E-06	--	--	3E-06		- -	0.1	- -	0.1
		Exposure Point Total						3E-06					0.1
	Exposure Medium Total							3E-06					0.1
Medium Total								4E-06					0.2

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	7E-06	--	1E-06	--	8E-06	Skin, CVS	0.04	--	0.008	0.05
			Chemical Total	7E-06	--	1E-06	--	8E-06		0.04	--	0.008	0.05
		Exposure Point Total						8E-06					0.05
	Exposure Medium Total							8E-06					0.05
	Air	Subarea C	Arsenic	--	3E-09	--	--	3E-09	NA	--	0.0002	--	0.0002
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.0002	- -	0.0002
		Exposure Point Total						3E-09					0.0002
	Exposure Medium Total							3E-09					0.0002
Medium Total								8E-06					0.05
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	4E-06	--	8E-07	--	5E-06	Skin, CVS	0.03	--	0.005	0.03
			Chromium	4E-06	--	- -	--	4E-06	None Reported	0.008	--	--	0.008
			Chemical Total	8E-06	--	8E-07	--	9E-06		0.03	--	0.005	0.04
		Exposure Point Total						9E-06					0.04
	Exposure Medium Total							9E-06					0.04
	Air	Subarea C	Arsenic	--	2E-09	--	--	2E-09	NA	--	0.00009	--	0.00009
			Chromium	--	1E-07	--	--	1E-07	Respiratory	--	0.00004	--	0.00004
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.0001	- -	0.0001
		Exposure Point Total						1E-07					0.0001
	Exposure Medium Total							1E-07					0.0001
Medium Total								9E-06					0.04

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	5E-07	--	9E-08	--	6E-07	Skin, CVS	0.007	--	0.001	0.009
			Chemical Total	5E-07	--	9E-08	--	6E-07		0.007	--	0.001	0.009
		Exposure Point Total						6E-07					0.009
	Exposure Medium Total							6E-07					0.009
	Air	Subarea C	Arsenic	--	7E-11	--	--	7E-11	NA	--	0.000008	--	0.000008
			Chemical Total	--	7E-11	--	--	7E-11		- -	0.000008	- -	0.000008
		Exposure Point Total						7E-11					0.000008
	Exposure Medium Total							7E-11					0.000008
Medium Total								6E-07					0.009
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	3E-07	--	6E-08	--	3E-07	Skin, CVS	0.004	--	0.0009	0.005
			Chromium	9E-07	--	- -	--	9E-07	None Reported	0.001	--	--	0.001
			Chemical Total	1E-06	--	6E-08	--	1E-06		0.006	--	0.0009	0.007
		Exposure Point Total						1E-06					0.007
	Exposure Medium Total							1E-06					0.007
	Air	Subarea C	Arsenic	--	4E-11	--	--	4E-11	NA	--	0.000005	--	0.000005
			Chromium	--	8E-09	--	--	8E-09	Respiratory	--	0.000002	--	0.000002
			Chemical Total	--	8E-09	--	--	8E-09		- -	0.000007	- -	0.000007
		Exposure Point Total						8E-09					0.000007
	Exposure Medium Total							8E-09					0.000007
Medium Total								1E-06					0.007

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	2E-06	--	3E-07	--	2E-06	Skin, CVS	0.04	--	0.007	0.05
			Chemical Total	2E-06	--	3E-07	--	2E-06		0.04	--	0.007	0.05
		Exposure Point Total						2E-06					0.05
	Exposure Medium Total							2E-06					0.05
	Air	Subarea C	Arsenic	--	9E-11	--	--	9E-11	NA	--	0.00002	--	0.00002
			Chemical Total	--	9E-11	--	--	9E-11		- -	0.00002	- -	0.00002
		Exposure Point Total						9E-11					0.00002
	Exposure Medium Total							9E-11					0.00002
Medium Total								2E-06					0.05
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	1E-06	--	2E-07	--	1E-06	Skin, CVS	0.03	--	0.004	0.03
			Chromium	5E-06	--	- -	--	5E-06	None Reported	0.008	--	--	0.008
			Chemical Total	6E-06	--	2E-07	--	6E-06		0.03	--	0.004	0.04
		Exposure Point Total						6E-06					0.04
	Exposure Medium Total							6E-06					0.04
	Air	Subarea C	Arsenic	--	5E-11	--	--	5E-11	NA	--	0.000010	--	0.000010
			Chromium	--	2E-08	--	--	2E-08	Respiratory	--	0.000004	--	0.000004
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.00001	- -	0.00001
		Exposure Point Total						2E-08					0.00001
	Exposure Medium Total							2E-08					0.00001
Medium Total								6E-06					0.04

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	7E-07	--	3E-07	--	9E-07	Skin, CVS	0.004	--	0.002	0.006
			Chemical Total	7E-07	--	3E-07	--	9E-07		0.004	--	0.002	0.006
		Exposure Point Total						9E-07					0.006
	Exposure Medium Total							9E-07					0.006
	Air	Subarea C	Arsenic	--	2E-10	--	--	2E-10	NA	--	0.000008	--	0.000008
			Chemical Total	--	2E-10	--	--	2E-10		- -	0.000008	- -	0.000008
		Exposure Point Total						2E-10					0.000008
	Exposure Medium Total							2E-10					0.000008
Medium Total								9E-07					0.006
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	4E-07	--	2E-07	--	6E-07	Skin, CVS	0.003	--	0.001	0.004
			Chromium	8E-07	--	- -	--	8E-07	None Reported	0.0008	--	--	0.0008
			Chemical Total	1E-06	--	2E-07	--	1E-06		0.004	--	0.001	0.005
		Exposure Point Total						1E-06					0.005
	Exposure Medium Total							1E-06					0.005
	Air	Subarea C	Arsenic	--	1E-10	--	--	1E-10	NA	--	0.000005	--	0.000005
			Chromium	--	1E-08	--	--	1E-08	Respiratory	--	0.000002	--	0.000002
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.000007	- -	0.000007
		Exposure Point Total						1E-08					0.000007
	Exposure Medium Total							1E-08					0.000007
Medium Total								1E-06					0.005

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total CVS HI	0.010
Total Respiratory HI	0.000002
Total None Reported HI	0.0008
Total Skin HI	0.010
Total NA HI	0.00001

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	2E-06	--	5E-07	--	3E-06					
			Chemical Total	2E-06	--	5E-07	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
	Air	Subarea C	Arsenic	--	3E-10	--	--	3E-10					
			Chemical Total	--	3E-10	--	--	3E-10					
		Exposure Point Total						3E-10					
	Exposure Medium Total							3E-10					
Medium Total								3E-06					
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	1E-06	--	3E-07	--	2E-06					
			Chromium	6E-06	--	- -	--	6E-06					
			Chemical Total	7E-06	--	3E-07	--	8E-06					
		Exposure Point Total						8E-06					
	Exposure Medium Total							8E-06					
	Air	Subarea C	Arsenic	--	2E-10	--	--	2E-10					
			Chromium	--	3E-08	--	--	3E-08					
			Chemical Total	--	3E-08	--	--	3E-08					
		Exposure Point Total						3E-08					
	Exposure Medium Total							3E-08					
Medium Total								8E-06					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	2E-05	--	2E-06	--	2E-05	Skin, CVS	0.6	--	0.05	0.6
			Chemical Total	2E-05	--	2E-06	--	2E-05		0.6	--	0.05	0.6
		Exposure Point Total						2E-05					0.6
	Exposure Medium Total							2E-05					0.6
	Air	Subarea C	Arsenic	--	4E-09	--	--	4E-09	NA	--	0.0006	--	0.0006
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0006	- -	0.0006
		Exposure Point Total						4E-09					0.0006
	Exposure Medium Total							4E-09					0.0006
Medium Total								2E-05					0.6
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	1E-05	--	1E-06	--	1E-05	Skin, CVS	0.3	--	0.03	0.4
			Chromium	7E-05	--	- -	--	7E-05	None Reported	0.1	--	--	0.1
			Chemical Total	8E-05	--	1E-06	--	9E-05		0.4	--	0.03	0.5
		Exposure Point Total						9E-05					0.5
	Exposure Medium Total							9E-05					0.5
	Air	Subarea C	Arsenic	--	2E-09	--	--	2E-09	NA	--	0.0004	--	0.0004
			Chromium	--	7E-07	--	--	7E-07	Respiratory	--	0.0002	--	0.0002
			Chemical Total	--	7E-07	--	--	7E-07		- -	0.0006	- -	0.0006
		Exposure Point Total						7E-07					0.0006
	Exposure Medium Total							7E-07					0.0006
Medium Total								9E-05					0.5

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	9E-06	--	1E-06	--	1E-05	Skin, CVS	0.06	--	0.007	0.07
			Chemical Total	9E-06	--	1E-06	--	1E-05		0.06	--	0.007	0.07
		Exposure Point Total						1E-05					0.07
	Exposure Medium Total							1E-05					0.07
	Air	Subarea C	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0006	--	0.0006
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0006	- -	0.0006
		Exposure Point Total						1E-08					0.0006
	Exposure Medium Total							1E-08					0.0006
Medium Total								1E-05					0.07
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	6E-06	--	7E-07	--	6E-06	Skin, CVS	0.04	--	0.004	0.04
			Chromium	1E-05	--	- -	--	1E-05	None Reported	0.01	--	--	0.01
			Chemical Total	2E-05	--	7E-07	--	2E-05		0.05	--	0.004	0.05
		Exposure Point Total						2E-05					0.05
	Exposure Medium Total							2E-05					0.05
	Air	Subarea C	Arsenic	--	9E-09	--	--	9E-09	NA	--	0.0004	--	0.0004
			Chromium	--	9E-07	--	--	9E-07	Respiratory	--	0.0002	--	0.0002
			Chemical Total	--	9E-07	--	--	9E-07		- -	0.0006	- -	0.0006
		Exposure Point Total						9E-07					0.0006
	Exposure Medium Total							9E-07					0.0006
Medium Total								2E-05					0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	3E-05	--	3E-06	--	3E-05					
			Chemical Total	3E-05	--	3E-06	--	3E-05					
		Exposure Point Total						3E-05					
	Exposure Medium Total							3E-05					
	Air	Subarea C	Arsenic	--	2E-08	--	--	2E-08					
			Chemical Total	--	2E-08	--	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
Medium Total								3E-05					
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	2E-05	--	2E-06	--	2E-05					
			Chromium	8E-05	--	- -	--	8E-05					
			Chemical Total	1E-04	--	2E-06	--	1E-04					
		Exposure Point Total						1E-04					
	Exposure Medium Total							1E-04					
	Air	Subarea C	Arsenic	--	1E-08	--	--	1E-08					
			Chromium	--	2E-06	--	--	2E-06					
			Chemical Total	--	2E-06	--	--	2E-06					
		Exposure Point Total						2E-06					
	Exposure Medium Total							2E-06					
Medium Total								1E-04					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	1E-07	--	8E-09	--	1E-07	Skin, CVS	0.02	--	0.001	0.02
			Chemical Total	1E-07	--	8E-09	--	1E-07		0.02	--	0.001	0.02
		Exposure Point Total						1E-07					0.02
	Exposure Medium Total							1E-07					0.02
	Air	Subarea C	Arsenic	--	4E-08	--	--	4E-08	NA	--	0.07	--	0.07
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.07	- -	0.07
		Exposure Point Total						4E-08					0.07
	Exposure Medium Total							4E-08					0.07
Medium Total								2E-07					0.09
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	8E-08	--	5E-09	--	9E-08	Skin, CVS	0.01	--	0.0008	0.01
			Chromium	8E-08	--	- -	--	8E-08	None Reported	0.004	--	--	0.004
			Chemical Total	2E-07	--	5E-09	--	2E-07		0.02	--	0.0008	0.02
		Exposure Point Total						2E-07					0.02
	Exposure Medium Total							2E-07					0.02
	Air	Subarea C	Arsenic	--	3E-08	--	--	3E-08	NA	--	0.04	--	0.04
			Chromium	--	1E-06	--	--	1E-06	Respiratory	--	0.01	--	0.01
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.05	- -	0.05
		Exposure Point Total						2E-06					0.05
	Exposure Medium Total							2E-06					0.05
Medium Total								2E-06					0.07

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	1E-06	--	4E-08	--	1E-06	Skin, CVS	0.02	--	0.0007	0.02
			Chemical Total	1E-06	--	4E-08	--	1E-06		0.02	--	0.0007	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Subarea C	Arsenic	--	1E-09	--	--	1E-09	NA	--	0.0001	--	0.0001
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						1E-09					0.0001
	Exposure Medium Total							1E-09					0.0001
Medium Total								1E-06					0.02
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	7E-07	--	3E-08	--	7E-07	Skin, CVS	0.01	--	0.0005	0.01
			Chromium	7E-07	--	- -	--	7E-07	None Reported	0.003	--	--	0.003
			Chemical Total	1E-06	--	3E-08	--	1E-06		0.02	--	0.0005	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Subarea C	Arsenic	--	7E-10	--	--	7E-10	NA	--	0.00008	--	0.00008
			Chromium	--	4E-08	--	--	4E-08	Respiratory	--	0.00004	--	0.00004
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.0001	- -	0.0001
		Exposure Point Total						4E-08					0.0001
	Exposure Medium Total							4E-08					0.0001
Medium Total								1E-06					0.02

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	1E-07	--	1E-08	--	1E-07	Skin, CVS	0.002	--	0.0002	0.002
			Chemical Total	1E-07	--	1E-08	--	1E-07		0.002	--	0.0002	0.002
		Exposure Point Total						1E-07					0.002
	Exposure Medium Total							1E-07					0.002
	Air	Subarea C	Arsenic	--	2E-11	--	--	2E-11	NA	--	0.000002	--	0.000002
			Chemical Total	--	2E-11	--	--	2E-11		- -	0.000002	- -	0.000002
		Exposure Point Total						2E-11					0.000002
	Exposure Medium Total							2E-11					0.000002
Medium Total								1E-07					0.002
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	7E-08	--	9E-09	--	8E-08	Skin, CVS	0.001	--	0.0001	0.001
			Chromium	2E-07	--	- -	--	2E-07	None Reported	0.0003	--	--	0.0003
			Chemical Total	3E-07	--	9E-09	--	3E-07		0.001	--	0.0001	0.002
		Exposure Point Total						3E-07					0.002
	Exposure Medium Total							3E-07					0.002
	Air	Subarea C	Arsenic	--	1E-11	--	--	1E-11	NA	--	0.000001	--	0.000001
			Chromium	--	2E-09	--	--	2E-09	Respiratory	--	0.0000005	--	0.0000005
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.000002	- -	0.000002
		Exposure Point Total						2E-09					0.000002
	Exposure Medium Total							2E-09					0.000002
Medium Total								3E-07					0.002

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	1E-07	--	9E-09	--	1E-07	Skin, CVS	0.01	--	0.0007	0.01
			Chemical Total	1E-07	--	9E-09	--	1E-07		0.01	--	0.0007	0.01
		Exposure Point Total						1E-07					0.01
	Exposure Medium Total							1E-07					0.01
	Air	Subarea C	Arsenic	--	7E-12	--	--	7E-12	NA	--	0.000004	--	0.000004
			Chemical Total	--	7E-12	--	--	7E-12		- -	0.000004	- -	0.000004
		Exposure Point Total						7E-12					0.000004
	Exposure Medium Total							7E-12					0.000004
Medium Total								1E-07					0.01
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	8E-08	--	6E-09	--	9E-08	Skin, CVS	0.006	--	0.0004	0.007
			Chromium	5E-07	--	- -	--	5E-07	None Reported	0.002	--	--	0.002
			Chemical Total	6E-07	--	6E-09	--	6E-07		0.008	--	0.0004	0.009
		Exposure Point Total						6E-07					0.009
	Exposure Medium Total							6E-07					0.009
	Air	Subarea C	Arsenic	--	4E-12	--	--	4E-12	NA	--	0.000002	--	0.000002
			Chromium	--	2E-09	--	--	2E-09	Respiratory	--	0.000001	--	0.000001
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.000004	- -	0.000004
		Exposure Point Total						2E-09					0.000004
	Exposure Medium Total							2E-09					0.000004
Medium Total								6E-07					0.009

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	5E-08	--	3E-09	--	5E-08	Skin, CVS	0.001	--	0.00008	0.001
			Chemical Total	5E-08	--	3E-09	--	5E-08		0.001	--	0.00008	0.001
		Exposure Point Total						5E-08					0.001
	Exposure Medium Total							5E-08					0.001
	Air	Subarea C	Arsenic	--	3E-11	--	--	3E-11	NA	--	0.000004	--	0.000004
			Chemical Total	--	3E-11	--	--	3E-11		- -	0.000004	- -	0.000004
		Exposure Point Total						3E-11					0.000004
	Exposure Medium Total							3E-11					0.000004
Medium Total								5E-08					0.001
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	3E-08	--	2E-09	--	3E-08	Skin, CVS	0.0007	--	0.00005	0.0007
			Chromium	5E-08	--	- -	--	5E-08	None Reported	0.0002	--	--	0.0002
			Chemical Total	8E-08	--	2E-09	--	8E-08		0.0009	--	0.00005	0.0009
		Exposure Point Total						8E-08					0.0009
	Exposure Medium Total							8E-08					0.0009
	Air	Subarea C	Arsenic	--	2E-11	--	--	2E-11	NA	--	0.000002	--	0.000002
			Chromium	--	1E-09	--	--	1E-09	Respiratory	--	0.000001	--	0.000001
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.000004	- -	0.000004
		Exposure Point Total						1E-09					0.000004
	Exposure Medium Total							1E-09					0.000004
Medium Total								8E-08					0.0009

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total CVS HI	0.002
Total Respiratory HI	0.000001
Total None Reported HI	0.0002
Total Skin HI	0.002
Total NA HI	0.000006

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	2E-07	--	1E-08	--	2E-07					
			Chemical Total	2E-07	--	1E-08	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
	Air	Subarea C	Arsenic	--	3E-11	--	--	3E-11					
			Chemical Total	--	3E-11	--	--	3E-11					
		Exposure Point Total						3E-11					
	Exposure Medium Total							3E-11					
Medium Total								2E-07					
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	1E-07	--	8E-09	--	1E-07					
			Chromium	6E-07	--	- -	--	6E-07					
			Chemical Total	7E-07	--	8E-09	--	7E-07					
		Exposure Point Total						7E-07					
	Exposure Medium Total							7E-07					
	Air	Subarea C	Arsenic	--	2E-11	--	--	2E-11					
			Chromium	--	3E-09	--	--	3E-09					
			Chemical Total	--	3E-09	--	--	3E-09					
		Exposure Point Total						3E-09					
	Exposure Medium Total							3E-09					
Medium Total								7E-07					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	2E-06	--	8E-08	--	2E-06	Skin, CVS	0.2	--	0.006	0.2
			Chemical Total	2E-06	--	8E-08	--	2E-06		0.2	--	0.006	0.2
		Exposure Point Total						2E-06					0.2
	Exposure Medium Total							2E-06					0.2
	Air	Subarea C	Arsenic	--	8E-10	--	--	8E-10	NA	--	0.0004	--	0.0004
			Chemical Total	--	8E-10	--	--	8E-10		- -	0.0004	- -	0.0004
		Exposure Point Total						8E-10					0.0004
	Exposure Medium Total							8E-10					0.0004
Medium Total								2E-06					0.2
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	1E-06	--	5E-08	--	2E-06	Skin, CVS	0.1	--	0.004	0.1
			Chromium	1E-05	--	- -	--	1E-05	None Reported	0.03	--	--	0.03
			Chemical Total	1E-05	--	5E-08	--	1E-05		0.1	--	0.004	0.2
		Exposure Point Total						1E-05					0.2
	Exposure Medium Total							1E-05					0.2
	Air	Subarea C	Arsenic	--	5E-10	--	--	5E-10	NA	--	0.0003	--	0.0003
			Chromium	--	2E-07	--	--	2E-07	Respiratory	--	0.0001	--	0.0001
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.0004	- -	0.0004
		Exposure Point Total						2E-07					0.0004
	Exposure Medium Total							2E-07					0.0004
Medium Total								1E-05					0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	9E-07	--	3E-08	--	9E-07	Skin, CVS	0.02	--	0.0007	0.02
			Chemical Total	9E-07	--	3E-08	--	9E-07		0.02	--	0.0007	0.02
		Exposure Point Total						9E-07					0.02
	Exposure Medium Total							9E-07					0.02
	Air	Subarea C	Arsenic	--	3E-09	--	--	3E-09	NA	--	0.0004	--	0.0004
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.0004	- -	0.0004
		Exposure Point Total						3E-09					0.0004
	Exposure Medium Total							3E-09					0.0004
Medium Total								9E-07					0.02
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	6E-07	--	2E-08	--	6E-07	Skin, CVS	0.01	--	0.0004	0.01
			Chromium	9E-07	--	- -	--	9E-07	None Reported	0.004	--	--	0.004
			Chemical Total	1E-06	--	2E-08	--	1E-06		0.02	--	0.0004	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Subarea C	Arsenic	--	2E-09	--	--	2E-09	NA	--	0.0003	--	0.0003
			Chromium	--	2E-07	--	--	2E-07	Respiratory	--	0.0001	--	0.0001
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.0004	- -	0.0004
		Exposure Point Total						2E-07					0.0004
	Exposure Medium Total							2E-07					0.0004
Medium Total								2E-06					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Subarea C	Arsenic	3E-06	--	1E-07	--	3E-06					
			Chemical Total	3E-06	--	1E-07	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
	Air	Subarea C	Arsenic	--	4E-09	--	--	4E-09					
			Chemical Total	--	4E-09	--	--	4E-09					
		Exposure Point Total						4E-09					
	Exposure Medium Total							4E-09					
Medium Total								3E-06					
Subsurface Soil	Subsurface Soil	Subarea C	Arsenic	2E-06	--	7E-08	--	2E-06					
			Chromium	1E-05	--	- -	--	1E-05					
			Chemical Total	1E-05	--	7E-08	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
	Air	Subarea C	Arsenic	--	2E-09	--	--	2E-09					
			Chromium	--	3E-07	--	--	3E-07					
			Chemical Total	--	3E-07	--	--	3E-07					
		Exposure Point Total						3E-07					
	Exposure Medium Total							3E-07					
Medium Total								1E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX I.5

SUBAREA F

I.5.1 Samples Used in Risk Assessment
I.5.2 RAGS Part D Tables
I.5.3 RAGS Part D Tables for Chemicals Present at Naturally Occurring Levels

APPENDIX I.5.1

SAMPLES USED IN RISK ASSESSMENT

TABLE 1
SAMPLES USED IN THE HUMAN HEALTH RISH ASSESSMENT

Surface Soil	Subsurface Soil
18FSB0010002	18FSB0010507
18FSB0020002	18FSB0020507
18FSB0030002	18FSB0030507
18FSS0010002	
18FSS0020002	
18FCP0010002	
18FCP0020002	

APPENDIX I.5.2

RAGS PART D TABLES

RAGS Part D Table 1

Selection of Exposure Pathways

TABLE 1
SELECTION OF EXPOSURE PATHWAYS - SUBAREA F
SWMU 18 – LOAD AND FILL AREA
NSWC CRANE
CRANE INDIANA
PAGE 1 OF 2

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	Subarea F	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Trespassers may contact surface soil while at the site.
		Air	Subarea F	Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Worker	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during work activities.
				Trespassers	Adolescent	Inhalation	Quant	Trespassers may be exposed to fugitive dust and volatile emissions while at the site.
	Subsurface Soil	Subsurface Soil	Subarea F	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Industrial Worker	Adult	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by industrial workers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by trespassers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
		Air	Subarea F	Construction Workers	Adult	Inhalation	Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Industrial Worker	Adult	Inhalation	Quant	Although exposures to subsurface soil by industrial workers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
				Trespassers	Adolescent	Inhalation	Quant	Although exposures to subsurface soil by trespassers is considered unlikely at the site this scenario is included to aid in future risk management decisions.
Future	Surface Soil	Surface Soil	Subarea F	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	
		Air	Subarea F	Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

TABLE 1
SELECTION OF EXPOSURE PATHWAYS - SUBAREA F
SWMU 18 – LOAD AND FILL AREA
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
Future	Subsurface Soil	Subsurface Soil	Subarea F	Recreational Users	Child	Ingestion	Quant	Although exposures to subsurface soil by recreational users is considered unlikely at the site this scenario is included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
				Residents	Child	Ingestion	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air	Subarea F	Recreational Users	Child	Inhalation	Quant	Although exposures to subsurface soil by recreational users is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

Notes:
Qual - Qualitative.
Quant - Quantitative.

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

LIST OF TABLES
RAGS PART D TABLE 2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

2.1 Surface Soil - Direct Contact
2.2 Surface Soil - Migration From Soil to Groundwater
2.3 Subsurface Soil - Direct Contact
2.4 Subsurface Soil - Migration From Soil to Groundwater

TABLE 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea F	**Polycyclic Aromatic Hydrocarbons**													
	91-57-6	2-Methylnaphthalene	0.00244 J	0.00244 J	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.00244	NA	31 N	370 S	No	BSL
	56-55-3	Benzo(a)anthracene	0.0215	0.0215	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0215	NA	0.15 C	2.1 C	No	BSL
	50-32-8	**Benzo(a)pyrene**	0.0268	0.0268	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0268	NA	**0.015 C**	0.21 C	**Yes**	ASL
	205-99-2	Benzo(b)fluoranthene	0.0474	0.0474	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0474	NA	0.15 C	2.1 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	0.028	0.028	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.028	NA	170 N[7]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	0.0161	0.0161	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0161	NA	1.5 C	21 C	No	BSL
	218-01-9	Chrysene	0.0315	0.0315	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0315	NA	15 C	210 C	No	BSL
	206-44-0	Fluoranthene	0.0464	0.0464	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0464	NA	230 N	3,200 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.0255	0.0255	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0255	NA	0.15 C	2.1 C	No	BSL
	129-00-0	Pyrene	0.0414	0.0414	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0414	NA	170 N	2,400 N	No	BSL
	PCBs													
	12674-11-2	Aroclor-1016	0.00367 J	0.00367 J	mg/kg	18FCP0010002	1/2	0.00188 - 0.00188	0.00367	NA	0.39 N	5.5 N	No	BSL
	11096-82-5	Aroclor-1260	0.00167 J	0.00269 J	mg/kg	18FCP0020002	2/2	-	0.00269	NA	0.22 C	3.1 C	No	BSL
	Metals													
	7429-90-5	Aluminum	4,400	11,500	mg/kg	18FSB0030002	3/3	-	11,500	No	**7,700 N**	100,000 L	No	BKG
	7440-38-2	Arsenic	2.39 J	6.84	mg/kg	18FSB0030002	3/3	-	6.84	No	**0.39 C**	**5.5 C**	No	BKG
	7440-39-3	Barium	36.3 J	105 J	mg/kg	18FSB0030002	3/3	-	105	No	1,500 N	21,000 N	No	BSL, BKG
	7440-41-7	Beryllium	0.574 J	0.872 J	mg/kg	18FSB0030002	3/3	-	0.872	Yes	16 N	220 N	No	BSL
	7440-70-2	Calcium	1,590 J	36,700 J	mg/kg	18FSB0010002	3/3	-	36,700	Yes	NA	NA	No	NUT
	7440-47-3	Chromium	12.6 J	15.5 J	mg/kg	18FSB0030002	3/3	-	15.5	No	**0.29 C**	**4.1 C**	No	BKG
	7440-48-4	Cobalt	3.45 J	11.3	mg/kg	18FSB0030002	3/3	-	11.3	No	**2.3 N**	32 N	No	BKG
	7440-50-8	Copper	7.52	14	mg/kg	18FSB0030002	3/3	-	14	No	310 N	4,300 N	No	BKG
	7439-89-6	Iron	14,400 J	20,500 J	mg/kg	18FSB0030002	3/3	-	20,500	No	**5,500 N**	77,000 N	No	BKG
	7439-92-1	Lead	9.95	13.8	mg/kg	18FSB0030002	3/3	-	13.8	No	400	400	No	BSL, BKG
	7439-95-4	Magnesium	1,430 J	3,080 J	mg/kg	18FSB0030002	3/3	-	3,080	Yes	NA	NA	No	NUT
	7439-96-5	Manganese	150	2,340	mg/kg	18FSB0030002	3/3	-	2,340	No	**180 N**	2,500 N	No	BKG
	7439-97-6	Mercury	0.0327 J	0.0509	mg/kg	18FSB0030002	2/3	0.0359 - 0.0359	0.0509	No	2.3 N[10]	32 N[10]	No	BSL, BKG
	7440-02-0	Nickel	8.1	15.4	mg/kg	18FSB0010002	3/3	-	15.4	No	150 N	2,100 N	No	BSL, BKG
	7440-09-7	Potassium	493 J	697 J	mg/kg	18FSB0010002	3/3	-	697	No	NA	NA	No	NUT, BKG
	7440-28-0	**Thallium**	3.93	3.93	mg/kg	18FSB0030002	1/3	1.11 - 1.12	3.93	Yes	**0.078 N**	**1.1 N**	**Yes**	ASL
	7440-62-2	Vanadium	10.2 J	26.7 J	mg/kg	18FSB0030002	3/3	-	26.7	No	39 N	NA	No	BSL, BKG
	7440-66-6	Zinc	20.9	115	mg/kg	18FSB0030002	3/3	-	115	Yes	2,300 N	32,000 N	No	BSL
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	20.8	31	mg/kg	18FSS0020002	2/2	-	31	NA	NA	3,100	No	BSL
	- -	DRO (C08-C34)	26.8	43.2	mg/kg	18FSS0020002	2/2	-	43.2	NA	NA	3,100	No	BSL

Footnotes:

1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Value is for pyrene.
8 - Value is for total PCBs.
9 - Value is for hexavalent chromium.
10 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:

C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

Rationale Codes:

For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

Associated Samples

18FSB0010002	18FSB0030002	18FSS0020002	18FCP0020002
18FSB0020002	18FSS0010002	18FCP0010002	

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	USEPA RSL Protection of Groundwater[4]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea F	**Polycyclic Aromatic Hydrocarbons**													
	91-57-6	2-Methylnaphthalene	0.00244 J	0.00244 J	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.00244	NA	2.8	2.8 N	No	BSL
	56-55-3	Benzo(a)anthracene	0.0215	0.0215	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0215	NA	0.2	2.1 C	No	BSL
	50-32-8	Benzo(a)pyrene	0.0268	0.0268	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0268	NA	0.07	4.7 M	No	BSL
	205-99-2	Benzo(b)fluoranthene	0.0474	0.0474	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0474	NA	0.7	7 C	No	BSL
	191-24-2	Benzo(g,h,i)perylene	0.028	0.028	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.028	NA	190 [7]	NA	No	BSL
	207-08-9	Benzo(k)fluoranthene	0.0161	0.0161	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0161	NA	7	68 C	No	BSL
	218-01-9	Chrysene	0.0315	0.0315	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0315	NA	22	210 C	No	BSL
	206-44-0	Fluoranthene	0.0464	0.0464	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0464	NA	1,400	1,400 N	No	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.0255	0.0255	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0255	NA	2.4	23 C	No	BSL
	129-00-0	Pyrene	0.0414	0.0414	mg/kg	18FSS0020002	1/2	0.00397 - 0.00397	0.0414	NA	190	190 N	No	BSL
	PCBs													
	12674-11-2	Aroclor-1016	0.00367 J	0.00367 J	mg/kg	18FCP0010002	1/2	0.00188 - 0.00188	0.00367	NA	1.84	2.1 N	No	BSL
	11096-82-5	Aroclor-1260	0.00167 J	0.00269 J	mg/kg	18FCP0020002	2/2	-	0.00269	NA	0.48	4.8 C	No	BSL
	Metals													
	7429-90-5	Aluminum	4,400	11,500	mg/kg	18FSB0030002	3/3	-	11,500	No	460,000	1,000,000 R	No	BSL, BKG
	7440-38-2	Arsenic	2.39 J	6.84	mg/kg	18FSB0030002	3/3	-	6.84	No	**0.026**	**5.9 M**	No	BKG
	7440-39-3	Barium	36.3 J	105 J	mg/kg	18FSB0030002	3/3	-	105	No	2,400	1,700 M	No	BSL, BKG
	7440-41-7	Beryllium	0.574 J	0.872 J	mg/kg	18FSB0030002	3/3	-	0.872	Yes	260	63 M	No	BSL
	7440-70-2	Calcium	1,590 J	36,700 J	mg/kg	18FSB0010002	3/3	-	36,700	Yes	NA	NA	No	NUT
	7440-47-3	Chromium	12.6 J	15.5 J	mg/kg	18FSB0030002	3/3	-	15.5	No	**0.0118** [9]	**0.12 C**	No	BKG
	7440-48-4	Cobalt	3.45 J	11.3	mg/kg	18FSB0030002	3/3	-	11.3	No	**4.2**	**4.3 N**	No	BKG
	7440-50-8	Copper	7.52	14	mg/kg	18FSB0030002	3/3	-	14	No	440	920 M	No	BSL, BKG
	7439-89-6	Iron	14,400 J	20,500 J	mg/kg	18FSB0030002	3/3	-	20,500	No	**5,400**	**5,600 N**	No	BKG
	7439-92-1	Lead	9.95	13.8	mg/kg	18FSB0030002	3/3	-	13.8	No	280 [10]	270 M	No	BSL, BKG
	7439-95-4	Magnesium	1,430 J	3,080 J	mg/kg	18FSB0030002	3/3	-	3,080	Yes	NA	NA	No	NUT
	7439-96-5	Manganese	150	2,340	mg/kg	18FSB0030002	3/3	-	2,340	No	**420**	**420 N**	No	BKG
	7439-97-6	Mercury	0.0327 J	0.0509	mg/kg	18FSB0030002	2/3	0.0359 - 0.0359	0.0509	No	0.66	2.1 M	No	BSL, BKG
	7440-02-0	Nickel	8.1	15.4	mg/kg	18FSB0010002	3/3	-	15.4	No	400	17,000 N	No	BSL, BKG
	7440-09-7	Potassium	493 J	697 J	mg/kg	18FSB0010002	3/3	-	697	No	NA	NA	No	NUT, BKG
	7440-28-0	**Thallium**	3.93	3.93	mg/kg	18FSB0030002	1/3	1.11 - 1.12	3.93	Yes	**0.22**	**2.9 M**	**Yes**	ASL
	7440-62-2	Vanadium	10.2 J	26.7 J	mg/kg	18FSB0030002	3/3	-	26.7	No	1,560	NA	No	BSL, BKG
	7440-66-6	Zinc	20.9	115	mg/kg	18FSB0030002	3/3	-	115	Yes	5,800	NA	No	BSL
	Petroleum Hydrocarbons													
	- -	DRO (C08-C28)	20.8	31	mg/kg	18FSS0020002	2/2	-	31	NA	NA	230	No	BSL
	- -	DRO (C08-C34)	26.8	43.2	mg/kg	18FSS0020002	2/2	-	43.2	NA	NA	230	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Value is for pyrene.
8 - Value is for total PCBs.
9 - Value is for hexavalent chromium.
10 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

18FSB0010002	18FSS0020002
18FSB0020002	18FCP0010002
18FSB0030002	18FCP0020002
18FSS0010002	

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

TABLE 2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea F	**Metals**													
	7429-90-5	Aluminum	6,750	20,800	mg/kg	18FSB0030507	3/3	-	20,800	No	**7,700 N**	100,000 L	No	BKG
	7440-38-2	Arsenic	1.94 J	6.1	mg/kg	18FSB0030507	3/3	-	6.1	No	**0.39 C**	**5.5 C**	No	BKG
	7440-39-3	Barium	54.9 J	99.5 J	mg/kg	18FSB0030507	3/3	-	99.5	No	1,500 N	21,000 N	No	BSL, BKG
	7440-41-7	Beryllium	0.445 J	0.969 J	mg/kg	18FSB0010507	3/3	-	0.969	No	16 N	220 N	No	BSL, BKG
	7440-70-2	Calcium	525 J	722 J	mg/kg	18FSB0030507	3/3	-	722	No	NA	NA	No	NUT, BKG
	7440-47-3	Chromium	13.7 J	25.1 J	mg/kg	18FSB0030507	3/3	-	25.1	No	**0.29 C[7]**	**4.1 C**	No	BKG
	7440-48-4	**Cobalt**	7.08	27.7	mg/kg	18FSB0010507	3/3	-	27.7	Yes	**2.3 N**	32 N	**Yes**	ASL
	7440-50-8	Copper	11	18.1	mg/kg	18FSB0020507	3/3	-	18.1	No	310 N	4,300 N	No	BSL, BKG
	7439-89-6	Iron	12,200 J	21,200 J	mg/kg	18FSB0030507	3/3	-	21,200	No	**5,500 N**	77,000 N	No	BKG
	7439-92-1	Lead	6.23	10.6	mg/kg	18FSB0030507	3/3	-	10.6	No	400	400	No	BSL, BKG
	7439-95-4	Magnesium	1,110 J	1,790 J	mg/kg	18FSB0030507	3/3	-	1,790	No	NA	NA	No	NUT, BKG
	7439-96-5	Manganese	232	697	mg/kg	18FSB0030507	3/3	-	697	No	**180 N**	2,500 N	No	BKG
	7439-97-6	Mercury	0.0175 J	0.0319 J	mg/kg	18FSB0030507	2/3	0.0387 - 0.0387	0.0319	No	2.3 N[8]	32 N[8]	No	BSL, BKG
	7440-02-0	Nickel	9.98	20	mg/kg	18FSB0010507	3/3	-	20	No	150 N	2,100 N	No	BSL, BKG
	7440-09-7	Potassium	628 J	891 J	mg/kg	18FSB0010507	3/3	-	891	No	NA	NA	No	NUT, BKG
	7440-62-2	Vanadium	13.6 J	31.3 J	mg/kg	18FSB0030507	3/3	-	31.3	No	39 N	NA	No	BSL, BKG
	7440-66-6	Zinc	26.1	48.5	mg/kg	18FSB0030507	3/3	-	48.5	No	2,300 N	32,000 N	No	BSL, BKG

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Value is for hexavalent chromium.
8 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18FSB0010507
18FSB0020507
18FSB0030507

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

TABLE 2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	USEPA RSL Protection of Groundwater[4]	IDEM Migration to Groundwater[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Subarea F	**Metals**													
	7429-90-5	Aluminum	6,750	20,800	mg/kg	18FSB0030507	3/3	-	20,800	No	460,000	1,000,000 R	No	BSL, BKG
	7440-38-2	Arsenic	1.94 J	6.1	mg/kg	18FSB0030507	3/3	-	6.1	No	**0.026**	**5.9 M**	No	BKG
	7440-39-3	Barium	54.9 J	99.5 J	mg/kg	18FSB0030507	3/3	-	99.5	No	2,400	1,700 M	No	BSL, BKG
	7440-41-7	Beryllium	0.445 J	0.969 J	mg/kg	18FSB0010507	3/3	-	0.969	No	260	63 M	No	BSL, BKG
	7440-70-2	Calcium	525 J	722 J	mg/kg	18FSB0030507	3/3	-	722	No	NA	NA	No	NUT, BKG
	7440-47-3	Chromium	13.7 J	25.1 J	mg/kg	18FSB0030507	3/3	-	25.1	No	**0.0118 [7]**	**0.12 C**	No	BKG
	7440-48-4	**Cobalt**	7.08	27.7	mg/kg	18FSB0010507	3/3	-	27.7	Yes	**4.2**	**4.3 N**	**Yes**	ASL
	7440-50-8	Copper	11	18.1	mg/kg	18FSB0020507	3/3	-	18.1	No	440	920 M	No	BSL, BKG
	7439-89-6	Iron	12,200 J	21,200 J	mg/kg	18FSB0030507	3/3	-	21,200	No	**5,400**	**5,600 N**	No	BKG
	7439-92-1	Lead	6.23	10.6	mg/kg	18FSB0030507	3/3	-	10.6	No	280 [8]	270 M	No	BSL, BKG
	7439-95-4	Magnesium	1,110 J	1,790 J	mg/kg	18FSB0030507	3/3	-	1,790	No	NA	NA	No	NUT, BKG
	7439-96-5	Manganese	232	697	mg/kg	18FSB0030507	3/3	-	697	No	**420**	**420 N**	No	BKG
	7439-97-6	Mercury	0.0175 J	0.0319 J	mg/kg	18FSB0030507	2/3	0.0387 - 0.0387	0.0319	No	0.66	2.1 M	No	BSL, BKG
	7440-02-0	Nickel	9.98	20	mg/kg	18FSB0010507	3/3	-	20	No	400	17,000 N	No	BSL, BKG
	7440-09-7	Potassium	628 J	891 J	mg/kg	18FSB0010507	3/3	-	891	No	NA	NA	No	NUT, BKG
	7440-62-2	Vanadium	13.6 J	31.3 J	mg/kg	18FSB0030507	3/3	-	31.3	No	1,560	NA	No	BSL, BKG
	7440-66-6	Zinc	26.1	48.5	mg/kg	18FSB0030507	3/3	-	48.5	No	5,800	NA	No	BSL, BKG

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
5 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - Value is for hexavalent chromium.
8 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18FSB0010507
18FSB0020507
18FSB0030507

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

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RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

3.1.RME Surface Soil
3.2.RME Subsurface Soil

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Subarea F	Benzo(a)pyrene	mg/kg	0.012	(1)	0.0268	0.0268	mg/kg	Maximum Detected Concentration	(1)
	Thallium	mg/kg	1.68	(1)	3.93	3.93	mg/kg	Maximum Detected Concentration	(1)

1 - There are only three samples. Reliable statistics cannot be computed. The maximum concentration was used as the EPC.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Subarea F	Cobalt	mg/kg	14.5	(1)	27.7	27.7	mg/kg	Maximum Detected Concentration	(1)

1 - There are only three samples. Reliable statistics cannot be computed. The maximum concentration was used as the EPC.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

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RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	Reasonable Maximum Exposures
7.1.RME	Construction Workers
7.2.RME	Industrial Workers
7.3.RME	Adolescent Trespassers
7.4.RME	Child Recreational Users
7.5.RME	Adult Recreational Users
7.6.RME	Child Residents
7.7.RME	Adult Residents
	Central Tendency Exposures
7.1.CTE	Construction Workers
7.2.CTE	Industrial Workers
7.3.CTE	Adolescent Trespassers
7.4.CTE	Child Recreational Users
7.5.CTE	Adult Recreational Users
7.6.CTE	Child Residents
7.7.CTE	Adult Residents

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	7.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.4E-09	5.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.4E-09					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	2.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-09	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-09					--
		Exposure Point Total									7.5E-09					--
	Exposure Medium Total										7.5E-09					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-8	mg/m^3	3.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.3E-11	2.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	2.9E-6	mg/m^3	5.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.0E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.3E-11					--
		Exposure Point Total									4.3E-11					--
	Exposure Medium Total										4.3E-11					--
Medium Total											7.6E-09					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	7.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
			Exp. Route Total								- -					0.02
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.02
	Exposure Medium Total										- -					0.02
	Air	Area F	Inhalation	Cobalt	2.1E-5	mg/m^3	4.0E-08	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.6E-07	2.8E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.1
			Exp. Route Total								3.6E-07					0.1
		Exposure Point Total									3.6E-07					0.1
	Exposure Medium Total										3.6E-07					0.1
Medium Total											3.6E-07					0.2

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	9.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-08	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.8E-08					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	8.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.9E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.9E-08					--
		Exposure Point Total									1.3E-07					--
	Exposure Medium Total										1.3E-07					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	1.7E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.8E-12	4.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	2.4E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.8E-12					--
		Exposure Point Total									1.8E-12					--
	Exposure Medium Total										1.8E-12					--
Medium Total											1.3E-07					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	9.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
			Exp. Route Total								- -					0.09
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.09
	Exposure Medium Total										- -					0.09
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	1.7E-09	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.5E-08	4.8E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0008
			Exp. Route Total								1.5E-08					0.0008
		Exposure Point Total									1.5E-08					0.0008
	Exposure Medium Total										1.5E-08					0.0008
Medium Total											1.5E-08					0.09

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-08	4.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	9.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-08					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	1.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	3.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-08					--
		Exposure Point Total									2.6E-08					--
	Exposure Medium Total										2.6E-08					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	1.0E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-13	2.4E-13	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	5.1E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-13					--
		Exposure Point Total									1.1E-13					--
	Exposure Medium Total										1.1E-13					--
Medium Total											2.6E-08					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	6.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								- -					0.02
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.02
	Exposure Medium Total										- -					0.02
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	3.6E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.2E-10	2.5E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00004
			Exp. Route Total								3.2E-10					0.00004
		Exposure Point Total									3.2E-10					0.00004
	Exposure Medium Total										3.2E-10					0.00004
Medium Total											3.2E-10					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.5E-08	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.5E-08					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	8.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-08	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.2E-08					--
		Exposure Point Total									1.5E-07					--
	Exposure Medium Total										1.5E-07					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	2.2E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.4E-13	4.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	6.1E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-13					--
		Exposure Point Total									2.4E-13					--
	Exposure Medium Total										2.4E-13					--
Medium Total											1.5E-07					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	2.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
			Exp. Route Total								- -					0.09
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.09
	Exposure Medium Total										- -					0.09
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	4.3E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.9E-10	5.0E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00008
			Exp. Route Total								3.9E-10					0.00008
		Exposure Point Total									3.9E-10					0.00008
	Exposure Medium Total										3.9E-10					0.00008
Medium Total											3.9E-10					0.09

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-08	2.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-08					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	2.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-08	4.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-08					--
		Exposure Point Total									3.3E-08					--
	Exposure Medium Total										3.3E-08					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	3.0E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.3E-13	4.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	2.4E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-13					--
		Exposure Point Total									3.3E-13					--
	Exposure Medium Total										3.3E-13					--
Medium Total											3.3E-08					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	9.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
			Exp. Route Total								- -					0.009
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.009
	Exposure Medium Total										- -					0.009
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	1.7E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.5E-09	5.0E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00008
			Exp. Route Total								1.5E-09					0.00008
		Exposure Point Total									1.5E-09					0.00008
	Exposure Medium Total										1.5E-09					0.00008
Medium Total											1.5E-09					0.009

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-06	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-06					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	5.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-07	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.2E-07					--
		Exposure Point Total									1.6E-06					--
	Exposure Medium Total										1.6E-06					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	8.9E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.8E-12	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	2.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.8E-12					--
		Exposure Point Total									9.8E-12					--
	Exposure Medium Total										9.8E-12					--
Medium Total											1.6E-06					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.2
			Exp. Route Total								- -					1.2
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					1.2
	Exposure Medium Total										- -					1.2
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	1.7E-09	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.6E-08	2.0E-08	(mg/m^3)	6.0E-06	(mg/m^3)	0.003
			Exp. Route Total								1.6E-08					0.003
		Exposure Point Total									1.6E-08					0.003
	Exposure Medium Total										1.6E-08					0.003
Medium Total											1.6E-08					1.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	2.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-07	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-06	(mg/kg/day)	NA	(mg/kg/day)	0.0
			Exp. Route Total								1.7E-07					0.0
			Dermal	Benzo(a)pyrene	0.027	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.7E-08	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.7E-08					--
		Exposure Point Total									2.6E-07					0.0
	Exposure Medium Total										2.6E-07					0.0
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-11	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	9.8E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.4E-11					--
		Exposure Point Total									1.4E-11					--
	Exposure Medium Total										1.4E-11					--
Medium Total											2.6E-07					0.0
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
			Exp. Route Total								- -					0.1
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.1
	Exposure Medium Total										- -					0.1
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	6.9E-09	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	6.2E-08	2.0E-08	(mg/m^3)	6.0E-06	(mg/m^3)	0.003
			Exp. Route Total								6.2E-08					0.003
		Exposure Point Total									6.2E-08					0.003
	Exposure Medium Total										6.2E-08					0.003
Medium Total											6.2E-08					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-09	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-09					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	4.8E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-10	3.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.5E-10					--
		Exposure Point Total									1.7E-09					--
	Exposure Medium Total										1.7E-09					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-8	mg/m^3	2.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.2E-11	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	2.9E-6	mg/m^3	2.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-11					--
		Exposure Point Total									2.2E-11					--
	Exposure Medium Total										2.2E-11					--
Medium Total											1.7E-09					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	1.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
			Exp. Route Total								- -					0.004
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.004
	Exposure Medium Total										- -					0.004
	Air	Area F	Inhalation	Cobalt	2.1E-5	mg/m^3	2.0E-08	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.8E-07	1.4E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.07
			Exp. Route Total								1.8E-07					0.07
		Exposure Point Total									1.8E-07					0.07
	Exposure Medium Total										1.8E-07					0.07
Medium Total											1.8E-07					0.08

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	2.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-08					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	2.5E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-09	2.0E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-09					--
		Exposure Point Total									1.3E-08					--
	Exposure Medium Total										1.3E-08					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	5.2E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.8E-13	4.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	7.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.8E-13					--
		Exposure Point Total									5.8E-13					--
	Exposure Medium Total										5.8E-13					--
Medium Total											1.3E-08					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								- -					0.04
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.04
	Exposure Medium Total										- -					0.04
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	5.4E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	4.9E-09	4.2E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0007
			Exp. Route Total								4.9E-09					0.0007
		Exposure Point Total									4.9E-09					0.0007
	Exposure Medium Total										4.9E-09					0.0007
Medium Total											4.9E-09					0.04

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	4.8E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-09	1.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	2.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.5E-09					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	2.6E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-09	6.1E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-09					--
		Exposure Point Total									5.4E-09					--
	Exposure Medium Total										5.4E-09					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	2.6E-14	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.8E-14	6.0E-14	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	1.3E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.9E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.8E-14					--
		Exposure Point Total									2.8E-14					--
	Exposure Medium Total										2.8E-14					--
Medium Total											5.4E-09					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
			Exp. Route Total								- -					0.004
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.004
	Exposure Medium Total										- -					0.004
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	8.9E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	8.0E-11	6.2E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.00001
			Exp. Route Total								8.0E-11					0.00001
		Exposure Point Total									8.0E-11					0.00001
	Exposure Medium Total										8.0E-11					0.00001
Medium Total											8.0E-11					0.004

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.6E-09	6.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.6E-09					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	3.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-09	1.9E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.5E-09					--
		Exposure Point Total									1.1E-08					--
	Exposure Medium Total										1.1E-08					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	2.2E-14	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.5E-14	1.2E-13	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	5.1E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.5E-14					--
		Exposure Point Total									2.5E-14					--
	Exposure Medium Total										2.5E-14					--
Medium Total											1.1E-08					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	1.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
			Exp. Route Total								- -					0.02
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.02
	Exposure Medium Total										- -					0.02
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	3.6E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.2E-11	1.2E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00002
			Exp. Route Total								3.2E-11					0.00002
		Exposure Point Total									3.2E-11					0.00002
	Exposure Medium Total										3.2E-11					0.00002
Medium Total											3.2E-11					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.1E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.8E-10	6.8E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	1.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.8E-10					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	3.2E-11	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-10	2.0E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-10					--
		Exposure Point Total									1.0E-09					--
	Exposure Medium Total										1.0E-09					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	1.9E-14	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-14	1.2E-13	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	1.8E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.1E-14					--
		Exposure Point Total									2.1E-14					--
	Exposure Medium Total										2.1E-14					--
Medium Total											1.0E-09					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	7.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								- -					0.002
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.002
	Exposure Medium Total										- -					0.002
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	1.2E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.1E-10	1.2E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00002
			Exp. Route Total								1.1E-10					0.00002
		Exposure Point Total									1.1E-10					0.00002
	Exposure Medium Total										1.1E-10					0.00002
Medium Total											1.1E-10					0.002

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	2.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	4.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-07					--
			Dermal	Benzo(a)pyrene	0.027	mg/kg	3.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-08					--
		Exposure Point Total									1.8E-07					--
	Exposure Medium Total										1.8E-07					--
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	2.4E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.7E-12	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	5.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.7E-12					--
		Exposure Point Total									2.7E-12					--
	Exposure Medium Total										2.7E-12					--
Medium Total											1.8E-07					--
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	3.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
			Exp. Route Total								- -					0.4
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.4
	Exposure Medium Total										- -					0.4
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	3.9E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.5E-09	1.3E-08	(mg/m^3)	6.0E-06	(mg/m^3)	0.002
			Exp. Route Total								3.5E-09					0.002
		Exposure Point Total									3.5E-09					0.002
	Exposure Medium Total										3.5E-09					0.002
Medium Total											3.5E-09					0.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Benzo(a)pyrene	0.027	mg/kg	1.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-08	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	0.0
			Exp. Route Total								1.4E-08					0.0
			Dermal	Benzo(a)pyrene	0.027	mg/kg	2.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-09	1.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Thallium	3.93	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-09					--
		Exposure Point Total									1.6E-08					0.0
	Exposure Medium Total										1.6E-08					0.0
	Air	Area F	Inhalation	Benzo(a)pyrene	2.0E-11	mg/m^3	2.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-12	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Thallium	3.0E-9	mg/m^3	1.9E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.3E-12					--
		Exposure Point Total									2.3E-12					--
	Exposure Medium Total										2.3E-12					--
Medium Total											1.6E-08					0.0
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Cobalt	27.7	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								- -					0.04
			Dermal	Cobalt	27.7	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
			Exp. Route Total								- -					--
		Exposure Point Total									- -					0.04
	Exposure Medium Total										- -					0.04
	Air	Area F	Inhalation	Cobalt	2.1E-8	mg/m^3	1.3E-09	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.2E-08	1.3E-08	(mg/m^3)	6.0E-06	(mg/m^3)	0.002
			Exp. Route Total								1.2E-08					0.002
		Exposure Point Total									1.2E-08					0.002
	Exposure Medium Total										1.2E-08					0.002
Medium Total											1.2E-08					0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

Reasonable Maximum Exposures

9.1.RME Construction Workers
9.2.RME Industrial Workers
9.3.RME Adolescent Trespassers
9.4.RME Child Recreational Users
9.5.RME Adult Recreational Users
9.6.RME Lifelong Recreational Users
9.7.RME Child Residents
9.8.RME Adult Residents
9.9.RME Lifelong Residents

Central Tendency Exposures

9.1.CTE Construction Workers
9.2.CTE Industrial Workers
9.3.CTE Adolescent Trespassers
9.4.CTE Child Recreational Users
9.5.CTE Adult Recreational Users
9.6.CTE Lifelong Recreational Users
9.7.CTE Child Residents
9.8.CTE Adult Residents
9.9.CTE Lifelong Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	5E-09	--	2E-09	--	8E-09	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	5E-09	--	2E-09	--	8E-09		--	--	--	--
		Exposure Point Total						8E-09					--
	Exposure Medium Total							8E-09					--
	Air	Area F	Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	4E-11	--	--	4E-11		- -	--	- -	--
		Exposure Point Total						4E-11					--
	Exposure Medium Total							4E-11					--
Medium Total								8E-09					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	--	0.02
			Chemical Total	- -	--	- -	--	- -		0.02	--	--	0.02
		Exposure Point Total						- -					0.02
	Exposure Medium Total							- -					0.02
	Air	Area F	Cobalt	--	4E-07	--	--	4E-07	Respiratory	--	0.1	--	0.1
			Chemical Total	--	4E-07	--	--	4E-07		- -	0.1	- -	0.1
		Exposure Point Total						4E-07					0.1
	Exposure Medium Total							4E-07					0.1
Medium Total								4E-07					0.2

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	7E-08	--	6E-08	--	1E-07	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	7E-08	--	6E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
	Air	Area F	Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-07					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.09	--	--	0.09
			Chemical Total	- -	--	- -	--	- -		0.09	--	--	0.09
		Exposure Point Total						- -					0.09
	Exposure Medium Total							- -					0.09
	Air	Area F	Cobalt	--	2E-08	--	--	2E-08	Respiratory	--	0.0008	--	0.0008
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0008	- -	0.0008
		Exposure Point Total						2E-08					0.0008
	Exposure Medium Total							2E-08					0.0008
Medium Total								2E-08					0.09

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-08	--	1E-08	--	3E-08	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-08	--	1E-08	--	3E-08		--	--	--	--
		Exposure Point Total						3E-08					--
	Exposure Medium Total							3E-08					--
	Air	Area F	Benzo(a)pyrene	--	1E-13	--	--	1E-13	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	1E-13	--	--	1E-13		- -	--	- -	--
		Exposure Point Total						1E-13					--
	Exposure Medium Total							1E-13					--
Medium Total								3E-08					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	--	0.02
			Chemical Total	- -	--	- -	--	- -		0.02	--	--	0.02
		Exposure Point Total						- -					0.02
	Exposure Medium Total							- -					0.02
	Air	Area F	Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.00004	--	0.00004
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00004	- -	0.00004
		Exposure Point Total						3E-10					0.00004
	Exposure Medium Total							3E-10					0.00004
Medium Total								3E-10					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	8E-08	--	6E-08	--	1E-07	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	8E-08	--	6E-08	--	1E-07		--	--	--	--
		Exposure Point Total						1E-07					--
	Exposure Medium Total							1E-07					--
	Air	Area F	Benzo(a)pyrene	--	2E-13	--	--	2E-13	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-13	--	--	2E-13		- -	--	- -	--
		Exposure Point Total						2E-13					--
	Exposure Medium Total							2E-13					--
Medium Total								1E-07					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.09	--	--	0.09
			Chemical Total	- -	--	- -	--	- -		0.09	--	--	0.09
		Exposure Point Total						- -					0.09
	Exposure Medium Total							- -					0.09
	Air	Area F	Cobalt	--	4E-10	--	--	4E-10	Respiratory	--	0.00008	--	0.00008
			Chemical Total	--	4E-10	--	--	4E-10		- -	0.00008	- -	0.00008
		Exposure Point Total						4E-10					0.00008
	Exposure Medium Total							4E-10					0.00008
Medium Total								4E-10					0.09

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-08	--	2E-08	--	3E-08	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-08	--	2E-08	--	3E-08		--	--	--	--
		Exposure Point Total						3E-08					--
	Exposure Medium Total							3E-08					--
	Air	Area F	Benzo(a)pyrene	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	3E-13	--	--	3E-13		- -	--	- -	--
		Exposure Point Total						3E-13					--
	Exposure Medium Total							3E-13					--
Medium Total								3E-08					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.009	--	--	0.009
			Chemical Total	- -	--	- -	--	- -		0.009	--	--	0.009
		Exposure Point Total						- -					0.009
	Exposure Medium Total							- -					0.009
	Air	Area F	Cobalt	--	2E-09	--	--	2E-09	Respiratory	--	0.00008	--	0.00008
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.00008	- -	0.00008
		Exposure Point Total						2E-09					0.00008
	Exposure Medium Total							2E-09					0.00008
Medium Total								2E-09					0.009

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-07	--	8E-08	--	2E-07					
			Thallium	- -	--	- -	--	- -					
			Chemical Total	1E-07	--	8E-08	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
	Air	Area F	Benzo(a)pyrene	--	6E-13	--	--	6E-13					
			Thallium	--	- -	--	--	- -					
			Chemical Total	--	6E-13	--	--	6E-13					
		Exposure Point Total						6E-13					
	Exposure Medium Total							6E-13					
Medium Total								2E-07					
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -					
			Chemical Total	- -	--	- -	--	- -					
		Exposure Point Total						- -					
	Exposure Medium Total							- -					
	Air	Area F	Cobalt	--	2E-09	--	--	2E-09					
			Chemical Total	--	2E-09	--	--	2E-09					
		Exposure Point Total						2E-09					
	Exposure Medium Total							2E-09					
Medium Total								2E-09					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-06	--	4E-07	--	2E-06	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-06	--	4E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	Area F	Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								2E-06					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	1	--	--	1
			Chemical Total	- -	--	- -	--	- -		1	--	--	1
		Exposure Point Total						- -					1
	Exposure Medium Total							- -					1
	Air	Area F	Cobalt	--	2E-08	--	--	2E-08	Respiratory	--	0.003	--	0.003
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.003	- -	0.003
		Exposure Point Total						2E-08					0.003
	Exposure Medium Total							2E-08					0.003
Medium Total								2E-08					1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	2E-07	--	9E-08	--	3E-07	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	0.0	--	--	0.0
			Chemical Total	2E-07	--	9E-08	--	3E-07		0.0	--	--	0.0
		Exposure Point Total						3E-07					0.0
	Exposure Medium Total							3E-07					0.0
	Air	Area F	Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								3E-07					0.0
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.1	--	--	0.1
			Chemical Total	- -	--	- -	--	- -		0.1	--	--	0.1
		Exposure Point Total						- -					0.1
	Exposure Medium Total							- -					0.1
	Air	Area F	Cobalt	--	6E-08	--	--	6E-08	Respiratory	--	0.003	--	0.003
			Chemical Total	--	6E-08	--	--	6E-08		- -	0.003	- -	0.003
		Exposure Point Total						6E-08					0.003
	Exposure Medium Total							6E-08					0.003
Medium Total								6E-08					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-06	--	5E-07	--	2E-06					
			Thallium	- -	--	- -	--	- -					
			Chemical Total	1E-06	--	5E-07	--	2E-06					
		Exposure Point Total						2E-06					
	Exposure Medium Total							2E-06					
	Air	Area F	Benzo(a)pyrene	--	2E-11	--	--	2E-11					
			Thallium	--	- -	--	--	- -					
			Chemical Total	--	2E-11	--	--	2E-11					
		Exposure Point Total						2E-11					
	Exposure Medium Total							2E-11					
Medium Total								2E-06					
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -					
			Chemical Total	- -	--	- -	--	- -					
		Exposure Point Total						- -					
	Exposure Medium Total							- -					
	Air	Area F	Cobalt	--	8E-08	--	--	8E-08					
			Chemical Total	--	8E-08	--	--	8E-08					
		Exposure Point Total						8E-08					
	Exposure Medium Total							8E-08					
Medium Total								8E-08					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-09	--	4E-10	--	2E-09	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-09	--	4E-10	--	2E-09		--	--	--	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
	Air	Area F	Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								2E-09					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.004	--	--	0.004
			Chemical Total	- -	--	- -	--	- -		0.004	--	--	0.004
		Exposure Point Total						- -					0.004
	Exposure Medium Total							- -					0.004
	Air	Area F	Cobalt	--	2E-07	--	--	2E-07	Respiratory	--	0.07	--	0.07
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.07	- -	0.07
		Exposure Point Total						2E-07					0.07
	Exposure Medium Total							2E-07					0.07
Medium Total								2E-07					0.08

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-08	--	2E-09	--	1E-08	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-08	--	2E-09	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Air	Area F	Benzo(a)pyrene	--	6E-13	--	--	6E-13	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	6E-13	--	--	6E-13		- -	--	- -	--
		Exposure Point Total						6E-13					--
	Exposure Medium Total							6E-13					--
Medium Total								1E-08					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.04	--	--	0.04
			Chemical Total	- -	--	- -	--	- -		0.04	--	--	0.04
		Exposure Point Total						- -					0.04
	Exposure Medium Total							- -					0.04
	Air	Area F	Cobalt	--	5E-09	--	--	5E-09	Respiratory	--	0.0007	--	0.0007
			Chemical Total	--	5E-09	--	--	5E-09		- -	0.0007	- -	0.0007
		Exposure Point Total						5E-09					0.0007
	Exposure Medium Total							5E-09					0.0007
Medium Total								5E-09					0.04

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	3E-09	--	2E-09	--	5E-09	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	3E-09	--	2E-09	--	5E-09		--	--	--	--
		Exposure Point Total						5E-09					--
	Exposure Medium Total							5E-09					--
	Air	Area F	Benzo(a)pyrene	--	3E-14	--	--	3E-14	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	3E-14	--	--	3E-14		- -	--	- -	--
		Exposure Point Total						3E-14					--
	Exposure Medium Total							3E-14					--
Medium Total								5E-09					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.004	--	--	0.004
			Chemical Total	- -	--	- -	--	- -		0.004	--	--	0.004
		Exposure Point Total						- -					0.004
	Exposure Medium Total							- -					0.004
	Air	Area F	Cobalt	--	8E-11	--	--	8E-11	Respiratory	--	0.00001	--	0.00001
			Chemical Total	--	8E-11	--	--	8E-11		- -	0.00001	- -	0.00001
		Exposure Point Total						8E-11					0.00001
	Exposure Medium Total							8E-11					0.00001
Medium Total								8E-11					0.004

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	9E-09	--	3E-09	--	1E-08	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	9E-09	--	3E-09	--	1E-08		--	--	--	--
		Exposure Point Total						1E-08					--
	Exposure Medium Total							1E-08					--
	Air	Area F	Benzo(a)pyrene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-14	--	--	2E-14		- -	--	- -	--
		Exposure Point Total						2E-14					--
	Exposure Medium Total							2E-14					--
Medium Total								1E-08					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	--	0.02
			Chemical Total	- -	--	- -	--	- -		0.02	--	--	0.02
		Exposure Point Total						- -					0.02
	Exposure Medium Total							- -					0.02
	Air	Area F	Cobalt	--	3E-11	--	--	3E-11	Respiratory	--	0.00002	--	0.00002
			Chemical Total	--	3E-11	--	--	3E-11		- -	0.00002	- -	0.00002
		Exposure Point Total						3E-11					0.00002
	Exposure Medium Total							3E-11					0.00002
Medium Total								3E-11					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	8E-10	--	2E-10	--	1E-09	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	8E-10	--	2E-10	--	1E-09		--	--	--	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
	Air	Area F	Benzo(a)pyrene	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-14	--	--	2E-14		- -	--	- -	--
		Exposure Point Total						2E-14					--
	Exposure Medium Total							2E-14					--
Medium Total								1E-09					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	--	0.002
			Chemical Total	- -	--	- -	--	- -		0.002	--	--	0.002
		Exposure Point Total						- -					0.002
	Exposure Medium Total							- -					0.002
	Air	Area F	Cobalt	--	1E-10	--	--	1E-10	Respiratory	--	0.00002	--	0.00002
			Chemical Total	--	1E-10	--	--	1E-10		- -	0.00002	- -	0.00002
		Exposure Point Total						1E-10					0.00002
	Exposure Medium Total							1E-10					0.00002
Medium Total								1E-10					0.002

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	9E-09	--	3E-09	--	1E-08					
			Thallium	- -	--	- -	--	- -					
			Chemical Total	9E-09	--	3E-09	--	1E-08					
		Exposure Point Total						1E-08					
	Exposure Medium Total							1E-08					
	Air	Area F	Benzo(a)pyrene	--	5E-14	--	--	5E-14					
			Thallium	--	- -	--	--	- -					
			Chemical Total	--	5E-14	--	--	5E-14					
		Exposure Point Total						5E-14					
	Exposure Medium Total							5E-14					
Medium Total								1E-08					
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -					
			Chemical Total	- -	--	- -	--	- -					
		Exposure Point Total						- -					
	Exposure Medium Total							- -					
	Air	Area F	Cobalt	--	1E-10	--	--	1E-10					
			Chemical Total	--	1E-10	--	--	1E-10					
		Exposure Point Total						1E-10					
	Exposure Medium Total							1E-10					
Medium Total								1E-10					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	2E-07	--	2E-08	--	2E-07	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	2E-07	--	2E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	Area F	Benzo(a)pyrene	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								2E-07					--
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.4	--	--	0.4
			Chemical Total	- -	--	- -	--	- -		0.4	--	--	0.4
		Exposure Point Total						- -					0.4
	Exposure Medium Total							- -					0.4
	Air	Area F	Cobalt	--	3E-09	--	--	3E-09	Respiratory	--	0.002	--	0.002
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.002	- -	0.002
		Exposure Point Total						3E-09					0.002
	Exposure Medium Total							3E-09					0.002
Medium Total								3E-09					0.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	1E-08	--	2E-09	--	2E-08	NA	--	--	--	--
			Thallium	- -	--	- -	--	- -	NA	0.0	--	--	0.0
			Chemical Total	1E-08	--	2E-09	--	2E-08		0.0	--	--	0.0
		Exposure Point Total						2E-08					0.0
	Exposure Medium Total							2E-08					0.0
	Air	Area F	Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Thallium	--	- -	--	--	- -	NA	--	--	--	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								2E-08					0.0
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -	Thyroid	0.04	--	--	0.04
			Chemical Total	- -	--	- -	--	- -		0.04	--	--	0.04
		Exposure Point Total						- -					0.04
	Exposure Medium Total							- -					0.04
	Air	Area F	Cobalt	--	1E-08	--	--	1E-08	Respiratory	--	0.002	--	0.002
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.002	- -	0.002
		Exposure Point Total						1E-08					0.002
	Exposure Medium Total							1E-08					0.002
Medium Total								1E-08					0.04

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
FORMER DERECKTOR SHIPYARD, NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Benzo(a)pyrene	2E-07	--	2E-08	--	2E-07					
			Thallium	- -	--	- -	--	- -					
			Chemical Total	2E-07	--	2E-08	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
	Air	Area F	Benzo(a)pyrene	--	5E-12	--	--	5E-12					
			Thallium	--	- -	--	--	- -					
			Chemical Total	--	5E-12	--	--	5E-12					
		Exposure Point Total						5E-12					
	Exposure Medium Total							5E-12					
Medium Total								2E-07					
Subsurface Soil	Subsurface Soil	Area F	Cobalt	- -	--	- -	--	- -					
			Chemical Total	- -	--	- -	--	- -					
		Exposure Point Total						- -					
	Exposure Medium Total							- -					
	Air	Area F	Cobalt	--	2E-08	--	--	2E-08					
			Chemical Total	--	2E-08	--	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
Medium Total								2E-08					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX I.5.3

RAGS PART D TABLES FOR CHEMICALS
PRESENT AT NATURALLY OCCURRING LEVELS

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

3.1.RME Surface Soil
3.2.RME Subsurface Soil

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Subarea F	Aluminum	mg/kg	(1)	(1)	11500	11500	mg/kg	Maximum Detected Concentration	(1)
	Arsenic	mg/kg	(1)	(1)	6.84	6.84	mg/kg	Maximum Detected Concentration	(1)
	Chromium	mg/kg	(1)	(1)	15.5 J	15.5	mg/kg	Maximum Detected Concentration	(1)
	Cobalt	mg/kg	(1)	(1)	11.3	11.3	mg/kg	Maximum Detected Concentration	(1)
	Iron	mg/kg	(1)	(1)	20,500 J	20,500	mg/kg	Maximum Detected Concentration	(1)
	Manganese	mg/kg	(1)	(1)	2340	2340	mg/kg	Maximum Detected Concentration	(1)

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

(1) There are only three samples. Reliable statistics cannot be computed. The Maximum concentration was used as the EPC.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Subarea F	Aluminum	mg/kg	(1)	(1)	20800	20800	mg/kg	Maximum Detected Concentration	(1)
	Arsenic	mg/kg	(1)	(1)	6.1	6.1	mg/kg	Maximum Detected Concentration	(1)
	Chromium	mg/kg	(1)	(1)	25.1 J	25.1	mg/kg	Maximum Detected Concentration	(1)
	Iron	mg/kg	(1)	(1)	21,200 J	21,200	mg/kg	Maximum Detected Concentration	(1)
	Manganese	mg/kg	(1)	(1)	697	697	mg/kg	Maximum Detected Concentration	(1)

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

(1) There are only three samples. Reliable statistics cannot be computed. The Maximum concentration was used as the EPC.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	Reasonable Maximum Exposures
7.1.RME	Construction Workers
7.2.RME	Industrial Workers
7.3.RME	Adolescent Trespassers
7.4.RME	Child Recreational Users
7.5.RME	Adult Recreational Users
7.6.RME	Child Residents
7.7.RME	Adult Residents
	Central Tendency Exposures
7.1.CTE	Construction Workers
7.2.CTE	Industrial Workers
7.3.CTE	Adolescent Trespassers
7.4.CTE	Child Recreational Users
7.5.CTE	Adult Recreational Users
7.6.CTE	Child Residents
7.7.CTE	Adult Residents

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	3.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	6.84	mg/kg	1.9E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.8E-07	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Chromium	15.5	mg/kg	4.3E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.1E-07	3.0E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
				Cobalt	11.3	mg/kg	3.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.007
				Iron	20,500	mg/kg	5.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.06
				Manganese	2,340	mg/kg	6.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.2
			Exp. Route Total								5.0E-07					0.3
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	1.7E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-08	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.6E-08					0.004
		Exposure Point Total									5.2E-07					0.3
	Exposure Medium Total										5.2E-07					0.3
	Air	Area F	Inhalation	Aluminum	0.009	mg/m^3	1.7E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-03	(mg/m^3)	5.0E+03	(mg/m^3)	2.4E-7
				Arsenic	5.1E-6	mg/m^3	1.0E-08	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.3E-08	7.0E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.07
				Chromium	1.2E-5	mg/m^3	2.3E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.9E-06	1.6E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.02
				Cobalt	8.4E-6	mg/m^3	1.7E-08	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.5E-07	1.2E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.06
				Iron	0.015	mg/m^3	3.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.002	mg/m^3	3.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-04	(mg/m^3)	5.0E-05	(mg/m^3)	4.8
			Exp. Route Total								2.1E-06					4.9
		Exposure Point Total									2.1E-06					4.9
	Exposure Medium Total										2.1E-06					4.9
Medium Total											2.6E-06					5.3
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	5.8E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.04
				Arsenic	6.10	mg/kg	1.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.5E-07	1.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Chromium	25.1	mg/kg	6.9E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.5E-07	4.9E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
				Iron	21,200	mg/kg	5.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.06
				Manganese	697	mg/kg	1.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.06
			Exp. Route Total								6.0E-07					0.2
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	1.5E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.3E-08	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.3E-08					0.004
		Exposure Point Total									6.2E-07					0.2
	Exposure Medium Total										6.2E-07					0.2
	Air	Area F	Inhalation	Aluminum	0.016	mg/m^3	3.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-03	(mg/m^3)	5.0E+03	(mg/m^3)	4.3E-7
				Arsenic	4.6E-6	mg/m^3	8.9E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.8E-08	6.2E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.06
				Chromium	1.9E-5	mg/m^3	3.7E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.1E-06	2.6E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.03
				Iron	0.016	mg/m^3	3.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.2E-4	mg/m^3	1.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-05	(mg/m^3)	5.0E-05	(mg/m^3)	1.4
			Exp. Route Total								3.1E-06					1.5
		Exposure Point Total									3.1E-06					1.5
	Exposure Medium Total										3.1E-06					1.5
Medium Total											3.7E-06					1.7

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	4.0E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				Arsenic	6.84	mg/kg	2.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.6E-06	6.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium	15.5	mg/kg	5.4E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.7E-06	1.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
				Cobalt	11.3	mg/kg	3.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	20,500	mg/kg	7.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	2,340	mg/kg	8.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.10
			Exp. Route Total								6.3E-06					0.2
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	4.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.1E-07	1.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								7.1E-07					0.004
		Exposure Point Total									7.0E-06					0.2
	Exposure Medium Total										7.0E-06					0.2
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	7.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0004
				Arsenic	5.2E-9	mg/m^3	4.2E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.8E-09	1.2E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00008
				Chromium	1.2E-8	mg/m^3	9.6E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	8.1E-08	2.7E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00003
				Cobalt	8.6E-9	mg/m^3	7.0E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	6.3E-09	2.0E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0003
				Iron	1.6E-5	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	1.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.1E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.008
			Exp. Route Total								8.9E-08					0.009
		Exposure Point Total									8.9E-08					0.009
	Exposure Medium Total										8.9E-08					0.009
Medium Total											7.1E-06					0.2
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	7.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	6.10	mg/kg	2.1E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.2E-06	6.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium	25.1	mg/kg	8.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.4E-06	2.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.008
				Iron	21,200	mg/kg	7.4E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	697	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.03
			Exp. Route Total								7.6E-06					0.1
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	4.2E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.3E-07	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								6.3E-07					0.004
		Exposure Point Total									8.2E-06					0.1
	Exposure Medium Total										8.2E-06					0.1
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0007
				Arsenic	4.6E-9	mg/m^3	3.8E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.6E-09	1.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00007
				Chromium	1.9E-8	mg/m^3	1.6E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.3E-07	4.4E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00004
				Iron	1.6E-5	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	4.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.002
			Exp. Route Total								1.3E-07					0.003
		Exposure Point Total									1.3E-07					0.003
	Exposure Medium Total										1.3E-07					0.003
Medium Total											8.3E-06					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	2.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Arsenic	6.84	mg/kg	1.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.4E-07	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	15.5	mg/kg	1.1E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.5E-07	2.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0009
				Cobalt	11.3	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Iron	20,500	mg/kg	4.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	2,340	mg/kg	5.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
			Exp. Route Total								7.9E-07					0.03
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	3.2E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.8E-08	2.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								4.8E-08					0.0007
		Exposure Point Total									8.4E-07					0.03
	Exposure Medium Total										8.4E-07					0.03
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	1.5E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00002
				Arsenic	5.2E-9	mg/m^3	8.8E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.8E-11	6.2E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
				Chromium	1.2E-8	mg/m^3	6.0E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	5.0E-09	1.4E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
				Cobalt	8.6E-9	mg/m^3	1.5E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.3E-10	1.0E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00002
				Iron	1.6E-5	mg/m^3	2.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	3.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
			Exp. Route Total								5.2E-09					0.0005
		Exposure Point Total									5.2E-09					0.0005
	Exposure Medium Total										5.2E-09					0.0005
Medium Total											8.5E-07					0.03
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	4.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.003
				Arsenic	6.10	mg/kg	1.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-07	1.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium	25.1	mg/kg	1.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.9E-07	4.2E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
				Iron	21,200	mg/kg	5.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	697	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.005
			Exp. Route Total								1.1E-06					0.02
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	2.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.3E-08	2.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								4.3E-08					0.0007
		Exposure Point Total									1.2E-06					0.02
	Exposure Medium Total										1.2E-06					0.02
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	2.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00004
				Arsenic	4.6E-9	mg/m^3	7.9E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.4E-11	5.5E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
				Chromium	1.9E-8	mg/m^3	9.7E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	8.2E-09	2.3E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000002
				Iron	1.6E-5	mg/m^3	2.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	9.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
			Exp. Route Total								8.2E-09					0.0002
		Exposure Point Total									8.2E-09					0.0002
	Exposure Medium Total										8.2E-09					0.0002
Medium Total											1.2E-06					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	9.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				Arsenic	6.84	mg/kg	5.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.4E-07	6.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium	15.5	mg/kg	6.7E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.4E-06	1.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
				Cobalt	11.3	mg/kg	9.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	20,500	mg/kg	1.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	2,340	mg/kg	1.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.09
			Exp. Route Total								4.2E-06					0.2
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	9.4E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-07	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.4E-07					0.004
		Exposure Point Total									4.3E-06					0.2
	Exposure Medium Total										4.3E-06					0.2
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	1.8E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00004
				Arsenic	5.2E-9	mg/m^3	1.1E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.5E-11	1.2E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000008
				Chromium	1.2E-8	mg/m^3	1.3E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.1E-08	2.8E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000003
				Cobalt	8.6E-9	mg/m^3	1.7E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.6E-10	2.0E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00003
				Iron	1.6E-5	mg/m^3	3.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.7E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	3.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.2E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0008
			Exp. Route Total								1.1E-08					0.0009
		Exposure Point Total									1.1E-08					0.0009
	Exposure Medium Total										1.1E-08					0.0009
Medium Total											4.4E-06					0.2
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	1.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	6.10	mg/kg	5.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.4E-07	5.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium	25.1	mg/kg	1.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.4E-06	2.4E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.008
				Iron	21,200	mg/kg	1.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	697	mg/kg	5.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.03
			Exp. Route Total								6.2E-06					0.1
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	8.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-07	9.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.3E-07					0.003
		Exposure Point Total									6.3E-06					0.1
	Exposure Medium Total										6.3E-06					0.1
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	3.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.8E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00008
				Arsenic	4.6E-9	mg/m^3	9.4E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.1E-11	1.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000007
				Chromium	1.9E-8	mg/m^3	2.1E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.7E-08	4.5E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000005
				Iron	1.6E-5	mg/m^3	3.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	1.1E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0003
			Exp. Route Total								1.7E-08					0.0003
		Exposure Point Total									1.7E-08					0.0003
	Exposure Medium Total										1.7E-08					0.0003
Medium Total											6.3E-06					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	4.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001
				Arsenic	6.84	mg/kg	2.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.6E-07	7.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium	15.5	mg/kg	9.9E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.0E-07	1.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0005
				Cobalt	11.3	mg/kg	3.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	20,500	mg/kg	7.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				Manganese	2,340	mg/kg	8.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.010
			Exp. Route Total								8.5E-07					0.02
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	9.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-07	2.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.4E-07					0.0009
		Exposure Point Total									9.9E-07					0.02
	Exposure Medium Total										9.9E-07					0.02
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	3.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00002
				Arsenic	5.2E-9	mg/m^3	2.1E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	9.1E-11	6.2E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
				Chromium	1.2E-8	mg/m^3	8.8E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	7.4E-09	1.4E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
				Cobalt	8.6E-9	mg/m^3	3.5E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.1E-10	1.0E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00002
				Iron	1.6E-5	mg/m^3	6.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	7.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
			Exp. Route Total								7.8E-09					0.0005
		Exposure Point Total									7.8E-09					0.0005
	Exposure Medium Total										7.8E-09					0.0005
Medium Total											1.0E-06					0.02
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	7.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Arsenic	6.10	mg/kg	2.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.2E-07	6.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium	25.1	mg/kg	1.6E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.0E-07	2.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0009
				Iron	21,200	mg/kg	7.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				Manganese	697	mg/kg	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.1E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.003
			Exp. Route Total								1.1E-06					0.01
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	8.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-07	2.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.2E-07					0.0008
		Exposure Point Total									1.2E-06					0.01
	Exposure Medium Total										1.2E-06					0.01
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	6.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00004
				Arsenic	4.6E-9	mg/m^3	1.9E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.1E-11	5.5E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000004
				Chromium	1.9E-8	mg/m^3	1.4E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.2E-08	2.3E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000002
				Iron	1.6E-5	mg/m^3	6.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	2.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
			Exp. Route Total								1.2E-08					0.0002
		Exposure Point Total									1.2E-08					0.0002
	Exposure Medium Total										1.2E-08					0.0002
Medium Total											1.3E-06					0.01

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	1.3E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.1
				Arsenic	6.84	mg/kg	7.5E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-05	8.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Chromium	15.5	mg/kg	9.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.5E-05	2.0E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.07
				Cobalt	11.3	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Iron	20,500	mg/kg	2.2E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.4
				Manganese	2,340	mg/kg	2.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	1.2
			Exp. Route Total								5.7E-05					2.6
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	6.3E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.4E-07	7.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								9.4E-07					0.02
		Exposure Point Total									5.7E-05					2.6
	Exposure Medium Total										5.7E-05					2.6
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	7.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.4E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.002
				Arsenic	5.2E-9	mg/m^3	4.3E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.8E-09	5.0E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Chromium	1.2E-8	mg/m^3	5.2E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.3E-07	1.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
				Cobalt	8.6E-9	mg/m^3	7.1E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	6.4E-09	8.2E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.001
				Iron	1.6E-5	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	1.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.03
			Exp. Route Total								4.4E-07					0.04
		Exposure Point Total									4.4E-07					0.04
	Exposure Medium Total										4.4E-07					0.04
Medium Total											5.8E-05					2.7
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	2.3E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.3
				Arsenic	6.10	mg/kg	6.7E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.0E-05	7.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Chromium	25.1	mg/kg	1.5E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.3E-05	3.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.1
				Iron	21,200	mg/kg	2.3E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.4
				Manganese	697	mg/kg	7.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.9E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.4
			Exp. Route Total								8.3E-05					1.4
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	5.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.4E-07	6.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								8.4E-07					0.02
		Exposure Point Total									8.4E-05					1.4
	Exposure Medium Total										8.4E-05					1.4
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	5.0E-03	(mg/m^3)	0.003
				Arsenic	4.6E-9	mg/m^3	3.8E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.6E-09	4.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Chromium	1.9E-8	mg/m^3	8.4E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	7.0E-07	1.8E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0002
				Iron	1.6E-5	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	4.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.1E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.01
			Exp. Route Total								7.0E-07					0.01
		Exposure Point Total									7.0E-07					0.01
	Exposure Medium Total										7.0E-07					0.01
Medium Total											8.5E-05					1.4

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	5.4E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	6.84	mg/kg	3.2E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.8E-06	9.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium	15.5	mg/kg	1.3E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.7E-06	2.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.007
				Cobalt	11.3	mg/kg	5.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				Iron	20,500	mg/kg	9.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.04
				Manganese	2,340	mg/kg	1.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.1
			Exp. Route Total								1.1E-05					0.3
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	3.8E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.8E-07	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								5.8E-07					0.004
		Exposure Point Total									1.2E-05					0.3
	Exposure Medium Total										1.2E-05					0.3
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	2.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.4E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.002
				Arsenic	5.2E-9	mg/m^3	1.7E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.3E-09	5.0E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Chromium	1.2E-8	mg/m^3	7.1E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	6.0E-07	1.1E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
				Cobalt	8.6E-9	mg/m^3	2.8E-09	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.5E-08	8.2E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.001
				Iron	1.6E-5	mg/m^3	5.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	5.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.03
			Exp. Route Total								6.3E-07					0.04
		Exposure Point Total									6.3E-07					0.04
	Exposure Medium Total										6.3E-07					0.04
Medium Total											1.3E-05					0.3
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	9.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.03
				Arsenic	6.10	mg/kg	2.9E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.3E-06	8.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium	25.1	mg/kg	2.2E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.1E-05	3.4E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
				Iron	21,200	mg/kg	1.0E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.04
				Manganese	697	mg/kg	3.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.04
			Exp. Route Total								1.5E-05					0.1
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	3.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.1E-07	1.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								5.1E-07					0.003
		Exposure Point Total									1.6E-05					0.2
	Exposure Medium Total										1.6E-05					0.2
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	5.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	5.0E-03	(mg/m^3)	0.003
				Arsenic	4.6E-9	mg/m^3	1.5E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	6.6E-09	4.4E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Chromium	1.9E-8	mg/m^3	1.1E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	9.7E-07	1.8E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0002
				Iron	1.6E-5	mg/m^3	5.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	1.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.1E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.01
			Exp. Route Total								9.7E-07					0.01
		Exposure Point Total									9.7E-07					0.01
	Exposure Medium Total										9.7E-07					0.01
Medium Total											1.7E-05					0.2
										Total of Receptor Risks Across All Media	2.9E-05			Total of Receptor Hazards Across All Media		0.5

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	8.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.006
				Arsenic	6.84	mg/kg	4.7E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.1E-08	3.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium	15.5	mg/kg	1.1E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.4E-08	7.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
				Cobalt	11.3	mg/kg	7.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Iron	20,500	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	2,340	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.05
			Exp. Route Total								1.2E-07					0.08
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	2.8E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.3E-09	2.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								4.3E-09					0.0007
		Exposure Point Total									1.3E-07					0.08
	Exposure Medium Total										1.3E-07					0.08
	Air	Area F	Inhalation	Aluminum	0.009	mg/m^3	8.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.9E-04	(mg/m^3)	5.0E+03	(mg/m^3)	1.2E-7
				Arsenic	5.1E-6	mg/m^3	5.0E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.1E-08	3.5E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.03
				Chromium	1.2E-5	mg/m^3	1.1E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	9.5E-07	7.9E-07	(mg/m^3)	1.0E-04	(mg/m^3)	0.008
				Cobalt	8.4E-6	mg/m^3	8.3E-09	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	7.4E-08	5.8E-07	(mg/m^3)	2.0E-05	(mg/m^3)	0.03
				Iron	0.015	mg/m^3	1.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	0.002	mg/m^3	1.7E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-04	(mg/m^3)	5.0E-05	(mg/m^3)	2.4
			Exp. Route Total								1.0E-06					2.5
		Exposure Point Total									1.0E-06					2.5
	Exposure Medium Total										1.0E-06					2.5
Medium Total											1.2E-06					2.5
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				Arsenic	6.10	mg/kg	4.2E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.3E-08	3.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.010
				Chromium	25.1	mg/kg	1.7E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.7E-08	1.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Iron	21,200	mg/kg	1.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	697	mg/kg	4.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.01
			Exp. Route Total								1.5E-07					0.05
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	2.5E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.8E-09	1.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								3.8E-09					0.0006
		Exposure Point Total									1.5E-07					0.05
	Exposure Medium Total										1.5E-07					0.05
	Air	Area F	Inhalation	Aluminum	0.016	mg/m^3	1.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-03	(mg/m^3)	5.0E+03	(mg/m^3)	2.1E-7
				Arsenic	4.6E-6	mg/m^3	4.5E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.9E-08	3.1E-07	(mg/m^3)	1.0E-05	(mg/m^3)	0.03
				Chromium	1.9E-5	mg/m^3	1.8E-08	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.5E-06	1.3E-06	(mg/m^3)	1.0E-04	(mg/m^3)	0.01
				Iron	0.016	mg/m^3	1.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.2E-4	mg/m^3	5.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-05	(mg/m^3)	5.0E-05	(mg/m^3)	0.7
			Exp. Route Total								1.6E-06					0.8
		Exposure Point Total									1.6E-06					0.8
	Exposure Medium Total										1.6E-06					0.8
Medium Total											1.7E-06					0.8

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	6.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.005
				Arsenic	6.84	mg/kg	3.8E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.7E-07	2.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.010
				Chromium	15.5	mg/kg	8.5E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.3E-07	6.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Cobalt	11.3	mg/kg	6.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	20,500	mg/kg	1.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	2,340	mg/kg	1.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.04
			Exp. Route Total								9.9E-07					0.09
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	1.5E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-08	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.2E-08					0.0004
		Exposure Point Total									1.0E-06					0.09
	Exposure Medium Total										1.0E-06					0.09
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	2.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0003
				Arsenic	5.2E-9	mg/m^3	1.3E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	5.7E-10	1.0E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00007
				Chromium	1.2E-8	mg/m^3	3.0E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.5E-08	2.4E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00002
				Cobalt	8.6E-9	mg/m^3	2.2E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.0E-09	1.7E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0003
				Iron	1.6E-5	mg/m^3	4.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	4.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.007
			Exp. Route Total								2.8E-08					0.008
		Exposure Point Total									2.8E-08					0.008
	Exposure Medium Total										2.8E-08					0.008
Medium Total											1.0E-06					0.10
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	1.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.9E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.009
				Arsenic	6.10	mg/kg	3.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.0E-07	2.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Chromium	25.1	mg/kg	1.4E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.9E-07	1.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Iron	21,200	mg/kg	1.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	697	mg/kg	3.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.01
			Exp. Route Total								1.2E-06					0.05
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	1.3E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.0E-08	1.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.0E-08					0.0003
		Exposure Point Total									1.2E-06					0.05
	Exposure Medium Total										1.2E-06					0.05
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	4.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.0006
				Arsenic	4.6E-9	mg/m^3	1.2E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	5.1E-10	9.3E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00006
				Chromium	1.9E-8	mg/m^3	4.9E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.1E-08	3.8E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00004
				Iron	1.6E-5	mg/m^3	4.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	1.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.002
			Exp. Route Total								4.2E-08					0.003
		Exposure Point Total									4.2E-08					0.003
	Exposure Medium Total										4.2E-08					0.003
Medium Total											1.3E-06					0.05

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	6.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0005
				Arsenic	6.84	mg/kg	4.0E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.1E-08	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Chromium	15.5	mg/kg	2.8E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-07	6.4E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Cobalt	11.3	mg/kg	6.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Iron	20,500	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	2,340	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.004
			Exp. Route Total								2.0E-07					0.008
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	5.1E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.7E-09	3.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								7.7E-09					0.0001
		Exposure Point Total									2.1E-07					0.009
	Exposure Medium Total										2.1E-07					0.009
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	3.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000005
				Arsenic	5.2E-9	mg/m^3	2.2E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	9.5E-12	1.5E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000001
				Chromium	1.2E-8	mg/m^3	1.5E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.3E-09	3.5E-11	(mg/m^3)	1.0E-04	(mg/m^3)	3.5E-7
				Cobalt	8.6E-9	mg/m^3	3.6E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.3E-11	2.5E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000004
				Iron	1.6E-5	mg/m^3	6.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	7.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.3E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0001
			Exp. Route Total								1.3E-09					0.0001
		Exposure Point Total									1.3E-09					0.0001
	Exposure Medium Total										1.3E-09					0.0001
Medium Total											2.1E-07					0.009
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.6E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0009
				Arsenic	6.10	mg/kg	3.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.4E-08	2.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Chromium	25.1	mg/kg	4.5E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.2E-07	1.0E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
				Iron	21,200	mg/kg	1.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	697	mg/kg	4.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.8E-07					0.005
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	4.6E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.9E-09	3.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0001
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								6.9E-09					0.0001
		Exposure Point Total									2.8E-07					0.005
	Exposure Medium Total										2.8E-07					0.005
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	6.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.7E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000009
				Arsenic	4.6E-9	mg/m^3	2.0E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.5E-12	1.4E-11	(mg/m^3)	1.5E-05	(mg/m^3)	9.2E-7
				Chromium	1.9E-8	mg/m^3	2.4E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.0E-09	5.7E-11	(mg/m^3)	1.0E-04	(mg/m^3)	5.7E-7
				Iron	1.6E-5	mg/m^3	6.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	2.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00003
			Exp. Route Total								2.0E-09					0.00004
		Exposure Point Total									2.0E-09					0.00004
	Exposure Medium Total										2.0E-09					0.00004
Medium Total											2.9E-07					0.005

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	7.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.003
				Arsenic	6.84	mg/kg	4.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.0E-08	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium	15.5	mg/kg	6.8E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.4E-07	3.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
				Cobalt	11.3	mg/kg	7.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Iron	20,500	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.007
				Manganese	2,340	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
			Exp. Route Total								4.1E-07					0.05
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	3.1E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.7E-09	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								4.7E-09					0.0004
		Exposure Point Total									4.2E-07					0.05
	Exposure Medium Total										4.2E-07					0.05
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	1.5E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00001
				Arsenic	5.2E-9	mg/m^3	8.8E-13	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.8E-12	3.1E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Chromium	1.2E-8	mg/m^3	1.3E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.1E-09	7.0E-11	(mg/m^3)	1.0E-04	(mg/m^3)	7.0E-7
				Cobalt	8.6E-9	mg/m^3	1.5E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.3E-11	5.1E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000008
				Iron	1.6E-5	mg/m^3	2.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	3.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0002
			Exp. Route Total								1.1E-09					0.0002
		Exposure Point Total									1.1E-09					0.0002
	Exposure Medium Total										1.1E-09					0.0002
Medium Total											4.2E-07					0.05
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.005
				Arsenic	6.10	mg/kg	4.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.2E-08	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium	25.1	mg/kg	1.1E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.5E-07	6.0E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Iron	21,200	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.007
				Manganese	697	mg/kg	4.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.007
			Exp. Route Total								6.2E-07					0.03
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	2.8E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-09	9.7E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								4.2E-09					0.0003
		Exposure Point Total									6.2E-07					0.03
	Exposure Medium Total										6.2E-07					0.03
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.4E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00002
				Arsenic	4.6E-9	mg/m^3	7.9E-13	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.4E-12	2.8E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Chromium	1.9E-8	mg/m^3	2.1E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.8E-09	1.1E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
				Iron	1.6E-5	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	9.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00006
			Exp. Route Total								1.8E-09					0.00008
		Exposure Point Total									1.8E-09					0.00008
	Exposure Medium Total										1.8E-09					0.00008
Medium Total											6.2E-07					0.03

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				Arsenic	6.84	mg/kg	1.7E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-08	1.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Chromium	15.5	mg/kg	6.2E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.1E-08	3.9E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001
				Cobalt	11.3	mg/kg	2.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0010
				Iron	20,500	mg/kg	5.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0007
				Manganese	2,340	mg/kg	6.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.002
			Exp. Route Total								5.7E-08					0.005
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	1.2E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.8E-09	1.2E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.8E-09					0.00004
		Exposure Point Total									5.9E-08					0.005
	Exposure Medium Total										5.9E-08					0.005
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	5.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00001
				Arsenic	5.2E-9	mg/m^3	3.1E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.3E-11	3.1E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Chromium	1.2E-8	mg/m^3	1.1E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	9.2E-10	7.0E-11	(mg/m^3)	1.0E-04	(mg/m^3)	7.0E-7
				Cobalt	8.6E-9	mg/m^3	5.1E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	4.6E-11	5.1E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000008
				Iron	1.6E-5	mg/m^3	9.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	1.1E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0002
			Exp. Route Total								9.8E-10					0.0002
		Exposure Point Total									9.8E-10					0.0002
	Exposure Medium Total										9.8E-10					0.0002
Medium Total											6.0E-08					0.005
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	5.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0005
				Arsenic	6.10	mg/kg	1.6E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.3E-08	1.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0005
				Chromium	25.1	mg/kg	1.0E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.0E-08	6.4E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Iron	21,200	mg/kg	5.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0008
				Manganese	697	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0007
			Exp. Route Total								7.3E-08					0.003
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	1.1E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-09	1.1E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00004
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.6E-09					0.00004
		Exposure Point Total									7.5E-08					0.003
	Exposure Medium Total										7.5E-08					0.003
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	9.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.4E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.00002
				Arsenic	4.6E-9	mg/m^3	2.8E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.2E-11	2.8E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000002
				Chromium	1.9E-8	mg/m^3	1.8E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.5E-09	1.1E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000001
				Iron	1.6E-5	mg/m^3	9.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	3.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00006
			Exp. Route Total								1.5E-09					0.00008
		Exposure Point Total									1.5E-09					0.00008
	Exposure Medium Total										1.5E-09					0.00008
Medium Total											7.7E-08					0.003

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	1.4E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.05
				Arsenic	6.84	mg/kg	8.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-06	2.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.10
				Chromium	15.5	mg/kg	1.2E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.2E-06	6.6E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
				Cobalt	11.3	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Iron	20,500	mg/kg	2.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.1
				Manganese	2,340	mg/kg	2.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.4
			Exp. Route Total								7.4E-06					0.9
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	2.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-08	9.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								4.2E-08					0.003
		Exposure Point Total									7.4E-06					0.9
	Exposure Medium Total										7.4E-06					0.9
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	1.6E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.001
				Arsenic	5.2E-9	mg/m^3	9.5E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.1E-10	3.3E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0002
				Chromium	1.2E-8	mg/m^3	1.4E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.2E-07	7.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Cobalt	8.6E-9	mg/m^3	1.6E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.4E-09	5.5E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0009
				Iron	1.6E-5	mg/m^3	2.9E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	3.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.02
			Exp. Route Total								1.2E-07					0.03
		Exposure Point Total									1.2E-07					0.03
	Exposure Medium Total										1.2E-07					0.03
Medium Total											7.6E-06					0.9
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	2.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.9E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.09
				Arsenic	6.10	mg/kg	7.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				Chromium	25.1	mg/kg	2.0E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.0E-05	1.1E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				Iron	21,200	mg/kg	2.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.1
				Manganese	697	mg/kg	8.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.1
			Exp. Route Total								1.1E-05					0.5
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	2.5E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.8E-08	8.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								3.8E-08					0.003
		Exposure Point Total									1.1E-05					0.5
	Exposure Medium Total										1.1E-05					0.5
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	2.9E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	5.0E-03	(mg/m^3)	0.002
				Arsenic	4.6E-9	mg/m^3	8.5E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.7E-10	3.0E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0002
				Chromium	1.9E-8	mg/m^3	2.3E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.9E-07	1.2E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
				Iron	1.6E-5	mg/m^3	3.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	9.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.007
			Exp. Route Total								1.9E-07					0.009
		Exposure Point Total									1.9E-07					0.009
	Exposure Medium Total										1.9E-07					0.009
Medium Total											1.1E-05					0.5

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Area F	Ingestion	Aluminum	11,500	mg/kg	5.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.005
				Arsenic	6.84	mg/kg	3.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.7E-07	3.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium	15.5	mg/kg	1.1E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.6E-07	7.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
				Cobalt	11.3	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	20,500	mg/kg	9.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	2,340	mg/kg	1.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.04
			Exp. Route Total								1.0E-06					0.09
			Dermal	Aluminum	11,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.84	mg/kg	1.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-08	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium	15.5	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	11.3	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	20,500	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	2,340	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.6E-08					0.0004
		Exposure Point Total									1.0E-06					0.09
	Exposure Medium Total										1.0E-06					0.09
	Air	Area F	Inhalation	Aluminum	8.7E-6	mg/m^3	5.6E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-06	(mg/m^3)	5.0E-03	(mg/m^3)	0.001
				Arsenic	5.2E-9	mg/m^3	3.3E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.4E-09	3.3E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0002
				Chromium	1.2E-8	mg/m^3	1.2E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.0E-07	7.6E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Cobalt	8.6E-9	mg/m^3	5.5E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	5.0E-09	5.5E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0009
				Iron	1.6E-5	mg/m^3	1.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.8E-6	mg/m^3	1.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	5.0E-05	(mg/m^3)	0.02
			Exp. Route Total								1.1E-07					0.03
		Exposure Point Total									1.1E-07					0.03
	Exposure Medium Total										1.1E-07					0.03
Medium Total											1.1E-06					0.1
Subsurface Soil	Subsurface Soil	Area F	Ingestion	Aluminum	20,800	mg/kg	9.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.010
				Arsenic	6.10	mg/kg	2.8E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-07	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Chromium	25.1	mg/kg	1.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	9.0E-07	1.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Iron	21,200	mg/kg	9.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	697	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.01
			Exp. Route Total								1.3E-06					0.05
			Dermal	Aluminum	20,800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.10	mg/kg	9.6E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-08	9.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				Chromium	25.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Iron	21,200	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	697	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.4E-08					0.0003
		Exposure Point Total									1.3E-06					0.05
	Exposure Medium Total										1.3E-06					0.05
	Air	Area F	Inhalation	Aluminum	1.6E-5	mg/m^3	1.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	5.0E-03	(mg/m^3)	0.002
				Arsenic	4.6E-9	mg/m^3	3.0E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.3E-09	3.0E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0002
				Chromium	1.9E-8	mg/m^3	1.9E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	1.6E-07	1.2E-08	(mg/m^3)	1.0E-04	(mg/m^3)	0.0001
				Iron	1.6E-5	mg/m^3	1.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	5.3E-7	mg/m^3	3.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-07	(mg/m^3)	5.0E-05	(mg/m^3)	0.007
			Exp. Route Total								1.6E-07					0.009
		Exposure Point Total									1.6E-07					0.009
	Exposure Medium Total										1.6E-07					0.009
Medium Total											1.5E-06					0.06
										Total of Receptor Risks Across All Media	2.6E-06			Total of Receptor Hazards Across All Media		0.2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

Reasonable Maximum Exposures

9.1.RME Construction Workers
9.2.RME Industrial Workers
9.3.RME Adolescent Trespassers
9.4.RME Child Recreational Users
9.5.RME Adult Recreational Users
9.6.RME Lifelong Recreational Users
9.7.RME Child Residents
9.8.RME Adult Residents
9.9.RME Lifelong Residents

Central Tendency Exposures

9.1.CTE Construction Workers
9.2.CTE Industrial Workers
9.3.CTE Adolescent Trespassers
9.4.CTE Child Recreational Users
9.5.CTE Adult Recreational Users
9.6.CTE Lifelong Recreational Users
9.7.CTE Child Residents
9.8.CTE Adult Residents
9.9.CTE Lifelong Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	--	0.02
			Arsenic	3E-07	--	3E-08	--	3E-07	Skin, CVS	0.04	--	0.004	0.05
			Chromium	2E-07	--	- -	--	2E-07	None Reported	0.01	--	--	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	--	0.007
			Iron	- -	--	- -	--	- -	GS	0.06	--	--	0.06
			Manganese	- -	--	- -	--	- -	CNS	0.2	--	--	0.2
			Chemical Total	5E-07	--	3E-08	--	5E-07		0.3	--	0.004	0.3
		Exposure Point Total						5E-07					0.3
	Exposure Medium Total							5E-07					0.3
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0000002	--	0.0000002
			Arsenic	--	4E-08	--	--	4E-08	NA	--	0.07	--	0.07
			Chromium	--	2E-06	--	--	2E-06	Respiratory	--	0.02	--	0.02
			Cobalt	--	1E-07	--	--	1E-07	Respiratory	--	0.06	--	0.06
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	5	--	5
			Chemical Total	--	2E-06	--	--	2E-06		- -	5	- -	5
		Exposure Point Total						2E-06					5
	Exposure Medium Total							2E-06					5
Medium Total								3E-06					5
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.04	--	--	0.04
			Arsenic	3E-07	--	2E-08	--	3E-07	Skin, CVS	0.04	--	0.004	0.04
			Chromium	3E-07	--	- -	--	3E-07	None Reported	0.02	--	--	0.02
			Iron	- -	--	- -	--	- -	GS	0.06	--	--	0.06
			Manganese	- -	--	- -	--	- -	CNS	0.06	--	--	0.06
			Chemical Total	6E-07	--	2E-08	--	6E-07		0.2	--	0.004	0.2
		Exposure Point Total						6E-07					0.2
	Exposure Medium Total							6E-07					0.2
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0000004	--	0.0000004
			Arsenic	--	4E-08	--	--	4E-08	NA	--	0.06	--	0.06
			Chromium	--	3E-06	--	--	3E-06	Respiratory	--	0.03	--	0.03
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	1	--	1
			Chemical Total	--	3E-06	--	--	3E-06		- -	2	- -	2
		Exposure Point Total						3E-06					2
	Exposure Medium Total							3E-06					2
Medium Total								4E-06					2

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Arsenic	4E-06	--	7E-07	--	4E-06	Skin, CVS	0.02	--	0.004	0.03
			Chromium	3E-06	--	- -	--	3E-06	None Reported	0.005	--	--	0.005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.04	--	--	0.04
			Iron	- -	--	- -	--	- -	GS	0.03	--	--	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.10	--	--	0.10
			Chemical Total	6E-06	--	7E-07	--	7E-06		0.2	--	0.004	0.2
		Exposure Point Total						7E-06					0.2
	Exposure Medium Total							7E-06					0.2
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.00008	--	0.00008
			Chromium	--	8E-08	--	--	8E-08	Respiratory	--	0.00003	--	0.00003
			Cobalt	--	6E-09	--	--	6E-09	Respiratory	--	0.0003	--	0.0003
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.008	--	0.008
			Chemical Total	--	9E-08	--	--	9E-08		- -	0.009	- -	0.009
		Exposure Point Total						9E-08					0.009
	Exposure Medium Total							9E-08					0.009
Medium Total								7E-06					0.2
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	--	0.02
			Arsenic	3E-06	--	6E-07	--	4E-06	Skin, CVS	0.02	--	0.004	0.02
			Chromium	4E-06	--	- -	--	4E-06	None Reported	0.008	--	--	0.008
			Iron	- -	--	- -	--	- -	GS	0.03	--	--	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.03	--	--	0.03
			Chemical Total	8E-06	--	6E-07	--	8E-06		0.1	--	0.004	0.1
		Exposure Point Total						8E-06					0.1
	Exposure Medium Total							8E-06					0.1
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0007	--	0.0007
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.00007	--	0.00007
			Chromium	--	1E-07	--	--	1E-07	Respiratory	--	0.00004	--	0.00004
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.003	- -	0.003
		Exposure Point Total						1E-07					0.003
	Exposure Medium Total							1E-07					0.003
Medium Total								8E-06					0.1

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.002	--	--	0.002
			Arsenic	2E-07	--	5E-08	--	3E-07	Skin, CVS	0.004	--	0.0007	0.005
			Chromium	6E-07	--	- -	--	6E-07	None Reported	0.0009	--	--	0.0009
			Cobalt	- -	--	- -	--	- -	Thyroid	0.006	--	--	0.006
			Iron	- -	--	- -	--	- -	GS	0.005	--	--	0.005
			Manganese	- -	--	- -	--	- -	CNS	0.02	--	--	0.02
			Chemical Total	8E-07	--	5E-08	--	8E-07		0.03	--	0.0007	0.03
		Exposure Point Total						8E-07					0.03
	Exposure Medium Total							8E-07					0.03
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Arsenic	--	4E-11	--	--	4E-11	NA	--	0.000004	--	0.000004
			Chromium	--	5E-09	--	--	5E-09	Respiratory	--	0.000001	--	0.000001
			Cobalt	--	1E-10	--	--	1E-10	Respiratory	--	0.00002	--	0.00002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Chemical Total	--	5E-09	--	--	5E-09		- -	0.0005	- -	0.0005
		Exposure Point Total						5E-09					0.0005
	Exposure Medium Total							5E-09					0.0005
Medium Total								8E-07					0.03
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.003	--	--	0.003
			Arsenic	2E-07	--	4E-08	--	3E-07	Skin, CVS	0.003	--	0.0007	0.004
			Chromium	9E-07	--	- -	--	9E-07	None Reported	0.001	--	--	0.001
			Iron	- -	--	- -	--	- -	GS	0.005	--	--	0.005
			Manganese	- -	--	- -	--	- -	CNS	0.005	--	--	0.005
			Chemical Total	1E-06	--	4E-08	--	1E-06		0.02	--	0.0007	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00004	--	0.00004
			Arsenic	--	3E-11	--	--	3E-11	NA	--	0.000004	--	0.000004
			Chromium	--	8E-09	--	--	8E-09	Respiratory	--	0.000002	--	0.000002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Chemical Total	--	8E-09	--	--	8E-09		- -	0.0002	- -	0.0002
		Exposure Point Total						8E-09					0.0002
	Exposure Medium Total							8E-09					0.0002
Medium Total								1E-06					0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Arsenic	8E-07	--	1E-07	--	1E-06	Skin, CVS	0.02	--	0.004	0.03
			Chromium	3E-06	--	- -	--	3E-06	None Reported	0.005	--	--	0.005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.04	--	--	0.04
			Iron	- -	--	- -	--	- -	GS	0.03	--	--	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.09	--	--	0.09
			Chemical Total	4E-06	--	1E-07	--	4E-06		0.2	--	0.004	0.2
		Exposure Point Total						4E-06					0.2
	Exposure Medium Total							4E-06					0.2
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00004	--	0.00004
			Arsenic	--	5E-11	--	--	5E-11	NA	--	0.000008	--	0.000008
			Chromium	--	1E-08	--	--	1E-08	Respiratory	--	0.000003	--	0.000003
			Cobalt	--	2E-10	--	--	2E-10	Respiratory	--	0.00003	--	0.00003
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0008	--	0.0008
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0009	- -	0.0009
		Exposure Point Total						1E-08					0.0009
	Exposure Medium Total							1E-08					0.0009
Medium Total								4E-06					0.2
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	--	0.02
			Arsenic	7E-07	--	1E-07	--	9E-07	Skin, CVS	0.02	--	0.003	0.02
			Chromium	5E-06	--	- -	--	5E-06	None Reported	0.008	--	--	0.008
			Iron	- -	--	- -	--	- -	GS	0.03	--	--	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.03	--	--	0.03
			Chemical Total	6E-06	--	1E-07	--	6E-06		0.1	--	0.003	0.1
		Exposure Point Total						6E-06					0.1
	Exposure Medium Total							6E-06					0.1
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00008	--	0.00008
			Arsenic	--	4E-11	--	--	4E-11	NA	--	0.000007	--	0.000007
			Chromium	--	2E-08	--	--	2E-08	Respiratory	--	0.000005	--	0.000005
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0003	--	0.0003
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0003	- -	0.0003
		Exposure Point Total						2E-08					0.0003
	Exposure Medium Total							2E-08					0.0003
Medium Total								6E-06					0.1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.001	--	--	0.001
			Arsenic	4E-07	--	1E-07	--	5E-07	Skin, CVS	0.002	--	0.0009	0.003
			Chromium	5E-07	--	- -	--	5E-07	None Reported	0.0005	--	--	0.0005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.004	--	--	0.004
			Iron	- -	--	- -	--	- -	GS	0.003	--	--	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.010	--	--	0.010
			Chemical Total	9E-07	--	1E-07	--	1E-06		0.02	--	0.0009	0.02
		Exposure Point Total						1E-06					0.02
	Exposure Medium Total							1E-06					0.02
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Arsenic	--	9E-11	--	--	9E-11	NA	--	0.000004	--	0.000004
			Chromium	--	7E-09	--	--	7E-09	Respiratory	--	0.000001	--	0.000001
			Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.00002	--	0.00002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0004	--	0.0004
			Chemical Total	--	8E-09	--	--	8E-09		- -	0.0005	- -	0.0005
		Exposure Point Total						8E-09					0.0005
	Exposure Medium Total							8E-09					0.0005
Medium Total								1E-06					0.02
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.002	--	--	0.002
			Arsenic	3E-07	--	1E-07	--	4E-07	Skin, CVS	0.002	--	0.0008	0.003
			Chromium	8E-07	--	- -	--	8E-07	None Reported	0.0009	--	--	0.0009
			Iron	- -	--	- -	--	- -	GS	0.003	--	--	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.003	--	--	0.003
			Chemical Total	1E-06	--	1E-07	--	1E-06		0.01	--	0.0008	0.01
		Exposure Point Total						1E-06					0.01
	Exposure Medium Total							1E-06					0.01
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00004	--	0.00004
			Arsenic	--	8E-11	--	--	8E-11	NA	--	0.000004	--	0.000004
			Chromium	--	1E-08	--	--	1E-08	Respiratory	--	0.000002	--	0.000002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0002	- -	0.0002
		Exposure Point Total						1E-08					0.0002
	Exposure Medium Total							1E-08					0.0002
Medium Total								1E-06					0.01

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.001	--	--	0.001
			Arsenic	1E-06	--	3E-07	--	1E-06					
			Chromium	4E-06	--	- -	--	4E-06					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	5E-06	--	3E-07	--	5E-06					
		Exposure Point Total						5E-06					
	Exposure Medium Total							5E-06					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	1E-10	--	--	1E-10					
			Chromium	--	2E-08	--	--	2E-08					
			Cobalt	--	5E-10	--	--	5E-10					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	2E-08	--	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
Medium Total								5E-06					
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	1E-06	--	2E-07	--	1E-06					
			Chromium	6E-06	--	- -	--	6E-06					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	7E-06	--	2E-07	--	8E-06					
		Exposure Point Total						8E-06					
	Exposure Medium Total							8E-06					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	1E-10	--	--	1E-10					
			Chromium	--	3E-08	--	--	3E-08					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	3E-08	--	--	3E-08					
		Exposure Point Total						3E-08					
	Exposure Medium Total							3E-08					
Medium Total								8E-06					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.1	--	--	0.1
			Arsenic	1E-05	--	9E-07	--	1E-05	Skin, CVS	0.3	--	0.02	0.3
			Chromium	5E-05	--	- -	--	5E-05	None Reported	0.07	--	--	0.07
			Cobalt	- -	--	- -	--	- -	Thyroid	0.5	--	--	0.5
			Iron	- -	--	- -	--	- -	GS	0.4	--	--	0.4
			Manganese	- -	--	- -	--	- -	CNS	1	--	--	1
			Chemical Total	6E-05	--	9E-07	--	6E-05		3	--	0.02	3
		Exposure Point Total						6E-05					3
	Exposure Medium Total							6E-05					3
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.0003	--	0.0003
			Chromium	--	4E-07	--	--	4E-07	Respiratory	--	0.0001	--	0.0001
			Cobalt	--	6E-09	--	--	6E-09	Respiratory	--	0.001	--	0.001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.03	--	0.03
			Chemical Total	--	4E-07	--	--	4E-07		- -	0.04	- -	0.04
		Exposure Point Total						4E-07					0.04
	Exposure Medium Total							4E-07					0.04
Medium Total								6E-05					3
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.3	--	--	0.3
			Arsenic	1E-05	--	8E-07	--	1E-05	Skin, CVS	0.3	--	0.02	0.3
			Chromium	7E-05	--	- -	--	7E-05	None Reported	0.1	--	--	0.1
			Iron	- -	--	- -	--	- -	GS	0.4	--	--	0.4
			Manganese	- -	--	- -	--	- -	CNS	0.4	--	--	0.4
			Chemical Total	8E-05	--	8E-07	--	8E-05		1	--	0.02	1
		Exposure Point Total						8E-05					1
	Exposure Medium Total							8E-05					1
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.003	--	0.003
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.0003	--	0.0003
			Chromium	--	7E-07	--	--	7E-07	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.01	--	0.01
			Chemical Total	--	7E-07	--	--	7E-07		- -	0.01	- -	0.01
		Exposure Point Total						7E-07					0.01
	Exposure Medium Total							7E-07					0.01
Medium Total								8E-05					1

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	--	0.02
			Arsenic	5E-06	--	6E-07	--	5E-06	Skin, CVS	0.03	--	0.004	0.03
			Chromium	7E-06	--	- -	--	7E-06	None Reported	0.007	--	--	0.007
			Cobalt	- -	--	- -	--	- -	Thyroid	0.05	--	--	0.05
			Iron	- -	--	- -	--	- -	GS	0.04	--	--	0.04
			Manganese	- -	--	- -	--	- -	CNS	0.1	--	--	0.1
			Chemical Total	1E-05	--	6E-07	--	1E-05		0.3	--	0.004	0.3
		Exposure Point Total						1E-05					0.3
	Exposure Medium Total							1E-05					0.3
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Arsenic	--	7E-09	--	--	7E-09	NA	--	0.0003	--	0.0003
			Chromium	--	6E-07	--	--	6E-07	Respiratory	--	0.0001	--	0.0001
			Cobalt	--	3E-08	--	--	3E-08	Respiratory	--	0.001	--	0.001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.03	--	0.03
			Chemical Total	--	6E-07	--	--	6E-07		- -	0.04	- -	0.04
		Exposure Point Total						6E-07					0.04
	Exposure Medium Total							6E-07					0.04
Medium Total								1E-05					0.3
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.03	--	--	0.03
			Arsenic	4E-06	--	5E-07	--	5E-06	Skin, CVS	0.03	--	0.003	0.03
			Chromium	1E-05	--	- -	--	1E-05	None Reported	0.01	--	--	0.01
			Iron	- -	--	- -	--	- -	GS	0.04	--	--	0.04
			Manganese	- -	--	- -	--	- -	CNS	0.04	--	--	0.04
			Chemical Total	2E-05	--	5E-07	--	2E-05		0.1	--	0.003	0.2
		Exposure Point Total						2E-05					0.2
	Exposure Medium Total							2E-05					0.2
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.003	--	0.003
			Arsenic	--	7E-09	--	--	7E-09	NA	--	0.0003	--	0.0003
			Chromium	--	1E-06	--	--	1E-06	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.01	--	0.01
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.01	- -	0.01
		Exposure Point Total						1E-06					0.01
	Exposure Medium Total							1E-06					0.01
Medium Total								2E-05					0.2

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	2E-05	--	2E-06	--	2E-05					
			Chromium	5E-05	--	- -	--	5E-05					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	7E-05	--	2E-06	--	7E-05					
		Exposure Point Total						7E-05					
	Exposure Medium Total							7E-05					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	9E-09	--	--	9E-09					
			Chromium	--	1E-06	--	--	1E-06					
			Cobalt	--	3E-08	--	--	3E-08					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	1E-06	--	--	1E-06					
		Exposure Point Total						1E-06					
	Exposure Medium Total							1E-06					
Medium Total								7E-05					
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	1E-05	--	1E-06	--	2E-05					
			Chromium	8E-05	--	- -	--	8E-05					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	1E-04	--	1E-06	--	1E-04					
		Exposure Point Total						1E-04					
	Exposure Medium Total							1E-04					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	8E-09	--	--	8E-09					
			Chromium	--	2E-06	--	--	2E-06					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	2E-06	--	--	2E-06					
		Exposure Point Total						2E-06					
	Exposure Medium Total							2E-06					
Medium Total								1E-04					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.006	--	--	0.006
			Arsenic	7E-08	--	4E-09	--	8E-08	Skin, CVS	0.01	--	0.0007	0.01
			Chromium	5E-08	--	- -	--	5E-08	None Reported	0.003	--	--	0.003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	--	0.002
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.05	--	--	0.05
			Chemical Total	1E-07	--	4E-09	--	1E-07		0.08	--	0.0007	0.08
		Exposure Point Total						1E-07					0.08
	Exposure Medium Total							1E-07					0.08
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0000001	--	0.0000001
			Arsenic	--	2E-08	--	--	2E-08	NA	--	0.03	--	0.03
			Chromium	--	1E-06	--	--	1E-06	Respiratory	--	0.008	--	0.008
			Cobalt	--	7E-08	--	--	7E-08	Respiratory	--	0.03	--	0.03
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	2	--	2
			Chemical Total	--	1E-06	--	--	1E-06		- -	2	- -	2
		Exposure Point Total						1E-06					2
	Exposure Medium Total							1E-06					2
Medium Total								1E-06					3
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Arsenic	6E-08	--	4E-09	--	7E-08	Skin, CVS	0.010	--	0.0006	0.01
			Chromium	9E-08	--	- -	--	9E-08	None Reported	0.004	--	--	0.004
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Chemical Total	2E-07	--	4E-09	--	2E-07		0.05	--	0.0006	0.05
		Exposure Point Total						2E-07					0.05
	Exposure Medium Total							2E-07					0.05
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0000002	--	0.0000002
			Arsenic	--	2E-08	--	--	2E-08	NA	--	0.03	--	0.03
			Chromium	--	2E-06	--	--	2E-06	Respiratory	--	0.01	--	0.01
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.7	--	0.7
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.8	- -	0.8
		Exposure Point Total						2E-06					0.8
	Exposure Medium Total							2E-06					0.8
Medium Total								2E-06					0.8

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.005	--	--	0.005
			Arsenic	6E-07	--	2E-08	--	6E-07	Skin, CVS	0.010	--	0.0004	0.01
			Chromium	4E-07	--	- -	--	4E-07	None Reported	0.002	--	--	0.002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	--	0.02
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.04	--	--	0.04
			Chemical Total	1E-06	--	2E-08	--	1E-06		0.09	--	0.0004	0.09
		Exposure Point Total						1E-06					0.09
	Exposure Medium Total							1E-06					0.09
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0003	--	0.0003
			Arsenic	--	6E-10	--	--	6E-10	NA	--	0.00007	--	0.00007
			Chromium	--	3E-08	--	--	3E-08	Respiratory	--	0.00002	--	0.00002
			Cobalt	--	2E-09	--	--	2E-09	Respiratory	--	0.0003	--	0.0003
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.007	--	0.007
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.008	- -	0.008
		Exposure Point Total						3E-08					0.008
	Exposure Medium Total							3E-08					0.008
Medium Total								1E-06					0.10
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.009	--	--	0.009
			Arsenic	5E-07	--	2E-08	--	5E-07	Skin, CVS	0.009	--	0.0003	0.009
			Chromium	7E-07	--	- -	--	7E-07	None Reported	0.004	--	--	0.004
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Chemical Total	1E-06	--	2E-08	--	1E-06		0.05	--	0.0003	0.05
		Exposure Point Total						1E-06					0.05
	Exposure Medium Total							1E-06					0.05
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.0006	--	0.0006
			Arsenic	--	5E-10	--	--	5E-10	NA	--	0.00006	--	0.00006
			Chromium	--	4E-08	--	--	4E-08	Respiratory	--	0.00004	--	0.00004
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.003	- -	0.003
		Exposure Point Total						4E-08					0.003
	Exposure Medium Total							4E-08					0.003
Medium Total								1E-06					0.05

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.0005	--	--	0.0005
			Arsenic	6E-08	--	8E-09	--	7E-08	Skin, CVS	0.0009	--	0.0001	0.001
			Chromium	1E-07	--	- -	--	1E-07	None Reported	0.0002	--	--	0.0002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	--	0.002
			Iron	- -	--	- -	--	- -	GS	0.001	--	--	0.001
			Manganese	- -	--	- -	--	- -	CNS	0.004	--	--	0.004
			Chemical Total	2E-07	--	8E-09	--	2E-07		0.008	--	0.0001	0.009
		Exposure Point Total						2E-07					0.009
	Exposure Medium Total							2E-07					0.009
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.000005	--	0.000005
			Arsenic	--	9E-12	--	--	9E-12	NA	--	0.000001	--	0.000001
			Chromium	--	1E-09	--	--	1E-09	Respiratory	--	0.0000003	--	0.0000003
			Cobalt	--	3E-11	--	--	3E-11	Respiratory	--	0.000004	--	0.000004
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0001	--	0.0001
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						1E-09					0.0001
	Exposure Medium Total							1E-09					0.0001
Medium Total								2E-07					0.009
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.0009	--	--	0.0009
			Arsenic	5E-08	--	7E-09	--	6E-08	Skin, CVS	0.0008	--	0.0001	0.0009
			Chromium	2E-07	--	- -	--	2E-07	None Reported	0.0003	--	--	0.0003
			Iron	- -	--	- -	--	- -	GS	0.001	--	--	0.001
			Manganese	- -	--	- -	--	- -	CNS	0.001	--	--	0.001
			Chemical Total	3E-07	--	7E-09	--	3E-07		0.005	--	0.0001	0.005
		Exposure Point Total						3E-07					0.005
	Exposure Medium Total							3E-07					0.005
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.000009	--	0.000009
			Arsenic	--	8E-12	--	--	8E-12	NA	--	0.0000009	--	0.0000009
			Chromium	--	2E-09	--	--	2E-09	Respiratory	--	0.0000006	--	0.0000006
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00003	--	0.00003
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.00004	- -	0.00004
		Exposure Point Total						2E-09					0.00004
	Exposure Medium Total							2E-09					0.00004
Medium Total								3E-07					0.005

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.003	--	--	0.003
			Arsenic	7E-08	--	5E-09	--	7E-08	Skin, CVS	0.005	--	0.0004	0.006
			Chromium	3E-07	--	- -	--	3E-07	None Reported	0.001	--	--	0.001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.009	--	--	0.009
			Iron	- -	--	- -	--	- -	GS	0.007	--	--	0.007
			Manganese	- -	--	- -	--	- -	CNS	0.02	--	--	0.02
			Chemical Total	4E-07	--	5E-09	--	4E-07		0.05	--	0.0004	0.05
		Exposure Point Total						4E-07					0.05
	Exposure Medium Total							4E-07					0.05
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Arsenic	--	4E-12	--	--	4E-12	NA	--	0.000002	--	0.000002
			Chromium	--	1E-09	--	--	1E-09	Respiratory	--	0.0000007	--	0.0000007
			Cobalt	--	1E-11	--	--	1E-11	Respiratory	--	0.000008	--	0.000008
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.0002	- -	0.0002
		Exposure Point Total						1E-09					0.0002
	Exposure Medium Total							1E-09					0.0002
Medium Total								4E-07					0.05
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.005	--	--	0.005
			Arsenic	6E-08	--	4E-09	--	7E-08	Skin, CVS	0.005	--	0.0003	0.005
			Chromium	6E-07	--	- -	--	6E-07	None Reported	0.002	--	--	0.002
			Iron	- -	--	- -	--	- -	GS	0.007	--	--	0.007
			Manganese	- -	--	- -	--	- -	CNS	0.007	--	--	0.007
			Chemical Total	6E-07	--	4E-09	--	6E-07		0.03	--	0.0003	0.03
		Exposure Point Total						6E-07					0.03
	Exposure Medium Total							6E-07					0.03
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Arsenic	--	3E-12	--	--	3E-12	NA	--	0.000002	--	0.000002
			Chromium	--	2E-09	--	--	2E-09	Respiratory	--	0.000001	--	0.000001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00006	--	0.00006
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.00008	- -	0.00008
		Exposure Point Total						2E-09					0.00008
	Exposure Medium Total							2E-09					0.00008
Medium Total								6E-07					0.03

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.0003	--	--	0.0003
			Arsenic	3E-08	--	2E-09	--	3E-08	Skin, CVS	0.0006	--	0.00004	0.0006
			Chromium	3E-08	--	- -	--	3E-08	None Reported	0.0001	--	--	0.0001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0010	--	--	0.0010
			Iron	- -	--	- -	--	- -	GS	0.0007	--	--	0.0007
			Manganese	- -	--	- -	--	- -	CNS	0.002	--	--	0.002
			Chemical Total	6E-08	--	2E-09	--	6E-08		0.005	--	0.00004	0.005
		Exposure Point Total						6E-08					0.005
	Exposure Medium Total							6E-08					0.005
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00001	--	0.00001
			Arsenic	--	1E-11	--	--	1E-11	NA	--	0.000002	--	0.000002
			Chromium	--	9E-10	--	--	9E-10	Respiratory	--	0.0000007	--	0.0000007
			Cobalt	--	5E-11	--	--	5E-11	Respiratory	--	0.000008	--	0.000008
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.0002	- -	0.0002
		Exposure Point Total						1E-09					0.0002
	Exposure Medium Total							1E-09					0.0002
Medium Total								6E-08					0.005
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.0005	--	--	0.0005
			Arsenic	2E-08	--	2E-09	--	2E-08	Skin, CVS	0.0005	--	0.00004	0.0006
			Chromium	5E-08	--	- -	--	5E-08	None Reported	0.0002	--	--	0.0002
			Iron	- -	--	- -	--	- -	GS	0.0008	--	--	0.0008
			Manganese	- -	--	- -	--	- -	CNS	0.0007	--	--	0.0007
			Chemical Total	7E-08	--	2E-09	--	8E-08		0.003	--	0.00004	0.003
		Exposure Point Total						8E-08					0.003
	Exposure Medium Total							8E-08					0.003
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Arsenic	--	1E-11	--	--	1E-11	NA	--	0.000002	--	0.000002
			Chromium	--	1E-09	--	--	1E-09	Respiratory	--	0.000001	--	0.000001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00006	--	0.00006
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.00008	- -	0.00008
		Exposure Point Total						2E-09					0.00008
	Exposure Medium Total							2E-09					0.00008
Medium Total								8E-08					0.003

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	1E-07	--	6E-09	--	1E-07					
			Chromium	4E-07	--	- -	--	4E-07					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	5E-07	--	6E-09	--	5E-07					
		Exposure Point Total						5E-07					
	Exposure Medium Total							5E-07					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	2E-11	--	--	2E-11					
			Chromium	--	2E-09	--	--	2E-09					
			Cobalt	--	6E-11	--	--	6E-11					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	2E-09	--	--	2E-09					
		Exposure Point Total						2E-09					
	Exposure Medium Total							2E-09					
Medium Total								5E-07					
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	9E-08	--	6E-09	--	9E-08					
			Chromium	6E-07	--	- -	--	6E-07					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	7E-07	--	6E-09	--	7E-07					
		Exposure Point Total						7E-07					
	Exposure Medium Total							7E-07					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	2E-11	--	--	2E-11					
			Chromium	--	3E-09	--	--	3E-09					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	3E-09	--	--	3E-09					
		Exposure Point Total						3E-09					
	Exposure Medium Total							3E-09					
Medium Total								7E-07					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.05	--	--	0.05
			Arsenic	1E-06	--	4E-08	--	1E-06	Skin, CVS	0.10	--	0.003	0.1
			Chromium	6E-06	--	- -	--	6E-06	None Reported	0.02	--	--	0.02
			Cobalt	- -	--	- -	--	- -	Thyroid	0.2	--	--	0.2
			Iron	- -	--	- -	--	- -	GS	0.1	--	--	0.1
			Manganese	- -	--	- -	--	- -	CNS	0.4	--	--	0.4
			Chemical Total	7E-06	--	4E-08	--	7E-06		0.9	--	0.003	0.9
		Exposure Point Total						7E-06					0.9
	Exposure Medium Total							7E-06					0.9
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Arsenic	--	4E-10	--	--	4E-10	NA	--	0.0002	--	0.0002
			Chromium	--	1E-07	--	--	1E-07	Respiratory	--	0.00008	--	0.00008
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.0009	--	0.0009
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.02	--	0.02
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.03	- -	0.03
		Exposure Point Total						1E-07					0.03
	Exposure Medium Total							1E-07					0.03
Medium Total								8E-06					0.9
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.09	--	--	0.09
			Arsenic	1E-06	--	4E-08	--	1E-06	Skin, CVS	0.09	--	0.003	0.09
			Chromium	1E-05	--	- -	--	1E-05	None Reported	0.04	--	--	0.04
			Iron	- -	--	- -	--	- -	GS	0.1	--	--	0.1
			Manganese	- -	--	- -	--	- -	CNS	0.1	--	--	0.1
			Chemical Total	1E-05	--	4E-08	--	1E-05		0.5	--	0.003	0.5
		Exposure Point Total						1E-05					0.5
	Exposure Medium Total							1E-05					0.5
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Arsenic	--	4E-10	--	--	4E-10	NA	--	0.0002	--	0.0002
			Chromium	--	2E-07	--	--	2E-07	Respiratory	--	0.0001	--	0.0001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.007	--	0.007
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.009	- -	0.009
		Exposure Point Total						2E-07					0.009
	Exposure Medium Total							2E-07					0.009
Medium Total								1E-05					0.5

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.005	--	--	0.005
			Arsenic	5E-07	--	2E-08	--	5E-07	Skin, CVS	0.01	--	0.0004	0.01
			Chromium	6E-07	--	- -	--	6E-07	None Reported	0.002	--	--	0.002
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	--	0.02
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.04	--	--	0.04
			Chemical Total	1E-06	--	2E-08	--	1E-06		0.09	--	0.0004	0.09
		Exposure Point Total						1E-06					0.09
	Exposure Medium Total							1E-06					0.09
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.001	--	0.001
			Arsenic	--	1E-09	--	--	1E-09	NA	--	0.0002	--	0.0002
			Chromium	--	1E-07	--	--	1E-07	Respiratory	--	0.00008	--	0.00008
			Cobalt	--	5E-09	--	--	5E-09	Respiratory	--	0.0009	--	0.0009
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.02	--	0.02
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.03	- -	0.03
		Exposure Point Total						1E-07					0.03
	Exposure Medium Total							1E-07					0.03
Medium Total								1E-06					0.1
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -	CNS	0.010	--	--	0.010
			Arsenic	4E-07	--	1E-08	--	4E-07	Skin, CVS	0.009	--	0.0003	0.010
			Chromium	9E-07	--	- -	--	9E-07	None Reported	0.004	--	--	0.004
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Chemical Total	1E-06	--	1E-08	--	1E-06		0.05	--	0.0003	0.05
		Exposure Point Total						1E-06					0.05
	Exposure Medium Total							1E-06					0.05
	Air	Area F	Aluminum	--	- -	--	--	- -	CNS	--	0.002	--	0.002
			Arsenic	--	1E-09	--	--	1E-09	NA	--	0.0002	--	0.0002
			Chromium	--	2E-07	--	--	2E-07	Respiratory	--	0.0001	--	0.0001
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.007	--	0.007
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.009	- -	0.009
		Exposure Point Total						2E-07					0.009
	Exposure Medium Total							2E-07					0.009
Medium Total								1E-06					0.06

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	2E-06	--	6E-08	--	2E-06					
			Chromium	7E-06	--	- -	--	7E-06					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	8E-06	--	6E-08	--	8E-06					
		Exposure Point Total						8E-06					
	Exposure Medium Total							8E-06					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	2E-09	--	--	2E-09					
			Chromium	--	2E-07	--	--	2E-07					
			Cobalt	--	6E-09	--	--	6E-09					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	2E-07	--	--	2E-07					
		Exposure Point Total						2E-07					
	Exposure Medium Total							2E-07					
Medium Total								9E-06					
Subsurface Soil	Subsurface Soil	Area F	Aluminum	- -	--	- -	--	- -					
			Arsenic	2E-06	--	5E-08	--	2E-06					
			Chromium	1E-05	--	- -	--	1E-05					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Chemical Total	1E-05	--	5E-08	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
	Air	Area F	Aluminum	--	- -	--	--	- -					
			Arsenic	--	2E-09	--	--	2E-09					
			Chromium	--	4E-07	--	--	4E-07					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Chemical Total	--	4E-07	--	--	4E-07					
		Exposure Point Total						4E-07					
	Exposure Medium Total							4E-07					
Medium Total								1E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX I.6

BOGGS CREEK

I.6.1 Samples Used in Risk Assessment
I.6.2 RAGS Part D Tables
I.6.3 ProUCL Outputs

APPENDIX I.6.1

SAMPLES USED IN RISK ASSESSMENT

TABLE 1
SAMPLES USED IN THE HUMAN HEALTH RISH ASSESSMENT

Surface Water	Sediment
18SW001	18SD0010006
18SW002	18SD0020006
18SW003	18SD0030006
18SW004	18SD0040006
18SW005	18SD0050006

APPENDIX I.6.2

RAGS PART D TABLES

RAGS Part D Table 1

Selection of Exposure Pathways

TABLE 1
SELECTION OF EXPOSURE PATHWAYS - BOGGS CREEK
SWMU 18 – LOAD AND FILL AREA
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 Water	Surface Water	Boggs Creek	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not exposed to surface water.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not exposed to surface water.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Trespassers may be exposed to surface water while at the site.
	Sediment	Sediment	Boggs Creek	Construction Workers	Adult	Ingestion Dermal	None None	Construction workers are not exposed to sediment.
				Industrial Worker	Adult	Ingestion Dermal	None None	Industrial workers are not exposed to sediment.
				Trespassers	Adolescent	Ingestion Dermal	Quant Quant	Current trespassers may be exposed to sediment while at the site.
Future	Surface Water	Surface Water	Boggs Creek	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to surface water while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	
	Sediment	Sediment	Boggs Creek	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may be exposed to sediment while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				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	

Notes:
Qual - Qualitative.
Quant - Quantitative.

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

LIST OF TABLES
RAGS PART D TABLE 2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

2.1 Surface Water
2.2 Sediment

TABLE 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE WATER - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Range of Background Concentrations[3]	Adjusted USEPA RSL Tapwater[4]	USEPA MCL[5]	IDEM Groundwater Residential[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Boggs Creek	**Explosives**														
	88-72-2	2-Nitrotoluene	0.145 J	0.145 J	ug/L	18SW001	1/5	0.157 - 0.16	0.145	NA	0.27 C	NA	2.7 C	No	BSL
	19406-51-0	4-Amino-2,6-Dinitrotoluene	0.247	0.247	ug/L	18SW004	1/5	0.157 - 0.16	0.247	NA	3 N	NA	30 N	No	BSL
	2691-41-0	HMX	0.346	2.21	ug/L	18SW004	4/5	0.16 - 0.16	2.21	NA	78 N	NA	780 N	No	BSL
	121-82-4	**RDX**	1.49	10.8	ug/L	18SW004	4/5	0.16 - 0.16	10.8	NA	**0.61 C**	NA	**6.1 C**	**Yes**	ASL
	Metals (Total)														
	7429-90-5	Aluminum	47.6 J	294 J	ug/L	18SW003	5/5	-	294	NA	1600 N	NA	16000 N	No	BSL
	7440-39-3	Barium	34.5	51	ug/L	18SW004	5/5	-	51	NA	290 N	2000	2000 M	No	BSL
	7440-43-9	Cadmium	0.255 J	0.272 J	ug/L	18SW003	2/5	0.5 - 0.5	0.272	NA	0.69 N	5	5 M	No	BSL
	7440-70-2	Calcium	37900 J	53600 J	ug/L	18SW004	5/5	-	53600	NA	NA	NA	NA	No	NUT
	7440-47-3	**Chromium**	0.527 J	0.905 J	ug/L	18SW001	3/5	1 - 1	0.905	NA	**0.031 C[8]**	100	**0.31 C[8]**	**Yes**	ASL
	7440-50-8	Copper	1.31 J	3.33 J	ug/L	18SW003	5/5	-	3.33	NA	62 N	1300 [9]	1300 M	No	BSL
	7439-89-6	Iron	42.1 J	223 J	ug/L	18SW003	5/5	-	223	NA	1100 N	NA	11000 N	No	BSL
	7439-92-1	Lead	0.436 J	0.436 J	ug/L	18SW003	1/5	0.75 - 0.75	0.436	NA	15	15 [9]	15 M	No	BSL
	7439-95-4	Magnesium	6420	8820	ug/L	18SW004	5/5	-	8820	NA	NA	NA	NA	No	NUT
	7439-96-5	Manganese	1.17 J	27.7	ug/L	18SW003	5/5	-	27.7	NA	32 N	NA	320 N	No	BSL
	7440-02-0	Nickel	1.08 J	1.88 J	ug/L	18SW001	3/5	1.5 - 1.5	1.88	NA	30 N	NA	300 N	No	BSL
	7440-09-7	Potassium	1630 J	4180	ug/L	18SW002	5/5	-	4180	NA	NA	NA	NA	No	NUT
	7440-23-5	Sodium	9160 J	31400 J	ug/L	18SW002	5/5	-	31400	NA	NA	NA	NA	No	NUT
	7440-66-6	Zinc	1.52 J	11.8	ug/L	18SW002	4/5	2.5 - 2.5	11.8	NA	470 N	NA	4700 N	No	BSL
	Metals (Filtered)														
	7429-90-5	Aluminum	25.9 J	40.2 J	ug/L	18SW003	5/5	-	40.2	NA	1600 N	NA	16000 N	No	BSL
	7440-39-3	Barium	34.3	49.7	ug/L	18SW004	5/5	-	49.7	NA	290 N	2000	2000 M	No	BSL
	7440-70-2	Calcium	35700	53600 J	ug/L	18SW004	5/5	-	53600	NA	NA	NA	NA	No	NUT
	7440-47-3	**Chromium**	0.581 J	0.849 J	ug/L	18SW002	2/5	1 - 1	0.849	NA	**0.031 C**	100	100 M	**Yes**	ASL
	7440-50-8	Copper	2.33 J	4.36	ug/L	18SW002	5/5	-	4.36	NA	62 N	1300 [9]	1300 M	No	BSL
	7439-89-6	Iron	7.66 J	12.1 J	ug/L	18SW004	5/5	-	12.1	NA	1100 N	NA	11000 N	No	BSL
	7439-95-4	Magnesium	6160	8680	ug/L	18SW004	5/5	-	8680	NA	NA	NA	NA	No	NUT
	7439-96-5	Manganese	1.82 J	9.33	ug/L	18SW001	5/5	-	9.33	NA	32 N	NA	320 N	No	BSL
	7440-02-0	Nickel	1.36 J	3.32	ug/L	18SW002	5/5	-	3.32	NA	30 N	NA	300 N	No	BSL
	7440-09-7	Potassium	1650 J	4130	ug/L	18SW002	5/5	-	4130	NA	NA	NA	NA	No	NUT
	7440-23-5	Sodium	9180 J	31000	ug/L	18SW002	5/5	-	31000	NA	NA	NA	NA	No	NUT
	7440-66-6	Zinc	4.04 J	10.4	ug/L	18SW002	5/5	-	10.4	NA	470 N	NA	4700 N	No	BSL
	Miscellaneous Parameters														
	- -	Ammonia-N	0.124 J	0.79	mg/L	18SW002	3/5	0.15 - 0.15	0.79	NA	NA	NA	NA	No	NTX

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - No background data is available for surface water.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
5 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
3 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Values are for hexavalent chromium.
9 - The MCL for this parameter is actually a treatment technique. The SDWA action level (at the tap) has been presented.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18SW001
18SW002
18SW003
18SW004
18SW005

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirements To Be Considered
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical Of Potential Concern
J = Estimated value
M = Maximum Contaminant Level
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level/ARAR/TBC

For elimination as a COPC:
BSL = Below COPC Screening Level
NTX = No toxicity criteria
NUT = Essential nutrient

TABLE 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SEDIMENT - BOGGS CREEK
SMWU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[1]	Concentration Used for Screening[2]	Above Background Concentration?[3]	Adjusted USEPA RSL Residential Soil[4]	IDEM Residential Soil[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Boggs Creek	**Explosives**													
	121-82-4	RDX	0.165	0.165	mg/kg	18SD0030006	1/5	0.0367 - 0.04	0.165	NA	5.6 C	78 C	No	BSL
	Metals													
	7429-90-5	Aluminum	2,490	6,350	mg/kg	18SD0030006	5/5	-	6,350	NA	7,700 N	100,000 L	No	BSL
	7440-38-2	**Arsenic**	4.53	19.5 J	mg/kg	18SD0030006	5/5	-	19.5	NA	**0.39 C**	**5.5 C**	**Yes**	ASL
	7440-39-3	Barium	30.7	92.6 J	mg/kg	18SD0030006	5/5	-	92.6	NA	1,500 N	21,000 N	No	BSL
	7440-41-7	Beryllium	0.630 J	2.01	mg/kg	18SD0030006	5/5	-	2.01	NA	16 N	220 N	No	BSL
	7440-43-9	Cadmium	0.681 J	4.24 J	mg/kg	18SD0040006	3/5	0.627 - 0.671	4.24	NA	7 N	98 N	No	BSL
	7440-70-2	Calcium	549 J	1,560	mg/kg	18SD0040006	5/5	-	1,560	NA	NA	NA	No	NUT
	7440-47-3	**Chromium**	11.1	38.3 J	mg/kg	18SD0040006	5/5	-	38.3	NA	**0.29 C**	**4.1 C[7]**	**Yes**	ASL
	7440-48-4	**Cobalt**	3.90 J	13.5 J	mg/kg	18SD0050006	5/5	-	13.5	NA	**2.3 N**	32 N	**Yes**	ASL
	7440-50-8	Copper	6.04	11.1 J	mg/kg	18SD0040006	5/5	-	11.1	NA	310 N	4,300 N	No	BSL
	7439-89-6	**Iron**	10,800	119,000	mg/kg	18SD0030006	5/5	-	119,000	NA	**5,500 N**	**77,000 N**	**Yes**	ASL
	7439-92-1	Lead	7.79	20.7 J	mg/kg	18SD0030006	5/5	-	20.7	NA	400	400	No	BSL
	7439-95-4	Magnesium	449 J	767 J	mg/kg	18SD0030006	3/5	939 - 1670	767	NA	NA	NA	No	NUT
	7439-96-5	**Manganese**	314	1,460 J	mg/kg	18SD0030006	5/5	-	1,460	NA	**180 N**	2,500 N	**Yes**	ASL
	7439-97-6	Mercury	0.021 J	0.034 J	mg/kg	18SD0050006	3/5	0.0411 - 0.0443	0.0342	NA	2.3 N[8]	3.1 S	No	BSL
	7440-02-0	Nickel	10.4	27.8	mg/kg	18SD0040006	5/5	-	27.8	NA	150 N	2,100 N	No	BSL
	7440-09-7	Potassium	309 J	410 J	mg/kg	18SD0050006	3/5	939 - 1010	410	NA	NA	NA	No	NUT
	7440-28-0	**Thallium**	1.41 J	2.28 J	mg/kg	18SD0030006	2/5	1.25 - 2.22	2.28	NA	**0.078 N**	**1.1 N**	**Yes**	ASL
	7440-62-2	Vanadium	12.9	35.2 J	mg/kg	18SD0030006	5/5	-	35.2	NA	39 N	NA	No	BSL
	7440-66-6	Zinc	21.8	72.8 J	mg/kg	18SD0040006	5/5	-	72.8	NA	2,300 N	32,000 N	No	BSL

Footnotes:
1 - Values presented are sample-specific quantitation limits.
2 - The maximum detected concentration is used for screening purposes.
3 - No background data is available for sediment.
4 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
2 - IDEM Closure Guide, March 22,2012.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
7 - Value is for hexavalent chromium.
8 - Value is for mercuric chloride (and other mercury salts).
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
18SD0010006
18SD0020006
18SD0030006
18SD0040006
18SD0050006

Definitions:
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg.
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit.

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level

For elimination as a COPC:
BSL = Below COPC Screening Level
NUT = Essential nutrient

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

3.1.RME Surface Water
3.2.RME Sediment

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Boggs Creek	RDX	ug/L	3.69	7.94 (N)	10.8	7.94	ug/L	95% KM (t) UCL	ProUCL 4.1.00
	Chromium	ug/L	0.661	1.03 (N)	0.905 J	0.905	ug/L	Maximum Detected Concentraition	(1)

N = Normal

1 - The maximum detected concentration is greater than the UCL, therefore the maximum detected concentration is used as the exposure point concentration.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSWC CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Boggs Creek	Arsenic	mg/kg	9.77	15.4 (N)	19.5 J	15.4	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Chromium	mg/kg	23.1	34.1 (N)	38.3 J	34.1	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Cobalt	mg/kg	10.1	14.1 (N)	13.5 J	14.1	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Iron	mg/kg	49220	91,940 (N)	119,000	91,940	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Manganese	mg/kg	811	1,244 (N)	1,460 J	1244	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Thallium	mg/kg	1.22	2.05 (NP)	2.28 J	2.05	mg/kg	95% KM (t) UCL	ProUCL 4.1.00

N = Normal
NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	Reasonable Maximum Exposures
7.1.RME	Adolescent Trespassers
7.2.RME	Child Recreational Users/Child Residents
7.3.RME	Adult Recreational Users/Child Residents
	Central Tendency Exposures
7.1.CTE	Adolescent Trespassers
7.2.CTE	Child Recreational Users/Child Residents
7.3.CTE	Adult Recreational Users/Child Residents

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Boggs Creek	Ingestion	RDX	7.94	ug/L	9.2E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	1.0E-08	6.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Chromium	0.905	ug/L	3.2E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.6E-08	7.4E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
			Exp. Route Total								2.6E-08					0.0002
			Dermal	RDX	7.94	ug/L	1.9E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	2.1E-09	1.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00004
				Chromium	0.905	ug/L	2.1E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	4.1E-07	4.8E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0006
			Exp. Route Total								4.2E-07					0.0007
		Exposure Point Total									4.4E-07					0.0009
	Exposure Medium Total										4.4E-07					0.0009
Medium Total											4.4E-07					0.0009
Sediment	Sediment	Boggs Creek	Ingestion	Arsenic	15.4	mg/kg	1.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-07	7.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium VI	34.1	mg/kg	7.4E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.7E-07	1.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0006
				Cobalt	14.1	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Iron	91,940	mg/kg	6.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.007
				Manganese	1,244	mg/kg	9.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.003
				Thallium	2.05	mg/kg	1.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.4E-07					0.01
			Dermal	Arsenic	15.4	mg/kg	4.4E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.6E-08	3.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	34.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	14.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	91,940	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	1,244	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
				Thallium	2.05	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.6E-08					0.001
		Exposure Point Total									6.1E-07					0.02
	Exposure Medium Total										6.1E-07					0.02
Medium Total											6.1E-07					0.02
										Total of Receptor Risks Across All Media	1.0E-06				Total of Receptor Hazards Across All Media	0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Boggs Creek	Ingestion	RDX	7.94	ug/L	2.6E-07	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	2.8E-08	3.0E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
				Chromium	0.905	ug/L	1.6E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.9E-08	3.4E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001
			Exp. Route Total								1.1E-07					0.001
			Dermal	RDX	7.94	ug/L	4.6E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	5.1E-09	5.4E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Chromium	0.905	ug/L	8.8E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.8E-06	1.9E-07	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.003
			Exp. Route Total								1.8E-06					0.003
		Exposure Point Total									1.9E-06					0.004
	Exposure Medium Total										1.9E-06					0.004
Medium Total											1.9E-06					0.004
Sediment	Sediment	Boggs Creek	Ingestion	Arsenic	15.4	mg/kg	1.3E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.9E-06	1.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				Chromium VI	34.1	mg/kg	1.5E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.4E-06	3.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.01
				Cobalt	14.1	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	91,940	mg/kg	7.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.1
				Manganese	1,244	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.05
				Thallium	2.05	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.3E-06					0.3
			Dermal	Arsenic	15.4	mg/kg	2.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.2E-07	2.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
				Chromium VI	34.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	14.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	91,940	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	1,244	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
				Thallium	2.05	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.2E-07					0.008
		Exposure Point Total									9.6E-06					0.3
	Exposure Medium Total										9.6E-06					0.3
Medium Total											9.6E-06					0.3
										Total of Receptor Risks Across All Media	1.1E-05			Total of Receptor Hazards Across All Media		0.3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Boggs Creek	Ingestion	RDX	7.94	ug/L	2.2E-07	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	2.4E-08	6.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002
				Chromium	0.905	ug/L	4.6E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.3E-08	7.4E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
			Exp. Route Total								4.8E-08					0.0002
			Dermal	RDX	7.94	ug/L	8.0E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	8.8E-09	2.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00008
				Chromium	0.905	ug/L	5.3E-08	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.1E-06	8.4E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.001
			Exp. Route Total								1.1E-06					0.001
		Exposure Point Total									1.1E-06					0.001
	Exposure Medium Total										1.1E-06					0.001
Medium Total											1.1E-06					0.001
Sediment	Sediment	Boggs Creek	Ingestion	Arsenic	15.4	mg/kg	5.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.1E-07	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Chromium VI	34.1	mg/kg	2.2E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.1E-06	3.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
				Cobalt	14.1	mg/kg	4.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Iron	91,940	mg/kg	3.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	1,244	mg/kg	4.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.005
				Thallium	2.05	mg/kg	7.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					0.03
			Dermal	Arsenic	15.4	mg/kg	1.3E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.9E-07	3.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	34.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	14.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	91,940	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	1,244	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
				Thallium	2.05	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-07					0.001
		Exposure Point Total									2.1E-06					0.03
	Exposure Medium Total										2.1E-06					0.03
Medium Total											2.1E-06					0.03
										Total of Receptor Risks Across All Media	3.2E-06			Total of Receptor Hazards Across All Media		0.03

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Boggs Creek	Ingestion	RDX	7.94	ug/L	2.3E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	2.5E-09	1.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00005
				Chromium	0.905	ug/L	7.9E-09	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	3.9E-09	1.8E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000006
			Exp. Route Total								6.5E-09					0.00006
			Dermal	RDX	7.94	ug/L	6.8E-09	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	7.5E-10	4.8E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00002
				Chromium	0.905	ug/L	5.2E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.0E-07	1.2E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0002
			Exp. Route Total								1.0E-07					0.0002
		Exposure Point Total									1.1E-07					0.0002
	Exposure Medium Total										1.1E-07					0.0002
Medium Total											1.1E-07					0.0002
Sediment	Sediment	Boggs Creek	Ingestion	Arsenic	15.4	mg/kg	2.8E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-08	2.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				Chromium VI	34.1	mg/kg	1.9E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	9.3E-08	4.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001
				Cobalt	14.1	mg/kg	2.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Iron	91,940	mg/kg	1.7E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.002
				Manganese	1,244	mg/kg	2.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.0007
				Thallium	2.05	mg/kg	3.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-07					0.004
			Dermal	Arsenic	15.4	mg/kg	6.6E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.9E-09	4.6E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				Chromium VI	34.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	14.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	91,940	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	1,244	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
				Thallium	2.05	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.9E-09					0.0002
		Exposure Point Total									1.4E-07					0.004
	Exposure Medium Total										1.4E-07					0.004
Medium Total											1.4E-07					0.004
										Total of Receptor Risks Across All Media	2.6E-07			Total of Receptor Hazards Across All Media		0.004

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Boggs Creek	Ingestion	RDX	7.94	ug/L	2.2E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	2.4E-09	7.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
				Chromium	0.905	ug/L	1.6E-08	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.0E-09	8.6E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
			Exp. Route Total								1.0E-08					0.0003
			Dermal	RDX	7.94	ug/L	5.4E-09	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	6.0E-10	1.9E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00006
				Chromium	0.905	ug/L	8.9E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	1.8E-07	4.8E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0006
			Exp. Route Total								1.8E-07					0.0007
		Exposure Point Total									1.9E-07					0.0010
	Exposure Medium Total										1.9E-07					0.0010
Medium Total											1.9E-07					0.0010
Sediment	Sediment	Boggs Creek	Ingestion	Arsenic	15.4	mg/kg	1.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-07	3.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium VI	34.1	mg/kg	1.5E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	7.5E-07	8.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
				Cobalt	14.1	mg/kg	9.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Iron	91,940	mg/kg	6.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	1,244	mg/kg	8.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.01
				Thallium	2.05	mg/kg	1.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.1E-07					0.07
			Dermal	Arsenic	15.4	mg/kg	7.0E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-08	2.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				Chromium VI	34.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	14.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	91,940	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	1,244	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
				Thallium	2.05	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-08					0.0008
		Exposure Point Total									9.2E-07					0.07
	Exposure Medium Total										9.2E-07					0.07
Medium Total											9.2E-07					0.07
										Total of Receptor Risks Across All Media	1.1E-06			Total of Receptor Hazards Across All Media		0.07

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Boggs Creek	Ingestion	RDX	7.94	ug/L	1.6E-08	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	1.8E-09	1.6E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00005
				Chromium	0.905	ug/L	2.9E-09	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-09	1.8E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000006
			Exp. Route Total								3.2E-09					0.00006
			Dermal	RDX	7.94	ug/L	8.3E-09	(mg/kg/day)	1.1E-01	$(mg/kg/day)^{-1}$	9.1E-10	8.3E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00003
				Chromium	0.905	ug/L	3.3E-09	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	6.6E-08	2.1E-08	(mg/kg/day)	7.5E-05	(mg/kg/day)	0.0003
			Exp. Route Total								6.7E-08					0.0003
		Exposure Point Total									7.0E-08					0.0004
	Exposure Medium Total										7.0E-08					0.0004
Medium Total											7.0E-08					0.0004
Sediment	Sediment	Boggs Creek	Ingestion	Arsenic	15.4	mg/kg	3.9E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.9E-08	3.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	34.1	mg/kg	1.4E-07	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.8E-08	8.7E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003
				Cobalt	14.1	mg/kg	3.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Iron	91,940	mg/kg	2.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				Manganese	1,244	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.001
				Thallium	2.05	mg/kg	5.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-07					0.007
			Dermal	Arsenic	15.4	mg/kg	2.7E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.0E-09	2.7E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00009
				Chromium VI	34.1	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	14.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	91,940	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Manganese	1,244	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
				Thallium	2.05	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.0E-09					0.00009
		Exposure Point Total									1.3E-07					0.008
	Exposure Medium Total										1.3E-07					0.008
Medium Total											1.3E-07					0.008
										Total of Receptor Risks Across All Media	2.0E-07			Total of Receptor Hazards Across All Media		0.008

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

Reasonable Maximum Exposures

9.1.RME Adolescent Trespassers
9.2.RME Child Recreational Users/Child Residents
9.3.RME Adult Recreational Users/Child Residents
9.4.RME Lifelong Recreational Users/Residents

Central Tendency Exposures

9.1.CTE Adolescent Trespassers
9.2.CTE Child Recreational Users/Child Residents
9.3.CTE Adult Recreational Users/Child Residents
9.4.CTE Lifelong Recreational Users/Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	1E-08	--	2E-09	--	1E-08	Prostate	0.0002	--	0.00004	0.0003
			Chromium	2E-08	--	4E-07	--	4E-07	None Reported	0.00002	--	0.0006	0.0007
			Chemical Total	3E-08	--	4E-07	--	4E-07		0.0002	--	0.0007	0.0009
		Exposure Point Total						4E-07					0.0009
	Exposure Medium Total							4E-07					0.0009
Medium Total								4E-07					0.0009
Sediment	Sediment	Boggs Creek	Arsenic	2E-07	--	7E-08	--	2E-07	Skin, CVS	0.003	--	0.001	0.004
			Chromium VI	4E-07	--	- -	--	4E-07	None Reported	0.0006	--	--	0.0006
			Cobalt	- -	--	- -	--	- -	Thyroid	0.002	--	--	0.002
			Iron	- -	--	- -	--	- -	GS	0.007	--	--	0.007
			Manganese	- -	--	- -	--	- -	CNS	0.003	--	--	0.003
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	5E-07	--	7E-08	--	6E-07		0.01	--	0.001	0.02
		Exposure Point Total						6E-07					0.02
	Exposure Medium Total							6E-07					0.02
Medium Total								6E-07					0.02
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	0.02

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	3E-08	--	5E-09	--	3E-08	Prostate	0.001	--	0.0002	0.001
			Chromium	8E-08	--	2E-06	--	2E-06	None Reported	0.0001	--	0.003	0.003
			Chemical Total	1E-07	--	2E-06	--	2E-06		0.001	--	0.003	0.004
		Exposure Point Total						2E-06					0.004
	Exposure Medium Total							2E-06					0.004
Medium Total								2E-06					0.004
Sediment	Sediment	Boggs Creek	Arsenic	2E-06	--	3E-07	--	2E-06	Skin, CVS	0.05	--	0.008	0.06
			Chromium VI	7E-06	--	- -	--	7E-06	None Reported	0.01	--	--	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	0.04	--	--	0.04
			Iron	- -	--	- -	--	- -	GS	0.1	--	--	0.1
			Manganese	- -	--	- -	--	- -	CNS	0.05	--	--	0.05
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	9E-06	--	3E-07	--	1E-05		0.3	--	0.008	0.3
		Exposure Point Total						1E-05					0.3
	Exposure Medium Total							1E-05					0.3
Medium Total								1E-05					0.3
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	0.3

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	2E-08	--	9E-09	--	3E-08	Prostate	0.0002	--	0.00008	0.0003
			Chromium	2E-08	--	1E-06	--	1E-06	None Reported	0.00002	--	0.001	0.001
			Chemical Total	5E-08	--	1E-06	--	1E-06		0.0002	--	0.001	0.001
		Exposure Point Total						1E-06					0.001
	Exposure Medium Total							1E-06					0.001
Medium Total								1E-06					0.001
Sediment	Sediment	Boggs Creek	Arsenic	8E-07	--	2E-07	--	1E-06	Skin, CVS	0.005	--	0.001	0.006
			Chromium VI	1E-06	--	- -	--	1E-06	None Reported	0.001	--	--	0.001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.005	--	--	0.005
			Iron	- -	--	- -	--	- -	GS	0.01	--	--	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.005	--	--	0.005
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	2E-06	--	2E-07	--	2E-06		0.03	--	0.001	0.03
		Exposure Point Total						2E-06					0.03
	Exposure Medium Total							2E-06					0.03
Medium Total								2E-06					0.03
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	0.03

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	5E-08	--	1E-08	--	7E-08					
			Chromium	1E-07	--	3E-06	--	3E-06					
			Chemical Total	2E-07	--	3E-06	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
Medium Total								3E-06					
Sediment	Sediment	Boggs Creek	Arsenic	3E-06	--	5E-07	--	3E-06					
			Chromium VI	8E-06	--	- -	--	8E-06					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			Chemical Total	1E-05	--	5E-07	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
Medium Total								1E-05					
Receptor Total							Receptor Risk Total	1E-05					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	3E-09	--	7E-10	--	3E-09	Prostate	0.00005	--	0.00002	0.00007
			Chromium	4E-09	--	1E-07	--	1E-07	None Reported	0.000006	--	0.0002	0.0002
			Chemical Total	6E-09	--	1E-07	--	1E-07		0.00006	--	0.0002	0.0002
		Exposure Point Total						1E-07					0.0002
	Exposure Medium Total							1E-07					0.0002
Medium Total								1E-07					0.0002
Sediment	Sediment	Boggs Creek	Arsenic	4E-08	--	1E-08	--	5E-08	Skin, CVS	0.0007	--	0.0002	0.0008
			Chromium VI	9E-08	--	- -	--	9E-08	None Reported	0.0001	--	--	0.0001
			Cobalt	- -	--	- -	--	- -	Thyroid	0.0006	--	--	0.0006
			Iron	- -	--	- -	--	- -	GS	0.002	--	--	0.002
			Manganese	- -	--	- -	--	- -	CNS	0.0007	--	--	0.0007
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-07	--	1E-08	--	1E-07		0.004	--	0.0002	0.004
		Exposure Point Total						1E-07					0.004
	Exposure Medium Total							1E-07					0.004
Medium Total								1E-07					0.004
Receptor Total							Receptor Risk Total	3E-07				Receptor HI Total	0.004

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	2E-09	--	6E-10	--	3E-09	Prostate	0.0003	--	0.00006	0.0003
			Chromium	8E-09	--	2E-07	--	2E-07	None Reported	0.00003	--	0.0006	0.0007
			Chemical Total	1E-08	--	2E-07	--	2E-07		0.0003	--	0.0007	0.0010
		Exposure Point Total						2E-07					0.0010
	Exposure Medium Total							2E-07					0.0010
Medium Total								2E-07					0.0010
Sediment	Sediment	Boggs Creek	Arsenic	2E-07	--	1E-08	--	2E-07	Skin, CVS	0.01	--	0.0008	0.01
			Chromium VI	8E-07	--	- -	--	8E-07	None Reported	0.003	--	--	0.003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.01	--	--	0.01
			Iron	- -	--	- -	--	- -	GS	0.03	--	--	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.01	--	--	0.01
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	9E-07	--	1E-08	--	9E-07		0.07	--	0.0008	0.07
		Exposure Point Total						9E-07					0.07
	Exposure Medium Total							9E-07					0.07
Medium Total								9E-07					0.07
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	0.07

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	2E-09	--	9E-10	--	3E-09	Prostate	0.00005	--	0.00003	0.00008
			Chromium	1E-09	--	7E-08	--	7E-08	None Reported	0.000006	--	0.0003	0.0003
			Chemical Total	3E-09	--	7E-08	--	7E-08		0.00006	--	0.0003	0.0004
		Exposure Point Total						7E-08					0.0004
	Exposure Medium Total							7E-08					0.0004
Medium Total								7E-08					0.0004
Sediment	Sediment	Boggs Creek	Arsenic	6E-08	--	4E-09	--	6E-08	Skin, CVS	0.001	--	0.00009	0.001
			Chromium VI	7E-08	--	- -	--	7E-08	None Reported	0.0003	--	--	0.0003
			Cobalt	- -	--	- -	--	- -	Thyroid	0.001	--	--	0.001
			Iron	- -	--	- -	--	- -	GS	0.003	--	--	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.001	--	--	0.001
			Thallium	- -	--	- -	--	- -	NA	--	--	--	--
			Chemical Total	1E-07	--	4E-09	--	1E-07		0.007	--	0.00009	0.008
		Exposure Point Total						1E-07					0.008
	Exposure Medium Total							1E-07					0.008
Medium Total								1E-07					0.008
Receptor Total							Receptor Risk Total	2E-07				Receptor HI Total	0.008

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Recreational Users/Residents
Receptor Age: Lifelong (Child and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Boggs Creek	RDX	4E-09	--	2E-09	--	6E-09					
			Chromium	9E-09	--	2E-07	--	3E-07					
			Chemical Total	1E-08	--	2E-07	--	3E-07					
		Exposure Point Total						3E-07					
	Exposure Medium Total							3E-07					
Medium Total								3E-07					
Sediment	Sediment	Boggs Creek	Arsenic	2E-07	--	1E-08	--	2E-07					
			Chromium VI	8E-07	--	- -	--	8E-07					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Thallium	- -	--	- -	--	- -					
			Chemical Total	1E-06	--	1E-08	--	1E-06					
		Exposure Point Total						1E-06					
	Exposure Medium Total							1E-06					
Medium Total								1E-06					
Receptor Total							Receptor Risk Total	1E-06					

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

APPENDIX I.6.3

PROUCL PRINTOUTS

SURFACE WATER

	General UCL Statistics for Data Sets with Non-Detects		
User Selected Options			
From File	C:\Work Folders\Projects\Crane\SWMU 18\Data\Surface Water\ProUCL Data - Surface Water Boggs Creek.xls.w		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		

RDX

General Statistics

Number of Valid Data	5	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	1
		Percent Non-Detects	20.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.49	Minimum Detected	0.399
Maximum Detected	10.8	Maximum Detected	2.38
Mean of Detected	4.593	Mean of Detected	1.183
SD of Detected	4.373	SD of Detected	0.948
Minimum Non-Detect	0.16	Minimum Non-Detect	-1.833
Maximum Non-Detect	0.16	Maximum Non-Detect	-1.833

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.829	Shapiro Wilk Test Statistic	0.879
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.69	Mean	0.441
SD	4.291	SD	1.851
95% DL/2 (t) UCL	7.781	95% H-Stat (DL/2) UCL	27206
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	3.16	Mean in Log Scale	0.688
SD	4.549	SD in Log Scale	1.379
95% MLE (t) UCL	7.497	Mean in Original Scale	3.729
95% MLE (Tiku) UCL	7.547	SD in Original Scale	4.251
		95% t UCL	7.782
		95% Percentile Bootstrap UCL	6.847
		95% BCA Bootstrap UCL	7.682
		95% H UCL	478

RDX (Continued)			
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.569	**Data appear Normal at 5% Significance Level**	
Theta Star	8.067		
nu star	4.554		
A-D Test Statistic	0.412	**Nonparametric Statistics**	
5% A-D Critical Value	0.662	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.662	Mean	3.972
5% K-S Critical Value	0.399	SD	3.607
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.863
		95% KM (t) UCL	7.943
Assuming Gamma Distribution		95% KM (z) UCL	7.036
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	7.813
Minimum	0.000001	95% KM (bootstrap t) UCL	260.6
Maximum	10.8	95% KM (BCA) UCL	7.09
Mean	3.674	95% KM (Percentile Bootstrap) UCL	7.09
Median	1.56	95% KM (Chebyshev) UCL	12.09
SD	4.308	97.5% KM (Chebyshev) UCL	15.6
k star	0.226	99% KM (Chebyshev) UCL	22.51
Theta star	16.28		
Nu star	2.256	**Potential UCLs to Use**	
AppChi2	0.191	95% KM (t) UCL	7.943
95% Gamma Approximate UCL	43.36	95% KM (Percentile Bootstrap) UCL	7.09
95% Adjusted Gamma UCL	N/A		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			

CHROMIUM

General Statistics

Number of Valid Data	5	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	2
		Percent Non-Detects	40.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.527	Minimum Detected	-0.641
Maximum Detected	0.905	Maximum Detected	-0.0998
Mean of Detected	0.769	Mean of Detected	-0.292
SD of Detected	0.21	SD of Detected	0.303
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.811	Shapiro Wilk Test Statistic	0.798
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.661	Mean	-0.452
SD	0.209	SD	0.307
95% DL/2 (t) UCL	0.86	95% H-Stat (DL/2) UCL	0.966
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.292
		SD in Log Scale	0.246
		Mean in Original Scale	0.764
		SD in Original Scale	0.175
		95% t UCL	0.931
		95% Percentile Bootstrap UCL	0.886
		95% BCA Bootstrap UCL	0.883
		95% H-UCL	1.021

CHROMIUM (Continued)			
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data appear Normal at 5% Significance Level**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.769
5% K-S Critical Value	N/A	SD	0.171
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.121
		95% KM (t) UCL	1.027
Assuming Gamma Distribution		95% KM (z) UCL	0.968
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.052
Minimum	N/A	95% KM (bootstrap t) UCL	0.985
Maximum	N/A	95% KM (BCA) UCL	0.897
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.905
Median	N/A	95% KM (Chebyshev) UCL	1.297
SD	N/A	97.5% KM (Chebyshev) UCL	1.525
k star	N/A	99% KM (Chebyshev) UCL	1.974
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	1.027
95% Gamma Approximate UCL	N/A	95% KM (Percentile Bootstrap) UCL	0.905
95% Adjusted Gamma UCL	N/A		
Warning: Recommended UCL exceeds the maximum observation			
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			

SEDIMENT

	General UCL Statistics for Full Data Sets
User Selected Options	
From File	C:\Work Folders\Projects\Crane\SWMU 18\Data\Sediment\ProUCL Data - Boggs Creek Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		**Log-transformed Statistics**	
Minimum	4.53	Minimum of Log Data	1.511
Maximum	19.5	Maximum of Log Data	2.97
Mean	9.766	Mean of log Data	2.149
Median	9	SD of log Data	0.559
SD	5.873		
Std. Error of Mean	2.626		
Coefficient of Variation	0.601		
Skewness	1.479		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.866	Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	15.37	95% H-UCL	24.12
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	20.13
95% Adjusted-CLT UCL (Chen-1995)	15.94	97.5% Chebyshev (MVUE) UCL	24.65
95% Modified-t UCL (Johnson-1978)	15.65	99% Chebyshev (MVUE) UCL	33.52
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.734	**Data appear Normal at 5% Significance Level**	
Theta Star	5.633		
MLE of Mean	9.766		
MLE of Standard Deviation	7.417		
nu star	17.34		
Approximate Chi Square Value (.05)	8.913	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	14.09
Adjusted Chi Square Value	6.444	95% Jackknife UCL	15.37
		95% Standard Bootstrap UCL	13.51
Anderson-Darling Test Statistic	0.287	95% Bootstrap-t UCL	19.35
Anderson-Darling 5% Critical Value	0.681	95% Hall's Bootstrap UCL	32.44
Kolmogorov-Smirnov Test Statistic	0.22	95% Percentile Bootstrap UCL	14.05
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL	14.67
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	21.21
		97.5% Chebyshev(Mean, Sd) UCL	26.17
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	35.9
95% Approximate Gamma UCL	19		
95% Adjusted Gamma UCL	26.27		
Potential UCL to Use		Use 95% Student's-t UCL	15.37

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

CHROMIUM

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	11.1	Minimum of Log Data	2.407
Maximum	38.3	Maximum of Log Data	3.645
Mean	23.14	Mean of log Data	3.037
Median	20.8	SD of log Data	0.52
SD	11.48		
Std. Error of Mean	5.132		
Coefficient of Variation	0.496		
Skewness	0.429		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.936	Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	34.08	95% H-UCL	52.13
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	46.41
95% Adjusted-CLT UCL (Chen-1995)	32.63	97.5% Chebyshev (MVUE) UCL	56.47
95% Modified-t UCL (Johnson-1978)	34.24	99% Chebyshev (MVUE) UCL	76.22

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.107	**Data appear Normal at 5% Significance Level**	
Theta Star	10.98		
MLE of Mean	23.14		
MLE of Standard Deviation	15.94		
nu star	21.07		
Approximate Chi Square Value (.05)	11.65	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	31.58
Adjusted Chi Square Value	8.745	95% Jackknife UCL	34.08
		95% Standard Bootstrap UCL	30.77
Anderson-Darling Test Statistic	0.256	95% Bootstrap-t UCL	43.14
Anderson-Darling 5% Critical Value	0.681	95% Hall's Bootstrap UCL	38.54
Kolmogorov-Smirnov Test Statistic	0.203	95% Percentile Bootstrap UCL	30.6
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL	30.68
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	45.51
		97.5% Chebyshev(Mean, Sd) UCL	55.19
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	74.2
95% Approximate Gamma UCL	41.87		
95% Adjusted Gamma UCL	55.76		
Potential UCL to Use		Use 95% Student's-t UCL	34.08

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

COBALT

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	3.9	Minimum of Log Data	1.361
Maximum	13.5	Maximum of Log Data	2.603
Mean	10.07	Mean of log Data	2.213
Median	12.3	SD of log Data	0.534
SD	4.225		
Std. Error of Mean	1.89		
Coefficient of Variation	0.42		
Skewness	-0.944		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.844	Shapiro Wilk Test Statistic	0.812
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	14.1	95% H-UCL	23.87
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	20.76
95% Adjusted-CLT UCL (Chen-1995)	12.33	97.5% Chebyshev (MVUE) UCL	25.32
95% Modified-t UCL (Johnson-1978)	13.97	99% Chebyshev (MVUE) UCL	34.28
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.256	**Data appear Normal at 5% Significance Level**	
Theta Star	4.464		
MLE of Mean	10.07		
MLE of Standard Deviation	6.705		
nu star	22.56		
Approximate Chi Square Value (.05)	12.76	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	13.18
Adjusted Chi Square Value	9.698	95% Jackknife UCL	14.1
		95% Standard Bootstrap UCL	12.83
Anderson-Darling Test Statistic	0.547	95% Bootstrap-t UCL	13.28
Anderson-Darling 5% Critical Value	0.681	95% Hall's Bootstrap UCL	11.88
Kolmogorov-Smirnov Test Statistic	0.332	95% Percentile Bootstrap UCL	12.9
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL	12.23
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	18.31
		97.5% Chebyshev(Mean, Sd) UCL	21.87
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	28.87
95% Approximate Gamma UCL	17.81		
95% Adjusted Gamma UCL	23.43		
Potential UCL to Use		Use 95% Student's-t UCL	14.1

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.
Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

IRON

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	10800	Minimum of Log Data	9.287
Maximum	119000	Maximum of Log Data	11.69
Mean	49220	Mean of log Data	10.45
Median	28500	SD of log Data	0.964
SD	44810		
Std. Error of Mean	20040		
Coefficient of Variation	0.91		
Skewness	1.18		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.873	Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	91942	95% H-UCL	541723
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	137485
95% Adjusted-CLT UCL (Chen-1995)	93477	97.5% Chebyshev (MVUE) UCL	175788
95% Modified-t UCL (Johnson-1978)	93703	99% Chebyshev (MVUE) UCL	251026
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.753	**Data appear Normal at 5% Significance Level**	
Theta Star	65395		
MLE of Mean	49220		
MLE of Standard Deviation	56734		
nu star	7.527		
Approximate Chi Square Value (.05)	2.464	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	82182
Adjusted Chi Square Value	1.39	95% Jackknife UCL	91942
		95% Standard Bootstrap UCL	79010
Anderson-Darling Test Statistic	0.265	95% Bootstrap-t UCL	217359
Anderson-Darling 5% Critical Value	0.686	95% Hall's Bootstrap UCL	284717
Kolmogorov-Smirnov Test Statistic	0.234	95% Percentile Bootstrap UCL	80660
Kolmogorov-Smirnov 5% Critical Value	0.362	95% BCA Bootstrap UCL	82800
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	136571
		97.5% Chebyshev(Mean, Sd) UCL	174368
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	248612
95% Approximate Gamma UCL	150347		
95% Adjusted Gamma UCL	266549		
Potential UCL to Use		Use 95% Student's-t UCL	91942

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

MANGANESE

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	314	Minimum of Log Data	5.749
Maximum	1460	Maximum of Log Data	7.286
Mean	811.2	Mean of log Data	6.56
Median	765	SD of log Data	0.607
SD	453.7		
Std. Error of Mean	202.9		
Coefficient of Variation	0.559		
Skewness	0.564		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.982
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1244	95% H-UCL	2317
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1767
95% Adjusted-CLT UCL (Chen-1995)	1200	97.5% Chebyshev (MVUE) UCL	2178
95% Modified-t UCL (Johnson-1978)	1252	99% Chebyshev (MVUE) UCL	2986

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.643	**Data appear Normal at 5% Significance Level**	
Theta Star	493.8		
MLE of Mean	811.2		
MLE of Standard Deviation	632.9		
nu star	16.43		
Approximate Chi Square Value (.05)	8.265	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	1145
Adjusted Chi Square Value	5.908	95% Jackknife UCL	1244
		95% Standard Bootstrap UCL	1103
Anderson-Darling Test Statistic	0.179	95% Bootstrap-t UCL	1376
Anderson-Darling 5% Critical Value	0.682	95% Hall's Bootstrap UCL	1425
Kolmogorov-Smirnov Test Statistic	0.169	95% Percentile Bootstrap UCL	1126
Kolmogorov-Smirnov 5% Critical Value	0.359	95% BCA Bootstrap UCL	1096
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1696
		97.5% Chebyshev(Mean, Sd) UCL	2078
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2830
95% Approximate Gamma UCL	1612		
95% Adjusted Gamma UCL	2256		

Potential UCL to Use			
		Use 95% Student's-t UCL	1244

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects			
User Selected Options				
From File	C:\Work Folders\Projects\Crane\SWMU 18\Data\Sediment\ProUCL Data - Boggs Creek Sediment.xls.wst			
Full Precision	OFF			
Confidence Coefficient	95%			
Number of Bootstrap Operations	2000			
THALLIUM				
General Statistics				
Number of Valid Data	5		Number of Detected Data	2
Number of Distinct Detected Data	2		Number of Non-Detect Data	3
			Percent Non-Detects	60.00%
Raw Statistics			**Log-transformed Statistics**	
Minimum Detected	1.41		Minimum Detected	0.344
Maximum Detected	2.28		Maximum Detected	0.824
Mean of Detected	1.845		Mean of Detected	0.584
SD of Detected	0.615		SD of Detected	0.34
Minimum Non-Detect	1.25		Minimum Non-Detect	0.223
Maximum Non-Detect	2.22		Maximum Non-Detect	0.798
Note: Data have multiple DLs - Use of KM Method is recommended			Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),			Number treated as Detected	1
Observations < Largest ND are treated as NDs			Single DL Non-Detect Percentage	80.00%
Warning: Data set has only 2 Distinct Detected Values.				
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.				
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.				
Those methods will return a 'N/A' value on your output display!				
It is necessary to have 4 or more Distinct Values for bootstrap methods.				
However, results obtained using 4 to 9 distinct values may not be reliable.				
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.				
UCL Statistics				
Normal Distribution Test with Detected Values Only			**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	N/A		Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A		5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level			**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution			**Assuming Lognormal Distribution**	
DL/2 Substitution Method			DL/2 Substitution Method	
Mean	1.219		Mean	0.0803
SD	0.676		SD	0.538
95% DL/2 (t) UCL	1.864		95% H-Stat (DL/2) UCL	2.86
Maximum Likelihood Estimate(MLE) Method	N/A		Log ROS Method	
MLE method failed to converge properly			Mean in Log Scale	N/A
			SD in Log Scale	N/A
			Mean in Original Scale	N/A
			SD in Original Scale	N/A
			95% t UCL	N/A
			95% Percentile Bootstrap UCL	N/A
			95% BCA Bootstrap UCL	N/A
			95% H-UCL	N/A

THALLIUM (Continued)

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	1.584
5% K-S Critical Value	N/A	SD	0.348
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.22
		95% KM (t) UCL	2.053
Assuming Gamma Distribution		95% KM (z) UCL	1.946
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.32
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	2.28
Mean	N/A	95% KM (Percentile Bootstrap) UCL	2.28
Median	N/A	95% KM (Chebyshev) UCL	2.543
SD	N/A	97.5% KM (Chebyshev) UCL	2.958
k star	N/A	99% KM (Chebyshev) UCL	3.774
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	2.053
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	2.28
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

APPENDIX I.7

SAMPLE CALCULATIONS

CALCULATION WORKSHEET

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL INDUSTRIAL WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: R. JUPIN	**CHECKED BY:** L. Crofani	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface soil at Subarea C

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 (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1E-06 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:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	64.4	mg/kg	Chemical: Chromium
IR	=	100	mg/day	
EF	=	250	days/year	
ED	=	25	years	
FI	=	1		
CF	=	1E-06	kg/mg	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	9125	days	
CSFo	=	5.0E-01	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-03	(mg/kg/day)	

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL INDUSTRIAL WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: R. JUPIN	**CHECKED BY:** L. Cinfani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{64.4 \text{ mg/kg} \times 100 \text{ mg/day} \times 250 \text{ days/year} \times 25 \text{ years} \times 1 \times 1E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 2.25E-05 mg/kg/day

ILCR = 2.25E-05 mg/kg/day x 5.00E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 1.1E-05

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{64.4 \text{ mg/kg} \times 100 \text{ mg/day} \times 250 \text{ days/year} \times 25 \text{ years} \times 1 \times 1E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 9125 \text{ days}}$$

IEXnc = 6.30E-05 mg/kg/day

HQ = 6.30E-05 mg/kg/day / 3.00E-03 (mg/kg/day) = Hazard Quotient

HQ = 2.1E-02

CALCULATION WORKSHEET

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS INDUSTRIAL WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: R. JUPIN	**CHECKED BY:** L. Capone	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of surface soil at Subarea C.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24\ hours/day}$$

Where:

EC	=	exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (hours)
IUR	=	inhalation unit risk $((ug/m3)^{-1})$
RfC	=	inhalation reference concentration (mg/m3)

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFCi (mg/m3)

ASSUMPTIONS:

Cs	=	64.4	mg/kg	Chemical: Chromium
PEF	=	1.32E+09	m3/kg	
Ca	=	4.89E-08	mg/m3	
ET	=	8	hours/day	
EF	=	250	days/year	
ED	=	25	years	
ATc	=	25,550	days	
ATnc	=	9,125	days	
IUR	=	8.4E-02	$(ug/m3)^{-1}$	
RfC	=	1.0E-04	(mg/m3)	

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS INDUSTRIAL WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: R. JUPIN	**CHECKED BY:**	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{4.89E\text{-}08 \text{ mg/m3} \times 8 \text{ hours/day} \times 250 \text{ days/year} \times 25 \text{ years}}{25550 \text{ days} \times 24 \text{ hours/day}}$$

IEXc = 3.99E-09 mg/m3

ILCR = 3.99E-09 mg/m3 x 8.40E-02 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 3.4E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{4.89E\text{-}08 \text{ mg/m3} \times 8 \text{ hours/day} \times 250 \text{ days/year} \times 25 \text{ years}}{9125 \text{ days} \times 24 \text{ hours/day}}$$

IEXnc = 1.12E-08 mg/m3

HQ = 1.12E-08 mg/m3 / 1.00E-04 (mg/m3) = Hazard Quotient

HQ **1.1E-04**

CLIENT: NSA CRANE, CRANE, INDIANA	**JOB NUMBER:** 112G01851	
SUBJECT: CALCULATION OF PARTICULATE EMISSION FACTOR FOR CONSTRUCTION WORKERS		
BASED ON: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002)		
BY: R. JUPIN	**CHECKED BY:** L. Ciufoni	**DATE:** 11/26/2012

Equation 5-5
Derivation of the Particulate Emission Factor
Construction Scenario - Construction Worker

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \Sigma VKT} \right]$$

Parameter/Definition (units)	Default
PEF_{sc}/subchronic road particulate emission factor (m^3/kg)	site-specific
Q/C_{sr}/ inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m^2-s per kg/m^3)	23.02[a] (Equation 5-6)
F_D/dispersion correction factor (unitless)	0.185 (Appendix E)
T/total time over which construction occurs (s)	site-specific
A_R/surface area of contaminated road segment (m^2) L_R/length of road segment (ft) W_R/width of road segment (ft)	274.213 ($A_R = L_R \times W_R \times 0.092903 m^2/ft^2$)
W/mean vehicle weight (tons)	site-specific
p/number of days with at least 0.01 inches of precipitation (days/year)	site-specific (Exhibit 5-2)
ΣVKT/sum of fleet vehicle kilometers traveled during the exposure duration (km)	site-specific

[a] Assumes a 0.5 acre site

Q/C	23.02	(g/m^2-s per kg/m^3)	
Fd	0.185	dispersion correction factor (unitless)	
T	4.32E+06	sec	3600 sec/hr x 8hr/day x 150 days/yr
A_R	274.213	m^2	
W	8	tons	
p	125	day/year	
VKT	202.5	km	30 vehicles x 0.045 km/day x 150 days

PEF = 1.34E+06 m^3/kg

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from ingestion of groundwater at Subarea C.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IR \times EF \times ED}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/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:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cgw	=	1.79	ug/L	Chemical: Arsenic
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	8,760	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: R. JUPIN	**CHECKED BY:** L Ciofani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.79\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 24\ years}{70\ kg \times 25550\ days}$$

IEXc = 1.68E-05 mg/kg/day

ILCR = 1.68E-05 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 2.5E-05

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{1.79\ ug/L \times 0.001\ mg/ug \times 2\ L/day \times 350\ days/year \times 24\ years}{70\ kg \times 8760\ days}$$

IEXnc = 4.90E-05 mg/kg/day

$$HQ = \frac{4.90E\text{-}05\ mg/kg/day}{3.00E\text{-}04\ (mg/kg/day)} = \text{Hazard Quotient}$$

HQ = 1.6E-01

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Cofrin	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with groundwater at Subarea C.

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 dose 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:

ILCR (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:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$\text{If } tevent \le t^*, \text{ then: } DAevent = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If } tevent > t^*, \text{ then: } DAevent = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Clifford	**DATE:** 11/26/2012

Where:

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	=	0.00179 mg/L	Chemical: Arsenic
Kp	=	1.00E-03 cm/hr	
tevent	=	0.58 hr/event	

DA_{event} = 0.001 cm/hr x 0.00179 mg/L x 0.001 L/cm3 x 0.58 hr/event

DA_{event} 1.04E-09 mg/cm2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	18,000	cm^2
EV	=	1	event/day
ED	=	24	years
EF	=	350	days/year
BW	=	70	kg
ATc	=	25,550	days
ATnc	=	8,760	days
CSFd	=	1.5E+00	$(mg/kg/day)^{-1}$
RfDd	=	3.0E-04	(mg/kg/day)

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Cinfani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{1.04E\text{-}09 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 350 \text{ days/year} \times 18000 \text{ cm2}}{70 \text{ kg} \times 25550 \text{ days}}$$

DADc = 8.78E-08 mg/kg/day

DADc = 8.78E-08 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 1.3E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{1.04E\text{-}09 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 350 \text{ days/year} \times 18000 \text{ cm2}}{70 \text{ kg} \times 8760 \text{ days}}$$

DADnc = 2.56E-07 mg/kg/day

HQ = 2.56E-07 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 8.5E-04

CALCULATION WORKSHEET

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADULT RECREATIONAL USERS		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	**CHECKED BY:**	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface water at Boggs Creek.

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-3 mg/ug)
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:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo $(mg/kg/day)^{-1}$

HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Csw	=	7.94	ug/L	Chemical: RDX
CRsw	=	0.01	L/hr	
CF	=	1.0E-03	mg/ug	
ET	=	4	hours	
EF	=	26	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	8760	days	
CSFo	=	1.1E-01	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-03	(mg/kg/day)	

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADULT RECREATIONAL USERS		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	**CHECKED BY:** L. Cifone	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{7.94\ ug/L \times 1.0E\text{-}03\ mg/ug \times 0.01\ L/hr \times 4\ hours \times 26\ days/year \times 24\ years}{70\ kg \times 25550\ days}$$

IEXc = 1.11E-07 mg/kg/day

ICLR = 1.11E-07 mg/kg/day x 1.10E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ICLR **1.2E-08**

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{7.94\ ug/L \times 1.0E\text{-}03\ mg/ug \times 0.01\ L/hr \times 4\ hours \times 26\ days/year \times 24\ years}{70\ kg \times 8760\ days}$$

IEXnc = 3.23E-07 mg/kg/day

$$HQ = \frac{3.23E\text{-}07\ mg/kg/day}{3.00E\text{-}03\ (mg/kg/day)} = \text{Hazard Quotient}$$

HQ = 1.1E-04

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Cofrancesco	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface water.

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 dose 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:

ILCR (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:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$\text{If } tevent \le t^*, \text{ then: } DAevent = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If } tevent > t^*, \text{ then: } DAevent = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Ciufo	**DATE:** 11/26/2012

Where:

Kp	=	permeability coefficient from water (cm/hr)
Csw	=	concentration of chemical in surface water (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:

Csw	=	0.00794	mg/L	Chemical: RDX
Kp	=	3.39E-04	cm/hr	
FA	=	1	unitless	
tevent	=	4	hr/event	
CF	=	0.001	L/cm^3	
t*	=	4.42	hr/event	
τ	=	1.84	hr/event	
B	=	0.002		

tevent < t*, therefore,

$$DAevent = (2 \times 0.000339\ cm/hr)\ (1)\ (0.00794\ mg/L)\ (0.001\ L/cm3) \times \sqrt{\frac{6 \times 1.84\ hr/event \times 4\ hr/event}{\pi}}$$

DAevent = 2.02E-08 mg/cm^2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	5,700	cm^2
EV	=	1	event/day
ED	=	24	years
EF	=	26	days/year
BW	=	70	kg
ATc	=	25,550	days
ATnc	=	8,760	days
CSFd	=	1.1E-01	$(mg/kg/day)^{-1}$
RfDd	=	3.0E-03	(mg/kg/day)

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Cafaro	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{2.02E\text{-}08 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 26 \text{ days/year} \times 5700 \text{ cm2}}{70 \text{ kg} \times 25550 \text{ days}}$$

DADc = 4.01E-08 mg/kg/day

DADc = 4.01E-08 mg/kg/day x 1.10E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 4.4E-09

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{2.02E\text{-}08 \text{ mg/cm2-event} \times 1 \text{ event/day} \times 24 \text{ years} \times 26 \text{ days/year} \times 5700 \text{ cm2}}{70 \text{ kg} \times 8760 \text{ days}}$$

DADnc = 1.17E-07 mg/kg/day

HQ = 1.17E-07 mg/kg/day / 3.00E-03 (mg/kg/day) = Hazard Quotient

HQ = 3.9E-05

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989		
BY: R. JUPIN	**CHECKED BY:** L. Ciafani	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of sediment in Boggs Creek.

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 sediment (mg/kg)
IR	=	incidental 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:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	15.4	mg/kg	Chemical: Arsenic
IR	=	100	mg/day	
EF	=	52	days/year	
ED	=	24	years	
FI	=	0.5		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	8,760	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT ADULT RECREATIONAL USERS		
BASED ON: USEPA, DECEMBER 1989		
BY: R. JUPIN	**CHECKED BY:** L. Cinfoni	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{15.4 \text{ mg/kg} \times 100 \text{ mg/day} \times 52 \text{ days/year} \times 24 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 5.37E-07 mg/kg/day

ILCR = 5.37E-07 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 8.1E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{15.4 \text{ mg/kg} \times 100 \text{ mg/day} \times 52 \text{ days/year} \times 24 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 8760 \text{ days}}$$

IEXnc = 1.57E-06 mg/kg/day

HQ = 1.57E-06 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 5.2E-03

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT ADULT RECREATIONAL USERS		
BASED ON: USEPA, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 11/26/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with sediment.

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 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:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	15.4	mg/kg	Chemical: Arsenic
CF	=	1.0E-06	kg/mg	
SA	=	5,700	cm^2/day	
AF	=	0.07	mg/cm^2	
ABS	=	0.03		
EF	=	52	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	8,760	days	
CSFd	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDd	=	3.0E-04	(mg/kg/day)	

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT ADULT RECREATIONAL USERS		
BASED ON: USEPA, JULY 2004		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{15.4 \text{ mg/kg} \times 1.0E\text{-}06 \text{ kg/mg} \times 5700 \text{ cm2/day} \times 0.07 \text{ mg/cm2} \times 0.03 \times 52 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

DEXc = 1.29E-07 mg/kg/day

ILCR = 1.29E-07 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 1.9E-07

EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{15.4 \text{ mg/kg} \times 1.0E\text{-}06 \text{ kg/mg} \times 5700 \text{ cm2/day} \times 0.07 \text{ mg/cm2} \times 0.03 \times 52 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 8760 \text{ days}}$$

DEXnc = 3.75E-07 mg/kg/day

HQ = 3.75E-07 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 1.3E-03

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Capfani	**DATE:** 11/26/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion of sediment at Subarea C.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental 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)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.17	mg/kg	Chemical: Benzo(a)pyrene
IR	=	200	mg/day	
EF	=	52	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
FI	=	0.5		
CF	=	1.0E-06	kg/mg	
BW	=	15	kg	
AT	=	25,550	days	
CSFo	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L Cifani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{0.17 \text{ mg/kg} \times 200 \text{ mg/day} \times 52 \text{ days/year} \times 2 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 10$$

IEX_1 = 4.61E-08 mg/kg/day

$$IEX_2 = \frac{0.17 \text{ mg/kg} \times 200 \text{ mg/day} \times 52 \text{ days/year} \times 4 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEX_2 = 2.77E-08 mg/kg/day

ILCR = (4.61E-08 mg/kg/day + 2.77E-08 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 5.4E-07

CALCULATION WORKSHEET

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciufani	**DATE:** 11/26/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with of sediment at Subarea C.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (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)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.17	mg/kg	Chemical: Benzo(a)pyrene
CF	=	1.0E-06	kg/mg	
SA	=	2,800	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.13		
EF	=	52	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
AT	=	25,550	days	
CSFd	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Crofani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{0.17\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 52\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

DEXc = 3.36E-08 mg/kg/day

$$DEXc = \frac{0.17\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 52\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

DEXc = 2.02E-08 mg/kg/day

ILCR = (3.36E-08 mg/kg/day + 2.02E-08 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 3.9E-07

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Cuffaro	**DATE:** 11/26/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion of sediment at Subarea C.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental 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)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.17	mg/kg	Chemical: Benzo(a)pyrene
IR	=	100	mg/day	
EF	=	52	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
FI	=	0.5		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
AT	=	25,550	days	
CSFo	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:**	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{0.17 \text{ mg/kg} \times 100 \text{ mg/day} \times 52 \text{ days/year} \times 10 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEX_1 = 7.41E-09 mg/kg/day

$$IEX_2 = \frac{0.17 \text{ mg/kg} \times 100 \text{ mg/day} \times 52 \text{ days/year} \times 14 \text{ years} \times 0.5 \times 1.0E\text{-}06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 1$$

IEX_2 = 3.46E-09 mg/kg/day

ILCR = (7.41E-09 mg/kg/day + 3.46E-09 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 7.9E-08

CALCULATION WORKSHEET

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L. Ciofani	**DATE:** 11/26/2012

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with of sediment at Subarea C.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (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)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.17	mg/kg	Chemical: Benzo(a)pyrene
CF	=	1.0E-06	kg/mg	
SA	=	5,700	cm^2/day	
AF	=	0.07	mg/cm^2	
ABS	=	0.13		
EF	=	52	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
AT	=	25,550	days	
CSFd	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: NSWC CRANE, CRANE INDIANA		**JOB NUMBER:** 112G01851
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL ADULT RESIDENTS		
BASED ON: USEPA, JULY 2004, MARCH 2005		
BY: R. JUPIN	**CHECKED BY:** L Ciufani	**DATE:** 11/26/2012

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{0.17\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 5700\ cm2/day \times 0.07\ mg/cm2 \times 0.13 \times 52\ days/year \times 10\ years}{70\ kg \times 25550\ days} \times 3$$

DEXc = 7.69E-09 mg/kg/day

$$DEXc = \frac{0.17\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 5700\ cm2/day \times 0.07\ mg/cm2 \times 0.13 \times 52\ days/year \times 14\ years}{70\ kg \times 25550\ days} \times 1$$

DEXc = 3.59E-09 mg/kg/day

ILCR = (7.69E-09 mg/kg/day + 3.59E-09 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 8.2E-08

APPENDIX J

SUPPORTING DOCUMENTATION FOR THE ECOLOGICAL RISK ASSESSMENT

APPENDIX J
ECOLOGICAL RISK ASSESSMENT METHODOLOGY

This section presents the methodology for the ERAs performed for each subarea at SWMU 18. SWMU 18 was subdivided into ten subareas. Subarea-specific ERAs for Subarea B, Subarea C, Subarea F, and Boggs Creek are presented in Sections 6 through 9 of the report. The remaining subareas will be addressed in separate reports. The goal of the ERAs for SWMU 18 was to evaluate the potential for adverse ecological impacts due to site-related contamination. This goal was accomplished by identifying COPCs detected at concentrations that exceed screening levels, identifying the locations of these exceedances, and concluding whether or not further investigation and/or remedial action at SWMU 18 at NSA Crane is warranted from an ecological perspective.

1.0 INTRODUCTION

The screening-level ERA methodology used at NSA Crane is in accordance with the following guidance documents:

- Department of Navy (Navy) Environmental Policy Memorandum 97-04: Use of Ecological Risk Assessments dated May 16, 1997.
- Navy Policy for Conducting Ecological Risk Assessments (Navy, 1999).
- Final Guidelines for Ecological Risk Assessment (USEPA, 1998).
- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997).

This ERA consists of Steps 1, 2, and 3a of the eight-step ecological risk evaluation process discussed in USEPA guidance (USEPA, 1997 and 1998) and the Navy Policy for Conducting ERAs (Navy, 1999). The first two screening steps comprise the screening-level ERA, and correspond with Tier 1 of the Navy Policy (Navy, 1999), where conservative exposure estimates are compared to screening-level and threshold toxicity values. Step 3a is the first step of a baseline ecological risk assessment (BERA) and consists of refining the Tier 1 assumptions following Steps 1 and 2 to further focus the ERA process on the chemicals of greatest concern at a site. Step 3a corresponds with the first part of Tier 2 of the Navy Policy (Navy, 1999). Steps 3b through 7, which are conducted if additional ecological investigations are necessary, were not conducted for this ERA because no such investigations were carried out at the site.

Aspects of Step 8, risk management, are addressed throughout the ERA process, in cooperation with Region 5 regulators.

A schematic diagram of the general risk assessment process is provided on Figure J-1.

2.0 TIER 1, STEP 1: SCREENING-LEVEL PROBLEM FORMULATION

The screening-level problem formulation is the first step of the ERA and includes identification of potential receptor groups, COPCs, and the mechanisms for contaminant fate, transport, and toxicity. The complete exposure pathways that exist at a site are determined at this point to facilitate receptor selection. The problem formulation process enables the risk assessor to identify the ecological resources to be protected (known as assessment endpoints), the measures that were used to evaluate risks to those resources (known as measurement endpoints) and the chemicals, geographic areas, and environmental media relevant to the risk assessment.

As part of receptor identification, site habitats and potential ecological receptors, as they apply to ecological risk, are described in the following subsections.

2.1 ENVIRONMENTAL SETTING

2.1.1 Basewide Environmental Setting

A biological characterization of NSA Crane, including a list of plants and animals found at the facility, is presented in the Installation Assessment (IA) (Army, 1978) and the Initial Assessment Study (IAS) (NEESA, 1983) and is summarized in the Environmental Monitoring Reports (EMRs) (Halliburton NUS, 1992a and 1992b). A list of the species that may inhabit NSA Crane and that are protected under the United States Endangered Species Act, Indiana Department of Natural Resources Heritage Data Center, or the United States Fish and Wildlife Service (USFWS) is summarized in the RCRA Facility Permit and below. The following paragraphs briefly summarize the environmental setting at the base.

Eighty percent of NSA Crane's approximately 63,000 acres is classified as Central Hardwoods Forest of the United States (NEESA, 1983). In addition, some former agricultural fields are in various stages of succession. Open spaces on dry upland sites contain almost pure stands of grasses with some clumps of woody plants such as persimmon, sassafras, and sumac. Wetter sites have river birch, willow, sycamore, and cottonwood. Hillside communities have mostly hickory, white and black oak, red maple, sugar maple, tulip poplar, ash, and beech (NEESA, 1983).

The great variety of habitats at NSA Crane (i.e., many stages of forest succession, streams, ponds, Lake Greenwood, grassy open spaces) lead to great diversity of animal species (NEESA, 1983). These species include but are not limited to mammals such as white-tailed deer, beaver, coyote, hawks, red fox, rabbits, raccoons, and mice; birds such as ducks, geese, wild turkey, bobwhite quail, red-tailed hawks, and American robins; and various amphibians, reptiles, fish, and invertebrates.

Six main creeks receive drainage in five separate drainage basins at NSA Crane: First Creek, Sulphur Creek, Little Sulphur Creek, Boggs Creek, Turkey Creek, and Seed Tick Creek. There are also many smaller streams, creeks, and drainage ditches located at the facility, along with several small man-made ponds and one large lake (Lake Greenwood). Lake Greenwood is the source of potable water for NSA Crane. Surface water from the facility eventually discharges to the East Fork of the White River, which is located south of the facility.

Threatened and Endangered Species

The Endangered Species Management Plan for NSA Crane (Comarco Systems, Inc., 2000) identified the federal and state threatened and endangered species and species of special concern potentially present at the facility. Information included in the Endangered Species Management Plan was obtained from studies and surveys conducted by the Navy and other agencies and groups such as universities and research institutions. A small subset of these studies include the inventory of neotropical migratory birds, mist net and radiotelemetry surveys for the Indiana Bat, bobcat trapping, rattlesnake survey, Purdue University wildlife studies, and several fish surveys and bird counts. These studies and others that were used in compiling the list of endangered species present at NSA Crane are described in more detail in the Endangered Species Management Plan (Comarco Systems, Inc., 2000) and below.

The Indiana bat is the only federally threatened or endangered species documented to occur at NSA Crane. One mist net was located at SWMU 18 near the southern edge of subarea D during the mist net and radiotelemetry surveys for the Indiana Bat (ESI, 2005). No Indiana bats were captured at the location within SWMU 18 in June 2005.

The USFWS issued a notice in the Federal Register (72 FR 37346 et seq.) on July 9, 2007, that effective August 8, 2007, the American Bald Eagle would be removed from the federal List of Endangered and Threatened Wildlife and Plants. The American Bald Eagle is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The bald eagle is known to be present in Lake Greenwood approximately 2.5 miles north of SWMU 18.

In addition, a number of state endangered and federal and state species of concern have been listed for NSA Crane (Comarco Systems, Inc., 2000). The state endangered species list includes two mammals

(bobcat and Indiana bat), one reptile (timber rattlesnake), and several birds (bald eagle, osprey, loggerhead shrike, yellow-crowned night-heron, Virginia rail, king rail, and Henslow's sparrow).

2.1.2 Site-Specific Environmental Setting

SWMU 18 – Load and Fill Area is located in the west-central portion of NSA Crane. The site covers approximately 1 square mile (640 acres). It is bounded to the north and south by drainages to Boggs Creek, to the east by Boggs Creek, and to the west by Highway 101. Several buildings, roads, and paved lots are located within SWMU 18. Stormwater flows via drainage pathways on the ridge slops to tributaries of Boggs Creek and then to Boggs Creek.

The site was subdivided into 10 subareas for purposes of this investigation. Details on the environmental setting are discussed in the risk assessment for each subarea.

2.2 POTENTIAL SOURCES OF CONTAMINATION

SWMU 18 was used for projectile load and fills operations in the northern portion of the site and for research and development and testing in the southern portion of the site. Details on potential sources of contamination are discussed in the risk assessment for each subarea. Section 1 of this report presents in more detail descriptions of the operational history, descriptions of previous investigations and the potential sources of contamination for SWMU 18.

2.3 PHYSICAL AND CHEMICAL CHARACTERISTICS

VOCs, PAHs, PCBs, explosives, and metals were detected in environmental media from SWMU 18. Physical and chemical characteristics of contaminants may affect their mobility, transport, and bioavailability in the environment. These characteristics include bioaccumulation factors (BAFs), K_{OC}s, and K_{OW}s. The physical and chemical characteristics of the chemical classes present in SWMU 18 media are presented in the contaminant fate and transport sections of the RFI report and BAFs/biota-sediment accumulation factors (BSAFs) are presented in Table J.5.

2.4 POTENTIAL EXPOSURE PATHWAYS

Chemicals used and stored on site may have been released to soil and chemicals may have migrated to surface water drainage pathways. Details on potential exposure pathways are discussed in the risk assessment for each subarea.

2.4.1 Surface Soil

Several groups of terrestrial ecological receptors can be exposed to contaminants in surface soil. Invertebrates such as earthworms are exposed to contaminants as they move through the soil and ingest soil particles while searching for food. Plants are exposed to contaminants via direct contact as contaminants are absorbed through the roots, and contaminants are then translocated to different parts of the plants (e.g., leaves, seeds). These pathways are evaluated in the ERA.

Small mammals may be exposed to contaminants in soil via several exposure routes. They may be exposed by direct contact as they search for food or burrow into the soil. Exposure of terrestrial wildlife to contaminants in the soil via dermal contact is unlikely to represent a major exposure pathway because fur, feathers, and chitinous exoskeletons are expected to minimize transfer of contaminants across dermal tissue. Therefore, the dermal pathway was not evaluated in the ERA. Small mammals also may be exposed to contaminants in soil via incidental ingestion of soil and ingestion of plants and/or invertebrates that have accumulated contaminants from the soil. These pathways are evaluated in the ERA.

Larger predatory species such as the red fox and red-tailed hawk can be indirectly exposed to soil contaminants by ingesting small mammals that have accumulated contaminants from soil.

Terrestrial receptors are not substantially exposed to subsurface soils, so that pathway was not evaluated in the ERA. For this project, the surface soil depth interval was 0 to 2 feet below the ground surface. Soil samples from several locations listed below were collected under asphalt, concrete, or gravel. Terrestrial receptors are not substantially exposed to soil from those locations; therefore, data from those samples were not evaluated in the ERA.

Soil Sampling Locations Not Evaluated in ERA

Subarea	Locations collected under asphalt, concrete, gravel
A	18ASB002, 18ASB004
B	18BSB001, 18BSB003, 18BSB005, 18BSB006
C	18CSB005, 18CSB006, 18CSB008
D	18DSB003, 18DSB009, 18DSB011, 18DSB014, 18DSB016
E	18ESB006, 18ESB007, 18ESB008, 18ESB009, 18ESB010
F	18FSB001
G	18GSB004, 18GSS002
H	18HSB001, 18HSB002, 18HSB004
I	18ICP003

2.4.1 Sediment/Surface water

Contaminants in soil may enter Boggs Creek or tributaries to Boggs Creek via overland flow. Benthic invertebrates and other aquatic organisms can be exposed to chemicals in sediment and surface water. Piscivorous receptors may be exposed to contaminants in sediment via incidental ingestion of sediment and ingestion of invertebrates that have accumulated contaminants from the sediment. Terrestrial receptors and piscivorous receptors may be exposed to contaminants in surface water via ingestion of surface water and ingestion of organisms that have accumulated contaminants from surface water. These pathways are evaluated in the ERA. Surface water and sediment were only present at Subareas C and E and Boggs Creek. Piscivorous receptors were only evaluated at Boggs Creek. The water present at Subareas C and E was shallow with a maximum depth of 8 inches and water is expected to be present only part of the year; therefore, piscivorous receptors are not expected in these subareas.

Sediment samples from several locations (18ASD001, 18CSD003, 18CSD003, 18ESD003, 18ESD004, 18ESD005, 18ESD006, 18HSD001, 18HSD002, 18ISD001, 18ISD002, 18JSD001, and 18JSD002) were collected from within concrete settling basins. Benthic invertebrates, aquatic organisms, and piscivorous receptors are not substantially exposure to sediment located within settling basins; therefore, data from those samples were not evaluated in the ERA.

2.5 ASSESSMENT ENDPOINTS AND MEASUREMENT ENDPOINTS

Assessment endpoints are explicit expressions of the environmental value that is to be protected (USEPA, 1997). The selection of these endpoints is based on the habitats present, migration pathways of probable contaminants, and relevant exposure routes for the receptors. Measurement endpoints are estimates of measurable biological impacts (e.g., mortality, growth, and reproduction) that are used to evaluate the assessment endpoints. The assessment endpoints and measurement endpoints used to evaluate SWMU 18 data are presented in Table J.1.

2.5.1 Assessment Endpoints

Based on the habitat at SWMU 18, which consists of grass, nearby forested areas, and Boggs Creek and tributaries, and the chemicals present at the site, the assessment endpoints include protection of the following groups of receptors from adverse effects of contaminants on their growth, survival, and reproduction:

- Terrestrial vegetation
- Soil invertebrates
- Sediment invertebrates
- Aquatic organisms
- Herbivorous birds and mammals
- Invertivorous birds and mammals
- Piscivorous birds and mammals

The following paragraphs discuss the above assessment endpoints.

Terrestrial Vegetation: Terrestrial vegetation at SWMU 18 consists of grasses, shrubs, and trees. They serve as a food source and provide shade and cover for many organisms, and they help to prevent soil erosion, among other important functions. They also can accumulate some contaminants that can then be transferred to the higher trophic-level organisms that consume plants.

Soil Invertebrates: Soil invertebrates are present in soil at SWMU 18. They aid in the formation of soil and the redistribution and decomposition of organic matter in the soil, and they serve as a food source for higher trophic-level organisms. They also can accumulate bioaccumulative contaminants that can then be transferred to the higher trophic-level organisms that consume soil invertebrates.

Sediment Invertebrates: Sediment invertebrates present in sediment within Boggs Creek and tributaries serve as a food source for higher trophic-level organisms (i.e., fish, amphibians, birds, mammals). They can also accumulate contaminants, which can be transferred to higher trophic-level organisms that consume invertebrates.

Aquatic Organisms: Aquatic organisms such as amphibians, insects and other invertebrates serve as a food source for higher trophic-level organisms (i.e., birds, mammals). They can also accumulate contaminants, which can be transferred to higher trophic-level organisms that consume them.

Herbivorous Birds and Mammals: Herbivorous birds and mammals (i.e., animals that consume only plant tissue) forage in some portions of SWMU 18. Their role in the community is essential because, without them, higher trophic levels could not exist (Smith, 1966). They may be exposed to and accumulate contaminants present in the plants they consume.

Invertivorous Birds and Mammals: Invertivorous birds and mammals are present throughout the base in different terrestrial habitats (e.g., forested, open field) and are present at SWMU 18. These are

considered first-level carnivores, and they serve as a food source for higher trophic-level carnivores. They may be exposed to and accumulate contaminants present in the food items they consume.

Piscivorous Birds and Mammals: The term "piscivorous" is used here in a broad sense to describe birds and mammals that prey upon not only fish, but on a variety of aquatic and sediment dwelling organisms (e.g., crayfish, frogs). Piscivorous birds and mammals present at SWMU 18 can be exposed to and accumulate site-related contaminants that have accumulated in prey items obtained from the site.

As indicated in USEPA guidance (USEPA, 1997), "it is not practical or possible to directly evaluate risks to all of the individual components of the ecosystem at a site. Instead, assessment endpoints focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site." Therefore, the ERA will focus on the endpoints that will tend to yield the highest risks, which should then account for endpoints that will have lower risks.

Omnivores were not selected as assessment endpoints because exposure to contaminants in plants is greatest for herbivores, and exposure to contaminants in animals is greatest for invertivores. Therefore, omnivores are protected by protecting herbivores and invertivores. Large carnivorous birds and mammals were not selected as assessment endpoints because their home range (hundreds of acres) is much larger than the subareas from SWMU 18 that are evaluated in separate ERAs. The subareas range in size from approximately 20 acres to 90 acres, so they would only consume a small portion of food from the site. Therefore, risks would be greater to small mammals and birds that may obtain all of their food from the site. Although reptiles and amphibians may be present, they were not selected as assessment endpoints because of the general lack of toxicity information and the lack of methods to evaluate their exposure to chemicals.

2.5.2 Measurement Endpoints

Measurement endpoints used to evaluate the assessment endpoints in the ERA are presented in Table J.1

2.5.3 Selection of Receptor Species

Many receptors in the soil/sediment environment at SWMU 18 are typically grouped into general categories such as soil/sediment invertebrates and vegetation. This is a reflection of the nature of the threshold values, effects values, or criteria typically used to characterize risk for such organisms. However, for vertebrate receptors, selection of a representative species is required so that risks to these upper-level species incurred by intake through eating and drinking can be estimated.

Ingestion is the primary route of exposure for most mammals and birds. The selection of species used to represent the receptor groups identified in Section 2.5.1 was based on considerations of their preferred habitat, body size, sensitivity to contaminants, home range, abundance, commercial or sport utilization, legal status, and functional role (e.g., predators). The availability of exposure parameters such as body mass, feeding rate, and drinking rate was also a factor in selecting surrogate species. The following surrogate species were used in the food chain modeling conducted as part of this ERA:

- Herbivorous mammal - Meadow vole
- Herbivorous bird - Bobwhite quail
- Invertivorous mammal - Short-tailed shrew
- Invertivorous bird - American woodcock
- Piscivorous mammal – Mink
- Piscivorous bird – Belted kingfisher

Receptor profiles for each of the species above are presented in Appendix J.

2.6 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) in ERA problem formulation is a written description of predicted relationships between ecological entities and the stressors to which they may be exposed (USEPA, 1998). The CSM consists of two primary components: predicted relationships among stressor, exposure, and assessment endpoint response, and a diagram that illustrates the relationships (USEPA, 1998). At SWMU 18, the sources of the chemicals include the chemicals used and stored on site for projectile load and fill operations and research and development and testing. The primary stressors to ecological receptors are contaminants in surface soil, surface water, and sediment. The primary receptors for contaminants in surface soil, surface water, and sediment are plants, soil invertebrates, sediment invertebrates, and aquatic organisms and secondary receptors are birds and mammals. Figure J-2 represents the ecological CSM for SWMU 18.

3.0 TIER 1, STEP 2: SCREENING-LEVEL EXPOSURE ESTIMATE AND RISK QUOTIENTS

3.1 ECOLOGICAL EFFECTS EVALUATION

The preliminary ecological effects evaluation is an investigation of the relationship between the magnitude of exposure to a chemical and the nature and magnitude of adverse effects resulting from exposure. In addition to being a toxicological evaluation, it may also include descriptions of apparent effects seen during the site visit (e.g., stressed vegetation). Toxicity thresholds are usually expressed in units of concentration when the medium of concern is in intimate contact with the receptor, such as soil for soil

invertebrates. For other receptors, such as terrestrial vertebrates, toxicity data are typically available as doses, with units equal to mass of contaminant per unit of body mass per unit of time (usually mg/kg-day).

3.2 EXPOSURE CHARACTERIZATION

As the first step in the ecological effects evaluation, COPCs were selected by comparing contaminant concentrations in surface soil to ecological screening levels. For surface soil, chemical concentrations were compared to USEPA Ecological Soil Screening Levels (Eco SSLs) (USEPA, 2007a and supporting documents) because they are the most current screening levels. If USEPA Eco SSLs were not available, Region 5 soil ESLs (USEPA, 2003) were used next in order of preference, followed by the values from Canadian Soil Quality Guidelines (CCME, 1999a-e, 2001, 2004a-d, 2010) and the Oak Ridge National Laboratory (ORNL) Toxicological Benchmarks for plants (Efroymson et al., 1997a) and invertebrates (Efroymson et al., 1997b), Ecotoxicology of Explosives (Sunahara, et al., 2009), and Los Alamos National Laboratory (LANL) ECORISK database (version 3; LANL, 2011). Note that because most of the Region 5 ESLs are based on risks to mammals, screening levels specific to plants or invertebrates from other sources were used preferentially for those endpoints, when available. Table J.2 presents the soil screening levels for plants, invertebrates, mammals, and birds for each chemical and the sources of each value. For sediment, the Region 5 sediment ESLs (USEPA, 2003), followed by Region 3 freshwater sediment ESLs (USEPA, 2006a) and freshwater sediment screening levels (or marine values if freshwater criteria were not available) from the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (Buchman, 2008) were used in COPC selection for all chemicals except explosives. Sediment screening values for explosives are from the Ecotoxicology of Explosives (Sunahara et al., 2009). These sediment screening values are protective of sediment invertebrates. For surface water, the USEPA National Recommended Water Quality Criteria, chronic freshwater (USEPA, 2009), followed by USEPA Region 5 water ESLs (USEPA, 2003) and Region 3 freshwater ESLs (USEPA, 2006b) were used in COPC selection. These surface water screening values are protective of aquatic organisms.

The doses in mg/kg-day were estimated for mammals and birds using exposure dose equations. Note that the food chain models were conducted on a dry-weight basis to be consistent with the soil/sediment concentrations which are reported on a dry-weight basis. Therefore, the concentrations in the food items were estimated on a dry-weight basis. The following generic equation was used to calculate the EPCs for wildlife from exposure to chemicals in soil/sediment, surface water, and associated food items such as plants, soil invertebrates, and fish/sediment invertebrates:

$$CDI = \frac{[(Cf * If) + (Cs * Is) + (Cs * Iw)] * H}{BW}$$

Where: CDI = Chronic daily intake [milligrams per kilogram (mg/kg)-day]
Cf = Chemical concentration in food – (see discussion below)
Cs = Chemical concentration in surface soil/sediment (mg/kg)
If = Food ingestion rate [kilograms per day (kg/day)]
Is = Incidental surface soil/sediment ingestion rate (kg/day)
Iw = Water ingestion rate (L/day)
H = Portion of food intake from the contaminated area (unitless)
BW = Body weight (kg)

The exposure factors used for the food chain model, their derivation, and the receptor profiles for the surrogate species are presented in Appendix J. The exposure assumptions (i.e., ingestion rate, body weight) were obtained primarily from the Wildlife Exposure Factors Handbook (USEPA, 1993) and USEPA Eco SSL Guidance Attachment 4-1 (2007a) with other sources used as necessary. Food ingestion rates are on a dry-weight basis as discussed above.

Chemical concentrations in food items for soil invertivorous and herbivorous receptors were calculated using soil-to-invertebrate or soil-to-plant BAFs and regression equations from the USEPA Eco SSL Guidance Document Attachment 4-1 (2007a). The BAFs are documented in Appendix J. The following equation was used to calculate chemical concentrations in plants or invertebrates when BAFs were used:

$$Cf = Cs * BAF$$

Where: Cf = Contaminant concentration in food (mg/kg)
Cs = Contaminant concentration in surface soil (mg/kg)
BAF = Biota-soil bioaccumulation factor (unitless)

Chemical concentrations in food items for piscivorous receptors were calculated using sediment-to-fish biota-sediment bioaccumulation factors (BSAFs) and sediment-to-invertebrate BSAFs. Contaminant concentrations in food items for piscivorous receptors were calculated as follows:

$$Cf\ (\text{for inorganics}) = Csd * BSAF$$

Where: Cf = Contaminant concentration in food (mg/kg)
Csd = Contaminant concentration in sediment (mg/kg)
BSAF = Biota-sediment bioaccumulation factor (unitless)

$$Cf\ (\text{for organics}) = Csd * \left(BSAF * \frac{\%L}{\%TOC} \right)$$

Where: Cf = Contaminant concentration in food (mg/kg)
Csd = Contaminant concentration in sediment (mg/kg)
BSAF = Biota-sediment bioaccumulation factor (for organics) (unitless)
%L = Percent lipids [14.4% (dry weight)]
%TOC = Percent total organic carbon (0.77% average of Boggs Creek data)

A default value of 1.0 was used for the BAF and BSAF when chemical-specific data was not available. Sources of BAFs and BSAFs are documented in Appendix J.

The food chain model scenarios were calculated using various exposure assumptions to present a range of potential risks. For selecting chemicals as COPCs, the following Tier 1 exposure assumptions were used:

- Maximum soil concentrations
- 90th percentile BAFs (or maximum value if a 90th percentile value is not available) or regression equations
- Conservative receptor body weight and ingestion rates
- Receptors spend 100% of their time at the Site

3.3 RISK CHARACTERIZATION

An Ecological Effects Quotient (EEQ) approach was used to characterize the risk to ecological receptors. This approach characterizes potential effects by comparing exposure concentrations with effects data. The EEQs for terrestrial receptors were calculated as follows:

$$EEQ = \frac{Css}{SSSL}$$

where: EEQ = Ecological Effects Quotient (unitless)
C_{ss} = Contaminant concentration in surface soil (µg/kg)
SSSL = Surface soil screening level (µg/kg)

The EEQs for sediment invertebrates were calculated as follows:

$$EEQ = \frac{Csd}{SdSL}$$

where: EEQ = Ecological Effects Quotient (unitless)
Csd = Chemical concentration in sediment (µg/kg or mg/kg)
SdSL = Sediment screening level (µg/kg or mg/kg)

The EEQs for aquatic organisms were calculated as follows:

$$EEQ = \frac{Csw}{SwSL}$$

where: EEQ = Ecological Effects Quotient (unitless)
Csw = Chemical concentration in surface water (µg/L)
SwSL = Surface water screening level (µg/L)

The EEQs for wildlife were calculated as follows:

$$EEQ = \frac{CDI}{TRV}$$

where: EEQ = Ecological effects Quotient (unitless)
CDI = Chronic daily intake dose (mg/kg-day)
TRV = Toxicity reference value (NOAEL or LOAEL) (mg/kg-day)

An EEQ of greater than 1.0 was considered to indicate potential risk. Such values do not necessarily indicate that an effect will occur but only that a low (i.e., conservative) threshold has been exceeded.

3.4 TIER 1, STEP 2: SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN

The following rules were used to select COPCs for SWMU 18:

- A contaminant was selected as a COPC for risks to terrestrial plants, soil invertebrates, sediment invertebrates, and aquatic organisms if the maximum detected concentration in surface soil, sediment, or surface water exceeded the associated screening level or a screening level was not available.

- If a contaminant had a maximum detected concentration that exceeded associated soil screening level for birds or mammals or a screening level was not available for a bioaccumulative chemical, then the chemical was retained for food chain modeling for wildlife. If the EEQs were greater than 1.0 based on the conservative food chain model, the chemical was selected as a COPC.

- All bioaccumulative chemicals detected in sediment were retained for food chain modeling for wildlife. If the EEQs were greater than 1.0 based on the conservative food chain model, the chemical was selected as a COPC.

- Calcium, magnesium, potassium, and sodium were not selected as COPCs because they are naturally occurring, essential nutrients that can be tolerated by living systems at high concentrations. No evidence indicates that these chemicals are related to site operations, and they are not considered hazardous chemicals.

- Chemicals with concentrations that were determined to be similar to or less than background concentrations based on the background evaluation presented in Section 5 were not selected as COPCs because they are not considered related to site operations.

- Diesel range organics (DRO) were not selected as COPCs because they lack ecological screening levels. However, because the soil and sediment samples were analyzed for PAHs and VOCs, risks from these compounds are evaluated indirectly by evaluating risks from the individual chemicals. Therefore, risks from DRO are not discussed below.

Contaminants retained as COPCs were further evaluated as part of Step 3a of the eight-step ERA process.

4.0 TIER 2, STEP 3A – COPC REFINEMENT

Step 3a consists of refining the conservative exposure assumptions/concentrations used to evaluate potential risks to ecological receptors and re-evaluating the analytical data using benchmarks that are more appropriate for the assessment endpoints. The objective of the Step 3a refinement was to better determine which chemicals contribute to potentially unacceptable levels of ecological risk, and to identify and eliminate from further consideration those COPCs that were initially selected as COPCs because of the use of very conservative exposure scenarios but are not likely causing a significant risk. The Step 3a evaluation can also be used to eliminate chemicals from further evaluation for certain groups of receptors that are not at significant risk. For example, a chemical might not be retained as a COPC in soil for plants based on low risks to plants but the same chemical might be retained as a COPC based on risks to

invertebrates or wildlife. This is important because if the site proceeds further to a BERA, the studies in the BERA should only focus on the receptors that are at potential risk.

For chemicals evaluated further in Step 3a, the following factors were evaluated, as appropriate, to determine if the risks are great enough to warrant additional evaluations (i.e., proceed to a BERA, develop cleanup levels, proceed to a Corrective Measures Study [CMS]). All of these factors may not be discussed for each chemical and/or receptor group.

- Magnitude of criterion exceedance: Although the magnitude of risks may not relate directly to the magnitude of a criterion exceedance, the magnitude of the criterion exceedance may be one item used in a lines-of-evidence approach to determine the need for further site evaluation. The greater the criterion exceedance, the greater the probability and concern that an unacceptable risk exists.

- Frequency of chemical detection and spatial distribution: A chemical detected at a low frequency typically is of less concern than a chemical detected at higher frequency if toxicity and concentrations and spatial areas represented by the data are similar. All else being equal, chemicals detected frequently were given greater consideration than those detected relatively infrequently. In addition, the spatial distribution of a chemical may be evaluated to determine the area that a sample represents.

- Contaminant bioavailability: Many contaminants (especially inorganics) are present in the environment in forms that are typically not bioavailable, and limited bioavailability was considered when evaluating exposures of receptors to site contaminants. Contaminants with generally less bioavailability are considered to be less toxic than more bioavailable contaminants, all other factors being equal.

- Habitat: Although exceedances of criteria may occur, potential risks to ecological receptors may be minimal if there is little habitat for those receptors. Therefore, the extent of habitat was used qualitatively when considering additional evaluation. Areas with little habitat were less of a concern than areas with suitable habitat to support the receptors of interest.

- Alternate benchmarks: These benchmarks are used to further evaluate risks to specific groups of ecological receptors (e.g., plants, invertebrates). Higher effect benchmarks [e.g., probable effects concentrations (PECs)] are used to further evaluate risks to sediment invertebrates from chemicals that exceeded conservative screening levels.

- Food Chain Modeling: Exposure via the food chain is a major pathway of concern for chemicals known to significantly bioaccumulate and/or biomagnify. Thus, potential risk to upper level receptors was evaluated using food chain models. The Tier 1 exposure doses calculated for terrestrial wildlife were re-calculated using the following Tier 2, Step 3a exposure assumptions and chemical concentrations:

    - Average soil/sediment concentrations
    - Median or mean BAFs (if available)
    - Average receptor body weights and ingestion rates

5.0 ECOLOGICAL RISK UNCERTAINTY ANALYSIS

This section discusses some of the uncertainties associated with the SWMU 18 ERA.

5.1 UNCERTAINTY IN ASSESSMENT ENDPOINTS AND MEASUREMENT ENDPOINTS

Measurement endpoints were used to evaluate the assessment endpoints selected for the ERA. For the ERA, the measurement endpoints were not the same as the assessment endpoints. Measurement endpoints were used to predict effects to the assessment endpoints by selecting surrogate species to be evaluated. For example, a decrease in reproduction of a shrew was used to assess a decrease in reproduction of the small mammal population. However, predicting a decrease in reproduction of a shrew may either underprotect or overprotect the small mammal population based on differences in ingestion rates, toxicity, food preferences, home ranges, etc. between different species.

As discussed in Section 2.1.1, several endangered and threatened species or species of special concern are present at NSA Crane and potentially may inhabit SWMU 18. Risks to these species were not specifically calculated, so the uncertainties of not calculating risks to these species are presented here. Unacceptable risks to the bobcat, bald eagle, Northern harrier, and osprey are not expected because habitat is not available. The bobcat has a significantly larger home range. The bald eagle and osprey require open water habitat, which is not available at SWMU 18, but is available in Lake Greenwood located approximately 2.5 miles from the site. The Northern harrier prefers wetlands habitat, which is not available at SWMU 18. However, there is uncertainty with this conclusion because risks were not quantitatively evaluated.

Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American woodcock in the food-chain model. Because worms are in direct contact with soil, it is expected that they would have greater levels of contaminants at SWMU 18 than aboveground insects; therefore, risks to the woodcock

from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. By protecting the woodcock, these other invertivorous birds will also be protected. As mentioned in Section 2.1.1, the presence of the Indiana bat has not been documented at SWMU 18 and no Indiana bats were captured at the mist net site within SWMU 18.

Finally, there are uncertainties in risks to reptiles and amphibians because there is a lack of exposure factors for reptiles and amphibians and a lack of reptile and amphibian toxicity data for the detected chemicals. As discussed in Section 2.1.1, one threatened reptilian species is listed as potentially present at NSA Crane. Based on the preferred habitat of the timber rattlesnake and the ecology of SWMU 18, this species likely does not inhabit areas of SWMU 18. Risks to carnivorous reptiles were not specifically calculated; however, risks are accounted for by using invertivorous birds and mammals as surrogates.

5.2 UNCERTAINTY IN EXPOSURE CHARACTERIZATION

The contaminant dose to terrestrial wildlife is calculated using an equation that incorporates ingestion rates, body weights, BAFs, and other exposure factors. The exposure factors were obtained from literature studies or predicted using various equations. Ingestion rates and body weights vary among species, especially among species inhabiting different areas. This was taken into account when selecting exposure parameters from USEPA (USEPA, 1993), and an attempt was made to minimize the uncertainties associated with the exposure characterization by selecting exposure parameters from studies conducted in Indiana and surrounding states.

Bioaccumulation of contaminants into various biological media (e.g., plants, invertebrates, small mammals) depends on characteristics of the media such as pH, organic carbon, etc. Therefore, actual BAFs at the sites may be different than those used in the ERA and obtained from the literature. Also, the bioavailability of contaminants reported in toxicity studies is typically greater than the contaminants in environmental media. Typically, highly bioavailable forms of the chemicals are used when conducting toxicity tests and/or conducting dosing studies for wildlife.

Earthworm BAFs for 1,3-dinitrobenzene, HMX, and thallium were not available. A sediment invertebrate BSAF was not available for RDX. The explosives 1,3-dinitrobenzene, HMX, and RDX have plant BAGs greater than 1 indicating bioaccumulation in plants; however, these compounds are water soluble and not expected to accumulate in tissue; therefore, using a BAF/BSAF of 1 for soil and sediment invertebrates is conservative. These explosives do not indicate risk to soil and sediment invertebrates using the conservative BAF/BSAF of 1 because food chain modeling results in EEQs less than 1. Using a default earthworm BAF of 1 for thallium indicates risk to the short-tailed shrew at Subareas A, D through H, and J. However, using a default earthworm BAF of 1 is over conservative for thallium as thallium is not expected to accumulative in tissue. It is expected that the actual BAF would be more similar to chemicals

such as barium (0.091) cobalt (0.122) and vanadium (0.042), which also are not considered bioaccumulative chemicals. Had these lower BAFs been used, the EEQs for thallium would have been much lower and would not present a significant risk to wildlife at the concentrations detected at SWMU 18.

There is uncertainty in the chemical data collected at the site. Measured levels of chemicals are only estimates of true site chemical concentrations. At SWMU 18, samples were deliberately biased toward suspected high concentrations, so predicted doses are probably higher than actual doses. Whereas this is a conservative approach in predicting exposure concentrations, actual exposure of ecological receptors to chemical concentrations at SWMU 18 is likely overestimated. In particular, wildlife that typically roam over multiple sample locations are unlikely to obtain all of their food from within the most contaminated areas at SWMU 18.

The samples from the subareas at SWMU 18 were primarily collected from open areas near site activities. Most of the habitat in these areas consists of mowed grass. Because limited habitat is available near the sampling locations, it is not likely that wildlife would obtain a significant portion of their diet from these areas. Wildlife are expected to obtain most of their diet from nearby forested areas not impacted by site activities, where the habitat is better and chemical concentrations are lower.

5.3 UNCERTAINTY IN ECOLOGICAL EFFECTS DATA

Uncertainty exists in the ecological effects data, including the screening levels and wildlife TRVs. Several of the screening levels are very conservative, and typically are based on studies where the bioavailability of the chemical is much greater than it is in the environment. Also, toxicity data was not available or was limited for some chemicals.

The NOAELs/LOAELs used for the wildlife endpoints species are based on species other than the endpoint species (e.g., rats, mice). Uncertainty exists in the application of toxicity data across species because the contaminant may be more or less toxic to the endpoint species than it was to the test study species.

5.4 UNCERTAINTY IN RISK CHARACTERIZATION

Risks are possible if an EEQ is greater than or equal to 1.0 regardless of the magnitude of the EEQ. However, the magnitude of effects to ecological receptors cannot be inferred based on the magnitude of the EEQ. Rather, an EEQ greater than 1.0 simply indicates that the dose used to derive the toxicity reference value was exceeded.

Finally, there is uncertainty in how the predicted risks to a species at a site translate into risk to the population in the area as a whole.

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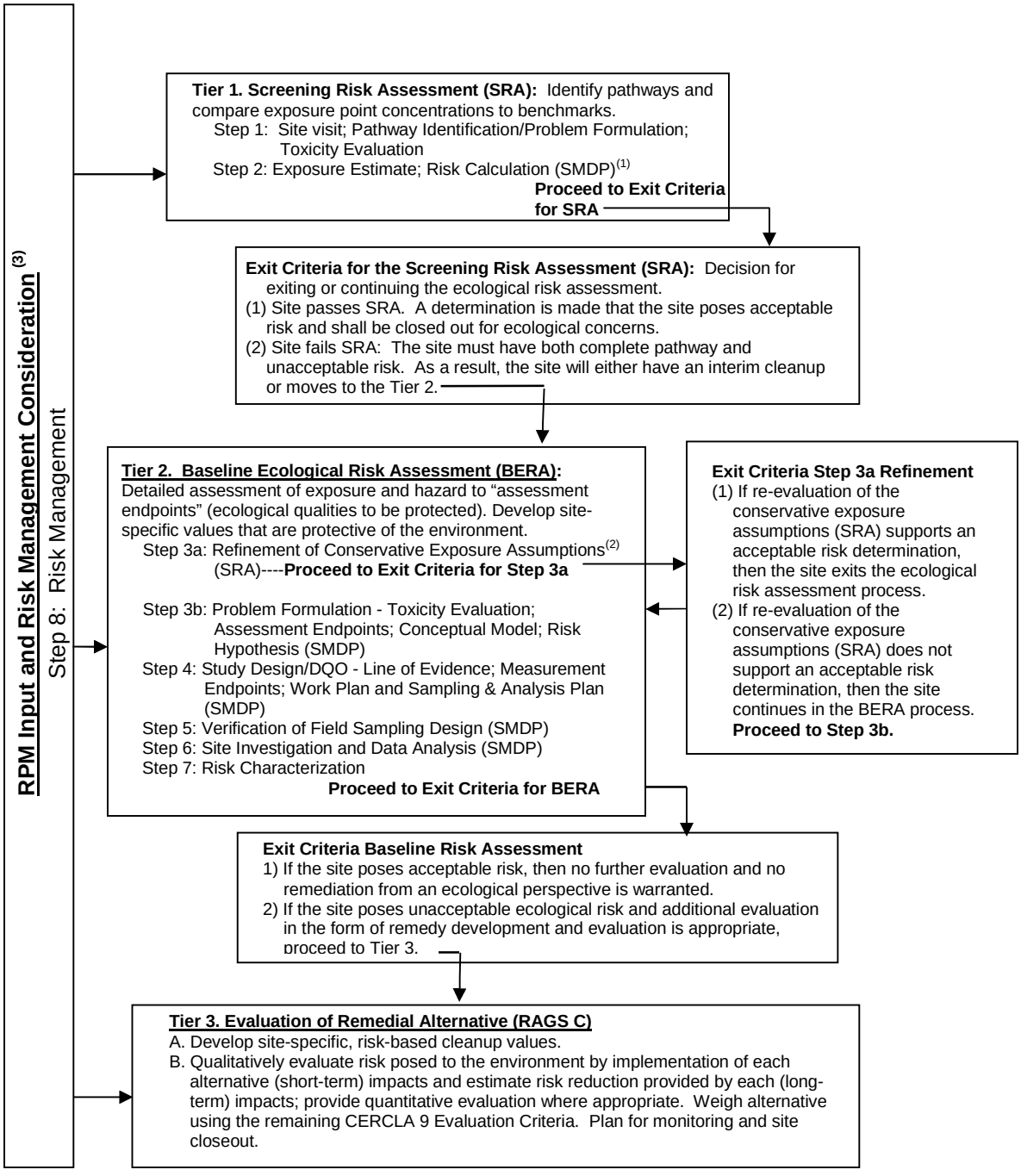
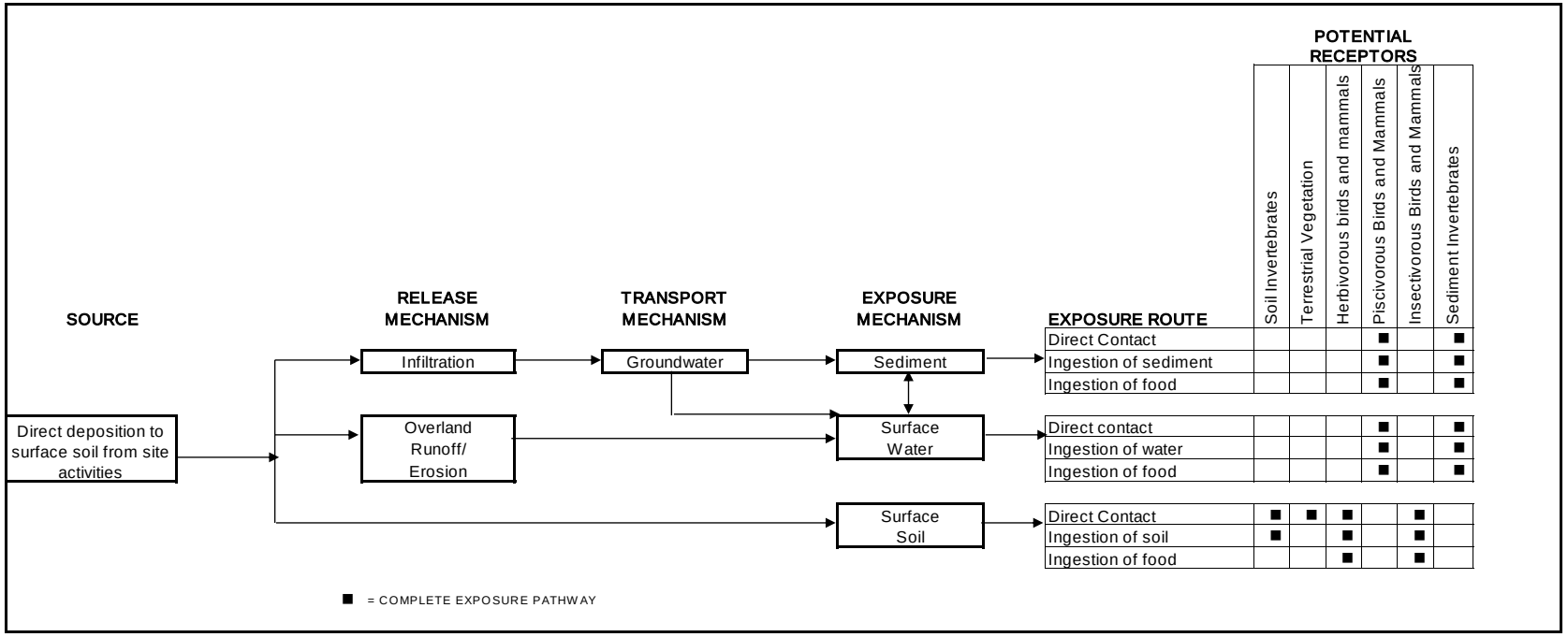
FIGURE J-1

NAVY ECOLOGICAL RISK ASSESSMENT TIERED APPROACH
SWMU 18 – LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA



Notes: 1 See USEPA's 8 Steps ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2 Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3 Risk management is incorporated throughout the tiered approach.



Blank space indicates incomplete exposure pathway or relatively insignificant, or not applicable, potential exposure.

FIGURE J-2

ECOLOGICAL CONCEPTUAL SITE MODEL
SWMU 18 | LOAD AND FILL AREA
NSA CRANE, INDIANA

This appendix presents a discussion of the different chemical classes detected at the sites, including toxicity information, potential food chain and trophic transfer, and bioaccumulation potential.

Polynuclear Aromatic Hydocarbons

Polynuclear aromatic hydocarbons (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, 1989a). In soil and sediments, microbial metabolism is the major process for degradation of PAHs (ATSDR, 1989a). 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, 1989a).

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, 1989a).

PCBs

The term polychlorinated biphenyls (PCBs) commonly refers to a variety of mixtures of individual biphenyl isomers, each consisting of two joined benzene rings and up to 10 chlorine atoms. Mixtures of these isomers are known by their commercial designation of Aroclor. This trade name is followed by a four-digit number; the first two numbers indicate the type of isomer mixture and the last two numbers indicate the approximate weight percent of chlorine in the mixture (USEPA, 1985).

PCBs released into water adsorb to sediments and other organic matter. Typically, PCB concentrations are greater in the sediment and suspended material than in the water column. Substantial quantities of PCBs in aquatic sediments can act as an environmental reservoir from which PCBs may be released slowly over a long period of time (ATSDR, 1989b). For PCBs that exist in the dissolved state in water, volatilization becomes the primary fate process (USEPA, 1985).

Degradation of PCBs in the environment is dependent upon the degree of chlorination. Generally, the more chlorinated the PCB molecule, the more persistent it will be in the environment. Factors that determine biodegradability include the amount of chlorination, concentration, type of microbial population, available nutrients, and the temperature (ATSDR, 1989b).

Because PCBs are highly lipophilic, they can bioaccumulate in the lipid portions of animals. Bioconcentration factors in the thousands have been reported for various aquatic species (Eisler, 1986). PCBs can also accumulate in upper trophic level animals such as piscivorous birds and mammals that feed on contaminated prey items (Eisler, 1986).

Adverse effects of PCBs on terrestrial wildlife include increased mortality, reproductive effects, and behavioral effects (USEPA, 1985). As a group, birds are more resistant to acutely toxic effects of PCBs than mammals (Eisler, 1986). Among sensitive avian species, PCBs disrupt the normal pattern of growth, reproduction, metabolism, and behavior (Eisler, 1986). Of the mammals, the mink is the most sensitive wildlife species tested for which data are available (Eisler, 1986). Impacts to mink include anorexia, weight loss, lethargy, reproductive effects, and death (Eisler, 1986).

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.

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TABLE J.1

ASSESSMENT ENDPOINTS AND MEASUREMENT ENDPOINTS
SWMU 18 – LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Assessment Endpoint	Measurement Endpoint
Adverse effects on the survival, reproduction, and/or growth of soil invertebrates	• Survival, growth, and/or reproduction of soil invertebrates were evaluated by comparing the measured concentrations of chemicals in the surface soil to invertebrate soil screening levels.
Adverse effects on the survival, reproduction, and/or growth of terrestrial plants	• Survival, growth, and/or reproduction of terrestrial plants were evaluated by comparing the measured concentrations of chemicals in the surface soil to plant soil screening levels.
Adverse effects on the survival, reproduction, and/or growth of sediment invertebrates	• Survival, growth, and/or reproduction of sediment invertebrates were evaluated by comparing the measured concentrations of chemicals in the sediment to sediment screening levels.
Adverse effects on the survival, reproduction, and/or growth of aquatic organisms	• Survival, growth, and/or reproduction of aquatic organisms were evaluated by comparing the measured concentrations of chemicals in the surface water to surface water screening levels.
Adverse effects on the survival, reproduction, and/or increase in development effects of invertivorous birds	• Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the surface soil, surface water, and earthworms to No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs) for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of invertivorous mammals	• Survival, reproduction, and/or increase in development effects of mammals were evaluated by comparing the estimated ingested dose of contaminants in the surface soil, surface water, and earthworms to NOAELs and LOAELs for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of herbivorous birds	• Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the surface soil, surface water, and plants to NOAELs and LOAELs for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of herbivorous mammals	• Survival, reproduction, and/or increase in development effects of mammals were evaluated by comparing the estimated ingested dose of contaminants in the surface soil, surface water, and plants to NOAELs and LOAELs for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of piscivorous birds	• Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the sediment, surface water, and aquatic organisms to NOAELs and LOAELs for surrogate wildlife species.
Adverse effects on the survival, reproduction, and/or increase in development effects of piscivorous mammals	• Survival, reproduction, and/or increase in development effects of mammals were evaluated by comparing the estimated ingested dose of contaminants in the sediment, surface water, and aquatic organisms to NOAELs and LOAELs for surrogate wildlife species.

TABLE J.2

SOIL SCREENING LEVELS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Ecological Soil Screening Level							
	Plant		Invertebrate		Avian		Mammal	
	Value	Source	Value	Source	Value	Source	Value	Source
EXPLOSIVES (MG/KG)								
1,3-DINITROBENZENE	NA	NA	NA	NA	0.079	LANL	0.655	Region 5
2,4,6-TRINITROTOLUENE	6	Sunahara	12	Sunahara	6.4	LANL	80	LANL
2,4-DINITROTOLUENE	6	Sunahara	20	Sunahara	NA	NA	1.28	Region 5
NITROBENZENE	NA	NA	40	ORNL	NA	NA	1.31	Region 5
RDX	9537	Sunahara	98	Sunahara	12	LANL	130	LANL
TETRYL	NA	NA	NA	NA	NA	NA	0.99	LANL
METALS (MG/KG)								
ALUMINUM	NA[1]	NA	NA[1]	NA	NA[1]	NA	NA[1]	NA
ARSENIC	18	EcoSSL	17	CCME	43	EcoSSL	46	EcoSSL
BARIUM	500	ORNL	330	EcoSSL	820	LANL	2000	EcoSSL
BERYLLIUM	10	ORNL	40	EcoSSL	NA	NA	21	EcoSSL
CADMIUM	32	EcoSSL	140	EcoSSL	0.77	EcoSSL	0.36	EcoSSL
CALCIUM	NA	NA	NA	NA	NA	NA	NA	NA
CHROMIUM	78	CCME	0.4	Region 5	26	EcoSSL	34	EcoSSL
COBALT	13	EcoSSL	1000	ORNL[2]	120	EcoSSL	230	EcoSSL
COPPER	70	EcoSSL	80	EcoSSL	28	EcoSSL	49	EcoSSL
IRON	NA[3]	NA	200	ORNL[2]	NA	NA	NA	NA
LEAD	120	EcoSSL	1700	EcoSSL	11	EcoSSL	56	EcoSSL
MAGNESIUM	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	220	EcoSSL	450	EcoSSL	4300	EcoSSL	4000	EcoSSL
MERCURY	12	CCME	0.1	Region 5	0.013	LANL	1.7	LANL
NICKEL	38	EcoSSL	280	EcoSSL	210	EcoSSL	130	EcoSSL
POTASSIUM	NA	NA	NA	NA	NA	NA	NA	NA
THALLIUM	1.4	CCME	1.4	CCME	0.9	LANL	0.0569	Region 5
VANADIUM	130	CCME	130	CCME	7.8	EcoSSL	280	EcoSSL
ZINC	160	EcoSSL	120	EcoSSL	46	EcoSSL	79	EcoSSL
VOLATILE ORGANIC COMPOUNDS (MG/KG)								
2-BUTANONE	NA	NA	NA	NA	NA	NA	89.6	Region 5
ACETONE	NA	NA	NA	NA	7.5	LANL	2.5	Region 5
BENZENE	31	CCME	31	CCME	NA	NA	0.255	Region 5
ETHYLBENZENE	55	CCME	55	CCME	NA	NA	5.16	Region 5
METHYLENE CHLORIDE	1600	LANL	NA	NA	NA	NA	4.05	Region 5
TOLUENE	75	CCME	75	CCME	NA	NA	5.45	Region 5
TOTAL XYLENES	10	Region 5	65	CCME	41	LANL	1.4	LANL
POLYCYCLIC AROMATIC HYDROCARBONS (MG/KG)								
2-METHYLNAPHTHALENE	NA	NA	29	EcoSSL	NA	NA	100	EcoSSL
ACENAPHTHYLENE	20	ORNL[4]	29	EcoSSL	NA	NA	100	EcoSSL
BENZO(A)ANTHRACENE	18	LANL	18	EcoSSL	0.8	LANL	1.1	EcoSSL
BENZO(A)PYRENE	20	CCME	18	EcoSSL	NA	NA	1.1	EcoSSL
BENZO(B)FLUORANTHENE	18	LANL	18	EcoSSL	NA	NA	1.1	EcoSSL
BENZO(G,H,I)PERYLENE	NA	NA	18	EcoSSL	NA	NA	1.1	EcoSSL
BENZO(K)FLUORANTHENE	NA	NA	18	EcoSSL	NA	NA	1.1	EcoSSL
CHRYSENE	NA	NA	18	EcoSSL	NA	NA	1.1	EcoSSL
FLUORANTHENE	50	CCME	29	EcoSSL	NA	NA	100	EcoSSL
INDENO(1,2,3-CD)PYRENE	NA	NA	18	EcoSSL	NA	NA	1.1	EcoSSL
NAPHTHALENE	1	LANL	29	EcoSSL	3.4	LANL	100	EcoSSL
PHENANTHRENE	NA	NA	29	EcoSSL	NA	NA	100	EcoSSL
PYRENE	NA	NA	18	EcoSSL	34	LANL	1.1	EcoSSL
POLYCHLORINATED BIPHENYLS (MG/KG)								
AROCLOR-1016	33	CCME	33	CCME	NA	NA	0.000332	Region 5
AROCLOR-1260	33	CCME	33	CCME	0.88	LANL	0.000332	Region 5
PETROLEUM HYDROCARBONS (MG/KG)								
DRO (C08-C28)	NA	NA	NA	NA	NA	NA	NA	NA
DRO (C08-C34)	NA	NA	NA	NA	NA	NA	NA	NA

TABLE J.2

SOIL SCREENING LEVELS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameter	Ecological Soil Screening Level							
	Plant		Invertebrate		Avian		Mammal	
	Value	Source	Value	Source	Value	Source	Value	Source

Ecological Screening Level sources used in the order of preference:
EcoSSL - EPA Ecological Soil Screening Levels (USEPA, 2005a-g, 2007b-f, 2008)
Region 5 - USEPA Region 5 Ecological Screening Levels (USEPA, 2003).
CCME - Canadian Soil Quality Guidelines (CCME, 1999a-e, 2001, 2004a-d, 2010).
ORNL - Oak Ridge National Laboratory Toxicological Benchmarks for plants and invertebrates (Efroymson et al., 1997a, 1997b).
Sunahara (Sunahara, et al., 2009)
LANL (3.0 database; LANL, 2011)

Footnotes:
1 - Only considered a COPC when the soil pH is less than 5.5.
2 - Value for microorganisms.
3 - Not expected to be toxic to plants with a soil pH between 5 and 8.
4 - Value for acenaphthene.
NA - Not available.

APPENDIX O

RECEPTOR PROFILES
SWMU 18
NSA CRANE
CRANE, INDIANA

The following sections present the receptor profiles for the representative herbivorous, invertivorous, and piscivorous receptors chosen for food chain modeling at SWMU 18. The majority of the information for the profiles was obtained from the Wildlife Exposure Factors Handbook (USEPA, 1993). The data for the incidental soil ingestion rates were obtained from the U.S. EPA Ecological Soil Screening Guidance, Attachment 4-1 (USEPA, 2007).

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 using the exposure factors presented below. The home ranges are presented in hectares in USEPA (1993) but were converted to acres by multiplying the number of hectares by 2.471. The only exception is the kingfisher's home range, which is presented in km of shoreline. Also note that the estimated percent of soil/sediment 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 and other invertebrates such as earthworms, slugs, and snails.

The adult body weight for the short-tailed shrew in various habitats ranged from 0.01525 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 food ingestion rate in kg/day was calculated as shown on Table O.3. The food ingestion rate was 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 USEPA (2007). 3% is the 90th percentile value and 0.9% is the 50th percentile value from USEPA (2007). The only available home range for the shrew (0. 9699 acres) was calculated using data from a tamarack bog in Manitoba (only value available).

American Woodcock (*Scolopax minor*)

Woodcocks inhabit both woodlands and abandoned fields, particularly those with rich 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 food ingestion rate in kg/day was calculated as shown in Table O.3. The food ingestion rate was 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 USEPA (2007). 16.4% is the 90th percentile value and 6.4% is the 50th percentile value from USEPA (2007).

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 food ingestion rate in kg/day was calculated as shown in Table O.3. The food ingestion rate was then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (USEPA, 2007), 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 USEPA (2007). 3.2% is the 90th percentile value and 1.2% is the 50th percentile value from USEPA (2007).

The range of home range sizes for the meadow vole is 0.0297 to 1.06 acres with an average home range of 0.16 acres.

Northern Bobwhite Quail (*Colinus virginianus*)

Bobwhite 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 food ingestion rate in kg/day was calculated as shown on Table O.3. The food ingestion rates were already dry-weight values. 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 USEPA (2007). 13.9% is the 90th percentile value and 6.1% is the 50th percentile value for the mourning dove from USEPA (2007).

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 known 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, ranges from 0.41 to 0.5 g/g-day (wet-weight). The water ingestion rate is estimated as 0.11 g/g-day. The food and water ingestion rates in kg/day and L/day, respectively, were calculated as shown in Table O.3. The food ingestion rates were then multiplied by 0.25, 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 of was calculated by multiplying the ingestion rate by the percentage of sediment that is incidentally ingested (3.3 percent). The 3.3 percent is based on the incidental sediment ingestion rate of a mallard (Beyer, 1994), which also consumes aquatic organisms, because an incidental

sediment ingestion rate was not available for the kingfisher.

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 1.103 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 O.3. The food ingestion rates were then multiplied by 0.25, 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 of was calculated by multiplying the ingestion rate by the percentage of sediment that is incidentally ingested (9.4 percent). The 9.4 percent is based on the incidental sediment ingestion rate of a raccoon (Beyer, 1994), which also consumes aquatic organisms, because an incidental sediment ingestion rate was 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.

References:

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TABLE J.3

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
SWMU 18- LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

	Conservative Inputs		Average Inputs		
Species/Exposure Inputs	**Values**	**Units**	**Values**	**Units**	**Source**
Meadow Vole					
Body Weight = BW	3.290E-02	kg	3.663E-02	kg	USEPA, 1993
Food Ingestion Rate = If	1.920E-03	kg/day	1.785E-03	kg/day	USEPA, 1993
Water Ingestion Rate = Iw	7.700E-03	L/day	6.400E-03	L/day	USEPA, 1993
Soil Ingestion Rate - Is	6.144E-05	kg/day	2.142E-05	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		1.640E-01	acres	USEPA, 1993
Short-Tailed Shrew					
Body Weight = BW	1.525E-02	kg	1.687E-02	kg	USEPA, 1993
Food Ingestion Rate = If	2.592E-03	kg/day	1.648E-03	kg/day	USEPA, 1993
Water Ingestion Rate = Iw	4.280E-03	L/day	3.760E-03	L/day	USEPA, 1993
Soil Ingestion Rate - Is	7.776E-05	kg/day	1.483E-05	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		9.700E-01	acres	USEPA, 1993
American Woodcock					
Body Weight = BW	1.660E-01	kg	1.895E-01	kg	USEPA, 1993
Food Ingestion Rate = If	3.032E-02	kg/day	2.526E-02	kg/day	USEPA, 1993
Water Ingestion Rate = Iw	2.130E-02	L/day	1.900E-02	L/day	USEPA, 1993
Soil Ingestion Rate - Is	4.972E-03	kg/day	1.617E-03	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		6.133E+01	acres	USEPA, 1993
Bobwhite Quail					
Body Weight = BW	1.620E-01	kg	1.770E-01	kg	USEPA, 1993
Food Ingestion Rate = If	1.640E-02	kg/day	1.440E-02	kg/day	USEPA, 1993
Water Ingestion Rate = Iw	2.310E-02	L/day	1.840E-02	L/day	USEPA, 1993
Soil Ingestion Rate - Is	2.280E-03	kg/day	8.784E-04	kg/day	Beyer, 1993
Home Range = HR	Assume 100% on site		2.860E+01	acres	USEPA, 1993
Mink					
Body Weight = BW	5.500E-01	kg	1.020E+00	kg	USEPA, 1993
Food Ingestion Rate = If	5.608E-02	kg/day	4.015E-02	kg/day	USEPA, 1993
Water Ingestion Rate = Iw	1.907E-01	L/day	8.050E-02	L/day	USEPA, 1993
Sediment Ingestion Rate = Is	5.271E-03	kg/day	3.774E-03	kg/day	USEPA, 2005
Home Range = HR	Assume 100% on site		3.484E+01	acres	USEPA, 1993
Belted Kingfisher					
Body Weight = BW	1.360E-01	kg	1.520E-01	kg	USEPA, 1993
Food Ingestion Rate = If	1.895E-02	kg/day	1.723E-02	kg/day	USEPA, 1993
Water Ingestion Rate = Iw	1.870E-02	L/day	1.670E-02	L/day	USEPA, 1993
Sediment Ingestion Rate = Is	6.254E-04	kg/day	5.684E-04	kg/day	Beyer, 1994
Home Range = HR	Assume 100% on site		1.160E+00	km-radius	USEPA, 1993

Notes:
The exposure factors were derived as presented in Appendix O Table O.4.

The soil/sediment ingestion rates were calculated by multiplying the food ingestion rates by the following incidental soil/sediment ingestion rates:

Receptor	Conservative	Average	Source
Bobwhite quail	13.9%	6.1%	1, 2
Meadow Vole	3.2%	1.2%	1
American woodcock	16.4%	6.4%	1
Short-tailed Shrew	3%	0.9%	1
Mink	9.4%	9.4%	3, 4
Belted Kingfisher	3.3%	3.3%	3, 5

1 - USEPA (U.S. Environmental Protection Agency), 2007. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Soli Waste and Emergency and Response. OSWER Directive 9285.7-55. April.
2 - Based on the mourning dove.

TABLE J.3

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
SWMU 18- LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

3 - Beyer, N., E. Connor, and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. Journal of Wildlife Management 58(2) pp. 375-382.
4 - Based on the raccoon.
5 - Based on the mallard.

TABLE O.4

CALCULATION OF EXPOSURE PARAMETERS FOR SURROGATE WILDLIFE RECEPTORS
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

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***	***1734***
Average	***36.6***		***16.87***		***190***	***177***		***152***	***1019.5***
Food Ingestion	0.3		0.49	0.77	1.0	0.067	0.079	0.5	0.13
Rate (g/g-day) [1]	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***
Conversion from wet weight to dry weight	***0.15*** [3]		***0.16*** [4]		***0.16*** [4]	***None*** [5]		**0.25**[6]	**0.25**[6]
Water Ingestion	0.14	0.21	0.223		0.1	0.115	0.1	0.11	0.11
Rate (g/g-day) [1]					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)[2]	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). If values from several studies are available, they are given. The minimum, maximum, and average values are derived from these studies.

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

(2) - The home range units for the Belted Kingfisher are kilometers of shoreline instead of hectares or acres.
(3) - Percent solids in vegetation
(4) - Percent solids in earthworms
(5) - Food items on dry weight basis
(6) - Percent solids in fish

APPENDIX J

BIOACCUMULATION FACTORS

This attachment presents the bioaccumulation factors (BAFs) that were used in the food chain models. The following sources of BAFs were used in the ecological risk assessment for most of the chemicals:

- Plant and Soil Invertebrate BAFs: EPA Guidance for Developing Ecological Soil Screening Levels, Attachment 4-1 (USEPA, 2007).

- Plant BAFs (organic chemicals): Toxicity and Chemical-Specific Factors Database (ORNL, 2012).

- Plant BAFs (metals): Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants (ORNL, 1998a).

- Soil Invertebrate BAFs: Development and Validation of Bioaccumulation Models for Earthworms (Sample et al., 1998).

- Fish BSAFs: The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, National Sediment Quality Survey: Second Edition. (USEPA, 2004).

- Sediment Invertebrate BSAFs: Biota Sediment Accumulation Factors for Invertebrates (ORNL, 1998b).

Table J.5 presents the BAFs/BSAFs that were used in the food-chain models for the individual constituents that were detected at SWMU 18. Note that dry weight BAFs were used for this ERA. A default value of 1.0 was used for the BAF/BSAF if chemical-specific data were not available.

The EPA Guidance for Developing Ecological Soil Screening Levels (Eco SSLs) was the source of the BAFs for some of the chemicals. The majority of these BAFs are regression equations that are used to calculate the tissue concentration from the soil concentration.

BSAFs for fish were obtained from USEPA (2004). BSAFs for metals were not available from USEPA (2004), so BSAFs from ORNL (1998b) for sediment invertebrates were used to estimate tissue concentrations of metals in food items of piscivorous birds and mammals.

References

ORNL (Oak Ridge National Laboratory). 1998a. Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants. BJC/OR-133. September.

ORNL. 1998b. Biota Sediment Accumulation Factors for Invertebrates: Review and recommendations for the Oak Ridge Reservation. BJC/OR-112. August.

ORNL. 2012. Toxicity and Chemical-Specific Factors Database. Oak Ridge National Laboratory Web Page, http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W., Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory. June. ES/ER/TM-220.

USEPA (U.S. Environmental Protection Agency), 2004. The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, Volume 1:National Sediment Quality Survey: Second Edition. Office of Science and Technology. Washington, D.C. EPA 823-R-04-007. November.

USEPA, 2007. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

TABLE J.5

TERRESTRIAL FOOD CHAIN MODEL - BAF/BSAF VALUES
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Plant Bioaccumulation Factors			Earthworm Bioaccumulation Factors			Sediment Invertebrate/Fish Bioaccumulation Factors		
	Conservative	Average		Conservative	Average		Conservative	Average	
EXPLOSIVES									
1,3-DINITROBENZENE	5.26		(1)	1			1		
RDX	12		(1)	1			1		
Metals									
ARSENIC	0.03752		(2)	EXP(0.706*LN(C)-1.421)		(2)	0.69	0.143	(5)
BARIUM	0.156		(2)	0.091		(2)	1		
CADMIUM	EXP(0.546*LN(C)-0.475)		(2)	EXP(0.795*LN(C)+2.114)		(2)	7.99	0.6	(5)
CHROMIUM	0.041		(2)	0.306		(2)	0.47	0.1	(5)
COPPER	EXP(0.394*LN(C)+0.668)		(2)	0.515		(2)	5.25	1.56	(5)
LEAD	EXP(0.561*LN(C)-1.328)		(2)	EXP(0.807*LN(C)-0.218)		(2)	0.61	0.071	(5)
MERCURY	5	0.652	(3)	EXP(0.3369*LN(C)+0.0781)		(4)	2.868	1.136	(5)
NICKEL	EXP(0.748*LN(C)-2.223)		(2)	1.06		(2)	2.32	0.486	(5)
THALLIUM	0.004		(1)	1			1		
ZINC	EXP(0.554*LN(C)+1.575)		(2)	EXP(0.328*LN(C)+4.449)		(2)	7.53	1.94	(5)
Polycyclic Aromatic Hydrocarbons									
ACENAPHTHYLENE	EXP(0.791*LN(C)-1.144)		(2)	22.9		(2)	0.29		(6)
BENZO(A)PYRENE	EXP(0.975*LN(C)-2.0615)		(2)	1.33		(2)	0.29		(6)
BENZO(B)FLUORANTHENE	0.31		(2)	2.6		(2)	0.29		(6)
BENZO(G,H,I)PERYLENE	EXP(1.1829*LN(C)-0.9313)		(2)	2.94		(2)	0.29		(6)
BENZO(K)FLUORANTHENE	EXP(0.8595*LN(C)-2.1579)		(2)	2.6		(2)	0.29		(6)
CHRYSENE	EXP(0.5944*LN(C)-2.7078)		(2)	2.29		(2)	0.29		(6)
FLUORANTHENE	0.5		(2)	3.04		(2)	0.29		(6)
INDENO(1,2,3-CD)PYRENE	0.11		(2)	2.86		(2)	0.29		(6)
PHENANTHRENE	EXP(0.6203*LN(C)-0.1665)		(2)	1.72		(2)	0.29		(6)
PCBs									
AROCLOR-1016	0.0212		(1)	15.9	6.67	(4)	1.85		(6)
AROCLOR-1260	0.00062		(1)	15.9	6.67	(4)	1.85		(6)

Notes:
A default value of 1.0 was assigned to chemicals with unknown BAFs. No footnotes are listed by these values.

Footnotes:
1 - ORNL (2012).
2 - USEPA (2007). Several tissue concentration will be calculated using regression equations (where C is the soil concentration) from USEPA (2007), Attachment 4-1, Tables 4a (for inorganics), 4b (for organics). Value for nickel is from 2005 version of the Eco SSL.
3 - ORNL (September, 1998) for all chemicals; conservative value is 90th percentile; average value is median value.
4 - Sample et al., (February, 1998) conservative value is 90th percentile; average value is median value.
5 - ORNL (August, 1998) for all chemicals; conservative value is 90th percentile; average value is median value.
6 - USEPA (2004); only one value is available for conservative and average exposures.

Sources:
ORNL (Oak Ridge National Laboratory). 1998. Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants. BJC/OR-133. September.
ORNL, 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. BJC/OR-112. August.

ORNL, 2012. Toxicity and Chemical-Specific Factors Database. Oak Ridge National Laboratory Web Page, http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef
Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W., Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory. February. ES/ER/TM-220.
USEPA, 2004. The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, Volume 1:National Sediment Quality Survey: Second Edition. Office of Science and Technology. Washington, D.C. EPA 823-R-04-007. November.
USEPA, 2007. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

TABLE J.6

TOXICITY REFERENCE VALUES
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

PARAMETER	Mammal		Bird	
	NOAEL	LOAEL	NOAEL	LOAEL
EXPLOSIVES				
1,3 Dinitrobenzene	0.113	0.264	0.422	4.22
RDX	8.94	28.3	2.36	4.49
INORGANICS				
Arsenic	1.04	4.55	2.24	4.51
Barium	51.8	82.7	20.8	41.7
Cadmium	0.77	6.9	1.47	6.35
Chromium	2.40	58.17	2.66	15.63
Copper	5.6	82.7	4.05	34.87
Lead	4.7	30.2	1.63	9.70
Mercury	0.032	0.16	0.0064	0.064
Nickel	1.70	14.77	6.71	18.57
Thallium	0.0074	0.074	0.35	3.5
Zinc	75.4	297.58	66.1	171.44
POLYCYCLIC AROMATIC HYDROCARBONS				
Acenaphthylene	65.6	356	2	20
Benzo(a)pyrene	0.615	38.4	2	20
Benzo(b)fluoranthene	0.615	38.4	2	20
Benzo(g,h,i)perylene	0.615	38.4	2	20
Benzo(k)fluoranthene	0.615	38.4	2	20
Chrysene	0.615	38.4	2	20
Fluoranthene	65.6	356	2	20
Indeno(1,2,3-cd)pyrene	0.615	38.4	2	20
Phenanthrene	65.6	356	2	20
POLYCHLORINATED BIPHENYLS				
Aroclor-1016	1.37	3.43	0.18	1.8
Aroclor-1260	0.068	0.68	0.18	1.8

The sources of these NOAELS and LOAELS are presented in the table titled "Sources and Endpoints for NOAELS and LOAELS for Terrestrial Wildlife" in this appendix.

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. If only a LOAEL was available, the value was divided by 10 to estimate the NOAEL.

TABLE J.7

SOURCES AND ENDPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference	Source of Reference
Explosives							
1,3-Dinitrobenzene	0.113	NOAEL	reproductive	chronic	rat	Talmage et al., 1999	LANL, 2011
1,3-Dinitrobenzene	0.264	LOAEL	reproductive	chronic	rat	Talmage et al., 1999	LANL, 2011
1,3-Dinitrobenzene	0.422	NOAEL	mortality	chronic	red-winged blackbird	USEPA, 1999	LANL, 2011
RDX	8.94	NOAEL	mortality & body weight	chronic	mammals	LANL, 2003	LANL, 2011
RDX	28.3	LOAEL	mortality & body weight	chronic	mammals	LANL, 2003	LANL, 2011
RDX	2.36	NOAEL	reproduction & development	chronic	birds	LANL, 2004	LANL, 2011
RDX	4.49	LOAEL	reproduction & development	chronic	birds	LANL, 2004	LANL, 2011
PAHs							
7,12-Dimethylbenz(a)anthracene	20	LOAEL	systemic	chronic	nestling/starlings	Trust et al., 1994	
7,12-Dimethylbenz(a)anthracene	2	NOAEL	systemic	chronic	nestling/starlings	Trust et al., 1994	
High Molecular Weight PAHs	38.4	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
High Molecular Weight PAHs	0.615	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Low Molecular Weight PAHs	356	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Low Molecular Weight PAHs	65.6	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
PCBs							
Aroclor-1016	3.43	LOAEL	reproduction	chronic	mink	Aulerich and Ringer 1980	Sample et.al., 1996
Aroclor-1016	1.37	NOAEL	reproduction	chronic	mink	Aulerich and Ringer 1980	Sample et.al., 1996
Aroclor-1254	1.8	LOAEL	reproductive	chronic	pheasant	Dahlgren et al., 1972	Sample et.al., 1996
Aroclor-1254	0.68	LOAEL	reproduction	chronic	mouse	McCoy et al., 1995	Sample et.al., 1996
Inorganics							
Arsenic	4.51	LOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Arsenic	4.55	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Arsenic	2.24	NOAEL	reproduction & growth	chronic	chicken	USEPA, 2005	
Arsenic	1.04	NOAEL	reproduction & growth	chronic	dog	USEPA, 2005	
Barium	82.7	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Barium	416.53	LOAEL	Survival	subchronic	chicks	Johnson et al., 1960	Sample et.al., 1996
Barium	51.8	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Barium	208.26	NOAEL	Survival	subchronic	chicks	Johnson et al., 1960	Sample et.al., 1996
Cadmium	6.35	LOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Cadmium	6.9	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2005	
Cadmium	1.47	NOAEL	reproduction & growth	chronic	birds	USEPA, 2005	
Cadmium	0.77	NOAEL	reproduction & growth	chronic	rat	USEPA, 2005	
Chromium(III)	15.63	LOAEL	reproduction & growth	chronic	birds	USEPA, 2008	
Chromium(III)	58.17	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2008	
Chromium(III)	2.66	NOAEL	reproduction & growth	chronic	birds	USEPA, 2008	
Chromium(III)	2.4	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2008	
Copper	34.87	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Copper	82.7	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Copper	4.05	NOAEL	reproduction & growth	chronic	chicken	USEPA, 2007	
Copper	5.6	NOAEL	reproduction & growth	chronic	pig	USEPA, 2007	
Lead	9.7	LOAEL	reproduction & growth	chronic	birds	Spec Pro, Inc and Exponent, Inc., 2009	
Lead	30.2	LOAEL	reproduction & growth	chronic	mammals	Spec Pro, Inc and Exponent, Inc., 2009	
Lead	1.63	NOAEL	reproduction & growth	chronic	chicken	USEPA, 2005	

TABLE J.7

SOURCES AND ENDPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Parameters	Concentration (mg/kg-day)	Endpoint	Effect	Chronic/ Subchronic	Species	Primary Reference	Source of Reference
Lead	4.7	NOAEL	reproduction & growth	chronic	rat	USEPA, 2005	
Mercury	0.064	LOAEL	reproductive	chronic	mallard duck	Heinz, 1979	Sample et.al., 1996
Mercury	0.16	LOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Mercury	0.032	NOAEL	reproductive	chronic	rat	Verschuuren et al., 1976	Sample et.al., 1996
Nickel	18.57	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Nickel	14.77	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Nickel	6.71	NOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Nickel	1.7	NOAEL	reproduction & growth	chronic	mouse	USEPA, 2007	
Thallium	0.74	LOAEL	reproductive	subchronic	rat	Formigli et al., 1986	Sample et.al., 1996
Thallium	35	LD50	mortality	acute	starling	USEPA, 1999	LANL, 2011
Zinc	297.58	LOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Zinc	171.44	LOAEL	reproduction & growth	chronic	birds	USEPA, 2007	
Zinc	75.4	NOAEL	reproduction & growth	chronic	mammals	USEPA, 2007	
Zinc	66.1	NOAEL	reproduction & growth	chronic	birds	USEPA, 2007	

Notes:

NOAEL = No Observed Adverse Effects Level

LOAEL = Lowest Observed Adverse Effects Level

The NOAELS and LOAELS for the following PAHs are based on the Low Molecular Weight PAH values: acenapthylene, acenaphthene, anthracene, fluoranthene, fluorene, phenanthrene.

The NOAELS and LOAELS for the following PAHs are based on the High Molecular Weight PAH values: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, indeno(1,2,3-c,d)pyrene, and pyrene.

The NOAELS and LOAELS for the PAHs for birds were based on 7,12-dimethylbenz(a)anthracene.

The LOAELs used for several metals were calculated as the geometric mean of growth and reproduction data from the Ecological Soil Screening Levels (U.S. EPA, 2005, 2007, 2008).

The LOAEL for Aroclor-1254 for mammals was used as a surrogate for Aroclor-1260. The LOAEL for Aroclor-1254 for birds was used as a surrogate for Aroclor-1016 and Aroclor-1260.

References for the NOAELS and LOAELs are presented in this Attachment and Titled "TRV Source and Endpoint References".

* Value has been adjusted for chronic effects.

SOURCES AND ENPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE

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APPENDIX J

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE - SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil Concentrations (mg/kg)				Earthworm Bioaccumulation Factors		Earthworm Concentrations (mg/kg)		Plant Bioaccumulation Factors		Plant Concentrations (mg/kg)	
	Maximum Detection	Average of All Results	Average of Positive Results	Average [1]	Conservative	Average	Maximum Detection	Average	Conservative	Average	Maximum Detection	Average
EXPLOSIVES												
1,3-DINITROBENZENE	8.33E-02	3.02E-02	8.33E-02	3.02E-02	1.00E+00	1.00E+00	8.33E-02	3.02E-02	5.26E+00	5.26E+00	4.38E-01	1.59E-01
POLYCLORINATED BIPHENYLS												
AROCLOR-1260	3.90E-02	1.47E-02	1.47E-02	1.47E-02	1.59E+01	6.67E+00	6.20E-01	9.81E-02	6.15E-04	6.15E-04	2.40E-05	9.05E-06

1 - Average concentration is the mean concentration of all samples, using 1/2 the detection limit for non-detects, unless the value is greater than the maximum concentration. In that case, the average concentration is the mean of the positive detections.

APPENDIX J

MEADOW VOLE - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	8.33E-02	4.38E-01	1.56E-04	2.56E-02	2.57E-02	1.13E-01	2.64E-01	2.3E-01	9.7E-02
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	3.90E-02	2.40E-05	7.28E-05	1.40E-06	7.42E-05	6.80E-02	6.80E-01	1.1E-03	1.1E-04

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.29E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.92E-03	kg/day	Dose (vegetation) = (Cv * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	6.14E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Cv = Contaminant concentration in vegetation	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

MEADOW VOLE - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	3.02E-02	1.59E-01	1.76E-05	7.73E-03	7.75E-03	1.13E-01	2.64E-01	6.9E-02	2.9E-02
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.47E-02	9.05E-06	8.60E-06	4.41E-07	9.04E-06	6.80E-02	6.80E-01	1.3E-04	1.3E-05

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.66E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.79E-03	kg/day	Dose (vegetation) = (Cv * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	2.14E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	1.64E-01	acres	Cv = Contaminant concentration in vegetation	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

BOBWHITE QUAIL - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	8.33E-02	4.38E-01	1.17E-03	4.44E-02	4.55E-02	4.22E-01	4.22E+00	1.1E-01	1.1E-02
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	3.90E-02	2.40E-05	5.49E-04	2.43E-06	5.51E-04	1.80E-01	1.80E+00	3.1E-03	3.1E-04

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.62E-01	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.64E-02	kg/day	Dose (vegetation) = (Cv * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	2.28E-03	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Cv = Contaminant concentration in vegetation	NV = No Value
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	NA = Not Available
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

BOBWHITE QUAIL - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	3.02E-02	1.59E-01	1.50E-04	1.29E-02	1.31E-02	4.22E-01	4.22E+00	3.1E-02	3.1E-03
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.47E-02	9.05E-06	7.30E-05	7.36E-07	7.37E-05	1.80E-01	1.80E+00	4.1E-04	4.1E-05

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.77E-01	kg
Food Ingestion Rate = (If)	1.44E-02	kg/day
Soil Ingestion Rate = (Is)	8.78E-04	kg/day
Home Range = (HR)	2.86E+01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No Value

APPENDIX J

SHORT-TAILED SHREW - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	8.33E-02	8.33E-02	4.25E-04	1.42E-02	1.46E-02	1.13E-01	2.64E-01	1.3E-01	5.5E-02
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	3.90E-02	6.20E-01	1.99E-04	1.05E-01	1.06E-01	6.80E-02	6.80E-01	1.6E+00	1.6E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.53E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	2.59E-03	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	7.78E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Ci = Contaminant concentration in invertebrate	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

SHORT-TAILED SHREW - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	3.02E-02	3.02E-02	2.65E-05	2.95E-03	2.97E-03	1.13E-01	2.64E-01	2.6E-02	1.1E-02
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.47E-02	9.81E-02	1.29E-05	9.58E-03	9.59E-03	6.80E-02	6.80E-01	1.4E-01	1.4E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.69E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.65E-03	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	1.48E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	9.70E-01	acres	Ci = Contaminant concentration in invertebrate	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

AMERICAN WOODCOCK - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	8.33E-02	8.33E-02	2.50E-03	1.52E-02	1.77E-02	4.22E-01	4.22E+00	4.2E-02	4.2E-03
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	3.90E-02	6.20E-01	1.17E-03	1.13E-01	1.14E-01	1.80E-01	1.80E+00	6.4E-01	6.4E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.66E-01	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	3.03E-02	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	4.97E-03	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Ci = Contaminant concentration in invertebrate	NV = No Value
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	

APPENDIX J

AMERICAN WOODCOCK - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA B
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
EXPLOSIVES									
1,3-DINITROBENZENE	3.02E-02	3.02E-02	2.57E-04	4.02E-03	4.28E-03	4.22E-01	4.22E+00	1.0E-02	1.0E-03
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.47E-02	9.81E-02	1.26E-04	1.31E-02	1.32E-02	1.80E-01	1.80E+00	7.3E-02	7.3E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.90E-01	kg	Dose (soil) = (Cs * Is)(H)/BW
Food Ingestion Rate = (If)	2.53E-02	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW
Soil Ingestion Rate = (Is)	1.62E-03	kg/day	
Home Range = (HR)	6.13E+01	acres	Ci = Contaminant concentration in invertebrate
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil
			Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No Value

APPENDIX J

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE - SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil Concentrations (mg/kg)				Earthworm Bioaccumulation Factors		Earthworm Concentrations (mg/kg)		Plant Bioaccumulation Factors		Plant Concentrations (mg/kg)	
	Maximum Detection	Average of All Results	Average of Positive Results	Average [1]	Conservative	Average	Maximum Detection	Average	Conservative	Average	Maximum Detection	Average
METALS												
BARIUM	1.94E+03	5.31E+02	5.31E+02	5.31E+02	9.10E-02	9.10E-02	1.77E+02	4.84E+01	1.56E-01	1.56E-01	3.03E+02	8.29E+01
CHROMIUM	4.75E+01	2.65E+01	2.65E+01	2.65E+01	3.06E-01	3.06E-01	1.45E+01	8.10E+00	4.10E-02	4.10E-02	1.95E+00	1.09E+00
LEAD	3.28E+01	1.63E+01	1.63E+01	1.63E+01	Regression equation from Eco SSL		1.34E+01	7.66E+00	Regression equation from Eco SSL		1.88E+00	1.27E+00
POLYCYCLIC AROMATIC HYDROCARBONS												
ACENAPHTHYLENE	1.25E-02	5.47E-03	1.25E-02	5.47E-03	2.29E+01	2.29E+01	2.86E-01	1.25E-01	Regression equation from Eco SSL		9.95E-03	5.18E-03
BENZO(B)FLUORANTHENE	6.11E-03	3.34E-03	6.11E-03	3.34E-03	2.60E+00	2.60E+00	1.59E-02	8.68E-03	3.10E-01	3.10E-01	1.89E-03	1.04E-03
BENZO(G,H,I)PERYLENE	6.66E-02	2.57E-02	3.76E-02	2.57E-02	2.94E+00	2.94E+00	1.96E-01	7.56E-02	Regression equation from Eco SSL		1.60E-02	5.19E-03
INDENO(1,2,3-CD)PYRENE	1.10E-02	4.97E-03	1.10E-02	4.97E-03	2.86E+00	2.86E+00	3.15E-02	1.42E-02	1.10E-01	1.10E-01	1.21E-03	5.47E-04
PHENANTHRENE	1.28E-02	5.73E-03	7.61E-03	5.73E-03	1.72E+00	1.72E+00	2.20E-02	9.85E-03	Regression equation from Eco SSL		5.67E-02	3.44E-02
POLYCLORINATED BIPHENYLS												
AROCLOR-1260	1.85E-02	NA	NA	1.85E-02	1.59E+01	6.67E+00	2.94E-01	1.23E-01	6.15E-04	6.15E-04	1.14E-05	1.14E-05

1 - Average concentration is the mean concentration of all samples, using 1/2 the detection limit for non-detects, unless the value is greater than the maximum concentration. In that case, the average concentration is the mean of the positive detections. Polychlorinated biphenyls were only analyzed in one sample, therefore, the maximum concentration is presented for the average concentration.

APPENDIX J

MEADOW VOLE - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	1.94E+03	3.03E+02	3.62E+00	1.77E+01	2.13E+01	5.18E+01	8.27E+01	4.1E-01	2.6E-01
CHROMIUM	4.75E+01	1.95E+00	8.87E-02	1.14E-01	2.02E-01	2.40E+00	5.82E+01	8.4E-02	3.5E-03
LEAD	3.28E+01	1.88E+00	6.13E-02	1.10E-01	1.71E-01	4.70E+00	3.02E+01	3.6E-02	5.7E-03
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	1.25E-02	9.95E-03	2.33E-05	5.81E-04	6.04E-04	6.56E+01	3.56E+02	9.2E-06	1.7E-06
BENZO(B)FLUORANTHENE	6.11E-03	1.89E-03	1.14E-05	1.11E-04	1.22E-04	6.15E-01	3.84E+01	2.0E-04	3.2E-06
BENZO(G,H,I)PERYLENE	6.66E-02	1.60E-02	1.24E-04	9.33E-04	1.06E-03	6.15E-01	3.84E+01	1.7E-03	2.8E-05
INDENO(1,2,3-CD)PYRENE	1.10E-02	1.21E-03	2.05E-05	7.06E-05	9.12E-05	6.15E-01	3.84E+01	1.5E-04	2.4E-06
PHENANTHRENE	1.28E-02	5.67E-02	2.39E-05	3.31E-03	3.33E-03	6.56E+01	3.56E+02	5.1E-05	9.4E-06
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	1.14E-05	3.45E-05	6.64E-07	3.52E-05	6.80E-02	6.80E-01	5.2E-04	5.2E-05

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.29E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.92E-03	kg/day	Dose (vegetation) = (Cv * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	6.14E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Cv = Contaminant concentration in vegetation	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

MEADOW VOLE - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	5.31E+02	8.29E+01	3.11E-01	4.04E+00	4.35E+00	5.18E+01	8.27E+01	8.4E-02	5.3E-02
CHROMIUM	2.65E+01	1.09E+00	1.55E-02	5.29E-02	6.84E-02	2.40E+00	5.82E+01	2.8E-02	1.2E-03
LEAD	1.63E+01	1.27E+00	9.55E-03	6.19E-02	7.14E-02	4.70E+00	3.02E+01	1.5E-02	2.4E-03
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	5.47E-03	5.18E-03	3.20E-06	2.52E-04	2.55E-04	6.56E+01	3.56E+02	3.9E-06	7.2E-07
BENZO(B)FLUORANTHENE	3.34E-03	1.04E-03	1.95E-06	5.05E-05	5.24E-05	6.15E-01	3.84E+01	8.5E-05	1.4E-06
BENZO(G,H,I)PERYLENE	2.57E-02	5.19E-03	1.50E-05	2.53E-04	2.68E-04	6.15E-01	3.84E+01	4.4E-04	7.0E-06
INDENO(1,2,3-CD)PYRENE	4.97E-03	5.47E-04	2.91E-06	2.66E-05	2.95E-05	6.15E-01	3.84E+01	4.8E-05	7.7E-07
PHENANTHRENE	5.73E-03	3.44E-02	3.35E-06	1.68E-03	1.68E-03	6.56E+01	3.56E+02	2.6E-05	4.7E-06
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	1.14E-05	1.08E-05	5.54E-07	1.14E-05	6.80E-02	6.80E-01	1.7E-04	1.7E-05

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.66E-02	kg
Food Ingestion Rate = (If)	1.79E-03	kg/day
Soil Ingestion Rate = (Is)	2.14E-05	kg/day
Home Range = (HR)	1.64E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX J

BOBWHITE QUAIL - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	1.94E+03	3.03E+02	2.73E+01	3.06E+01	5.79E+01	2.08E+01	4.17E+01	2.8E+00	1.4E+00
CHROMIUM	4.75E+01	1.95E+00	6.68E-01	1.97E-01	8.66E-01	2.66E+00	1.56E+01	3.3E-01	5.5E-02
LEAD	3.28E+01	1.88E+00	4.62E-01	1.90E-01	6.52E-01	1.63E+00	9.70E+00	4.0E-01	6.7E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	1.25E-02	9.95E-03	1.76E-04	1.01E-03	1.18E-03	2.00E+00	2.00E+01	5.9E-04	5.9E-05
BENZO(B)FLUORANTHENE	6.11E-03	1.89E-03	8.60E-05	1.92E-04	2.78E-04	2.00E+00	2.00E+01	1.4E-04	1.4E-05
BENZO(G,H,I)PERYLENE	6.66E-02	1.60E-02	9.37E-04	1.62E-03	2.56E-03	2.00E+00	2.00E+01	1.3E-03	1.3E-04
INDENO(1,2,3-CD)PYRENE	1.10E-02	1.21E-03	1.55E-04	1.22E-04	2.77E-04	2.00E+00	2.00E+01	1.4E-04	1.4E-05
PHENANTHRENE	1.28E-02	5.67E-02	1.80E-04	5.74E-03	5.92E-03	2.00E+00	2.00E+01	3.0E-03	3.0E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	1.14E-05	2.60E-04	1.15E-06	2.61E-04	1.80E-01	1.80E+00	1.5E-03	1.5E-04

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.62E-01	kg	Dose (soil) = (Cs * Is)(H)/BW
Food Ingestion Rate = (If)	1.64E-02	kg/day	Dose (vegetation) = (Cv * If)(H)/BW
Soil Ingestion Rate = (Is)	2.28E-03	kg/day	
Home Range = (HR)	Assume 100% on site		Cv = Contaminant concentration in vegetation
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil
			Total Dose = Dose (soil) + Dose (vegetation)
			H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No Value
NA = Not Available

APPENDIX J

BOBWHITE QUAIL - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	5.31E+02	8.29E+01	2.64E+00	6.74E+00	9.38E+00	2.08E+01	4.17E+01	4.5E-01	2.2E-01
CHROMIUM	2.65E+01	1.09E+00	1.31E-01	8.83E-02	2.20E-01	2.66E+00	1.56E+01	8.3E-02	1.4E-02
LEAD	1.63E+01	1.27E+00	8.10E-02	1.03E-01	1.84E-01	1.63E+00	9.70E+00	1.1E-01	1.9E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	5.47E-03	5.18E-03	2.71E-05	4.21E-04	4.48E-04	2.00E+00	2.00E+01	2.2E-04	2.2E-05
BENZO(B)FLUORANTHENE	3.34E-03	1.04E-03	1.66E-05	8.42E-05	1.01E-04	2.00E+00	2.00E+01	5.0E-05	5.0E-06
BENZO(G,H,I)PERYLENE	2.57E-02	5.19E-03	1.28E-04	4.22E-04	5.49E-04	2.00E+00	2.00E+01	2.7E-04	2.7E-05
INDENO(1,2,3-CD)PYRENE	4.97E-03	5.47E-04	2.47E-05	4.45E-05	6.91E-05	2.00E+00	2.00E+01	3.5E-05	3.5E-06
PHENANTHRENE	5.73E-03	3.44E-02	2.84E-05	2.80E-03	2.83E-03	2.00E+00	2.00E+01	1.4E-03	1.4E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	1.14E-05	9.18E-05	9.26E-07	9.27E-05	1.80E-01	1.80E+00	5.2E-04	5.2E-05

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.77E-01	kg
Food Ingestion Rate = (If)	1.44E-02	kg/day
Soil Ingestion Rate = (Is)	8.78E-04	kg/day
Home Range = (HR)	2.86E+01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX J

SHORT-TAILED SHREW - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	1.94E+03	1.77E+02	9.89E+00	3.00E+01	3.99E+01	5.18E+01	8.27E+01	7.7E-01	4.8E-01
CHROMIUM	4.75E+01	1.45E+01	2.42E-01	2.47E+00	2.71E+00	2.40E+00	5.82E+01	1.1E+00	4.7E-02
LEAD	3.28E+01	1.34E+01	1.67E-01	2.29E+00	2.45E+00	4.70E+00	3.02E+01	5.2E-01	8.1E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	1.25E-02	2.86E-01	6.37E-05	4.87E-02	4.87E-02	6.56E+01	3.56E+02	7.4E-04	1.4E-04
BENZO(B)FLUORANTHENE	6.11E-03	1.59E-02	3.12E-05	2.70E-03	2.73E-03	6.15E-01	3.84E+01	4.4E-03	7.1E-05
BENZO(G,H,I)PERYLENE	6.66E-02	1.96E-01	3.40E-04	3.33E-02	3.36E-02	6.15E-01	3.84E+01	5.5E-02	8.8E-04
INDENO(1,2,3-CD)PYRENE	1.10E-02	3.15E-02	5.61E-05	5.35E-03	5.40E-03	6.15E-01	3.84E+01	8.8E-03	1.4E-04
PHENANTHRENE	1.28E-02	2.20E-02	6.53E-05	3.74E-03	3.81E-03	6.56E+01	3.56E+02	5.8E-05	1.1E-05
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	2.94E-01	9.43E-05	5.00E-02	5.01E-02	6.80E-02	6.80E-01	7.4E-01	7.4E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.53E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	2.59E-03	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	7.78E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Ci = Contaminant concentration in invertebrate	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

SHORT-TAILED SHREW - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	5.31E+02	4.84E+01	4.67E-01	4.72E+00	5.19E+00	5.18E+01	8.27E+01	1.0E-01	6.3E-02
CHROMIUM	2.65E+01	8.10E+00	2.33E-02	7.91E-01	8.15E-01	2.40E+00	5.82E+01	3.4E-01	1.4E-02
LEAD	1.63E+01	7.66E+00	1.44E-02	7.48E-01	7.63E-01	4.70E+00	3.02E+01	1.6E-01	2.5E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	5.47E-03	1.25E-01	4.81E-06	1.22E-02	1.22E-02	6.56E+01	3.56E+02	1.9E-04	3.4E-05
BENZO(B)FLUORANTHENE	3.34E-03	8.68E-03	2.94E-06	8.48E-04	8.51E-04	6.15E-01	3.84E+01	1.4E-03	2.2E-05
BENZO(G,H,I)PERYLENE	2.57E-02	7.56E-02	2.26E-05	7.38E-03	7.41E-03	6.15E-01	3.84E+01	1.2E-02	1.9E-04
INDENO(1,2,3-CD)PYRENE	4.97E-03	1.42E-02	4.37E-06	1.39E-03	1.39E-03	6.15E-01	3.84E+01	2.3E-03	3.6E-05
PHENANTHRENE	5.73E-03	9.85E-03	5.04E-06	9.62E-04	9.68E-04	6.56E+01	3.56E+02	1.5E-05	2.7E-06
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	1.23E-01	1.63E-05	1.20E-02	1.21E-02	6.80E-02	6.80E-01	1.8E-01	1.8E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.69E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.65E-03	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	1.48E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	9.70E-01	acres	Ci = Contaminant concentration in invertebrate	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

AMERICAN WOODCOCK - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	1.94E+03	1.77E+02	5.81E+01	3.22E+01	9.04E+01	2.08E+01	4.17E+01	4.3E+00	2.2E+00
CHROMIUM	4.75E+01	1.45E+01	1.42E+00	2.65E+00	4.08E+00	2.66E+00	1.56E+01	1.5E+00	2.6E-01
LEAD	3.28E+01	1.34E+01	9.83E-01	2.46E+00	3.44E+00	1.63E+00	9.70E+00	2.1E+00	3.5E-01
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	1.25E-02	2.86E-01	3.74E-04	5.23E-02	5.27E-02	2.00E+00	2.00E+01	2.6E-02	2.6E-03
BENZO(B)FLUORANTHENE	6.11E-03	1.59E-02	1.83E-04	2.90E-03	3.08E-03	2.00E+00	2.00E+01	1.5E-03	1.5E-04
BENZO(G,H,I)PERYLENE	6.66E-02	1.96E-01	1.99E-03	3.58E-02	3.78E-02	2.00E+00	2.00E+01	1.9E-02	1.9E-03
INDENO(1,2,3-CD)PYRENE	1.10E-02	3.15E-02	3.30E-04	5.75E-03	6.08E-03	2.00E+00	2.00E+01	3.0E-03	3.0E-04
PHENANTHRENE	1.28E-02	2.20E-02	3.83E-04	4.02E-03	4.40E-03	2.00E+00	2.00E+01	2.2E-03	2.2E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	2.94E-01	5.54E-04	5.38E-02	5.43E-02	1.80E-01	1.80E+00	3.0E-01	3.0E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.66E-01	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	3.03E-02	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	4.97E-03	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Ci = Contaminant concentration in invertebrate	NV = No Value
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	

APPENDIX J

AMERICAN WOODCOCK - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA C
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
BARIUM	5.31E+02	4.84E+01	4.53E+00	6.45E+00	1.10E+01	2.08E+01	4.17E+01	5.3E-01	2.6E-01
CHROMIUM	2.65E+01	8.10E+00	2.26E-01	1.08E+00	1.31E+00	2.66E+00	1.56E+01	4.9E-01	8.4E-02
LEAD	1.63E+01	7.66E+00	1.39E-01	1.02E+00	1.16E+00	1.63E+00	9.70E+00	7.1E-01	1.2E-01
POLYCYCLIC AROMATIC HYDROCARBONS									
ACENAPHTHYLENE	5.47E-03	1.25E-01	4.67E-05	1.67E-02	1.67E-02	2.00E+00	2.00E+01	8.4E-03	8.4E-04
BENZO(B)FLUORANTHENE	3.34E-03	8.68E-03	2.85E-05	1.16E-03	1.19E-03	2.00E+00	2.00E+01	5.9E-04	5.9E-05
BENZO(G,H,I)PERYLENE	2.57E-02	7.56E-02	2.19E-04	1.01E-02	1.03E-02	2.00E+00	2.00E+01	5.1E-03	5.1E-04
INDENO(1,2,3-CD)PYRENE	4.97E-03	1.42E-02	4.24E-05	1.90E-03	1.94E-03	2.00E+00	2.00E+01	9.7E-04	9.7E-05
PHENANTHRENE	5.73E-03	9.85E-03	4.89E-05	1.31E-03	1.36E-03	2.00E+00	2.00E+01	6.8E-04	6.8E-05
POLYCLORINATED BIPHENYLS									
AROCLOR-1260	1.85E-02	1.23E-01	1.58E-04	1.64E-02	1.66E-02	1.80E-01	1.80E+00	9.2E-02	9.2E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.90E-01	kg	Dose (soil) = (Cs * Is)(H)/BW
Food Ingestion Rate = (If)	2.53E-02	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW
Soil Ingestion Rate = (Is)	1.62E-03	kg/day	
Home Range = (HR)	6.13E+01	acres	Ci = Contaminant concentration in invertebrate
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil
			Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX J

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE - SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Surface Soil Concentrations (mg/kg)				Earthworm Bioaccumulation Factors		Earthworm Concentrations (mg/kg)		Plant Bioaccumulation Factors		Plant Concentrations (mg/kg)	
	Maximum Detection	Average of All Results	Average of Positive Results	Average [1]	Conservative	Average	Maximum Detection	Average	Conservative	Average	Maximum Detection	Average
METALS												
THALLIUM	3.93E+00	2.24E+00	3.93E+00	2.24E+00	1.00E+00	1.00E+00	3.93E+00	2.24E+00	4.00E-03	4.00E-03	1.57E-02	8.97E-03
ZINC	1.15E+02	6.80E+01	6.80E+01	6.80E+01	Regression equation from Eco SSL		4.06E+02	3.41E+02	Regression equation from Eco SSL		6.69E+01	5.00E+01
POLYCYCLIC AROMATIC HYDROCARBONS												
BENZO(A)PYRENE	2.68E-02	1.44E-02	2.68E-02	1.44E-02	1.33E+00	1.33E+00	3.56E-02	1.91E-02	Regression equation from Eco SSL		3.73E-03	2.04E-03
BENZO(B)FLUORANTHENE	4.74E-02	2.47E-02	4.74E-02	2.47E-02	2.60E+00	2.60E+00	1.23E-01	6.42E-02	3.10E-01	3.10E-01	1.47E-02	7.65E-03
BENZO(G,H,I)PERYLENE	2.80E-02	1.50E-02	2.80E-02	1.50E-02	2.94E+00	2.94E+00	8.23E-02	4.41E-02	Regression equation from Eco SSL		5.74E-03	2.74E-03
BENZO(K)FLUORANTHENE	1.61E-02	9.04E-03	1.61E-02	9.04E-03	2.60E+00	2.60E+00	4.19E-02	2.35E-02	Regression equation from Eco SSL		3.32E-03	2.02E-03
CHRYSENE	3.15E-02	1.67E-02	3.15E-02	1.67E-02	2.29E+00	2.29E+00	7.21E-02	3.83E-02	Regression equation from Eco SSL		8.54E-03	5.86E-03
FLUORANTHENE	4.64E-02	2.42E-02	4.64E-02	2.42E-02	3.04E+00	3.04E+00	1.41E-01	7.35E-02	5.00E-01	5.00E-01	2.32E-02	1.21E-02
INDENO(1,2,3-CD)PYRENE	2.55E-02	1.37E-02	2.55E-02	1.37E-02	2.86E+00	2.86E+00	7.29E-02	3.93E-02	1.10E-01	1.10E-01	2.81E-03	1.51E-03
POLYCLORINATED BIPHENYLS												
AROCLOR-1016	3.67E-03	2.31E-03	3.67E-03	2.31E-03	1.59E+01	6.67E+00	5.84E-02	1.54E-02	2.12E-02	2.12E-02	7.78E-05	4.89E-05
AROCLOR-1260	2.69E-03	2.18E-03	2.18E-03	2.18E-03	1.59E+01	6.67E+00	4.28E-02	1.45E-02	6.15E-04	6.15E-04	1.65E-06	1.34E-06

1 - Average concentration is the mean concentration of all samples, using 1/2 the detection limit for non-detects, unless the value is greater than the maximum concentration. In that case, the average concentration is the mean of the positive detections.

APPENDIX J

MEADOW VOLE - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	3.93E+00	1.57E-02	7.34E-03	9.17E-04	8.26E-03	7.40E-03	7.40E-02	1.1E+00	1.1E-01
ZINC	1.15E+02	6.69E+01	2.15E-01	3.91E+00	4.12E+00	7.54E+01	2.98E+02	5.5E-02	1.4E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	2.68E-02	3.73E-03	5.00E-05	2.18E-04	2.68E-04	6.15E-01	3.84E+01	4.4E-04	7.0E-06
BENZO(B)FLUORANTHENE	4.74E-02	1.47E-02	8.85E-05	8.58E-04	9.46E-04	6.15E-01	3.84E+01	1.5E-03	2.5E-05
BENZO(G,H,I)PERYLENE	2.80E-02	5.74E-03	5.23E-05	3.35E-04	3.87E-04	6.15E-01	3.84E+01	6.3E-04	1.0E-05
BENZO(K)FLUORANTHENE	1.61E-02	3.32E-03	3.01E-05	1.94E-04	2.24E-04	6.15E-01	3.84E+01	3.6E-04	5.8E-06
CHRYSENE	3.15E-02	8.54E-03	5.88E-05	4.98E-04	5.57E-04	6.15E-01	3.84E+01	9.1E-04	1.5E-05
FLUORANTHENE	4.64E-02	2.32E-02	8.67E-05	1.35E-03	1.44E-03	6.56E+01	3.56E+02	2.2E-05	4.0E-06
INDENO(1,2,3-CD)PYRENE	2.55E-02	2.81E-03	4.76E-05	1.64E-04	2.11E-04	6.15E-01	3.84E+01	3.4E-04	5.5E-06
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	3.67E-03	7.78E-05	6.85E-06	4.54E-06	1.14E-05	1.37E+00	3.43E+00	8.3E-06	3.3E-06
AROCLOR-1260	2.69E-03	1.65E-06	5.02E-06	9.65E-08	5.12E-06	6.80E-02	6.80E-01	7.5E-05	7.5E-06

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.29E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.92E-03	kg/day	Dose (vegetation) = (Cv * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	6.14E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Cv = Contaminant concentration in vegetation	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

MEADOW VOLE - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	2.24E+00	8.97E-03	1.31E-03	4.37E-04	1.75E-03	7.40E-03	7.40E-02	2.4E-01	2.4E-02
ZINC	6.80E+01	5.00E+01	3.97E-02	2.44E+00	2.48E+00	7.54E+01	2.98E+02	3.3E-02	8.3E-03
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	1.44E-02	2.04E-03	8.42E-06	9.92E-05	1.08E-04	6.15E-01	3.84E+01	1.8E-04	2.8E-06
BENZO(B)FLUORANTHENE	2.47E-02	7.65E-03	1.44E-05	3.73E-04	3.87E-04	6.15E-01	3.84E+01	6.3E-04	1.0E-05
BENZO(G,H,I)PERYLENE	1.50E-02	2.74E-03	8.77E-06	1.34E-04	1.42E-04	6.15E-01	3.84E+01	2.3E-04	3.7E-06
BENZO(K)FLUORANTHENE	9.04E-03	2.02E-03	5.29E-06	9.86E-05	1.04E-04	6.15E-01	3.84E+01	1.7E-04	2.7E-06
CHRYSENE	1.67E-02	5.86E-03	9.79E-06	2.86E-04	2.96E-04	6.15E-01	3.84E+01	4.8E-04	7.7E-06
FLUORANTHENE	2.42E-02	1.21E-02	1.41E-05	5.89E-04	6.04E-04	6.56E+01	3.56E+02	9.2E-06	1.7E-06
INDENO(1,2,3-CD)PYRENE	1.37E-02	1.51E-03	8.04E-06	7.37E-05	8.17E-05	6.15E-01	3.84E+01	1.3E-04	2.1E-06
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	2.31E-03	4.89E-05	1.35E-06	2.38E-06	3.73E-06	1.37E+00	3.43E+00	2.7E-06	1.1E-06
AROCLOR-1260	2.18E-03	1.34E-06	1.27E-06	6.53E-08	1.34E-06	6.80E-02	6.80E-01	2.0E-05	2.0E-06

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	3.66E-02	kg
Food Ingestion Rate = (If)	1.79E-03	kg/day
Soil Ingestion Rate = (Is)	2.14E-05	kg/day
Home Range = (HR)	1.64E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX J

BOBWHITE QUAIL - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	3.93E+00	1.57E-02	5.53E-02	1.59E-03	5.69E-02	3.50E-01	3.50E+00	1.6E-01	1.6E-02
ZINC	1.15E+02	6.69E+01	1.62E+00	6.78E+00	8.39E+00	6.61E+01	1.71E+02	1.3E-01	4.9E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	2.68E-02	3.73E-03	3.77E-04	3.78E-04	7.55E-04	2.00E+00	2.00E+01	3.8E-04	3.8E-05
BENZO(B)FLUORANTHENE	4.74E-02	1.47E-02	6.67E-04	1.49E-03	2.15E-03	2.00E+00	2.00E+01	1.1E-03	1.08E-04
BENZO(G,H,I)PERYLENE	2.80E-02	5.74E-03	3.94E-04	5.81E-04	9.75E-04	2.00E+00	2.00E+01	4.9E-04	4.87E-05
BENZO(K)FLUORANTHENE	1.61E-02	3.32E-03	2.27E-04	3.36E-04	5.63E-04	2.00E+00	2.00E+01	2.8E-04	2.8E-05
CHRYSENE	3.15E-02	8.54E-03	4.43E-04	8.64E-04	1.31E-03	2.00E+00	2.00E+01	6.5E-04	6.5E-05
FLUORANTHENE	4.64E-02	2.32E-02	6.53E-04	2.35E-03	3.00E-03	2.00E+00	2.00E+01	1.5E-03	1.5E-04
INDENO(1,2,3-CD)PYRENE	2.55E-02	2.81E-03	3.59E-04	2.84E-04	6.43E-04	2.00E+00	2.00E+01	3.2E-04	3.2E-05
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	3.67E-03	7.78E-05	5.16E-05	7.88E-06	5.95E-05	1.80E-01	1.80E+00	3.3E-04	3.3E-05
AROCLOR-1260	2.69E-03	1.65E-06	3.79E-05	1.67E-07	3.80E-05	1.80E-01	1.80E+00	2.1E-04	2.1E-05

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.62E-01	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	1.64E-02	kg/day	Dose (vegetation) = (Cv * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	2.28E-03	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Cv = Contaminant concentration in vegetation	NV = No Value
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

BOBWHITE QUAIL - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Vegetation Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Veget.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	2.24E+00	8.97E-03	1.11E-02	7.30E-04	1.19E-02	3.50E-01	3.50E+00	3.4E-02	3.4E-03
ZINC	6.80E+01	5.00E+01	3.37E-01	4.07E+00	4.41E+00	6.61E+01	1.71E+02	6.7E-02	2.6E-02
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	1.44E-02	2.04E-03	7.14E-05	1.66E-04	2.37E-04	2.00E+00	2.00E+01	1.2E-04	1.2E-05
BENZO(B)FLUORANTHENE	2.47E-02	7.65E-03	1.23E-04	6.23E-04	7.45E-04	2.00E+00	2.00E+01	3.7E-04	3.7E-05
BENZO(G,H,I)PERYLENE	1.50E-02	2.74E-03	7.44E-05	2.23E-04	2.97E-04	2.00E+00	2.00E+01	1.5E-04	1.5E-05
BENZO(K)FLUORANTHENE	9.04E-03	2.02E-03	4.49E-05	1.65E-04	2.10E-04	2.00E+00	2.00E+01	1.0E-04	1.0E-05
CHRYSENE	1.67E-02	5.86E-03	8.31E-05	4.77E-04	5.60E-04	2.00E+00	2.00E+01	2.8E-04	2.8E-05
FLUORANTHENE	2.42E-02	1.21E-02	1.20E-04	9.84E-04	1.10E-03	2.00E+00	2.00E+01	5.5E-04	5.5E-05
INDENO(1,2,3-CD)PYRENE	1.37E-02	1.51E-03	6.82E-05	1.23E-04	1.91E-04	2.00E+00	2.00E+01	9.6E-05	9.6E-06
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	2.31E-03	4.89E-05	1.14E-05	3.98E-06	1.54E-05	1.80E-01	1.80E+00	8.6E-05	8.6E-06
AROCLOR-1260	2.18E-03	1.34E-06	1.08E-05	1.09E-07	1.09E-05	1.80E-01	1.80E+00	6.1E-05	6.1E-06

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.77E-01	kg
Food Ingestion Rate = (If)	1.44E-02	kg/day
Soil Ingestion Rate = (Is)	8.78E-04	kg/day
Home Range = (HR)	2.86E+01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No Value

APPENDIX J

SHORT-TAILED SHREW - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	3.93E+00	3.93E+00	2.00E-02	6.68E-01	6.88E-01	7.40E-03	7.40E-02	9.3E+01	9.3E+00
ZINC	1.15E+02	4.06E+02	5.86E-01	6.89E+01	6.95E+01	7.54E+01	2.98E+02	9.2E-01	2.3E-01
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	2.68E-02	3.56E-02	1.37E-04	6.06E-03	6.19E-03	6.15E-01	3.84E+01	1.0E-02	1.6E-04
BENZO(B)FLUORANTHENE	4.74E-02	1.23E-01	2.42E-04	2.09E-02	2.12E-02	6.15E-01	3.84E+01	3.4E-02	5.5E-04
BENZO(G,H,I)PERYLENE	2.80E-02	8.23E-02	1.43E-04	1.40E-02	1.41E-02	6.15E-01	3.84E+01	2.3E-02	3.7E-04
BENZO(K)FLUORANTHENE	1.61E-02	4.19E-02	8.21E-05	7.11E-03	7.20E-03	6.15E-01	3.84E+01	1.2E-02	1.9E-04
CHRYSENE	3.15E-02	7.21E-02	1.61E-04	1.23E-02	1.24E-02	6.15E-01	3.84E+01	2.0E-02	3.2E-04
FLUORANTHENE	4.64E-02	1.41E-01	2.37E-04	2.40E-02	2.42E-02	6.56E+01	3.56E+02	3.7E-04	6.8E-05
INDENO(1,2,3-CD)PYRENE	2.55E-02	7.29E-02	1.30E-04	1.24E-02	1.25E-02	6.15E-01	3.84E+01	2.0E-02	3.3E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	3.67E-03	5.84E-02	1.87E-05	9.92E-03	9.94E-03	1.37E+00	3.43E+00	7.3E-03	2.9E-03
AROCLOR-1260	2.69E-03	4.28E-02	1.37E-05	7.27E-03	7.29E-03	6.80E-02	6.80E-01	1.1E-01	1.1E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.53E-02	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	2.59E-03	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	7.78E-05	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Ci = Contaminant concentration in invertebrate	
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	
			H=CA/HR (Assume = to 1)	

APPENDIX J

SHORT-TAILED SHREW - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	2.24E+00	2.24E+00	1.97E-03	2.19E-01	2.21E-01	7.40E-03	7.40E-02	3.0E+01	3.0E+00
ZINC	6.80E+01	3.41E+02	5.97E-02	3.33E+01	3.34E+01	7.54E+01	2.98E+02	4.4E-01	1.1E-01
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	1.44E-02	1.91E-02	1.27E-05	1.87E-03	1.88E-03	6.15E-01	3.84E+01	3.1E-03	4.9E-05
BENZO(B)FLUORANTHENE	2.47E-02	6.42E-02	2.17E-05	6.27E-03	6.29E-03	6.15E-01	3.84E+01	1.0E-02	1.6E-04
BENZO(G,H,I)PERYLENE	1.50E-02	4.41E-02	1.32E-05	4.31E-03	4.32E-03	6.15E-01	3.84E+01	7.0E-03	1.1E-04
BENZO(K)FLUORANTHENE	9.04E-03	2.35E-02	7.95E-06	2.30E-03	2.30E-03	6.15E-01	3.84E+01	3.7E-03	6.0E-05
CHRYSENE	1.67E-02	3.83E-02	1.47E-05	3.75E-03	3.76E-03	6.15E-01	3.84E+01	6.1E-03	9.8E-05
FLUORANTHENE	2.42E-02	7.35E-02	2.13E-05	7.18E-03	7.21E-03	6.56E+01	3.56E+02	1.10E-04	2.0E-05
INDENO(1,2,3-CD)PYRENE	1.37E-02	3.93E-02	1.21E-05	3.84E-03	3.85E-03	6.15E-01	3.84E+01	6.3E-03	1.0E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	2.31E-03	1.54E-02	2.03E-06	1.50E-03	1.50E-03	1.37E+00	3.43E+00	1.1E-03	4.4E-04
AROCLOR-1260	2.18E-03	1.45E-02	1.92E-06	1.42E-03	1.42E-03	6.80E-02	6.80E-01	2.1E-02	2.1E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.69E-02	kg
Food Ingestion Rate = (If)	1.65E-03	kg/day
Soil Ingestion Rate = (Is)	1.48E-05	kg/day
Home Range = (HR)	9.70E-01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX J

AMERICAN WOODCOCK - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Max Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	3.93E+00	3.93E+00	1.18E-01	7.18E-01	8.36E-01	3.50E-01	3.50E+00	2.4E+00	2.4E-01
ZINC	1.15E+02	4.06E+02	3.44E+00	7.41E+01	7.75E+01	6.61E+01	1.71E+02	1.2E+00	4.5E-01
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	2.68E-02	3.56E-02	8.03E-04	6.51E-03	7.31E-03	2.00E+00	2.00E+01	3.7E-03	3.7E-04
BENZO(B)FLUORANTHENE	4.74E-02	1.23E-01	1.42E-03	2.25E-02	2.39E-02	2.00E+00	2.00E+01	1.2E-02	1.2E-03
BENZO(G,H,I)PERYLENE	2.80E-02	8.23E-02	8.39E-04	1.50E-02	1.59E-02	2.00E+00	2.00E+01	7.9E-03	7.9E-04
BENZO(K)FLUORANTHENE	1.61E-02	4.19E-02	4.82E-04	7.65E-03	8.13E-03	2.00E+00	2.00E+01	4.1E-03	4.1E-04
CHRYSENE	3.15E-02	7.21E-02	9.44E-04	1.32E-02	1.41E-02	2.00E+00	2.00E+01	7.1E-03	7.1E-04
FLUORANTHENE	4.64E-02	1.41E-01	1.39E-03	2.58E-02	2.72E-02	2.00E+00	2.00E+01	1.4E-02	1.4E-03
INDENO(1,2,3-CD)PYRENE	2.55E-02	7.29E-02	7.64E-04	1.33E-02	1.41E-02	2.00E+00	2.00E+01	7.0E-03	7.0E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	3.67E-03	5.84E-02	1.10E-04	1.07E-02	1.08E-02	1.80E-01	1.80E+00	6.0E-02	6.0E-03
AROCLOR-1260	2.69E-03	4.28E-02	8.06E-05	7.82E-03	7.90E-03	1.80E-01	1.80E+00	4.4E-02	4.4E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.66E-01	kg	Dose (soil) = (Cs * Is)(H)/BW	Conc = Concentration
Food Ingestion Rate = (If)	3.03E-02	kg/day	Dose (invertebrate) = (Ci * If)(H)/BW	LOAEL = Lowest Observed Adverse Effects Concentration
Soil Ingestion Rate = (Is)	4.97E-03	kg/day		NOAEL = No Observed Adverse Effects Concentration
Home Range = (HR)	Assume 100% on site		Ci = Contaminant concentration in invertebrate	NV = No Value
Contaminated Area = (CA)	Assume equal to home range		Cs = Contaminant concentration in soil	
			Total Dose = Dose (soil) + Dose (vegetation)	

APPENDIX J

AMERICAN WOODCOCK - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL, SUBAREA F
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Average Soil Conc. (mg/kg)	Invertebrate Conc. (mg/kg)	Dose (mg/kg/d) from: Soil	Dose (mg/kg/d) from: Invert.	Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients NOAEL	Hazard Quotients LOAEL
METALS									
THALLIUM	2.24E+00	2.24E+00	1.91E-02	2.99E-01	3.18E-01	3.50E-01	3.50E+00	9.1E-01	9.09E-02
ZINC	6.80E+01	3.41E+02	5.80E-01	4.55E+01	4.61E+01	6.61E+01	1.71E+02	7.0E-01	2.7E-01
POLYCYCLIC AROMATIC HYDROCARBONS									
BENZO(A)PYRENE	1.44E-02	1.91E-02	1.23E-04	2.55E-03	2.67E-03	2.00E+00	2.00E+01	1.3E-03	1.34E-04
BENZO(B)FLUORANTHENE	2.47E-02	6.42E-02	2.11E-04	8.56E-03	8.77E-03	2.00E+00	2.00E+01	4.4E-03	4.4E-04
BENZO(G,H,I)PERYLENE	1.50E-02	4.41E-02	1.28E-04	5.88E-03	6.00E-03	2.00E+00	2.00E+01	3.0E-03	3.0E-04
BENZO(K)FLUORANTHENE	9.04E-03	2.35E-02	7.72E-05	3.13E-03	3.21E-03	2.00E+00	2.00E+01	1.6E-03	1.6E-04
CHRYSENE	1.67E-02	3.83E-02	1.43E-04	5.11E-03	5.25E-03	2.00E+00	2.00E+01	2.6E-03	2.6E-04
FLUORANTHENE	2.42E-02	7.35E-02	2.06E-04	9.80E-03	1.00E-02	2.00E+00	2.00E+01	5.0E-03	5.0E-04
INDENO(1,2,3-CD)PYRENE	1.37E-02	3.93E-02	1.17E-04	5.24E-03	5.36E-03	2.00E+00	2.00E+01	2.7E-03	2.7E-04
POLYCLORINATED BIPHENYLS									
AROCLOR-1016	2.31E-03	1.54E-02	1.97E-05	2.05E-03	2.07E-03	1.80E-01	1.80E+00	1.1E-02	1.1E-03
AROCLOR-1260	2.18E-03	1.45E-02	1.86E-05	1.94E-03	1.96E-03	1.80E-01	1.80E+00	1.1E-02	1.1E-03

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.90E-01	kg
Food Ingestion Rate = (If)	2.53E-02	kg/day
Soil Ingestion Rate = (Is)	1.62E-03	kg/day
Home Range = (HR)	6.13E+01	acres
Contaminated Area = (CA)	Assume equal to home range	

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No Value

APPENDIX J

CHEMICAL CONCENTRATIONS IN SEDIMENT, SURFACE WATER, AND TISSUE - BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Chemical	Sediment Concentrations (mg/kg)				Surface Water Concentrations (mg/L)				Fish/Invertebrate Bioaccumulation Factors		Fish/Invertebrate Concentrations (mg/kg)	
	Maximum Detection	Overall Average	Average of Positive Detections	Average [(1)]	Maximum Detection	Overall Average	Average of Positive Detections	Average Concentration[(1)]	Conservative	Average	Maximum Detection	Average
EXPLOSIVES												
RDX	1.65E-01	4.84E-02	1.65E-01	4.84E-02	0.0108	0.00369	0.00459	3.69E-03	1.00E+00	1.00E+00	1.65E-01	4.84E-02
METALS												
ARSENIC	1.95E+01	9.77E+00	9.77E+00	9.77E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.90E-01	1.43E-01	1.35E+01	1.40E+00
CADMIUM	4.24E+00	1.25E+00	1.87E+00	1.25E+00	2.72E-04	2.55E-04	2.64E-04	2.55E-04	7.99E+00	6.00E-01	3.39E+01	7.51E-01
CHROMIUM	3.83E+01	2.31E+01	2.31E+01	2.31E+01	9.05E-04	6.61E-04	7.69E-04	6.61E-04	4.68E-01	1.00E-01	1.79E+01	2.31E+00
COPPER	1.11E+01	8.64E+00	8.64E+00	8.64E+00	3.33E-03	2.34E-03	2.34E-03	2.34E-03	5.25E+00	1.56E+00	5.83E+01	1.34E+01
LEAD	2.07E+01	1.36E+01	1.36E+01	1.36E+01	4.36E-04	3.87E-04	4.36E-04	3.87E-04	6.07E-01	7.10E-02	1.26E+01	9.63E-01
MERCURY	3.42E-02	2.56E-02	2.84E-02	2.56E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.87E+00	1.14E+00	9.81E-02	2.91E-02
NICKEL	2.78E+01	1.82E+01	1.82E+01	1.82E+01	1.88E-03	1.17E-03	1.45E-03	1.17E-03	2.32E+00	4.86E-01	6.45E+01	8.85E+00
ZINC	7.28E+01	4.22E+01	4.22E+01	4.22E+01	1.18E-02	6.15E-03	7.37E-03	6.15E-03	7.53E+00	1.94E+00	5.48E+02	8.17E+01

Percent TOC 7.77E-01
percent Lipids 1.44E+01
Invertebrate BSAFs used for inorganics

1 - Average concentration is the mean concentration of all samples, using 1/2 the detection limit for non-detects, unless the value is greater than the maximum concentration. In that case, the average concentration is the mean of the positive detections.

APPENDIX J

BELTED KINGFISHER - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION -SEDIMENT, BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Chemical	Max Sed. Conc. (mg/kg)	Max SW Conc. (mg/L)	Max Fish Conc. (mg/kg)	Dose (mg/kg/d) from:			Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients	
				Sediment	Surface Water	Fish				NOAEL	LOAEL
EXPLOSIVES											
RDX	1.65E-01	1.08E-02	1.65E-01	7.59E-04	1.49E-03	2.30E-02	2.52E-02	2.36E+00	4.49E+00	1.1E-02	5.6E-03
METALS											
ARSENIC	1.95E+01	0.00E+00	1.35E+01	8.97E-02	0.00E+00	1.87E+00	1.96E+00	2.24E+00	4.51E+00	8.8E-01	4.4E-01
CADMIUM	4.24E+00	2.72E-04	3.39E+01	1.95E-02	3.74E-05	4.72E+00	4.74E+00	1.47E+00	6.35E+00	3.2E+00	7.5E-01
CHROMIUM	3.83E+01	9.05E-04	1.79E+01	1.76E-01	1.24E-04	2.50E+00	2.67E+00	2.66E+00	1.56E+01	1.0E+00	1.7E-01
COPPER	1.11E+01	3.33E-03	5.83E+01	5.10E-02	4.58E-04	8.12E+00	8.17E+00	4.05E+00	3.49E+01	2.0E+00	2.3E-01
LEAD	2.07E+01	4.36E-04	1.26E+01	9.52E-02	6.00E-05	1.75E+00	1.85E+00	1.63E+00	9.70E+00	1.1E+00	1.9E-01
MERCURY	3.42E-02	0.00E+00	9.81E-02	1.57E-04	0.00E+00	1.37E-02	1.38E-02	6.40E-03	6.40E-02	2.2E+00	2.2E-01
NICKEL	2.78E+01	1.88E-03	6.45E+01	1.28E-01	2.59E-04	8.99E+00	9.11E+00	6.71E+00	1.86E+01	1.4E+00	4.9E-01
ZINC	7.28E+01	1.18E-02	5.48E+02	3.35E-01	1.62E-03	7.64E+01	7.67E+01	6.61E+01	1.71E+02	1.2E+00	4.5E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.36E-01	kg
Food Ingestion Rate = (If)	1.90E-02	kg/day
Water Ingestion Rate = (Iw)	1.87E-02	L/day
Sediment Ingestion Rate = (Is)	6.25E-04	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cf = Contaminant concentration in fish
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (water) + Dose (fish)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No value

APPENDIX J

BELTED KINGFISHER - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION -SEDIMENT, BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Chemical	Avg Sediment Conc. (mg/kg)	Avg SW Conc. (mg/L)	Avg Fish Conc. (mg/kg)	Dose (mg/kg/d) from:			Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients	
				Sediment	Surface Water	Fish				NOAEL	LOAEL
EXPLOSIVES											
RDX	4.84E-02	3.69E-03	4.84E-02	1.81E-04	4.05E-04	5.48E-03	6.07E-03	2.36E+00	4.49E+00	2.6E-03	1.4E-03
METALS											
ARSENIC	9.77E+00	0.00E+00	1.40E+00	3.65E-02	0.00E+00	1.58E-01	1.95E-01	2.24E+00	4.51E+00	8.7E-02	4.3E-02
CADMIUM	1.25E+00	2.55E-04	7.51E-01	4.68E-03	2.81E-05	8.51E-02	8.99E-02	1.47E+00	6.35E+00	6.1E-02	1.4E-02
CHROMIUM	2.31E+01	6.61E-04	2.31E+00	8.65E-02	7.26E-05	2.62E-01	3.49E-01	2.66E+00	1.56E+01	1.3E-01	2.2E-02
COPPER	8.64E+00	2.34E-03	1.34E+01	3.23E-02	2.57E-04	1.52E+00	1.56E+00	4.05E+00	3.49E+01	3.8E-01	4.5E-02
LEAD	1.36E+01	3.87E-04	9.63E-01	5.07E-02	4.25E-05	1.09E-01	1.60E-01	1.63E+00	9.70E+00	9.8E-02	1.6E-02
MERCURY	2.56E-02	0.00E+00	2.91E-02	9.57E-05	0.00E+00	3.29E-03	3.39E-03	6.40E-03	6.40E-02	5.3E-01	5.3E-02
NICKEL	1.82E+01	1.17E-03	8.85E+00	6.81E-02	1.28E-04	1.00E+00	1.07E+00	6.71E+00	1.86E+01	1.6E-01	5.8E-02
ZINC	4.22E+01	6.15E-03	8.17E+01	1.58E-01	6.75E-04	9.26E+00	9.42E+00	6.61E+01	1.71E+02	1.4E-01	5.5E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.52E-01	kg
Food Ingestion Rate = (If)	1.72E-02	kg/day
Water Ingestion Rate = (Iw)	1.67E-02	L/day
Sediment Ingestion Rate = (Is)	5.68E-04	kg/day
Home Range = (HR)	1.16E+00	
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cf = Contaminant concentration in fish
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (water) + Dose (fish)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration
NV = No value

APPENDIX J

MINK - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION -SEDIMENT, BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Chemical	Max Sed. Conc. (mg/kg)	Max SW Conc. (mg/L)	Max Fish Conc. (mg/kg)	Dose (mg/kg/d) from:			Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients	
				Sediment	Surface Water	Fish				NOAEL	LOAEL
EXPLOSIVES											
RDX	1.65E-01	1.08E-02	1.65E-01	1.58E-03	3.74E-03	1.68E-02	2.21E-02	8.94E+00	2.83E+01	2.5E-03	7.8E-04
METALS											
ARSENIC	1.95E+01	0.00E+00	1.35E+01	1.87E-01	0.00E+00	1.37E+00	1.56E+00	1.04E+00	4.55E+00	1.5E+00	3.4E-01
CADMIUM	4.24E+00	2.72E-04	3.39E+01	4.06E-02	9.43E-05	3.45E+00	3.49E+00	7.70E-01	6.90E+00	4.5E+00	5.1E-01
CHROMIUM	3.83E+01	9.05E-04	1.79E+01	3.67E-01	3.14E-04	1.83E+00	2.19E+00	2.40E+00	5.82E+01	9.1E-01	3.8E-02
COPPER	1.11E+01	3.33E-03	5.83E+01	1.06E-01	1.15E-03	5.94E+00	6.05E+00	5.60E+00	8.27E+01	1.1E+00	7.3E-02
LEAD	2.07E+01	4.36E-04	1.26E+01	1.98E-01	1.51E-04	1.28E+00	1.48E+00	4.70E+00	3.02E+01	3.1E-01	4.9E-02
MERCURY	3.42E-02	0.00E+00	9.81E-02	3.28E-04	0.00E+00	1.00E-02	1.03E-02	3.20E-02	1.60E-01	3.2E-01	6.5E-02
NICKEL	2.78E+01	1.88E-03	6.45E+01	2.66E-01	6.52E-04	6.58E+00	6.84E+00	1.70E+00	1.48E+01	4.0E+00	4.6E-01
ZINC	7.28E+01	1.18E-02	5.48E+02	6.98E-01	4.09E-03	5.59E+01	5.66E+01	7.54E+01	2.98E+02	7.5E-01	1.9E-01

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	5.50E-01	kg
Food Ingestion Rate = (If)	5.61E-02	kg/day
Water Ingestion Rate = (Iw)	1.91E-01	L/day
Sediment Ingestion Rate = (Is)	5.27E-03	kg/day
Home Range = (HR)	Assume 100% on site	
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cf = Contaminant concentration in fish
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (water) + Dose (fish)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX J

MINK - TIER 2, STEP 3A INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION -SEDIMENT, BOGGS CREEK
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, CRANE, INDIANA

Chemical	Avg Sediment Conc. (mg/kg)	Avg SW Conc. (mg/L)	Avg Fish Conc. (mg/kg)	Dose (mg/kg/d) from:			Total Dose (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Hazard Quotients	
				Sediment	Surface Water	Fish				NOAEL	LOAEL
EXPLOSIVES											
RDX	4.84E-02	3.69E-03	4.84E-02	1.79E-04	2.91E-04	1.91E-03	2.38E-03	8.94E+00	2.83E+01	2.7E-04	8.4E-05
METALS											
ARSENIC	9.77E+00	0.00E+00	1.40E+00	3.61E-02	0.00E+00	5.50E-02	9.11E-02	1.04E+00	4.55E+00	8.8E-02	2.0E-02
CADMIUM	1.25E+00	2.55E-04	7.51E-01	4.63E-03	2.02E-05	2.96E-02	3.42E-02	7.70E-01	6.90E+00	4.4E-02	5.0E-03
CHROMIUM	2.31E+01	6.61E-04	2.31E+00	8.56E-02	5.22E-05	9.11E-02	1.77E-01	2.40E+00	5.82E+01	7.4E-02	3.0E-03
COPPER	8.64E+00	2.34E-03	1.34E+01	3.20E-02	1.85E-04	5.29E-01	5.61E-01	5.60E+00	8.27E+01	1.0E-01	6.8E-03
LEAD	1.36E+01	3.87E-04	9.63E-01	5.02E-02	3.06E-05	3.79E-02	8.82E-02	4.70E+00	3.02E+01	1.9E-02	2.9E-03
MERCURY	2.56E-02	0.00E+00	2.91E-02	9.46E-05	0.00E+00	1.14E-03	1.24E-03	3.20E-02	1.60E-01	3.9E-02	7.7E-03
NICKEL	1.82E+01	1.17E-03	8.85E+00	6.74E-02	9.22E-05	3.49E-01	4.16E-01	1.70E+00	1.48E+01	2.4E-01	2.8E-02
ZINC	4.22E+01	6.15E-03	8.17E+01	1.56E-01	4.85E-04	3.22E+00	3.37E+00	7.54E+01	2.98E+02	4.5E-02	1.1E-02

Cells are shaded if the value is greater than 1.0

Body Weight = (BW)	1.02E+00	kg
Food Ingestion Rate = (If)	4.02E-02	kg/day
Water Ingestion Rate = (Iw)	8.05E-02	L/day
Sediment Ingestion Rate = (Is)	3.77E-03	kg/day
Home Range = (HR)	3.48E+01	
Contaminated Area = (CA)	Assume equal to home range	

Dose (sediment) = (Cs * Is)(H)/BW
Dose (fish) = (Cf * If)(H)/BW
Dose (water) = (Cw * Iw)(H)/BW
Cf = Contaminant concentration in fish
Cs = Contaminant concentration in sediment
Cw = Contaminant concentration in water
Total Dose = Dose (sediment) + Dose (water) + Dose (fish)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration