N00174.AR.000289
NSWC INDIAN HEAD
5090.3a

Remedial Investigation Report
for
IR Site 57
Former Drum Loading Area
Building 292

Indian Head Division
Naval Surface Warfare Center
Indian Head, Maryland

VOLUME II - APPENDICES

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0245

July 2000

FINAL

TETRA TECH NUS, INC.

APPENDIX A

Sample Log Sheets and Well Purging Data

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[✓] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: SS7MW0010101
Sample Location: SS7MW01
Sampled By: FCW
C.O.C. No.: 14
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1-25-99								
Time: 1037								
Method: Slow Flow	Clear	5.23	0.101	15.3	9	2.46	0.00	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 1-25-99								
Method: Slow Flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 26.06								
Static Water Level (WL): 7.5								
One Casing Volume(~~gal~~/L): 3.0								
Start Purge (hrs): 0922								
End Purge (hrs): 1050								
Total Purge Time (min): 88								
Total Vol. Purged (~~gal~~/L): 2.7								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC + ethyl ether	HCL / 4°C	3x40ml glass	✓
TDS + Ph	4°C	125ml plastic	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57MW01
DATE: 1-25-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
0922	7.5								START PURGING
0927	7.79	120	11.7	5.31	0.103	3.52	0.00	14	600
0934	7.81	80	12.8	5.46	0.103	3.56	0.00	18	560
0939	7.83	115	13.5	5.43	0.102	3.84	0.00	22	575
0944	7.9	115	13.8	5.43	0.105	2.84	0.00	15	575
0949	7.89	118	14.2	5.40	0.102	2.65	0.00	20	590
0954	7.89	118	14.3	5.38	0.099	3.23	0.00	16	590
0959	7.89	118	14.3	5.32	0.100	3.33	0.00	14	590
1004	7.90	125	14.6	5.30	0.101	1.90	0.00	15	620
1009	7.91	125	14.8	5.29	0.102	2.16	0.00	15	620
1014	7.89	120	14.7	5.31	0.101	3.07	0.00	11	600
1019	7.91	120	15.0	5.27	0.100	3.08	0.00	9	600
1024	7.91	120	15.1	5.24	0.100	2.83	0.00	9	600
1029	7.92	128	15.1	5.30	0.101	2.08	0.00	7	640
1034	7.92	128	14.9	5.30	0.101	3.27	0.00	7	640
1040	7.92	128	15.2	5.26	0.101	2.49	0.00	6	640
1045	7.92	128	15.0	5.25	0.101	2.88	0.00	4	640
1050	7.92		15.3	5.23	0.101	2.46	0.00	9	End purging
1051		Sample time							
1105		End sampling							

SIGNATURE(S) _____

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[✓] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0020101
Sample Location: S57MW02
Sampled By: FCW
C.O.C. No.: 14
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-25-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 0903	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Slow Flow	Clear	6.32	0.280	9.0	3	8.36	0.01	

PURGE DATA:

Date: 1-25-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 14.36								
Static Water Level (WL): 7.64								
One Casing Volume(~~gal~~/L): 1.1								
Start Purge (hrs): 0749								
End Purge (hrs): 0902								
Total Purge Time (min): 73								
Total Vol. Purged (~~gal~~/L): 1.6								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC + ethyl ether	HCL/4°C	3x 40 ml glass	✓
Total dissolved solids	4°C	125 ml plastic	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIANHEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57MW02
DATE: 1-25-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
0749	7.64								START PURGING
0753	7.98	135	7.5	6.18	0.308	6.85	0.01	34	
0758	7.98	135	8.1	6.31	0.298	6.87	0.01	38	1315
0803	8.00	125	8.5	6.32	0.295	6.76	0.01	20	675
0809	8.00	110	8.8	6.31	0.284	6.20	0.01	15	625
0815	8.00	110	7.4	6.40	0.285	6.67	0.01	5	had to change 660
0832	starting purging	again	8.5	6.34	0.282	6.46	0.01	9	battery
0837	7.95	120	↓	↓	↓	↓	↓	↓	600
0842	8.01	120	8.7	6.31	0.283	6.50	0.01	8	600
0847	8.02	120	8.8	6.34	0.293	6.91	0.01	7	600
0852	8.01	115	9.0	6.36	0.288	6.65	0.01	4	575
0857	8.02	115	9.1	6.36	0.281	6.20	0.01	3	575
0902	8.02	115	9.0	6.32	0.280	6.36	0.01	3	End purging
0903	Sample time								
0906	End sampling								

SIGNATURE(S) [signature]

PAGE 1 of 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0003@1101
Sample Location: S57MW0003 (DEEP)
Sampled By: GREG SISCO
C.O.C. No.: 14
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	Salinity %	Other NA
Date: 1-25-99								
Time: 1000								
Method: LOW FLOW	clear.	—	—	SEE	PURGE	DATA	SHEET	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 1-25-99								
Method: LOW FLOW	Initial							
Monitor Reading (ppm): n/a	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 24.21								
Static Water Level (WL): 8.77								
One Casing Volume(gal/L): ≈9l								
Start Purge (hrs): 915								
End Purge (hrs): 0956								
Total Purge Time (min): 36								
Total Vol. Purged (gal/L): 5.4l								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	✓
Ammonium Perchlorate	4°C	125 ml HDPE	~~✓~~ 247D
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	✓
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	✓
TCL PEST / PCBs	4°C	1 l AMB GLASS	✓
Explosives w/NC, NG, NG	4°C	1 l AMB GLASS + 125 ml HDPE	✓ ✓
TOC	H_2SO_4 4°C	250 ml HDPE	✓
~~TSS~~ TDS	4°C	125 ml HDPE	✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

150 30 ~~4500~~ 3150 6 ~~4500~~ 4500 90 ~~5490~~

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G. A. Sisco

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIANHEAD NSWC, SITE 57
PROJECT NUMBER: 7129

WELL I.D.: S57MW 0003 (DEEP)
DATE: 1-25-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
0922	9.01	135 mL/min	—	—	—	—	—	—	Purge Start 0915
0927	9.03	140	—	—	—	—	—	—	
0930	9.05	145	13.5	5.24	.107	8.39	—	+10	
0935	9.07	150	14.3	5.32	.103	8.30	—	+10	Sun warming HORIBA.
0941	9.075	155	14.9	5.36	.100	8.39	—	+10	
0946	9.075	155	15.1	5.33	.099	8.89	—	+10	Adjusted flow slightly.
0951	9.070	150	15.6	5.32	.099	9.20	—	+10	
0956	9.070	155	15.3	5.32	.099	9.46	—	+10	
1000	9.07	150	—	—	—	—	—	—	COLLECT SAMPLES.

MAB 1-25-99

*Disregard Turbidity readings. Meter out of calibration for Turbidity.

MAB

C.O.C. 14

SIGNATURE(S) M.F. Lisco 1-25-99

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0040101
Sample Location: S57MW004
Sampled By: G.F. SISCO
C.O.C. No.: 14
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	Salinity %	Other NA
Date: 1-25-99								
Time: 1205								
Method: LOW FLOW	CLEAR	5.47	.104	15.1	—	11.17	—	—

PURGE DATA:

Date: 1-25-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 18.27								
Static Water Level (WL): 8.88								
One Casing Volume(gal/L): ≈6l								
Start Purge (hrs): 1115								
End Purge (hrs): 1202								
Total Purge Time (min): 47								
Total Vol. Purged (gal/L): 5.9l								

See Page 2

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	✓
AMMONIUM PERCHLORATE	4°C	125 ml HDPE	~~✓~~ n/a
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE*	✓
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	✓
TCL PEST / PCBs	4°C	1 l AMB GLASS	✓
EXPLOSIVES w/NC, NQ, NG	4°C	1 l AMB GLASS + 125 ml HDPE	✓ ✓
TOC	H_2SO_4 4°C		✓
~~TSS~~ TDS			✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

13
125
42
875
5000
5875

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G.F. Sisco

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head NSWC Site 57
PROJECT NUMBER: 7129

WELL I.D.: S57MW0040101
DATE: 1-25-99.

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1115	08.88	—	—	—	—	—	—	—	(18.27' T.D.) Begin Purge.
1122	09.14	140	—	—	—	—	—	—	Adjusted Flow ↓
1127	09.18	135	16.0	5.44	.108	12.01	—	+10	
1132	09.20	130	15.6	5.46	.106	3.80	—	+10	D.O. reading ?
1137	09.22	140	15.5	5.46	.105	10.57	—	+10	
1142	09.215	125	15.3	5.47	.106	10.73	—	+10	Adjusted Flow ↓
1147	09.215	125	15.3	5.47	.107	10.87	—	+5	
1152	09.22	125	15.5	5.47	.106	10.87	—	+10	
1157	09.22	125	15.5	5.47	.103	10.98	—	+8	
1202	09.23	130	15.1	5.47	.104	11.17	—	+10	
1205	09.23	—	—	—	—	—	—	—	Collect Sample.

*JAP 1-25-99

JAP

C.O.C. 14

SIGNATURE(S) [signature]

*Disregard Turbidity readings. Meter out of calibration for Turbidity

PAGE 1 of 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 157MW0050101
Sample Location: 157MW0005
Sampled By: G.F. Sisco
C.O.C. No.: 16
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 1-27-99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 1047								
Method: LOW FLOW	CLEAR	4.86	.106	12.9	18	10.29	—	—

PURGE DATA:

Date: 1-27-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 19.85				SEE				
Static Water Level (WL): 5.64				PURGE				
One Casing Volume(gal/L): ≈5l				SHEET.				
Start Purge (hrs): 1003								
End Purge (hrs): 1047								
Total Purge Time (min): 44								
Total Vol. Purged (gal/L): ≈5.5l								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓✓✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	
Ammonium Perchlorate	4°C	125 ml HDPE	
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	
TCL PEST / PCBs	4°C	1 l AMB GLASS	
Explosives w/NC, NQ, NG	4°C	1 l AMB GLASS + 125 ml HDPE	
TOC	H_2SO_4 4°C		
~~TSS~~ TDS	4°C	125 ml HDPE	✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

325
44
~~388~~
~~6030~~

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G.F. Sisco

C-O-C #16

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: IH- Site 57
PROJECT NUMBER: 7129

WELL I.D.: S57MW0H PR 005
DATE: 2-27-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1003	5.64	—	—	—	—	—	—	—	
1007	5.69	140	—	—	—	—	—	—	
1011	5.72	125	10.8	5.15	.106	10.30	—	54	
1016	5.71	125	11.2	5.08	.105	10.04	—	45	Sun warming probe.
1021	5.72	125	11.5	5.07	.108	10.40	—	36	"
1027	5.72	125	11.7	5.01	.107	10.81	—	32	"
1032	5.72	125	12.0	5.03	.109	10.63	—	30	"
1037	5.72	125	12.5	4.84	.109	10.27	—	25	"
1042	5.72	125	12.7	4.86	.110	10.18	—	18	"
1047	5.72	125	12.9	4.86	.106	10.29	—	18	Collect sample.

DAS

SIGNATURE(S) G.T. Sisco

PAGE 1 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0060101
Sample Location: SITE57-MW006
Sampled By: G.F SISCO
C.O.C. No.: 16
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	Salinity %	Other NA
Date: 1-27-99								
Time: 1407								
Method: LOW FLOW	CLEAR	4.67	.099	13.4	10	11.89	—	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 1-27-99								
Method: LOW FLOW	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 14.25								
Static Water Level (WL): 5.73								
One Casing Volume(gal/L): ≈ 52								
Start Purge (hrs): 1332								
End Purge (hrs): 1407								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): ≈ 52								

SEE PURGE SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓✓✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	
AmmoniumPerchlorate	4°C	125 ml HDPE	
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	
TCL PEST / PCBs	4°C	1 l AMB GLASS	
Explosives w/NC, NG, NG	4°C	1 l AMB GLASS + 125 ml HDPE	
TOC	H_2SO_4 4°C		
~~TSS~~ TDS	4°C	125 ml HDPE	✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

130) 5000 (37
3900
1100

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G F Sisco

(C-O-C #16)

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: IH - NWSC - Site 57
PROJECT NUMBER: 7189

WELL I.D.: S57MW006
DATE: 1-27-98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1332	5.73	—	—	—	—	—	—	—	
1335	5.79	145	—	—	—	—	—	—	
1337	5.795	130	14.0	4.82	.108	13.00	—	31	Probe in Sun.
1342	5.80	130	13.2	4.80	.103	12.69	—	22	
1347	5.81	130	13.3	4.64	.104	12.25	—	17	(17)
1352	5.83	135	13.1	4.64	.101	12.57	—	14	
1357	5.82	130	13.3	4.59	.100	11.90	—	11	
1402	5.82	130	13.3	4.66	.099	11.91	—	10	
1407	5.82	130	13.4	4.67	.099	11.89	—	10	Collect Sample.

SIGNATURE(S) G. F. Lisco

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GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW007010
Sample Location: S57MW007
Sampled By: G.F. SISCO
C.O.C. No.: 14
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-25-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1542	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: LOW FLOW	CLEAR	5.61	.348	13.4	—	11.18	—	—

PURGE DATA:

Date: 1-25-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm): —	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 27.94								
Static Water Level (WL): 8.98					See			
One Casing Volume(gal/L): ≈ 12 l					purge			
Start Purge (hrs): 1458					sheet.			
End Purge (hrs): 1542								
Total Purge Time (min): 44								
Total Vol. Purged (gal/L): ≈ 6 l								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	
AMMONIUM PERCHLORATE	4°C	125 ml HDPE	
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	
TCL PEST / PCBs	4°C	1 l AMB GLASS	
EXPLOSIVES w/NC, NQ, NG	4°C	1 l AMB GLASS + 125 ml HDPE	
TOC	H_2SO_4 4°C		
~~TSS~~ TDS			✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

~~1260~~ 100
x 37
1260 3700
1260
5960

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G.F. Sisco

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: Indian Head NSWC Site 57
PROJECT NUMBER: 7129

WELL I.D.: S57MW0070101 (Deep)
DATE: 1-25-99.

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb.* (NTU)	Comments
1458	8.98	—	—	—	—	—	—	—	Begin Purge.
1501	9.30	185	—	—	—	—	—	—	Reduce flow rate.
1505	9.45	170	—	—	—	—	—	—	Reduce flowrate.
1509	9.55	110	—	—	—	—	—	—	Reduce flow rate.
1513	9.60	105	13.6	5.65	.340	11.57	—	11	—
1518	9.68	95	13.7	5.67	.310	11.56	—	11	Slight flow reduction
1523	9.72	90	12.4	5.66	.314	12.44	—	[illegible]	
1529	9.76	85	13.7	5.67	.348	11.30	—	10	
1534	9.79	90	13.5	5.61	.348	11.15	—	10	
1539	9.80	85	13.4	5.61	.348	11.18	—	10	Slight flow reduction.
1542	9.80	—	—	—	—	—	—	—	Collect sample.

NOTE: Could not turn flow rate down below about 80 to 90 ml/MIN. because peristaltic pump would not turn.

pg 8

SIGNAT (S) M. F. Fisco

C.O.C. # 14

PAGE 1 c

*Disc., & Turbidity readings. Meter out of calibration

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: B57MW0988101
Sample Location: 57MW088
Sampled By: G.F. Sisco
C.O.C. No.: 15
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 1-26-99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 0919								
Method: LOW FLOW	CLEAR	5.52	.364	10.9	116	9.30	—	—

PURGE DATA:

Date: 1-26-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm): n/a	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 16.82	~~16.82~~				See			
Static Water Level (WL): 8.26	~~8.26~~				Purge			
One Casing Volume(gal/L): ≈4l					Sheet.			
Start Purge (hrs): 0824								
End Purge (hrs): 0919								
Total Purge Time (min): 55								
Total Vol. Purged (gal/L) ≈5.7l								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	
AMMONIUM PERCHLORATE	4°C	125 ml HDPE	
TAL METALS (TOTAL + DISSOLVED)	HNO3 4°C	2 x 500 ml HDPE *	
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	
TCL PEST / PCBs	4°C	1 l AMB GLASS	
EXPLOSIVES w/NC, NQ, NG	4°C	1 l AMB GLASS + 125 ml HDPE	
TOC	H_2SO_4 4°C		✓
~~TSS~~ TDS			

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

105
×55
525
5250
5775

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G. F. Sisco

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: IH - NSWC Site 57
PROJECT NUMBER: 7129

WELL I.D.: ~~8A~~ 8A S57MW0080101
DATE: 1-26-99.

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
0824	08.26	—	~	—	—	—	—	—	Begin Purge.
0829	8.36	100	—	8A —	—	—	—	8A —	Clear. Some solids in
0832	8.37	100	8.6	8.496	.429	10.21	—	784	" " suspension.
0838	8.40	100	10.0	5.54	.393	9.46	—	828	Clear. With solids in suspension.
0843	8.41	110	9.9	5.59	.384	9.14	—	29	Clear. Very little solid in susp.
0848	8.42	110	10.3	5.63	.387	8.58	—	45	Slight flow reduction.
0853	8.42	105	9.0	5.61	.384	9.64	—	17	
0858	8.42	105	9.5	5.64	.390	9.71	—	23	
0903	8.42	105	10.5	5.60	.374	9.25	—	40	Sun hitting probe.
0908	8.425	105	10.5	5.60	.358	9.52	—	122	
0914	8.425	105	10.6	5.52	.359	9.45	—	100	
0919	8.425	105	10.9	5.52	.364	9.30	—	116	Collect samples.

* Not convinced about Turbidity readings — H_2O looks same as the 17 and 23 entries.

FINAL SAMPLE IS CRYSTAL CLEAR.

8A8

SIGNATURE(S) G. F. Sisco

C.O.C. #15

PAGE 1 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0901
Sample Location: S57MW009
Sampled By: G.F. S/SCD
C.O.C. No.: 15
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-26-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1113	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: LOW FLOW	CLEAR	4.85	.086	12.5	—	9.47	—	—

PURGE DATA:

Date: 1-26-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm): n/a	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 21.90	~~21.90~~ mbr				SEE			
Static Water Level (WL): 8.78	~~8.78~~ mbr				PURGE			
One Casing Volume(gal/L): ≈7.5l					SHEET			
Start Purge (hrs): 1028								
End Purge (hrs): 1113								
Total Purge Time (min): 45								
Total Vol. Purged (gal/L): ≈4.5l								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓✓✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	✓
AMMONIUM PERCHLORATE	4°C	125 ml HDPE	✓
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	✓✓
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	✓
TCL PEST / PCBs	4°C	1 l AMB GLASS	✓
EXPLOSIVES w/NC, NQ, NG	4°C	1 l AMB GLASS + 125 ml HDPE	✓✓
TOC	H_2SO_4 4°C	250 ~~125~~ ml HDPE	✓
~~TSS~~ TDS	4°C	125 ml HDPE	✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

100
45
4500

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G. Gibson

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: IH- NSWC - SITE57
PROJECT NUMBER: ~~SITE 57~~ #7129

WELL I.D.: S57MW0090101
DATE: 1-26-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1028	8.78	—	—	—	—	—	—	—	Begin Purge.
1032	9.08	150	—	—	—	—	—	—	Slightly Cloudy.
1034	9.12	120	13.6	5.04	.088	10.25	—	99	Reduced flow rate.
1039	9.16	110	13.2	5.00	.084	10.45	—	-10*	Reduced rate slightly.
1045	9.18	105	12.9	4.94	.087	10.27	—	"	Clearing.
1049	9.185	105	13.0	4.90	.087	10.07	—	"	
1054	9.19	105	12.8	4.90	.087	10.07	—	"	Clear.
1059	9.20	105	12.8	4.83	.087	9.81	—	"	
1104	9.19	95	12.6	4.77	.086	9.73	—	"	Slight flow reduction.
1109	9.185	95	12.5	4.82	.086	9.50	—	"	
1113	9.18	95	12.5	4.85	.086	9.47	—	"	Collect Sample.
									Final Sample: Crystal Clear.
						078			

SIGNATURE(S) D.F. Fisco

* OUT of Calibration for TURBIDITY.

PAGE 1 of 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW01010101
Sample Location: IH-Site 57
Sampled By: G.F. SISCO
C.O.C. No.: 15
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-26-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1400	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: LOW FLOW	CLEAR	6.69	.408	12.7	15	10.04	—	—

PURGE DATA:

Date: 1-26-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 16.05					SEE			
Static Water Level (WL): 8.86					PURGE			
One Casing Volume(gal/L): ≈4 l					SHEET			
Start Purge (hrs): 1300								
End Purge (hrs): 1400								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L) ≈4.8 l								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	✓
Ammonium Perchlorate	4°C	125 ml HDPE	✓
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	✓
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	✓
TCL PEST / PCBs	4°C	1 l AMB GLASS	✓
Explosives w/NC, NG, NG	4°C	1 l AMB GLASS + 125 ml HDPE	✓
TOC	H_2SO_4 4°C	250 ml HDPE	✓
~~TSS~~ TDS	—	125 ml HDPE	✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

16.05
8.86
7.19
-5
2.19

80
60
4800

Circle if applicable:
MS/MSD
Duplicate ID No.: —

Signature(s): G.F. Sisco

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: IH - NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57MW0100101
DATE: 1-26-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
									Fred Ramser
1300	8.86	—	—	—	—	—	—	—	Re-calibrated HORIBA. Zeroed TURBIDITY.
1303	8.94	75	—	—	—	—	—	—	
1306	9.02	85	—	—	—	—	—	—	Increase flow rate slightly.
1309	9.08	90	13.6	6.65	.469	12.87	—	39	
1315	9.11	90	13.0	6.82	.443	13.33	—	45	
1320	9.14	85	12.9	6.82	.430	11.13	—	33	
1325	9.18	85	12.7	6.94	.435	10.57	—	29	Reduce flow slightly.
1330	9.19	80	12.6	6.95	.434	10.48	—	27	
1335	9.20	80	12.9	6.93	.430	10.30	—	167*	
1340	9.21	80	12.7	6.78	.423	10.79	—	22	
1345	9.215	80	12.5	6.75	.413	10.19	—	21	
1350	9.22	80	12.6	6.71	.410	10.18	—	19	
1355	9.225	80	12.9	6.72	.409	10.04	—	16	
1400	9.23	80	12.7	6.69	.408	10.04	—	15	
1400									Collect Samples.

GAB

* Turbidity out-of-calibration?

SIGNATURE(S) G. A. Sisco

C-D-Cx 15

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW211010
Sample Location: MW 011
Sampled By: G.F. SISCO
C.O.C. No.: 16
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-27-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 0842	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: LOW FLOW	CLEAR	5.90	.193	11.2	7	8.53	—	—

PURGE DATA:

Date: 1-27-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 20.61					SEE			
Static Water Level (WL): 9.79					Purge			
One Casing Volume(gal/L): ≈6.2					Sheet.			
Start Purge (hrs): 0800								
End Purge (hrs): 0842								
Total Purge Time (min): 42								
Total Vol. Purged (gal/L): ≈62								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ethylether (LOW CONC)	HCL 4°C	3 x 40 ml VIAL	✓✓✓✓
TCL SVOCs (LOW CONC)	4°C	1 l AMB GLASS	
Ammonium Perchlorate	4°C	125 ml HDPE	
TAL METALS (TOTAL + DISSOLVED)	HNO_3 4°C	2 x 500 ml HDPE *	
CYANIDE	NaOH 4°C	1 x 500 ml HDPE	
TCL PEST / PCBs	4°C	1 l AMB GLASS	
Explosives w/NC, NQ, NG	4°C	1 l AMB GLASS + 125 ml HDPE	
TOC	H_2SO_4 4°C		
~~TSS~~ TDS	4°C	125 ml HDPE	✓✓

OBSERVATIONS / NOTES:

* INCLUDE HARDNESS IN TAL METAL (TOTAL)

$\frac{20}{10}$ 42

DUP. SET. COLLECTED.

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):
—	✓ S57MWDUP002	G.F. Sisco

C-O-C #16

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: IH - NWSC Site 57
PROJECT NUMBER: 7129

WELL I.D.: 857MW011
DATE: 1-27-91

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
0800	9.79	—	—	—	—	—	—	—	
0804	10.08	130	—	—	—	—	—	—	Reduced flow rate.
0808	10.09	90	—	—	—	—	—	—	
0811	10.11	100	10.6	5.70	.234	8.79	—	10	
0816	10.13	105	10.9	5.89	.195	8.55	—	13	
0821	10.14	100	11.0	5.94	.198	8.63	—	13	Slight flow reduction.
0826	10.15	105	11.2	5.91	.199	8.62	—	11	
0831	10.16	105	11.3	5.90	.195	8.89	—	12	
0837	10.15	100	11.0	5.92	.192	8.63	—	10	
0842	10.16	105	11.2	5.90	.193	8.53	—	7	Collect Sample.

SIGNATURE(S) D.F. Lee

PAGE 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[✓] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0120101
Sample Location: S57MW012
Sampled By: FCW
C.O.C. No.: 14
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 1-25-99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 1625								
Method: Slow Flow	Clear	6.34	0.209	13.7	6	3.65	0.00	

PURGE DATA:

Date: 1-25-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material Type: 2" PVC	2							
	3							
Total Well Depth (TD): 44.3								
Static Water Level (WL): 5.72								
One Casing Volume(gal/L): 6.2								
Start Purge (hrs): 1459								
End Purge (hrs): 1624								
Total Purge Time (min): 85								
Total Vol. Purged (gal/L): 2.7								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC + ee	HCL / 4°C	3x 40ml glass	✓
TCL SVOC	4°C	1L AMBER	✓
ammonium Perchlorate	4°C	125ml plastic	✓
TAL Metals (Total)	HNO_3 / 4°C	500ml plastic	✓
TAL Metals (dissolved)	HNO_3 / 4°C	500ml plastic	✓
TCL Pest / PCB	4°C	1L AMBER	✓
Explosives + NC, NQ, NG	4°C	1L AMBER + 125ml plastic	✓
Cyanide	NaOH / 4°C	500ml plastic	✓
Total dissolved solids + Ph	4°C	125ml plastic	✓
TOC + HARDNESS	H_2SO_4 / 4°C	250 ml plastic	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S57MWDUP001

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: 557MW012
DATE: 1-25-99.

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1459	5.72								START PURGING
1504	5.75	120	13.1	6.48	0.246	3.73	0.00	268	600
1509	5.76	115	13.1	6.37	0.236	3.50	0.00	122	575
1514	5.77	105	13.2	6.31	0.235	2.62	0.00	116	525
1519	5.77	120	13.2	6.29	0.235	2.68	0.00	119	600
1524	5.78	120	13.2	6.36	0.235	2.59	0.00	109	600
1529	5.79	120	13.4	6.36	0.236	2.35	0.00	80	600
1534	5.78	120	13.5	6.39	0.236	2.74	0.00	42	600
1539	5.78	125	13.7	6.33	0.234	2.54	0.00	25	625
1544	5.79	125	13.6	6.36	0.233	3.09	0.00	17	625
1549	5.79	120	13.6	6.36	0.232	2.61	0.00	16	600
1554	5.79	120	13.6	6.40	0.230	2.52	0.00	10	600
1559	5.79	120	13.7	6.36	0.226	2.91	0.00	11	600
1604	5.79	130	13.8	6.37	0.222	3.45	0.00	8	650
1609	5.79	130	13.7	6.30	0.217	2.83	0.00	9	650
1614	5.79	120	13.7	6.31	0.215	2.48	0.00	7	600
1619	5.79	120	13.7	6.30	0.212	2.58	0.00	6	600
1624	5.79	125	13.7	6.34	0.209	3.65	0.00	6	625
1625	sample								

SIGNATURE(S)

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[✓] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S57MW0130101
Sample Location: S57MW013
Sampled By: FCW
C.O.C. No.: 14
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1-25-99								
Time: 1252								
Method: Slow Flow	Clear	5.04	0.134	14.2	0	3.93	0.00	

PURGE DATA:

Date: 1-25-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material	2							
Type: 2" PVC	3							
Total Well Depth (TD): 17.96								
Static Water Level (WL): 5.59								
One Casing Volume(gal/L): 2.0								
Start Purge (hrs): 1150								
End Purge (hrs): 1251								
Total Purge Time (min): 61								
Total Vol. Purged (gal/L): 1.9								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC + ee	HCL / 4°C	3x 40mL glass	✓
TCL SVOC	4°C	1L amber	✓
ammonium perchlorate	4°C	125 ml plastic	✓
TAL Metals (total)	HNO_3 / 4°C	500 ml plastic	✓
TAL Metals (dissolved)	HNO_3 / 4°C	500ml plastic	✓
TCL Pest / PCB	4°C	1L amber	✓
Explosives + NC, NQ, NG	4°C	1L amber + 125ml plastic	✓
Cyanide	NaOH / 4°C	500ml plastic	✓
Total Dissolved Solids + pH	4°C	125 ml plastic	✓
TOC + hardness	H_2SO_4 / 4°C	250ml plastic	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57MW013
DATE: 1-25-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
~~1150~~	5.59								START PURGING
1150	↓								
1155	5.73	110	13.3	5.07	0.134	4.96	0.00	8	~~505~~ 550
1200	5.74	115	13.6	5.00	0.134	3.91	0.00	4	575
1205	5.76	120	13.6	4.98	0.135	3.97	0.00	3	600
1210	5.76	118	13.7	4.99	0.134	4.08	0.00	1	590
1215	5.76	118	13.7	4.96	0.135	3.88	0.00	1	590
1221	5.76	120	13.7	4.97	0.136	4.20	0.00	1	720
1226	5.76	120	13.9	5.02	0.135	3.86	0.00	0	600
1231	5.77	120	13.9	5.01	0.135	3.86	0.00	0	600
1236	5.77	120	13.9	5.02	0.135	3.50	0.00	0	600
1241	5.77	120	14.0	5.01	0.135	3.85	0.00	0	600
1246	5.77	120	14.0	5.05	0.134	3.86	0.00	0	600
1251	5.78	120	14.2	5.04	0.134	3.93	0.00	0	End purging
1252	sample								
1300	End sampling								

SIGNATURE(S) [signature]

PAGE 1 of 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[] Monitoring Well Data
[✓] Other Well Type: Temporary Well
[] QA Sample Type:

Sample ID No.: S57TW0010101
Sample Location: 557TW001
Sampled By: FCW
C.O.C. No.: 10
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1-22-99								
Time: 1618								
Method: Slow Flow	Cloudy	6.18	0.217	11.8	102	5.09	0.00	

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 1-22-99								
Method: Slow Flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material	2							
Type: 1.5" PVC	3							
Total Well Depth (TD): 13								
Static Water Level (WL): 9.1'								
One Casing Volume(~~gal~~/L): 0.3								
Start Purge (hrs): 0825								
End Purge (hrs): 1617								
Total Purge Time (min): 115								
Total Vol. Purged (~~gal~~/L): 0.6								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC + ethyl ether	HCL / 4°C	3 x 40 ml glass	✓

OBSERVATIONS / NOTES:

Stick up 2.0'

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57 TW001
DATE: 1-22-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments	
0805	9.1	START PURGING								
0820	11.53	90	10.4	5.60	0.284	3.70	0.01	999	dirty	+800
0830	went dry									+400
0942	11.43	START PURGING								
0946	12.11	90	9.5	6.57	0.221	8.03	0.00	999		+550
0950	dry									+140
1609	9.24									
1617	10.5	82	11.8	6.18	0.217	5.09	0.00	102	end purge	~~+00~~ 650
1618	Sample time									
* 1627	12.41	82	11.9	6.43	0.215	5.49	0.00	897	went dry	+600
* did last set of readings after sampling to get more data										

SIGNATURE(S)

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[] Monitoring Well Data
[✓] Other Well Type: TEMPORARY WELL
[] QA Sample Type:

Sample ID No.: S57TW0020101
Sample Location: S57TW002
Sampled By: FCW
C.O.C. No.: 9
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-21-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1725	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Slow Flow	DRK BRN	6.12	0.98	11.8	999	3.19	0.00	

PURGE DATA:

Date: 1-21-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material	2							
Type: 1.5" PVC	3							
Total Well Depth (TD): 10.02								
Static Water Level (WL): 4.82								
One Casing Volume(~~gal~~/L): 0.47								
Start Purge (hrs): 1604								
End Purge (hrs): 1724								
Total Purge Time (min): 80								
Total Vol. Purged (~~gal~~/L): 2.0								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCLVOC + ethyl ether	HCL 4°C	3 x 40ml vial	✓

OBSERVATIONS / NOTES:

1.8' STICK UP

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57TW002
DATE: 1-21-99.

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1604	4.82	Start PURGING							
1611	5.54	100	700ml	purged out	water is	thick +	dark		1700
1618	5.67	95	11.0	7.09	0.116	4.28	0.00	999	1665
1630	5.83	95	11.2	6.86	0.110	3.18	0.00	999	dirty 665
1638	5.92	95	11.7	6.35	0.105	2.05	0.00	999	1140
1646	5.90	95	11.8	6.20	0.103	2.50	0.00	999	760
1653	5.93	95	12.1	6.13	0.101	2.07	0.00	999	760
1702	5.97	95	11.8	6.13	0.100	3.33	0.00	999	665
1708	6.07	108	11.8	6.14	0.99	2.69	0.00	999	855
1716	5.92	95	11.7	6.21	0.98	2.54	0.00	999	648
1724	5.9	95	11.9	6.12	0.98	3.19	0.00	995	End purging 760
1725	Sample								

SIGNATURE(S)

PAGE 1 of 1

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: INDIAN HEAD NSWC
Project No.: 7129

[] Domestic Well Data
[] Monitoring Well Data
[✓] Other Well Type: Temporary well
[] QA Sample Type:

Sample ID No.: S57TW008~~0~~01 1 PVC
Sample Location: S57TW008
Sampled By: RCW
C.O.C. No.: 9
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1-21-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1539	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: slow flow	clear	6.77	1.54	12.8	12	3.45	0.07	–

PURGE DATA:

Date: 1-21-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: slow flow	Initial							
Monitor Reading (ppm): 0	1							
Well Casing Diameter & Material	2							
Type: 1.5" PVC	3							
Total Well Depth (TD): 10.09								
Static Water Level (WL): 5.52								
One Casing Volume(~~gal~~/L): 0.4								
Start Purge (hrs): 1423								
End Purge (hrs): 1538								
Total Purge Time (min): 75								
Total Vol. Purged (~~gal~~/L): 1.6								

SEE PURGE DATA SHEET

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCLVOC's + ethyl ether	HCL/4°C	3x 40ml glass	✓

OBSERVATIONS / NOTES:

0.5' stickup

.092 conversion

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
PROJECT NUMBER: 7129

WELL I.D.: S57TW003
DATE: 1-21-99

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments
1423	5.49' with tubing								start purging
1431	7.02	75	12.3	6.17	0.619	0.10	0.02	999	+600
1438	7.39	75	12.3	6.27	1.12	3.95	0.05	999	+600
1445	7.39	75	12.3	6.54	1.37	2.85	0.06	372	
1453	7.52	75	12.7	6.61	1.38	2.51	0.06	475	
1501	7.56	75	12.7	6.75	1.55	3.31	0.07	256	
1508	7.7	93	13.1	6.73	1.45	3.38	0.06	163	651
1515	7.52	84	12.8	6.83	1.67	3.69	0.07	61	588
1522	7.49	84	12.8	6.81	1.59	3.47	0.07	26	588
1530	7.52	86	12.7	6.78	1.56	2.53	0.07	20	602
1538	7.56	86	12.8	6.77	1.54	3.45	0.07	12	602
1539	sample time								

SIGNATURE(S) [illegible]

PAGE 1 of 1

SINGLE SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: S57SD0050101

Project No.: 7129

Sample Location: S57SD005

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: MW

C.O.C. No.: 7

Sample Method: DISPOSABLE PLASTIC TROWEL

Depth Sampled: 0-6"

Sample Date and Time: 1/20/99 1620

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

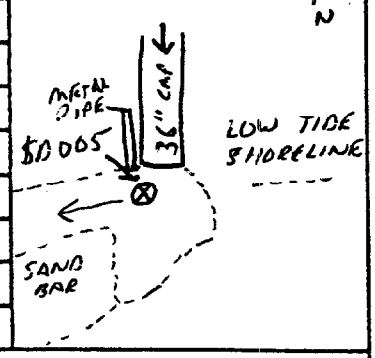
Sample	Time	Color/Description
	N	
	A	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
brown	sand w/ some gravel - wet little black organ

Analysis	Container Requirements	Collected (✓)
TCL VOC/EE/TOC	4 OZ GLASS	1
SVOC/PESTICIDES/PCBs	8 OZ GLASS	1
TAL METALS/CN		
EXPLOSIVES/	8 OZ GLASS	1
NITROGLYCERINE/		
NITROGUANIDINE/		
NITROCELLULOSE/		
SEM/AVS METALS		

Map:



Observations/Notes: THE PIPE (36") CAN BE LOCATED BY A METAL PIPE STICKING OUT OF THE WATER. SAMPLING SHOULD BE DONE DURING LOW TIDE.

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): [illegible]

SINGLE SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: 57D0060101

Sample Location: 57D006

Sampled By: MW

C.O.C. No.: 7

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: DISPOSABLE PLASTIC TROWEL

Depth Sampled: 0 - 6"

Sample Date and Time: 1/20/99 1540

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

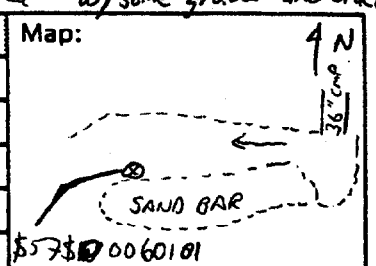
Sample	Time	Color/Description
	N	A

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
brown	sand - wet w/some gravel and black organ

Analysis	Container Requirements	Collected (✓)
TCL VOC/EE/TOC	4 OZ	1
SEM/AVS METALS	8 OZ	

Map:



Observations/Notes:
- SAMPLED DURING LOW TIDE

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): [illegible]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: $57$00070101

Project No.: 7129

Sample Location: $57$0007

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: MW

C.O.C. No.: #4

Sample Method: Disposable Plastic Auger

Depth Sampled: 0 - 2"

Sample Date and Time: 1/9/99 1610

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

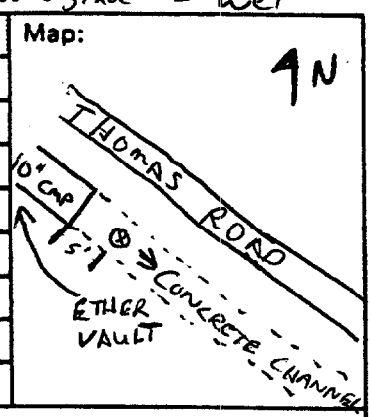
Sample	Time	Color/Description
	N	A

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
medium brown	Sand with some gravel - wet

Analysis	Container Requirements	Collected (✓)
TCL VOC/ETHYL ETHER	4 oz glass jar	✓

Map:



Observations/Notes:
- upgradient 10" CMP
- sample location just below a spigot within the concrete channel wall

Circle if Applicable:

MS/MSD — Duplicate ID No: —

Signature(s): [illegible]

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: $57$0008 0101

Sample Location: $57$0008

Sampled By: MW

C.O.C. No.: #4

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: Disposable Plastic Trowel

Depth Sampled: 0 - 1"

Sample Date and Time: 1/9/99 1040

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

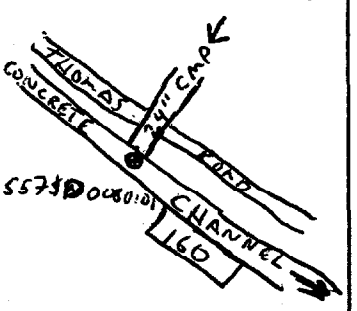
Sample	Time	Color/Description
	N	A

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
medium brown	sand - gravel wet

Analysis	Container Requirements	Collected (✓)
TCL VOC/	4 OZ GLASS JAR	✓
ETHYL ETHER		

Map:



Observations/Notes:

- sparse sediment

Circle if Applicable:

MS/MSD — Duplicate ID No: ___

Signature(s): [illegible]

SINGLE SAMPLE LOG SHEET

Page ____ of ____

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: 57D0090101

Sample Location: 57D009

Sampled By: FRED W RAMSER

C.O.C. No.: #17

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: DIRECT FILL

Depth Sampled: 0-3"

Sample Date and Time: 1-27-99 1115

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

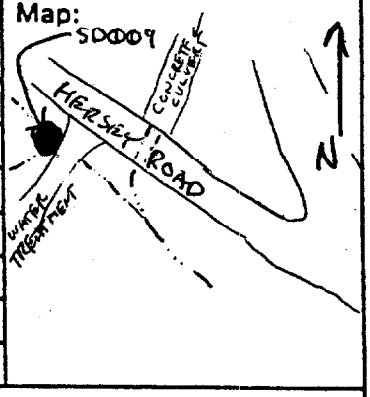
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
DK BRN	SAND + GRAVEL W/TR SILT ORG. WET

Analysis	Container Requirements	Collected (✓)
TCL VOC + E.E.	4oz	
TOC		
SEM/AVS METALS	8oz	

Map:



Observations/Notes:

SOME STANDING WATER

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ____ of ____

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: 57D0100101

Project No.: 7129

Sample Location: 57D010

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: MW

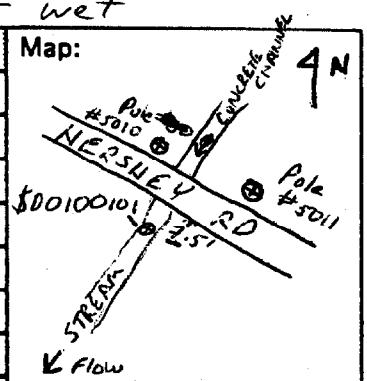
C.O.C. No.: 2

Sample Method: DISPOSABLE PLASTIC AUGER	Composite Sample Data		
	Sample	Time	Color/Description
Depth Sampled: 0 - 6"			
Sample Date and Time: 1/7/99 1000		N A	
Type of Sample			
☒ Grab			
☐ Composite			
☐ Grab-Composite			
☐ High Concentration			
☒ Low Concentration			

Grab Sample Data	
Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
medium brown tan	sand - wet

Analysis	Container Requirements	Collected (✓)
-TCL VOC/ETHYL ETHER	4 OZ GLASS JAR	1
-TCL SVOC/TCL PEST/PCBs/	8 OZ GLASS JAR	1
TAL Metals/CN		
- EXPLOSIVES	8 OZ GLASS JAR	1
NITROGLYCERINE		
NITROCELLULOSE		
NITROGUANADINE		
TOC + SEM/AVS METALS		

Map:



Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	
—	—	Maureen Bradford

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: 57D0110101

Sample Location: 57D011

Sampled By: MW

C.O.C. No.: 2

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: Disposable Plastic Auger

Depth Sampled: 0 – 6"

Sample Date and Time: 1/7/98 0840

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

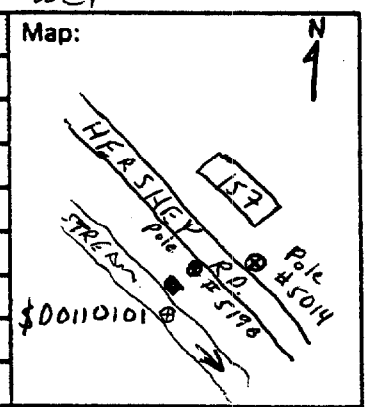
Sample	Time	Color/Description
	N/A	

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
medium brown tan	sand – wet

Analysis	Container Requirements	Collected (✓)
TCL VOC/ETHYL ETHER	4 OZ. GLASS JAR	1

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Marcia Woolford

SINGLE SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SD0120101

Sample Location: S57SD012

Sampled By: MW

C.O.C. No.: 6 pt. 7

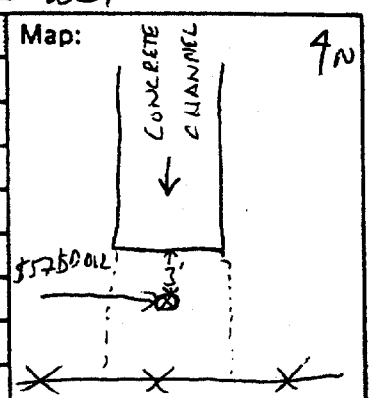
- ☐ Surface Soil
- ☐ Subsurface Soil
- ☒ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method:	Composite Sample Data		
DISPOSABLE PLASTIC TROWEL	Sample	Time	Color/Description
Depth Sampled: 0"-6"			
Sample Date and Time: 1/20/99 0740			
Type of Sample: ☒ Grab, ☐ Composite, ☐ Grab-Composite, ☐ High Concentration, ☒ Low Concentration			

Grab Sample Data	
Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
light tan	Sand - wet

Analysis	Container Requirements	Collected (✓)
TCL VOC/EE/TOC	4 OZ GLASS JAR	3
SVOC/PESTICIDES/PCB/	8 OZ GLASS JAR	3
TAL METALS/CN		
EXPLOSIVES/NITROCELLULOSE/	8 OZ GLASS JAR	3
NITROGLYCERINE/NITROGUANIDINE		
SEM/AVS METALS		

Map:



Observations/Notes:

Circle if Applicable: MS/MSD

Duplicate ID No: S57SDDUP0101

Signature(s): [illegible]

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Storm Sewer
[] QA Sample Type:

Sample ID No.: S57SW0001
Sample Location: Site57-SW0001
Sampled By: G.F. SISCO
C.O.C. No.: #16

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	Salinity %	Other NA
Date: 1-27-99								
Time: 1515								
Depth: ≈ 11 ft.	CLEAR	7.31	.310	15.8	22	11.80	/	/
Method: Peristaltic Pump								

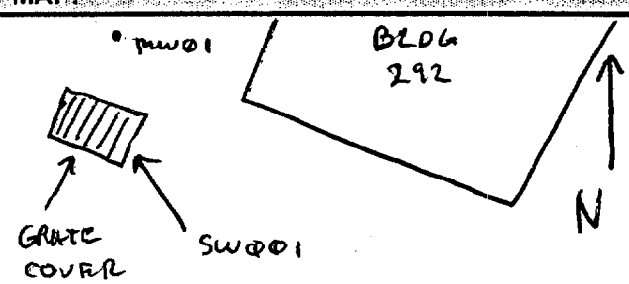
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL	3 x 40ml	✓

OBSERVATIONS / NOTES:

- Difficulties removing storm grate use peristaltic pump to collect spl. attached tubing to steel pipe lower to water.
- NO SEDIMENT IN PIPE, SOME Large gravel.

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): G.F. Sisco

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Storm Sewer
[] QA Sample Type: MS / MSD

Sample ID No.: S57SW0020101
Sample Location: Site 57-SW0002
Sampled By: G.E. Sisco
C.O.C. No.: 16

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	Salinity %	Other NA
Date: 1-27-99 Time: 1330 Depth: ≈ 11 ft. Method: Peristaltic pump	CLEAR	7.15	.305	16.0	20	10.65	/	/

SAMPLE COLLECTION INFORMATION:

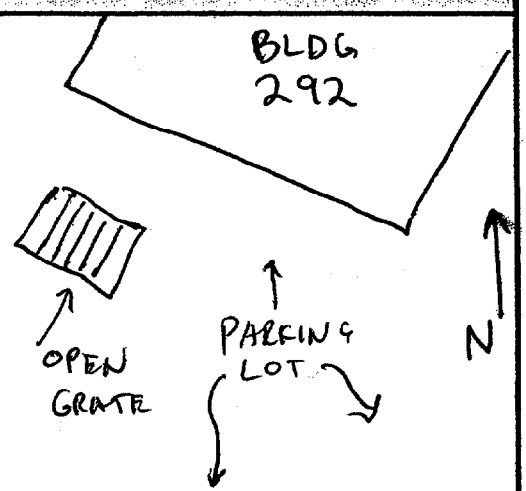
Analysis	Preservative	Container Requirements	Collected
TCL VOC's + ee	HCL	3 x 40ml VIAL	
TAL METALS (TOTAL)	HNO_3	1 x 500ml HDPE	
TAL METALS (DISS)	HNO_3	1 x 500ml HDPE	
CYANIDE	NaOH	1 x 500ml HDPE	
TCL PEST / PCB's	—		
TCL's S-VOCs	—		
TOC + HARDNESS	H_2SO_4		
EXPLOSIVES, NQ, NG + NC	—		

OBSERVATIONS / NOTES:

- Difficulties removing storm grate use peristaltic pump to collect spl. attached tubing to steel pipe Lower to water.

- No sediment in pipe, some large gravel

MAP:



Circle if Applicable:
MS/MSD
Duplicate ID No.: —

Signature(s): G.E. Sisco

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-430 (MH-1)

Sample ID No.: S57SW0030101
Sample Location: S57SW003
Sampled By: MW
C.O.C. No.: 10

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1/22/99	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Time: 1500								
Depth: -	YELLOW TINT	7.77	.310	14.3	14	8.33	0.01	
Method: SS BEAKER								

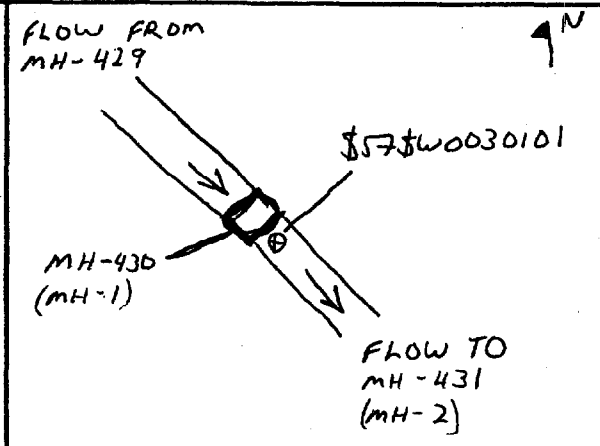
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC/ETHYL ETHER	HCl	40 mL VIAL	6
- SVOC	-	1 LITER GLASS AMBER	1
- PESTICIDES/PCBS	-	↓	1
- EXPLOSIVES/NITROGLYCERINE/ NITROGUANIDINE	-	↓	1
- NITROCELLULOSE	-	125 mL HDPE	1
- TAL METALS (TOTAL)	HNO_3	500 mL HDPE	1
- TAL METALS (FILTERED)	HNO_3	↓	1
- CYANIDE	NaOH	↓	1

OBSERVATIONS / NOTES:

- THERE WERE 2 OTHER PIPES THAT END AT MH-430 (MH-1). THERE WAS ONLY WATER COMING FROM A 6" DIA. BLACK PLASTIC PIPE. THE OTHER PIPE WAS
- A 12" DIA. METAL PIPE WHICH WAS DRY. THERE WAS ONE OTHER OLD PIPELINE THAT HAD BEEN SEALED WHEN OHM LINED THE STORM WATER SEWER SYSTEM.
- THERE WAS NO SEDIMENT AT THE BOTTOM OF THE MANHOLE.

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.: S57SWDUP0301
—	*DUPLICATE WAS COLLECTED FOR VOC/ETHYL ETHER ONLY

Signature(s): [illegible]

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-430 (MH-1)

Sample ID No.: 57W0030201
Sample Location: 57W003
Sampled By: MW
C.O.C. No.: 10

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	Salinity %	Other NA
Date: 1/22/99								
Time: 1550								
Depth: –								
Method: $S BEAKER								

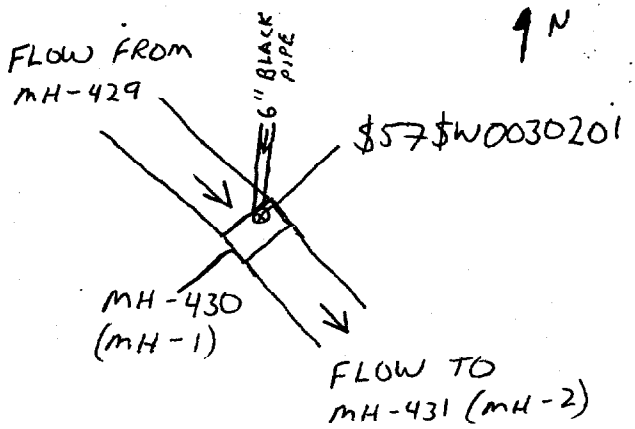
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
– TCL VOC/ETHYL ETHER	HCl	40 mL VIAL	3

OBSERVATIONS / NOTES:

– SEE SAMPLE LOG SHEET FOR SPL. 57W0030101

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Maureen Woolford

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

Sample ID No.: S57SW0040101
Sample Location: S57SW004
Sampled By: MW
C.O.C. No.: 10

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-431 (MH-2)

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1/21/99	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Time: 1400								
Depth: –	CLEAR	7.58	.310	14.5	16	7.30	0.01	
Method: SS BEAKER								

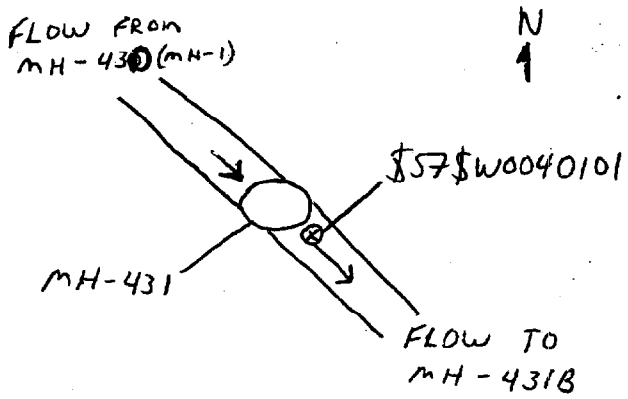
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
– TCL VOC / ETHYL ETHER	HCl	40 mL VIAL	3
– SVOC	–	1 LITER GLASS AMBER	1
– PESTICIDES / PCB	–	↓	1
– EXPLOSIVES / NITROGLYCERINE / NITROGUANIDINE	–	↓	1
– NITROCELLULOSE	–	125 mL HDPE	1
– TAL METALS (TOTAL)	HNO_3	500 mL HDPE	1
– TAL METALS (FILTERED)	HNO_3	↓	1
– CYANIDE	NaOH	↓	1

OBSERVATIONS / NOTES:

- ONLY ABLE TO SAMPLE THE OUTFLOW DUE TO HIGH TURBULENT FLOW THROUGH THE MANHOLE
- THERE WERE 5 OTHER PIPES THAT END AT MH-431 (MH-2). THERE WAS NO FLOW COMING FROM THESE PIPES: 3 - 6" DIA. and 2 - 12" DIA.
- THERE WAS NO SEDIMENT AT THE BOTTOM OF THE MANHOLE.

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Woolford

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-487

Sample ID No.: 57W0060101
Sample Location: 57W006
Sampled By: MW
C.O.C. No.: 8 - DUP ON 9

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	Salinity %	Other NA
Date: 1/21/99 Time: 1545 Depth: 0 Method: $$ BEAKER	cloudy	7.50	.316	14.2	30	5.87	0.01	

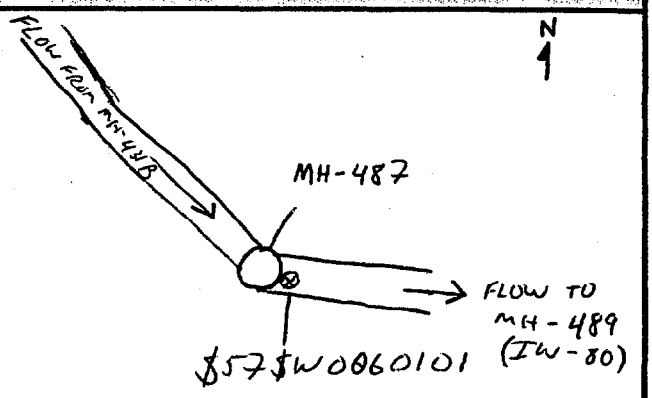
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC / ETHYL ETHER	HCl	40 mL VIAL	✓

OBSERVATIONS / NOTES:

- SAMPLED THE OUTLET FLOW TRAVELING TOWARD MH-489 (IW-80)
- NOTICED A SWEET ODOR FROM THE MANHOLE

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	57WDUP0201

Signature(s): [illegible]

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE TO MH-487

Sample ID No.: S57SW0060201
Sample Location: S57SW006
Sampled By: MW
C.O.C. No.: 8

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	Salinity %	Other NA
Date: 1/21/99 Time: 1500 Depth: 0" Method: SS BEAKER	CLOUDY	7.48	.216	15.7	120	6.77	0.00	

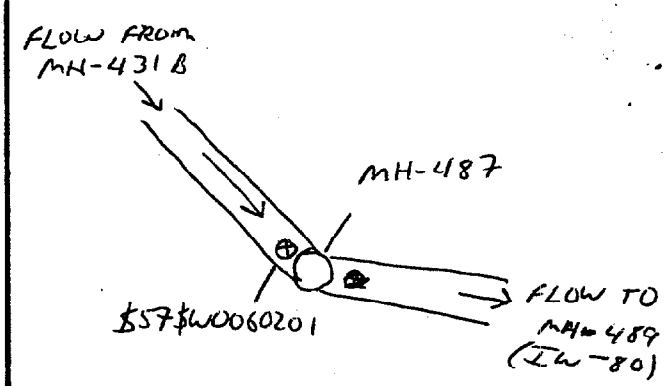
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC/ETHYL ETHER	HCl	40 ML VIAL	3

OBSERVATIONS / NOTES:

- SAMPLED THE INLET FLOW FROM THE DIRECTION OF MH-431B.
- NOTICED A SWEET ODOR FROM THE MANHOLE

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [illegible]

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

Sample ID No.: S57SW0070101
Sample Location: S57SW007
Sampled By: MW
C.O.C. No.: 8

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-489 (IW-80)

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	Salinity %	Other NA
Date: 1/21/99 Time: 1440 Depth: 0" Method: SS BEAKER	Clear	7.45	.350	14.6	10	7.32	0.01	

SAMPLE COLLECTION INFORMATION:

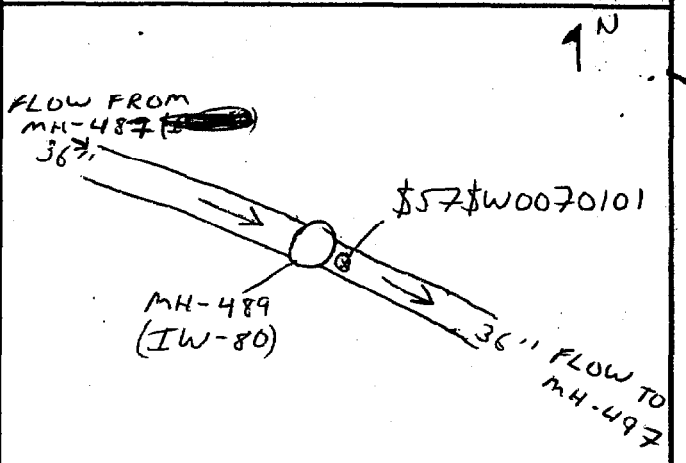
Analysis	Preservative	Container Requirements	Collected
- TCL VOC / ETHYL ETHER	HCl	40 mL VIALS	3
- SVOC	–	1 LITER GLASS AMBER	1
- PESTICIDES / PCBS	–	↓	1
- EXPLOSIVES / NITROGLYCERINE / NITROGUANIDINE	–	↓	1
- TAL METALS (TOTAL)	HNO_3	500 mL HDPE	1
- TAL METALS (FILTERED)	↓	↓	1
- CYANIDE	NaOH	↓	1
- NITROCELLULOSE	–	125 mL HDPE	1

OBSERVATIONS / NOTES:

- NOTICED A SHEEN FLOWING ON TOP OF THE WATER
- ALSO NOTICED A SWEET SMELL COMING FROM THE MANHOLE.

- RESAMPLED FOR FILTERED DISSOLVED METALS. 1-27-99

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Wardford

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

Sample ID No.: S57SW0070201
Sample Location: S57SW007
Sampled By: MW
C.O.C. No.: 8

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-489 (IW-80)

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	Salinity %	Other NA
Date: 1/21/99 Time: 1515 Depth: 0" Method: S S BEAKER	clear	7.48	.339	14.6	12	7.40	0.01	

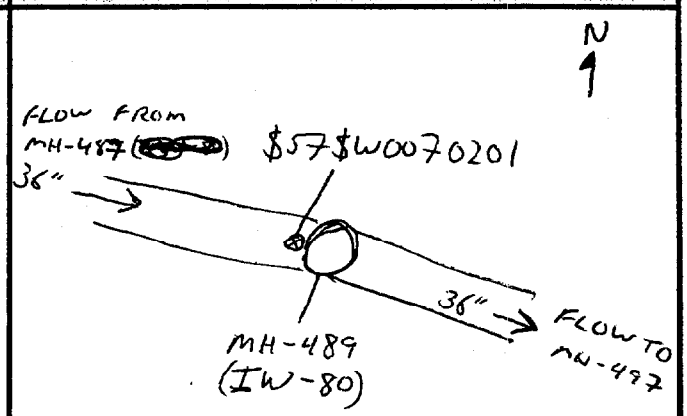
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC / ETHYL ETHER	HCl	40 mL VIAL	3

OBSERVATIONS / NOTES:

- NOTICED A SHEEN FLOWING ON TOP OF THE WATER.
- ALSO NOTICED A SWEET SMELL COMING FROM THE MANHOLE.

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Wexford

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM PIPE @ MH-497
[] QA Sample Type:

Sample ID No.: S57SW0080101
Sample Location: S57SW008
Sampled By: MW
C.O.C. No.: 8

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	Salinity %	Other NA
Date: 1/21/99 Time: 1230 Depth: 0" Method: STAINLESS STEEL BEAKER	clear	7.27	.365	13.9	11	6.61	0.01	

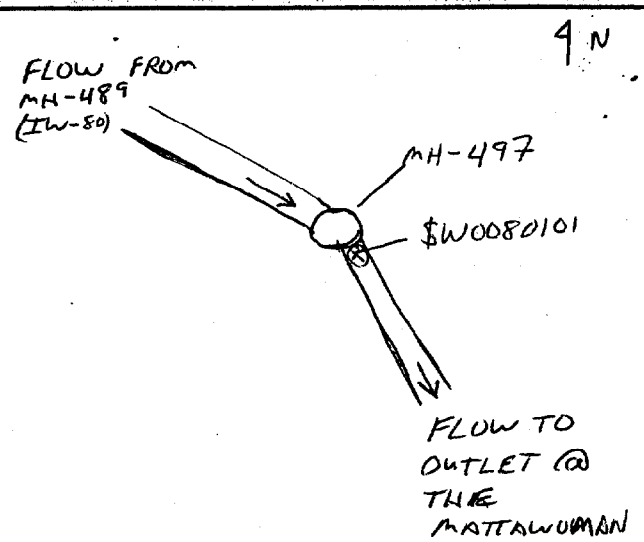
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC/ETHYL ETHER	HCl	40 mL VIALS	3

OBSERVATIONS / NOTES:

- OUTLET TOWARDS MATTAWOMAN

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Woolford

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-497

Sample ID No.: S57SW0080201
Sample Location: S57SW008
Sampled By: MW
C.O.C. No.: 8

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1/21/99	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Time: 1245								
Depth: 0	CLEAR	7.36	.354	14.4	8	7.00	0.01	
Method: SS BEAKER								

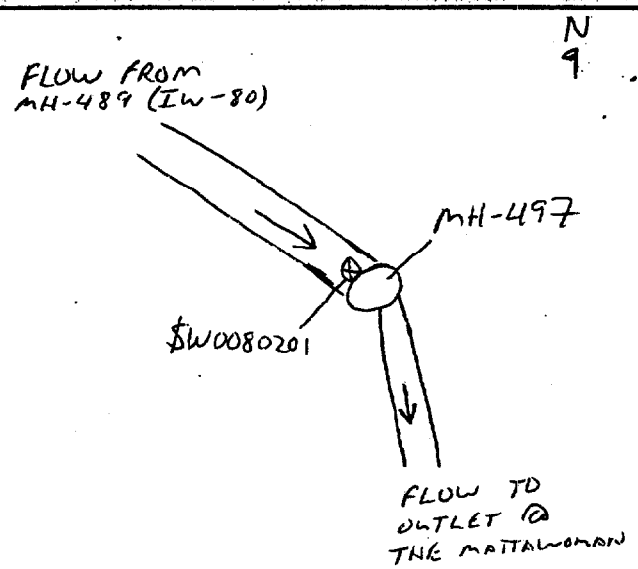
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC/ETHYL ETHER	HCl	40 mL VIALS	3

OBSERVATIONS / NOTES:

- SAMPLED PIPE INLET FROM IW-80 DIRECTION

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Wolfort

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM WATER SEWER SYSTEM
[] QA Sample Type: PIPE @ MH-497

Sample ID No.: S57SW0080301
Sample Location: S57SW008
Sampled By: MW
C.O.C. No.: 8

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	Salinity %	Other NA
Date: 1/21/99 Time: 1410 Depth: 0" Method: SS BEAKER	clear	7.05	.418	8.4	5	9.82	0.01	

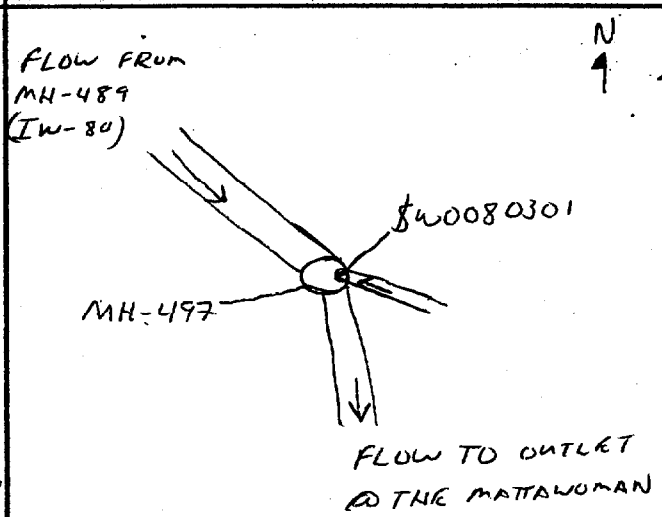
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC/ETHYL ETHER	HCl	40 mL VIAL	3

OBSERVATIONS / NOTES:

- PIPE SAMPLED WAS A 6" DIA. PIPE FROM THE SE DIRECTION AT A DEPTH OF 2.5' FROM THE TOP OF MANHOLE # MH-497. THE 6" PIPE WAS LOCATED JUST BELOW A 12" PIPE FROM THE SE.
- THERE WAS ALSO A 12" PIPE FROM THE NW DIRECTION, A 12" PIPE FROM THE SE CLOSEST TO THE BOTTOM.
- ONLY THE 6" PIPE HAD WATER TRICKLING FROM IT BESIDES THE INLET AND OUTLET.

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Woolford

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: OUTLET OF 36" CMP @ THE MATTAWOMAN
[] QA Sample Type:

Sample ID No.: S57SW0090101
Sample Location: S57SW009
Sampled By: MW
C.O.C. No.: 6

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	Salinity %	Other NA
Date: 1/20/99 Time: 1630 Depth: 0" Method: DIRECT FILL	clear	7.42	.368	13.6	8	9.02	0.01	

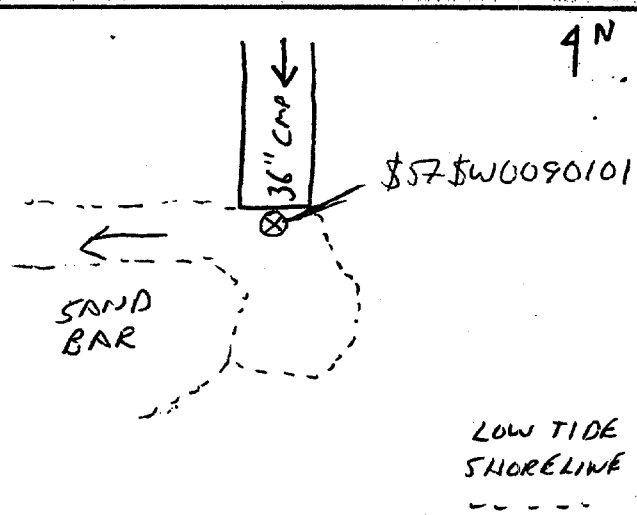
SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC / ETHYL ETHER	HCl	40 mL VIALS	3
- SVOC	–	1 LITER GLASS AMBERS	1
- PESTICIDES / PCBs	–	↓	1
- EXPLOSIVES / N-GLYCERINE / N-GUANIDINE	–	↓	1
- NITROCELLULOSE	–	125 mL HDPE	1
- TAL METALS (TOTAL) / HARDNESS	HNO_3	500 mL HDPE	1
- TAL METALS (FILTERED)	HNO_3	↓	1
- CYANIDE	NaOH	↓	1
- ECOLOGICAL PARAMETERS	–	↓	1
- TOC	H_2SO_4	250 mL HDPE	1

OBSERVATIONS / NOTES:

- SAMPLES SHOULD BE COLLECTED @ LOW TIDE

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Martha Wolfe

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[X] Lake
[X] Other: ON THE MATTAWOMAN
[] QA Sample Type: @ LOW TIDE

Sample ID No.: S57SW0100101
Sample Location: S57SW010
Sampled By: MW
C.O.C. No.: 6

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

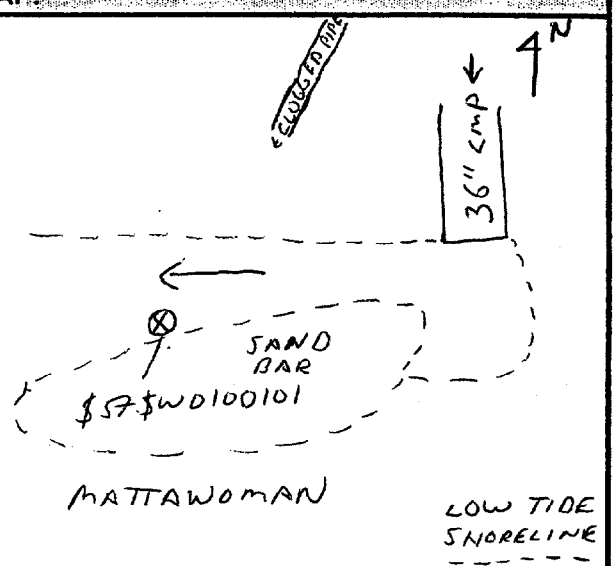
	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1/20/99 Time: 1600 Depth: 0 Method: DIRECT FILL	clear	7.25	.404	13.0	8	9.80	0.01	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC / ETHYL ETHER	HCl	40 mL VIALS	3

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Woodward

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: CONCRETE CHANNEL
[] QA Sample Type:

Sample ID No.: S57SW011010I
Sample Location: S57SW011
Sampled By: MW
C.O.C. No.: #3

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

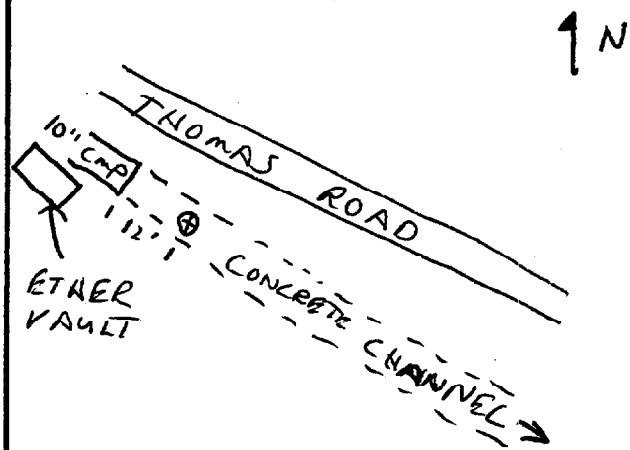
	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1/9/99 Time: 1600 Depth: 0" Method: Stainless Steel Beaker	cloudy	9.48	0.725	1.8°C	403	12.33	0.02	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC / ETHYL ETHER	HCl	40 mL VIALS	3

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Wolfe

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: Concrete Channel
[] QA Sample Type:

Sample ID No.: S57SW012 0101
Sample Location: S57SW012
Sampled By: MW
C.O.C. No.: #3

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

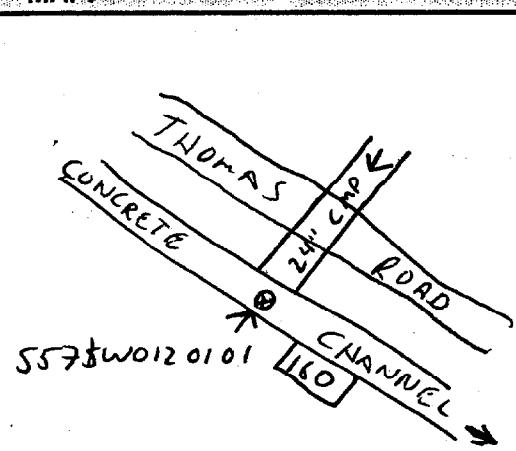
	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1/9/99 Time: 1030 Depth: 0 Method: Stainless Steel Beaker	clear	6.52	0.084	7.3	2	8.64	0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC/ETHYL ETHER	HCl	40 mL VIALS	3

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Matthew Woolford

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

Sample ID No.: S57SW0130101
Sample Location: S57SW013
Sampled By: FRED W RAMSER
C.O.C. No.: 15

[X] Stream
[] Spring
[] Pond
[] Lake
[] Other: _____
[] QA Sample Type: _____

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

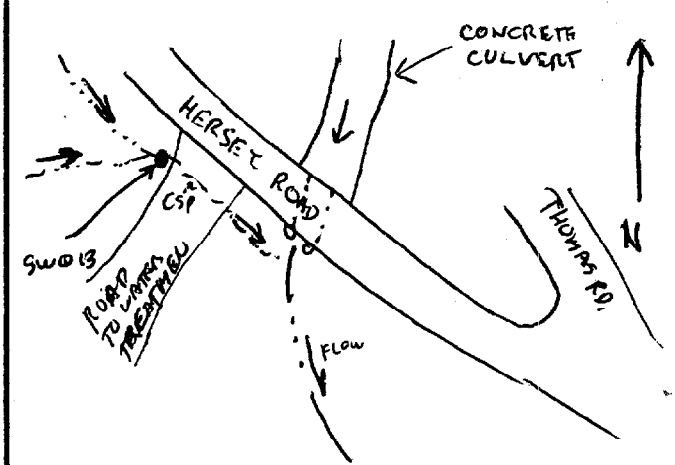
	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1-25-99 Time: 1200 Depth: SURFACE Method: DIRECT FILL	CLR	5.43	.288	10.1	17	7.30	0.01	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs w/ee	HCL 4°C	3x40 ml VIAL	✓
TOC	H_2SO_4 4°C	250 ml HDPE	✓
HARDNESS	— 4°C	500ml HDPE	✓
pH, TURBIDITY, TDS, TSS	— 4°C	500ml HDPE	✓
CHLORIDE, FLOURIDE, NITRATE			
NITRITE, SULFATE, SALINITY			
+ D.O.			

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramser

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

Sample ID No.: S57SW0140101
Sample Location: S57SW014
Sampled By: MW
C.O.C. No.: 1

[X] Stream
[] Spring
[] Pond
[] Lake
[] Other: _____
[] QA Sample Type: _____

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

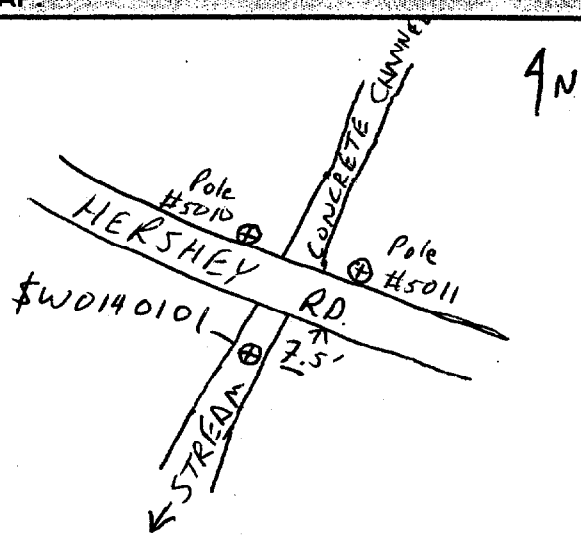
	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1/7/98 Time: 0930 Depth: surface Method: DIRECT FILL	clear	6.90	.171	2.3	0	9.60	0.00	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
- TCL VOC / ETHYL ETHER	HCl	40 mL VIALS	3
- TCL SVOC	–	1 LITER GLASS AMBER	1
- TCL PESTICIDES / PCB	–	↓	1
- EXPLOSIVES, NITROGLYCERINE	–	↓	1
NITROGUANIDINE			
- NITROCELLULOSE	–	125 mL HDPE	1
- TOC	H_2SO_4	250 mL HDPE	1
- TAL METALS (TOTAL) / HARDNESS	HNO_3	500 mL HDPE	1
- TAL METALS (FILTERED)	HNO_3	↓	1
- Cyanide	NaOH	↓	1
- pH, TURBIDITY, TSS, TDS, Cl, Fl,	–	↓	2
NITRATE/NITRITE, SULFATE, SALINITY, DO			

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	–

Signature(s): Master Woolford

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

Sample ID No.: 57W0150101
Sample Location: 57W015
Sampled By: MW
C.O.C. No.: 1

[X] Stream
[] Spring
[] Pond
[] Lake
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

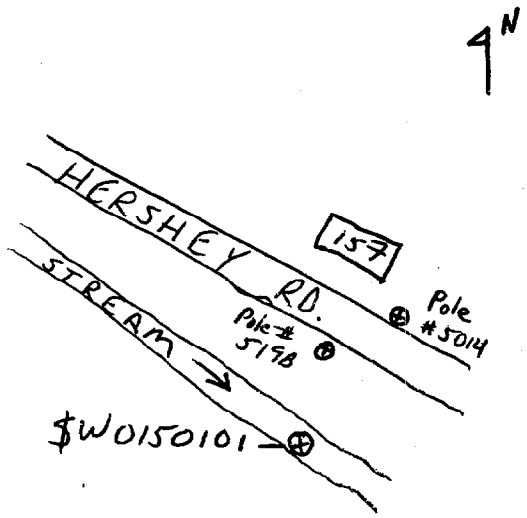
	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 1/7/98								
Time: 0830								
Depth: 0"								
Method: DIRECT FILL	clear	6.88	1.99	5.5	0	10.74	0.09	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
-TCL VOC/ETHYL ETHER	HCl	3 - 40 mL vials	3
-pH, turbidity, TDS, TSS	—	500 mL HDPE	1
Cl, Fl, NITRATE/NITRITE			
SULFATE, SALINITY,			
DISSOLVED OXYGEN			

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [illegible]

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: SITE 57, INDIAN HEAD
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: CONCRETE OUTFALL
[] QA Sample Type:

Sample ID No.: S57SW0160101
Sample Location: S57SW016
Sampled By: MW
C.O.C. No.: 6

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

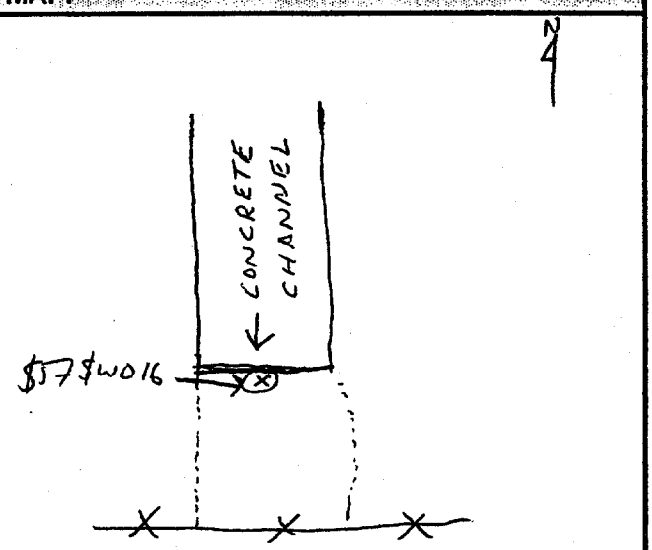
Date: 1/20/99	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Time: 0800								
Depth: 0								
Method: DIRECT FILL	clear	6.90	1.14	8.9	5	9.53	0.05	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOC / ETHYL ETHER	HCl	40 mL VIALS	12
TCL SVOC	–	1 Liter AMBER	4
TCL PESTICIDES / PCBs	–	↓	4
EXPLOSIVES / NITROGLYCERINE / NITROGUANIDINE	–	↓	4
NITROCELLULOSE	–	125 mL HDPE	4
TAL METALS (TOTAL) / HARDNESS	HNO_3	500 mL HDPE	4
TAL METALS (FILTERED)	HNO_3	↓	4
CYANIDE	NaOH	↓	4
ECOLOGICAL PARAMETERS	–	↓	4
TOC	H_2SO_4	250 mL HDPE	4

OBSERVATIONS / NOTES:

MAP:



Circle if Applicable:

MS/MSD X

Duplicate ID No.: S57SWDUP0101

Signature(s):

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sample ID No.: S57SS0010101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 0-0.5'

Sample Date and Time: 10-7-98 1615

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [x] Low Concentration

Composite Sample Data

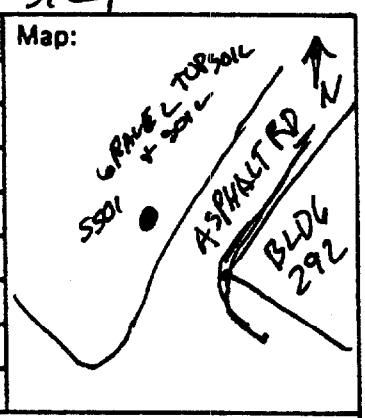
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SAND + SILT

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NY		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sample ID No.: S57SS002.0101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 0-0.5'

Sample Date and Time: 10-8-98 1015

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [x] Low Concentration

Composite Sample Data

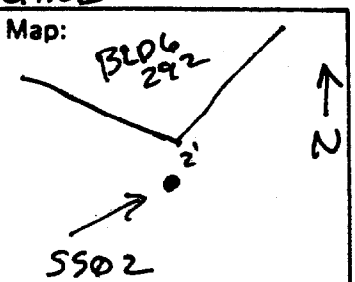
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
ORG-BRN	GRAVEL + SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NY		
TOC		✓

Map:



Observations/Notes:

Circle if Applicable:

(MS/MSD) Duplicate ID No: ___

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sample ID No.: S57SS0070101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 0-0.5'

Sample Date and Time: 10-7-98 1450

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [x] Low Concentration

Composite Sample Data

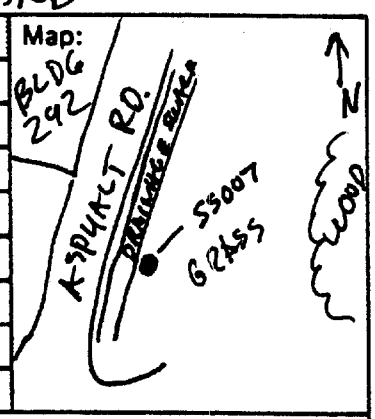
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
DK BRN	SILT + SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		✓
TAL METALS		✓
TCL PEST/PCBs		✓
EXPLOSIVES + NC, NG, NY		✓
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sample ID No.: S57SS0080101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 0-0.5'

Sample Date and Time: 10-8-98 0915

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [x] Low Concentration

Composite Sample Data

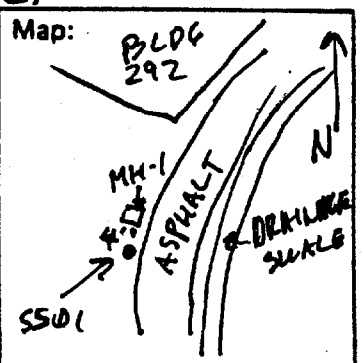
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SAND + SILT

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		✓
TAL METALS		✓
TCL PEST/PCBs		✓
EXPLOSIVES + NC, NG, UY		✓
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	S57DUP0003

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ____ of ____

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: $57$$0090101

Project No.: 7129

Sample Location: $57SB0009

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: FWR

C.O.C. No.: 11

Sample Method: S.S. TROWEL

Depth Sampled: 0-6"

Sample Date and Time: 1-22-99 1145

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
DK BRN	SAND + SILT TR GRA. MOIST

Analysis	Container Requirements	Collected (✓)
TCL VOC + ee	4oz	✓

Map: BLDG 292, N, SS009, THOMAS RD, I-29, SD009

Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	$57$$DUP001

Signature(s): Fred Ulander

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sample ID No.: S57SS0110101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 0-0.5'

Sample Date and Time: 10-7-98 1305

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [x] Low Concentration

Composite Sample Data

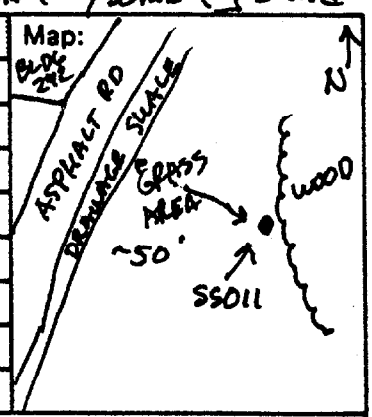
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SILT + CLAY w/ some f-g sand

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, UY		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD — Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: S57SS013101

Project No.: 7129

Sample Location: S57SB013/MW012

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sampled By: FRED W RAMSER

C.O.C. No.: 4

Sample Method: SPLIT SPOON

Depth Sampled: 0-6"

Sample Date and Time: 1-9-99 0910

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [ ] Low Concentration

Composite Sample Data

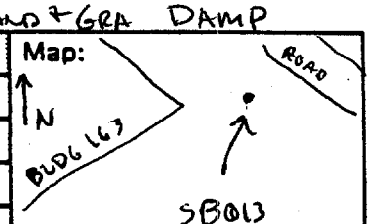
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SILT + SAND + GRA DAMP

Analysis	Container Requirements	Collected (✓)
TCL VOAs w/ee	4oz	✓
TCL SVOAs	8oz	
TAL METALS		✓
TCL PEST/PCBs		
EXPLOSIVES w/nc, ng, ng	8oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ____ of ____

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SS015001

Sample Location: S57SB015/MW005

Sampled By: FRED W. RAMSER

C.O.C. No.: 4

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sample Method: SPLIT SPOON

Depth Sampled: 0-6"

Sample Date and Time: 1-11-99 0815

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [ ] Low Concentration

Composite Sample Data

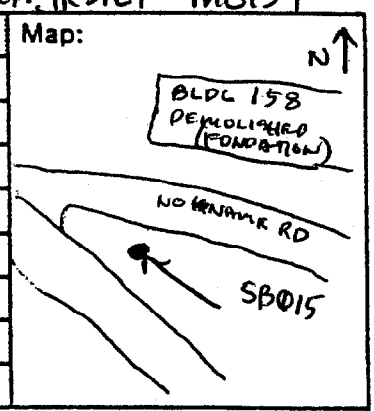
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SAND + GRA. TR SILT MOIST

Analysis	Container Requirements	Collected (✓)
VOCs (TCL) + ee	4oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0010101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 2'-4'

Sample Date and Time: 10-7-98 1615

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

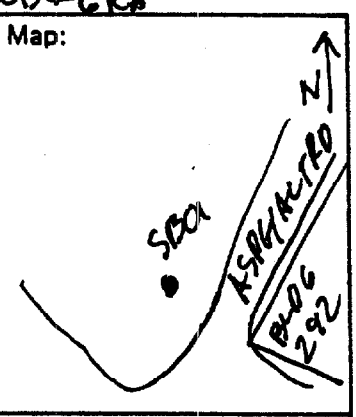
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	CLAY, SAND + GRA

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		✓ pyr
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0010201

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 4'-6'

Sample Date and Time: 10-7-98 1640

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

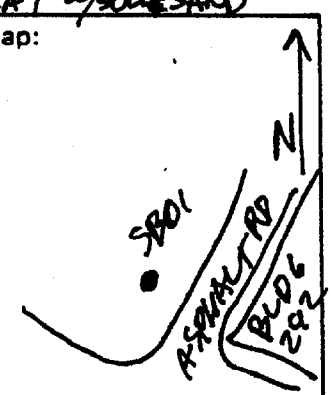
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	GRAVELLY CLAY w/SOME SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB002010 1

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 4'-6'

Sample Date and Time: 10-8-98 1020

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

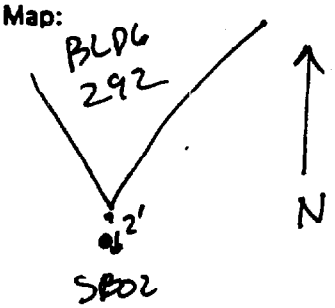
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SAND/GRAVEL + SILT

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0020201

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 8'-10'

Sample Date and Time: 10-8-98 1030

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

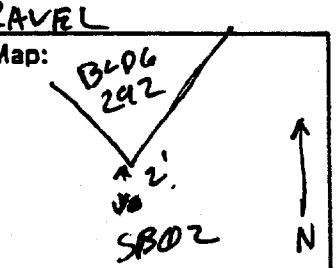
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND + GRAVEL

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		✓

Map:



Observations/Notes:

Circle If Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SB0020301

Sample Location: S57SB002/MW003

Sampled By: FRED W RAMSER

C.O.C. No.: #2

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: HSA / SPLIT SPOONS

Depth Sampled: 14'-16'

Sample Date and Time: 1-7-99 0825

Type of Sample
- ☐ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

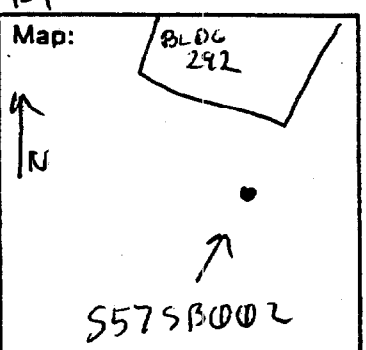
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND WET

Analysis	Container Requirements	Collected (✓)
TCL VOC	4 oz WMG	✓
TOC		

Map:



Observations/Notes:
SCREEN INTERVAL
*~~THIS SAMPLE WAS VOIDED BY FWR 1-20-99, REPLACED W/SAMPLE S57SB002060 FWR 6-14-99~~ THIS SAMPLE WAS ANALYZED BY LAB. FWR 6-14-99

Circle if Applicable:

MS/MSD — Duplicate ID No: ___

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: S57SB0020401

Project No.: 7129

Sample Location: S57SB002/MW003

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: FRED W. RAMSER

C.O.C. No.: #2

Sample Method: HSA / SPLIT SPOON

Depth Sampled: 6'-8'

Sample Date and Time: 1-7-99 0800

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

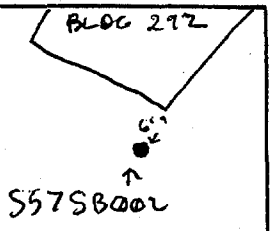
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YELBRN	SAND+GRA.

Analysis	Container Requirements	Collected (✓)
TOC / ~~VOA~~	4oz WMG	✓
GEOTECH		✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W. Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: 57B0002 0601

Project No.: 7129

Sample Location: $57MW0003

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: Fred W. RAMSER

C.O.C. No.: #11

Sample Method: SPLIT SPOON / HSA

Depth Sampled: 18'-20' SCREEN INTERVAL

Sample Date and Time: 1-22-99 0850

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

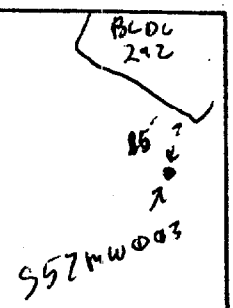
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
LT. GREEN/GREY	SAND WET

Analysis	Container Requirements	Collected (✓)
TCL VOC + ee	4oz	✓
TOC		✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	57BDUP0002

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SB0020501

Sample Location: S57SB002/MW003

Sampled By: FREDW RAMSER

C.O.C. No.: #2

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: HSA / SPLIT SPOONS

Depth Sampled: 24'-25'

Sample Date and Time: 1-7-99 0945

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

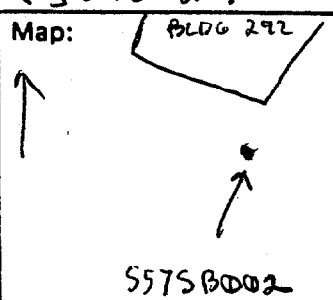
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL-	SILT+ CLAY+ F-g SAND SAT.

Analysis	Container Requirements	Collected (✓)
TOC	4 oz	✓
GEOTECH	1 x 8 oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0030101

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 3'-4'

Sample Date and Time: 10-7-98 1810

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

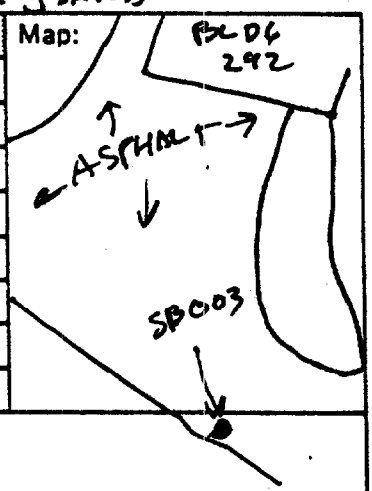
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SILT + F-g SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	S57DUP0001

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0030201

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 4'-6'

Sample Date and Time: 10-7-98 1815

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

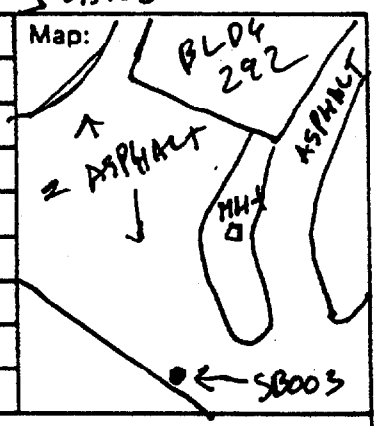
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SILT + f-g SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	S57DUP0002

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: 5575S0040101

Project No.: 7129

Sample Location: 5575B004/MW007

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sampled By: FRED W. RAMSER

C.O.C. No.: 4

Sample Method: SPLIT SPOON

Depth Sampled: 0-6"

Sample Date and Time: 1-10-99 0900

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [ ] Low Concentration

Composite Sample Data

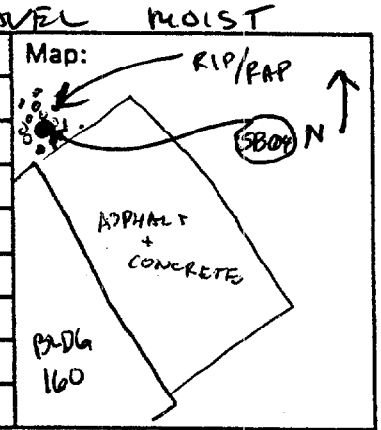
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SAND+GRAVEL MOIST

Analysis	Container Requirements	Collected (✓)
VOC's + ee	4oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W. Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SB0040101

Sample Location: S57SB004/MW007

Sampled By: FRED W. RAMSER

C.O.C. No.: 4

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON/HSA

Depth Sampled: 6'-8'

Sample Date and Time: 1-10-99 0920

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

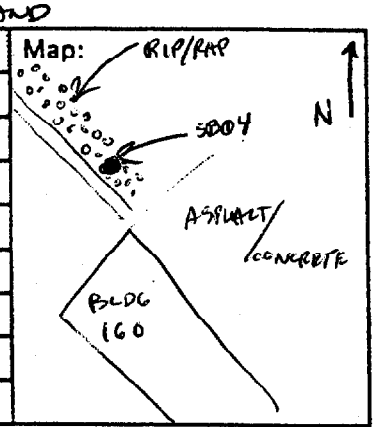
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
GREY LT OLIVE BRN	SILTY f-g SAND

Analysis	Container Requirements	Collected (✓)
VOCs + ee	4oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SB0040201

Sample Location: S57SB0004/MW0007

Sampled By: FRED W. RAMSER

C.O.C. No.: 4

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON/HSA

Depth Sampled: 4'-5'

Sample Date and Time: 1-10-99 1405

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

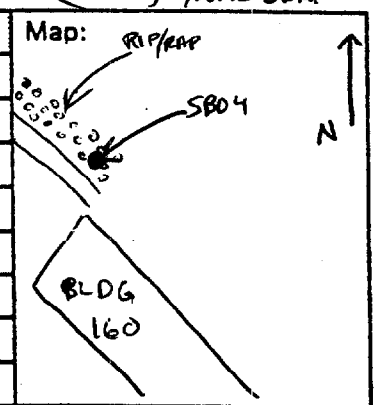
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
f-g PALE YEL BRN	f-g SAND (FILL) w/SOME GRA.

Analysis	Container Requirements	Collected (✓)
VOC's tee	4 oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SB0040301

Sample Location: S57SB004/MW007

Sampled By: FRED WRAMSER

C.O.C. No.: 4

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON

Depth Sampled: 14'-16'

Sample Date and Time: 1-10-99 1420

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

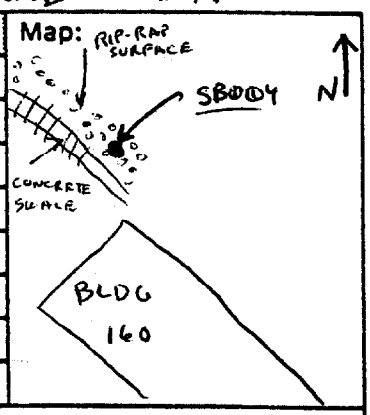
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
MED BRN	GRADED SAND WET.

Analysis	Container Requirements	Collected (✓)
TCL VOC	✓ } 4oz	✓
TOC	✓ }	✓

Map:



Observations/Notes:
Wellscreen interval

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	S57SBDUP0101

Signature(s): Fred Wramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIANHEAD

Sample ID No.: $57$$005101

Project No.: 7129

Sample Location: $57SB005/MW009

- [x] Surface Soil
- [ ] Subsurface Soil
- [ ] Sediment
- [ ] Other _____
- [ ] QA Sample Type: _____

Sampled By: FRED W RAMSER

C.O.C. No.: 5

Sample Method: SPLIT SPOON

Depth Sampled: 0-6"

Sample Date and Time: 1-12-99 1050

Type of Sample
- [x] Grab
- [ ] Composite
- [ ] Grab-Composite
- [ ] High Concentration
- [ ] Low Concentration

Composite Sample Data

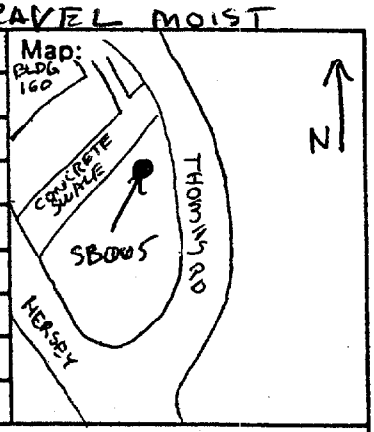
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND+GRAVEL MOIST

Analysis	Container Requirements	Collected (✓)
TCL VOC+ee	4 OZ	✓
TCL S-VOC	8 OZ	✓
TCL PEST/PCB		✓
TAL METALS		✓
EXPLOSIVES, NC, NG, NGY	8 OZ	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD ✓

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: 57B0050101

Sample Location: $57SB005/MW009

Sampled By: FRED W RAMSER

C.O.C. No.: #5

Sample Method: SPLITSPOON/HSA

Depth Sampled: 2'-4'

Sample Date and Time: 1-12-99 1055

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

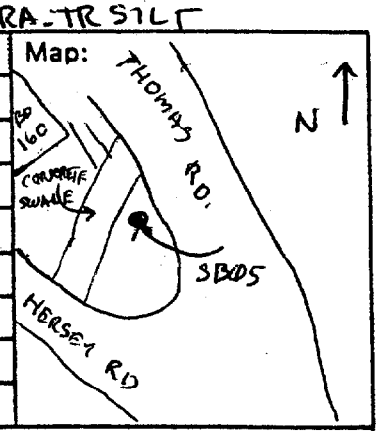
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND + GRA. TR SILT

Analysis	Container Requirements	Collected (✓)
TCL VOC + ee	4oz	✓
TOC		✓
TCL S-VOC	2x 8oz	✓
TCL PEST/PCB		✓
EXPLOSIVES + NC, NG, NGY		✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: 57B0050201

Sample Location: $57SB0005/MW0009

Sampled By: FRED W RAMSER

C.O.C. No.: 5

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON/HSA

Depth Sampled: 4'-6'

Sample Date and Time: 1-12-99 1105

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

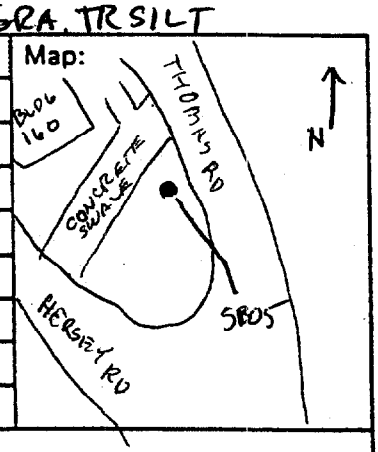
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND+GRA, TR SILT

Analysis	Container Requirements	Collected (✓)
TCL VOC	4oz	✓
TOC		✓
TCL S-VOC	2x8oz	✓
TCL PEST/PCB		✓
EXPLOSIVES+NC, NG, NGY		✓
TAL METALS		✓

Map:



Observations/Notes:
DUPLICATE COLLECTED AT THIS LOCATION FOR TCL S-VOC, TCL PEST/PCB, EXPLOSIVES+NC, NG, NGY AND TAL METALS

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	$57SBDUP0101

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: 57B0050301

Project No.: 7129

Sample Location: 57B005/MW009

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: FRED W RAMSER

C.O.C. No.: 5

Sample Method: SPLIT SPOON

Depth Sampled: 16'-18'

Sample Date and Time: 1-12-99 1140

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

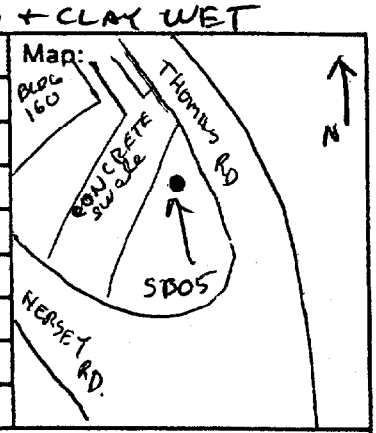
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN/GREEN GRAY	f-g SAND + CLAY WET

Analysis	Container Requirements	Collected (✓)
TCL VOA	4oz	
TOC		
TCL S-VOA		
TCL PEST/PCB	8oz	
TAL METALS		
EXPLOSIVES, NC, NG, NGY	8oz	

Map:



Observations/Notes:
Well screen Interval

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: $57SB0050401

Sample Location: $57SB005/MW009

Sampled By: FRED WRAMSER

C.O.C. No.: 13

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON/HSA

Depth Sampled: 3'-5'

Sample Date and Time: 1545 1-12-99 ~~1300~~

Type of Sample
- ☐ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

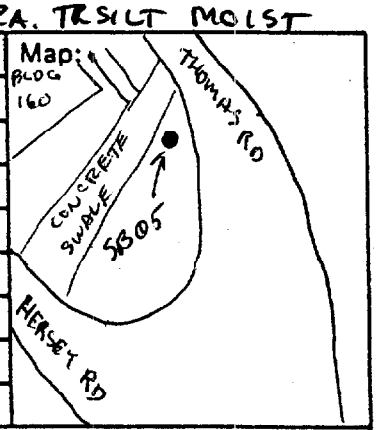
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
MED BRN	SAND + GRA. TR SILT MOIST

Analysis	Container Requirements	Collected (✓)
GEOPHYSICAL PARAMETERS	3x 8oz	✓

Map:



Observations/Notes:

JAR SAMPLE SENT TO ACKENHEIL ENGINEERS INC.

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred Wramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: $57SB0050501

Sample Location: $57MW009

Sampled By: Fred W Ramser

C.O.C. No.: 13

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON/HSA

Depth Sampled: 18-20'

Sample Date and Time: 1-12-99 1145

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

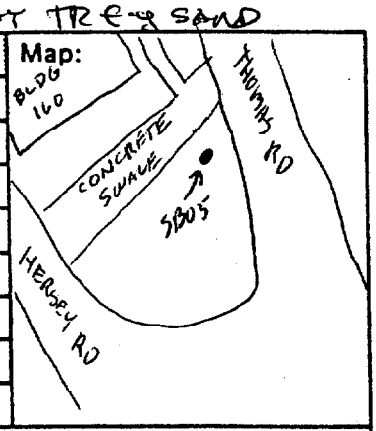
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
GREY/YEL BRN	SILTY CLAY TR f-g SAND

Analysis	Container Requirements	Collected (✓)
GRAIN SIZE DIST.	3 x 8 oz	
MOISTURE CONTENT		✓
BULK DENSITY		
SPECIFIC GRAVITY		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD: —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0060101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 3'-4'

Sample Date and Time: 10-8-98 0845

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

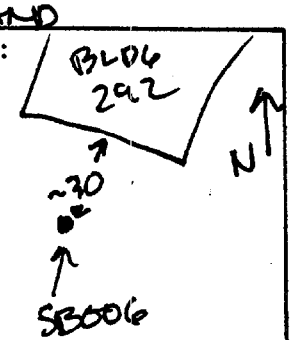
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BLK	GRAVEL + SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0060201

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 10'-11'

Sample Date and Time: 10-8-98 0855

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

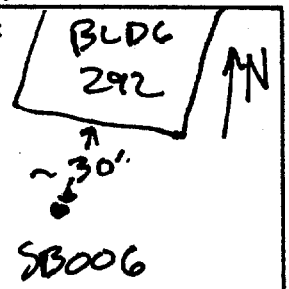
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL-BRN	SAND + GRA

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES+NC,NG,NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0070101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 4'-5'

Sample Date and Time: 10-7-98 1455

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

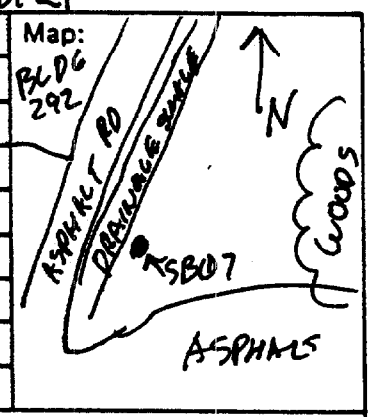
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	CLAY + SILT

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		✓
TAL METALS		✓
TCL PEST/PCBs		✓
EXPLOSIVES + NC, NG, NT		✓
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0070201

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 6'-8'

Sample Date and Time: 10-7-98 1505

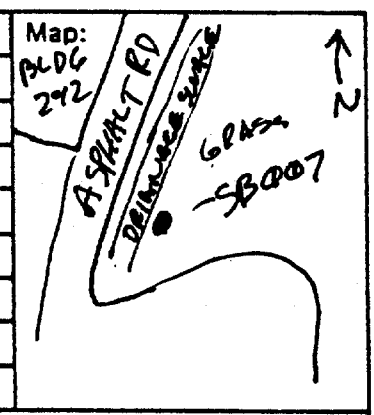
Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data		
Sample	Time	Color/Description

Grab Sample Data	
Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		✓
TAL METALS		✓
TCL PEST/PCBs		✓
EXPLOSIVES+NC, NG, N4		✓
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0080101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 4'-6'

Sample Date and Time: 10-8-98 0925

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

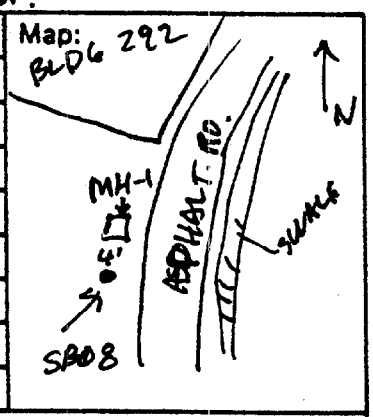
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND + GRA.

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		✓
TAL METALS		✓
TCL PEST/PCBs		✓
EXPLOSIVES + NC, NG, NT		✓
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	S57DUP0003

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0080201

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 10'-11'

Sample Date and Time: 10-8-98 0930

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

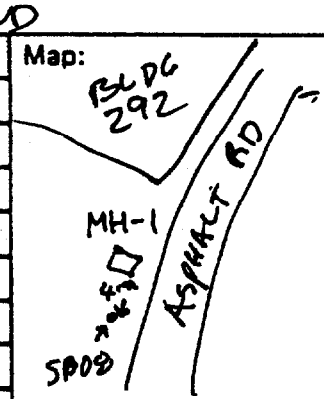
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	f-g SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + C/E		✓
TCL S-VOA		✓
TAL METALS		✓
TCL PEST/PCBs		✓
EXPLOSIVES+NC, NG, NT		✓
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0090101

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 3'-4'

Sample Date and Time: 10-7-98 1830

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

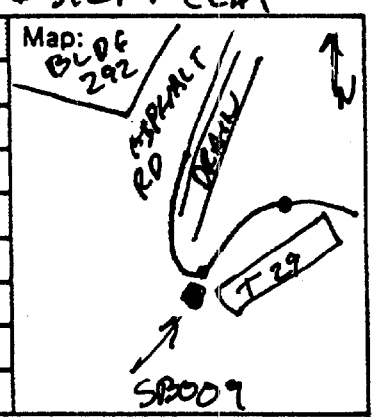
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	GRA, SAND + SILT + CLAY

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0090201

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 7'-8'

Sample Date and Time: 10-7-98 1835

Type of Sample

- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

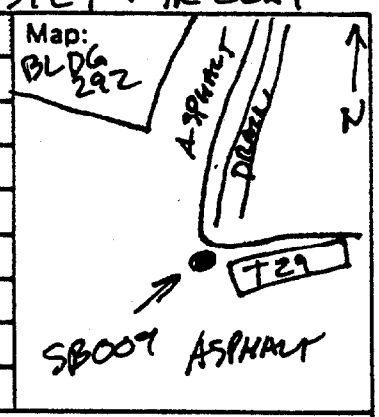
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	SAND + SILT + TR CLAY

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB010010I

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 3'-4'

Sample Date and Time: 10-7-98 1700

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

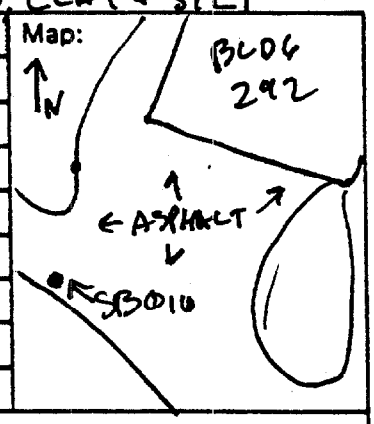
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	GRA, SAND, CLAY + SILT

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0100201

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 7'-8'

Sample Date and Time: 10-7-98 1705

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

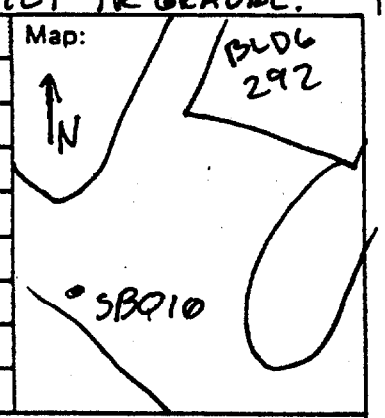
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
PALE YEL BRN	SAND + SILT TR GRAVEL.

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0110101

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 6'-8'

Sample Date and Time: 10-7-98 1320

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

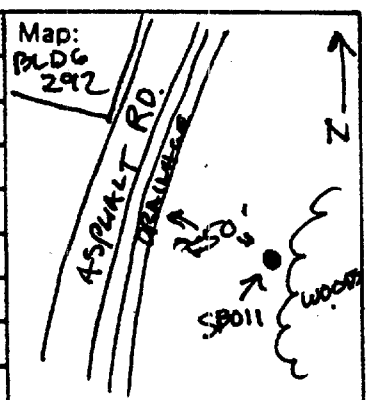
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES+NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB01102Ø1

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 14' - 15'

Sample Date and Time: 10-7-98 1345

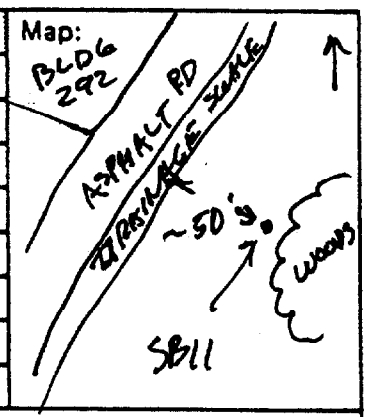
Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data		
Sample	Time	Color/Description

Grab Sample Data	
Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
PALE YEL BRN	f-g SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB012Ø1Ø1

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 3'-4'

Sample Date and Time: 10-7-98 1735

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

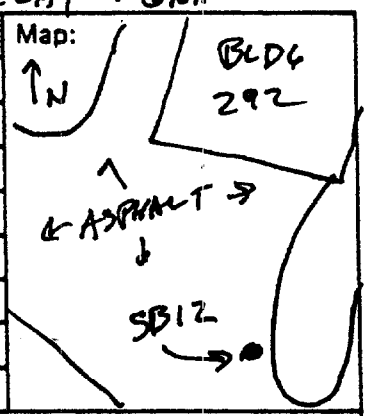
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BLK	SAND, CLAY + GRA

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB012020 1

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 7'-8'

Sample Date and Time: 10-7-98 1745

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

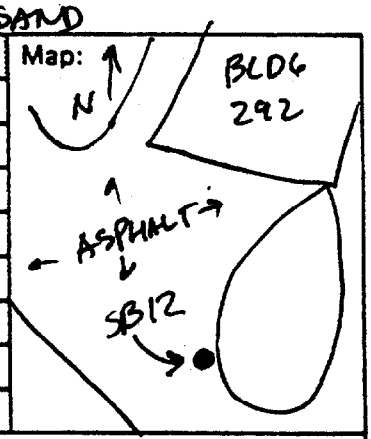
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	CLAYEY SAND

Analysis	Container Requirements	Collected (✓)
TCL VOA + C/E		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIANHEAD

Sample ID No.: S57SB013D101

Project No.: 7129

Sample Location: S57SB013/MW012

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: FRED W RAMSEUR

C.O.C. No.: 4

Sample Method: SPLIT SPOON / HSA

Depth Sampled: 3'-4'

Sample Date and Time: 1-9-99 0915

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

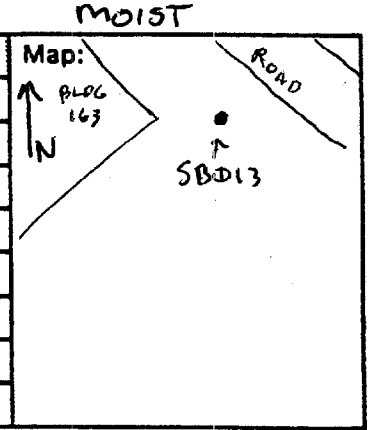
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	f-g SAND MOIST

Analysis	Container Requirements	Collected (✓)
TCL VOA w/ee	4 oz	✓
TCL SVOA	8 oz	
TAL METAL		✓
TCL PEST/PCB		
EXPLOSIVES w/nc,ng,nyl	8 oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramseur

SINGLE SAMPLE LOG SHEET

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Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: $57SB013020 1

Sample Location: 57SB013/MW012

Sampled By: FRED W RAMSER

C.O.C. No.: 5

Sample Method: SPLIT SPOON/HSA

Depth Sampled: 6'-8'

Sample Date and Time: 1-12-99 1530

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

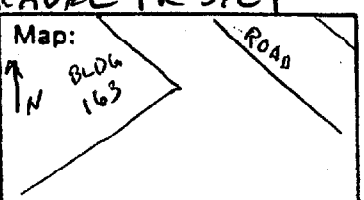
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL BRN	SAND + GRAVEL TR SILT

Analysis	Container Requirements	Collected (✓)
TCL VOC	4oz	✓
TOC		✓
TCL S-VOC		✓
TCL PEST/PCB	8oz	✓
TAL METALS		✓
EXPLOSIVES, NC, NG, NGY	8oz	✓

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD —

Duplicate ID No: —

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB014010 1

Sample Location: INDIANHEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 3'-5'

Sample Date and Time: 10-7-98 1535

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

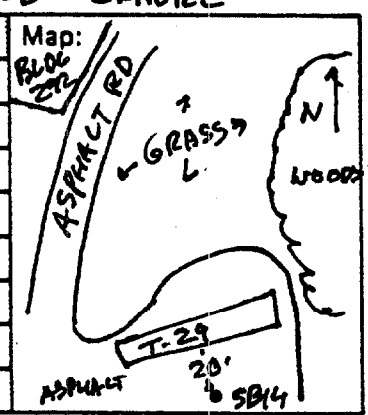
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL, BRN + BLK	CLAY + SAND + GRAVEL

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e	✓	✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57

Project No.: 7129

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: S57SB0140201

Sample Location: INDIAN HEAD NSWC

Sampled By: FRED W RAMSER

C.O.C. No.: _____

Sample Method: GEOPROBE 2" x 4' MACRO CORE

Depth Sampled: 7'-8'

Sample Date and Time: 10-7-98 1545

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☒ Low Concentration

Composite Sample Data

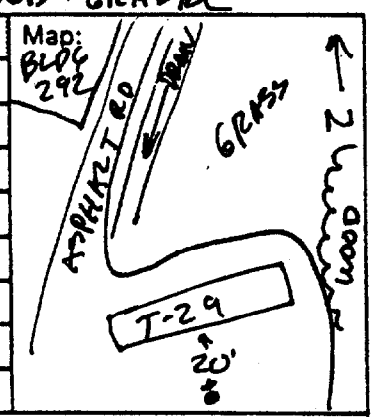
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL, BRN + BLK	CLAY + SAND + GRAVEL

Analysis	Container Requirements	Collected (✓)
TCL VOA + e/e		✓
TCL S-VOA		
TAL METALS		
TCL PEST/PCBs		
EXPLOSIVES + NC, NG, NT		
TOC		

Map:



Observations/Notes:

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Sample ID No.: S57SB015 0101

Project No.: 7129

Sample Location: S57SB015/MW005

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: FRED W RAMSER

C.O.C. No.: 4

Sample Method: SPLIT SPOON/ HSA

Depth Sampled: 2'-4'

Sample Date and Time: 1-11-99 0820

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

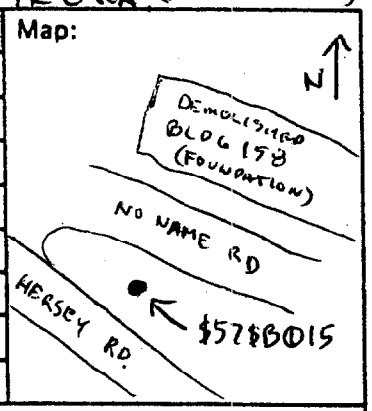
Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
BRN	f-g SAND TR GRA (MOIST TO WET)

Analysis	Container Requirements	Collected (✓)
TCL VOC+tee	4oz	✓

Map:



Observations/Notes:
GROUNDWATER AT ~4', THIS SPL IS BOTH middle of vadose, and GROUNDWATER VADOSE INTERFACE.

Circle if Applicable:

MS/MSD	Duplicate ID No:
—	—

Signature(s): Fred W Ramser

SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: SITE 57, INDIAN HEAD

Project No.: 7129

Sample ID No.: S57SB015D201

Sample Location: S57SB015/MW 005

Sampled By: FRED WRAMSER

C.O.C. No.: 4

- ☐ Surface Soil
- ☒ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample Method: SPLIT SPOON / HSA

Depth Sampled: 10-12'

Sample Date and Time: 1-11-99 1050

Type of Sample
- ☒ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)
YEL-BRN/GREY	SAND WET

Analysis	Container Requirements	Collected (✓)
TCL VOCs	4 #2	✓
TOC		✓

Map: SEE PG 1 FOR MAP.

Observations/Notes: SCREEN INTERVAL

Circle if Applicable:

MS/MSD ✓yes

Duplicate ID No: —

Signature(s): Fred Wramser

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

Sample ID No.: S57SW0090102
Sample Location: S57SW09
Sampled By: FWR
C.O.C. No.: 64018

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9-27-99	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Time: 1400								
Depth: SURFACE	CLEAR	7.49	0.465	24.4°	—	7.48	0.01	—
Method: DEDICATED PLASTIC SCOOP								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/N'S	4°C	2 x 1 L AMB GLASS	✓

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

FROM 36" PIPE OUTFALL AT MATTAWOMAN CREEK.

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
✓	S57SWDUP00102

Signature(s): Fred W Ramos

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

Sample ID No.: S57SW0080102
Sample Location: S57SW08
Sampled By: FWR
C.O.C. No.: 64018

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

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	Salinity %	Other NA
Date: 9-27-99								
Time: 1430								
Depth: SURFACE	CLEAR	7.57	0.520	26.1°	—	9.02	0.02	—
Method: DEDICATED PLASTIC SCOOP								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/ N'S	4°C	2 x 1 l AMB GLASS	

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

COLLECTED @ MH-497

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramse

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

Sample ID No.: S57SW0070102
Sample Location: S57SW07
Sampled By: FWR
C.O.C. No.: 64018

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

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	Salinity %	Other NA
Date: 9-27-99 Time: 1525 Depth: SURFACE Method: DEDICATED PLASTIC SCOOP	CLEAR	7.84	0.417	26.7	—	—	0.01	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/ N'S	4°C	2 x 1 l AMB GLASS	✓

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

- COLLECTED FROM IW-80 (MH-489)

- NSWC PERSONNEL MEASURED TEMP = 80°F (26.67°C) FLOW = 212,941 gpd @ 1435 HRS

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramse

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

Sample ID No.: S57SW0060102
Sample Location: S57SW006
Sampled By: FWR
C.O.C. No.: 64018

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

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	Salinity %	Other NA
Date: 9-27-99								
Time: 1550								
Depth: SURFACE	CLEAR	7.86	0.408	27°	—	—	0.01	—
Method: DEDICATED PLASTIC SCOOP								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/ N'S	4°C	2 x 1 L AMB GLASS	

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

COLLECTED @ MH-487

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramse

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

Sample ID No.: S57SW0040302
Sample Location: S57SW004
Sampled By: RWR
C.O.C. No.: 64018

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

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	Salinity %	Other NA
Date: 9-27-99								
Time: 1620								
Depth: SURFACE								
Method: DEDICATED PLASTIC SCOOP	CLEAR	8.11	0.412	27.4°	—	—	0.01	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL 4°C	3 x 40ml	✓
EXPLOSIVES W/ N'S	4°C	2 x 1 l AMB GLASS	✓

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

COLLECTED @ MH-02 (MH-431)

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramser

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

Sample ID No.: S57SW0030102
Sample Location: S57SW03
Sampled By: FWR
C.O.C. No.: 64018

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	Salinity %	Other NA
Date: 9-27-99 Time: 1640 Depth: SURFACE Method: DEDICATED PLASTIC SCOOP	CLEAR	8.30	0.416	27.4°	—	—	0.01	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/N'S	4°C	2 x 1 l AMB GLASS	✓

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

COLLECTED @ MH-01 (MH-430)

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Fred W Ranse

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

Sample ID No.: S57SW0020102
Sample Location: S57SW02
Sampled By: FWR
C.O.C. No.: 64018

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	Salinity %	Other NA
Date: 9-27-99 Time: 1715 Depth: SURFACE Method: DEDICATED PLASTIC SCOOP	CLEAR	8.33	0.415	27.4	—	—	0.01	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/N'S	4°C	2 x 1 l AMB GLASS	✓

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

COLLECTED @ MH-429

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramos

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: INDIAN HEAD NSWC SITE 57
Project No.: 7129

Sample ID No.: S57SW0010102
Sample Location: S57SW01
Sampled By: PWR
C.O.C. No.: 64018

[] Stream
[] Spring
[] Pond
[] Lake
[X] Other: STORM SEWER WATER
[] QA Sample Type:

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	Salinity %	Other NA
Date: 9-27-99								
Time: 1730								
Depth:	CLEAR	8.23	0.399	26.6	—	—	0.01	
Method: DEDICATED PLASTIC SCOOP								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs + ee	HCL + 4°C	3 x 40ml VIAL	✓
EXPLOSIVES W/N'S	4°C	2 x 1L AMB GLASS	

OBSERVATIONS / NOTES:

COLLECTED FROM MAIN FLOW, NO OTHER INLETS HAVE FLOW.

COLLECTED @ MH-427

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramos

APPENDIX B

Chain of Custody Forms

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference

Project: INDIAN HEAD NSWC #7129
Client: TT NUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-5684

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOCs + ETHYL ETHER	TCL SVOCs	TCL PESTICIDES	PCBs	EXPLOSIVES	NITROCELLULOSE	TOC	[illegible]	TCL [illegible]	Cyanide	ECOLOGICAL PARAMETERS *	Lab Cooler No. COC #1	CLIENT COMMENTS
Turnaround Time																	
# of Containers					3	1	1	1	1	1	1	1	1	1	1	1	
Container Type					40 mL Glass	1-Liter Amber	"	"	1-Liter Amber	1-Liter Amber	1-Liter Amber	1-Liter Amber	1-Liter Amber	1-Liter Amber	1-Liter Amber	1-Liter Amber	
Preservative Used					HCl	–	–	–	–	H_2SO_4	[illegible]	NaOH	–				
$57	SW0140101	1/7/99	0730	Surface Water	MW	X	X	X	X	X	X	X	X	X	X		
$57	SW0150101	"	0830	"	"	X									X		
$57	TB0010001	"	0800	Water	LAB	X											only 2 vials
$57	RB0010001	"	1500	WATER	FWR	X					X						

OPTIONAL FORM 99 (7-90) 1-20-99 NOTE CHANGES DATED 1-11-99

FAX TRANSMITTAL # of pages ▸ 2

To LEE LECK
Dept./Agency TENUS
Fax # 412-921-4040

From FRED WRAMSER
Phone # —
Fax # —

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

1/11/99 MW

* PLEASE ADD THE ETHYL ETHER ANALYSIS TO THE VOCs

* ECOLOGICAL PARAMETERS INCLUDES THE FOLLOWING: pH, TURBIDITY, TSS, TDS, Cl, FLUORIDE, SULFATE, ALKALINITY, DO, NITRATE/NITRITE

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/7/99 1615	[illegible]			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. _____

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference

Project: INDIAN HEAD NSWC # 7127
Client: TINUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-721-8684

Turnaround Time					STD									
# of Containers					1	1	1	1	1					
Container Type					4 OZ GLASS	4 OZ GLASS	8 OZ GLASS	4 OZ GLASS	4 OZ GLASS					
Preservative Used					–	–	–	–	–					
Type of Analysis					TCL VOC ETHYL ETHER	TCL SVOC TAL METALS +CN TCL PEST/PCB	EXPLOSIVES NITROCELLULOSE NITROGUANIDINE NITROCELLULOSE TOC + ALKALINITY	TOC	TCL VOC AND TOC					Lab Cooler No. C.O.C. # 2
Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials										CLIENT COMMENTS
57 $D011010 1	1/7/99	0840	Sediment	MW	X									
57 $D010010 1	"	1000	"	"	X	X	X							
57 $B002040 1	"	0800	Soil	FR				X						
57 $B002050 1	"	0745	Soil	FR				X						
57 $B002030 1	"	0825	Soil	FR					X					PLEASE HOLD DO NOT ANALYZE 1-20-99
								* PLEASE ADD THE ETHYL ETHER ANALYSIS TO THE VOCs			1/11/99 MW			

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

# of pages ►

To: KATHY BLOSE
From:
Dept./Agency: GP LABS
Phone #:
Fax #: 301-840-1209
Fax #:

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/7/99 1615	[illegible]			
Relinquished By:	**Date/Time**	**Received By:**	**Date/Time** / **Shipper:**	**Airbill No.:**	
Relinquished By:	**Date/Time**	**Received By:**	**Lab Comments:**	**Temp:**	

G.P. W.O. _____

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference

Project: INDIAN HEAD NSWC #7129
Client: TYNUS
Send Results To: GEORGE LATHLIPPE
Address: 661 ANDERSEN DR.
PITTSBURGH PA 15220
Phone: 412-921-8684

Turnaround Time	STD										
# of Containers	3	1	1	1	1	1	1	1	1	2	
Container Type	40mL	1 liter Amber	1 liter Amber	125 mL	250 mL	500 mL					
Preservative Used	HCl	-	-				H2SO4	NaOH			

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC	ETHYL ETHER	TCL SVOC	TCL PEST/PCBS	EXPLOSIVES NITROGLYCERINE NITROGUANIDINE	NITROCELLULOSE	TOC	TAL METALS (TOTAL) TAL ANTIMONY HARDNESS	CN	ECOLOGICAL PARAMETERS	TOTAL # OF CONTAINERS	Lab Cooler No. C.O.C.# 3	CLIENT COMMENTS
TB0020001	1/8/99	0730	water	LAB	X										2		
SW0120101	1/9/99	1030	surface water	MW	X										3		
SW0110101	"	1600	"	"	X										3		
RB0020101	"	1700	water	"	X	X	X	X	X		X				8		* HOLD - DO NOT ANALYZE
RB0030101	1/10/99	1700	"	"	X					X					4		
FB0020101	1/11/99	0725	"	"	X	X	X	X	X	X		X	X	X	12		
FB0010101	"	0745	"	"	X	X	X	X	X	X		X	X	X	12		
RB0040101	"	1300	"	"	X					X					4		* HOLD - DO NOT ANALYZE
															48		

* ECOLOGICAL PARAMETERS: pH, TURBIDITY, TDS, TSS, Cl, Fl, DO, SULFATE, SALINITY, NITRATE/NITRITE

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/11/99 17:00	01-11-98 [illegible] 17:00			
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Lab Comments:

Temp:

G.P.W.O. _____

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 2

To LEE LECK	From MATT WOOLFORD
Dept./Agency TYNUS	Phone #
Fax # 412-921-4040	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

Project: INDIANHEAD SITE 57 #7129
Client: TtNUS
Send Results To: GEORGE LATULLIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-8684

					Turnaround Time	STD	STD	STD	STD						
					# of Containers	1	1	1	1						
					Container Type	4oz	4oz	8oz	8oz						
					Preservative Used	4°C	4°C	4°C	4°C						
					Type of Analysis	TCL VOA	TCL VOA + 10	TOC	TCL SVOCs, PESTICIDES/PCBs (HERBS)	EXPLOSIVES, NC, NG, NGY				TOTAL # OF CONTAINERS	Lab Cooler No.
	Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials										C.O.C. #4 CLIENT COMMENTS
$57	$S0040101	1-10-99	0900	SO	FUR	✓								1	
$57	$B0040101		0920		FUR	✓								1	
$57	$S0040201		1405		FUR	✓								1	
$57	$B0040301	↓	1420		FUR		✓							1	
$57	$S0130101	1-9-99	0910		FUR	✓		✓	✓					3	
$57	$B0130101		0915		FUR	✓		✓	✓					3	
$57	$S0150101	1-11-99	0815		FUR	✓								1	
$57	$B0150101		0820		FUR	✓								1	
$57	$B0150201	1-11-99	1050		FUR		✓							2	RUN MS/MSD
$57	$BDUP0101	1-10-99	0000		FUR		✓							1	$57SB0040301
$57	$D0080101	1-9-99	1040		FUR/MW	✓								1	
$57	$D0070101	1-9-99	1610	SO	FUR/MW	✓								1	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/11/99 1700	01-11-99 [illegible] 17:00			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O.

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference:

Project: INDIAN HEAD - NSWC #7129
Client: TYNUS
Send Results To: GEORGE LATOLLINE
Address: 661 ANDERSON DR
PITTSBURGH, PA 15220
Phone: 412 - 921 - 8684

Turnaround Time: STD ← → STD

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC	TCL VOC/TCL + TOC	TCL SVOC, PESTICIDES TAL METAL	EXPLOSIVES NC, NG, NGY	TCL VOC	SVOC	PESTICIDES/HERBS	EXPLOSIVES NITROGLYCERINE		TOC	TAL METALS (TOTAL)	TOTAL # of Containers	CLIENT COMMENTS
# of Containers					3	1	1	1	1	1	1	1	1	1	1	1	
Container Type					40 ml	40 ml	8oz	8oz	4oz	Liter Amber	Liter Amber	Liter Amber	500 ml			500 ml	
Preservative Used					HCl	—	—	—	—	—	—	—	—			HNO3	
T3000001	1/12/99	0715	water	LJB	X											2	ONLY 2 CONTAINERS
$57 $B0050101	"	1050	soil	FWR	X		X	X	X							3	
$57 $B0050101	"	1055		FWR		✓	✓	✓								3	
$57 $B0050201	"	1105		FWR		✓	✓	✓				—				3	
$57 $BDUP0101	"	0000		FWR			✓	✓								2	
$57 B3 0130201	"	1530		FWR	X		X	X	X							3	
$57 RB 0050101	"	1600	water	MW	X					X	X	X	X	X	X	9	
$57 B8 0050301	"	1140	soil	MW		X	X	X								3	
																28	

C.O.C. # 5

Lab Cooler No.

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	1/12/99 1620	01-12-99 [signature] 16:20			

Date/Time	Shipper:	Airbill No.:

Lab Comments:

Temp:

G.P. W.O. _____

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 1

To	From
LEE LECK	MATT WOOLFORD
Dept./Agency: TYNUS	Phone #
Fax #: 412-921-4040	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference:

Project: INDIAN HEAD NSWC #7129
Client: TYNUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSEN DR
PITTSBURGH, PA 15220
Phone: 412-921-8684

Lab Cooler No.: C.O.C. # 6

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC + ETHYL ETHER	TCL SVOC	TCL PEST/PCBs	EXPLOSIVES	NITROGLYCERINE	NITROCELLULOSE	TOTAL ALKALINITY	TOTAL HARDNESS	TOTAL METALS (ICP)	TOC	CYANIDE	ECOLOGICAL PARAMETERS *	TOTAL # OF CONTAINERS		CLIENT COMMENTS
Turnaround Time					STD														STD
# of Containers					3	1	1	1						1	1	1	1		1
Container Type					40 mL	Liter Amber	Liter Amber	1 L						500 mL HDPE	250 mL HDPE	500 mL HDPE	500 mL HDPE		
Preservative Used					HCl	–	–	–						HNO_3	H_2SO_4				
TB004	1/19/99	1140	Water	LDE	▲	▲	▲										2		TCL VOC/EE ONLY
7 $WO160101	1/20/99	0800	Water	MW	▲	▲	▲	X	X	X	X	X		X	X	X	36		*RUN MS/MSD ON $WO160101
7 $WO100101	"	1600	"	"	▲												3		
7 $WO090101	"	1630	"	"	▲	▲	▲	X	X	X	X	X		X	X	X	12		
7 $WO080101	"	0000	"	"	▲	▲	▲	X	X	X	X	X		X	X	X	12		158 $WO160101
																	65		
																			▲ – LOW CONCENTRATION
						★	ECOLOGICAL PARAMETERS: pH, TURBIDITY, TSS & TDS,												
																Cl, Fl, NITRATE/NITRITE			
																SULFATE, SALINITY, DISSOLVED			
																OXYGEN			

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 2

To: LEE LECK	From: MATT WOOLFORD
Dept./Agency: TYNUS	Phone #: 1/21/99
Fax #: 412-921-4040	Fax #:

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/20/99 1800	01-20-99 [illegible] 18:00			
Relinquished By:	**Date/Time**	**Received By:**	**Date/Time**	**Shipper:**	**Airbill No.:**
Relinquished By:	**Date/Time**	**Received By:**	**Lab Comments:**		**Temp:**

G.P. W.O. _____

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference:

Project: INDIAN HEAD NSWC #7129
Client: TANUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSEN DR.
PITTSBURGH, PA 15220
Phone: 412-921-8684

Lab Cooler No.: C.O.C. # 7

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC / Phenol / Ethanol	TOC / SVOC / Pesticides/PCBs	Total Metals / CN	Explosives / Gen. Chem. / Nitro-G-Y / Cell / Sediment Metals	SEP/INS Metals	TOTAL # OF CONTAINERS						CLIENT COMMENTS
	Turnaround Time				STD				STD							
	# of Containers				1	1	1	1								
	Container Type				4oz	8oz	8oz	8oz								
	Preservative Used				–	–	–	–								
7 $D0120101	~~11/20/99~~	~~0740~~	SOIL	AW	X	X	X		6							X PLN MS/MSD ON
7 $D0060101	11/20/99	1540	"	"	X			X	2							$D0120101
7 $D0050101	"	1620	"	"	X	X	X		3							
7 $DDUP0101	"	0600	"	"	X	X	X		3							$57 $D0120101
									14							

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	11/20/99 1800	01-22-99 [illegible] 18:00			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. _____

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference:

Project: INDIAN HEAD - NSWC #7129
Client: TTNUS
Send Results To: GEORGE LATULIPE
Address: 661 ANDERSEN DR
PITTSBURGH, PA 15220
Phone: 412 - 921 - 5684

Turnaround Time	STD								
# of Containers	1	3	1	1	1	1	1	1	1
Container Type	125mL	40mL	Liter Amber	"	Stoppered Flask	"	"	Liter Amber	125 mL Flask
Preservative Used	–	HCl	–	–	HNO3	HNO3	NaOH	–	–

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Ammonium Perchlorate	TCL VOCs (Purge & Trap)	SVOC	Pesticides/PCBs	TAL Metals (Total)	TAL Metals (Filtered)	Cyanide	Explosives, Nitroaromatics, Nitroglycerine	Nitroaromatics	Total	CLIENT COMMENTS
44 MW0010005	1/21/99	1002	Groundwater	EW	X									3	RUN MS/MSD ON
44 MW0020005	"	1030	"	MW	X									1	MW0010005
44 MW0030005	"	1132	"	"	X									1	
44 MW0040500	"	0000	"	"	X									1	▲ - USE LOW
TB0050001	"	1100	"	MR		▲								2	DETECTION LIMITS
57 SW0080101	"	1230	"	MW		▲								3	
57 SW0080201	"	1245	"	"		▲								3	
57 SW0080301	"	1410	"	"		▲								3	
57 SW0070101	"	1440	"	"		▲	▲	▲	X	X	X	X	X	10	
57 SW0070201	"	1515	"	"		▲								3	
57 SW0060101	"	1545	"	"		▲								3	
57 SW0060201	"	1600	"	"		▲								3	

C.O.C # 8

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/21/99 1510	01-21-99 [illegible] 18:10		35	

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Lab Comments:

Temp:

G.P. W.O. _____

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 2

To	From
LEE LECK	MATT WOOLFORD
Dept./Agency: TTNUS	Phone #: 1/22/99
Fax #: 412 21 - 4040	Fax #:

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference:

Project: INDIAN HEAD NSWC #7129
Client: TAULIS
Send Results To: GEORGE LATULLIPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-8684

C.O.C. # 9

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC + ethyl ether	SVOC	PESTICIDES/PCBS	EXPLOSIVES & HERBICIDES	NITROCELLULOSE	CYANIDE	TOTAL METALS (TOTAL)	[illegible]	TOTAL	Lab Cooler No.	CLIENT COMMENTS
Turnaround Time					STD								STD		
# of Containers					3	1	1	9	1	1	1				
Container Type					40mL	Liter AMBER	"	"	125mL	100mL	"				
Preservative Used					HCl	–	–	–	–	NaOH	HNO3				
57 TW0030101	1-21-99	1539	AQ	FW	X								3		
57 TW0020101	"	1725	"	"	X								3		
57 RB0050101	"	1745	"	FW	▲	▲	▲	X	X	X	X		9		
57 RWINPU201	"	0000	"	ML	▲								3		$57 $W0060101
													18		▲ - LOW DETECTION LIMITS

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	1/21/99 1610	[signature] 01-21-99 18:10			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. _____

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference:

Project: INDIAN HEAD - NSWC #7129
Client: TRIUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSEN DR
PITTSBURGH, PA 15220
Phone: 412-921-8684

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC / ETHYL ETHER	SVOC	PESTICIDES / PCBS	EXPLOSIVES / NITROGLYCERIN / 1,2-DINITROBENZENE	NITROCELLULOSE	TAL METALS (TOTAL)	TAL METALS (FILTER)	CYANIDE	TOC	TOTALS	Lab Cooler No.	CLIENT COMMENTS
Turnaround Time					STD									STD		
# of Containers					3	1	1	1	1	1	1			1		
Container Type					40 mL	LITER AMBER	LITER AMBER	LITER AMBER	125 mL WIDE	500 mL HDPE	"			250 mL HDPE		
Preservative Used					HCl	—	—	—	—	HNO_3	NaOH			H_2SO_4		
Type of Analysis																C.O.C. #10
TB0060001	1/22/99	0730	WATER	AB	▲									2		
SW0040101	"	1400	WATER	MW	▲	▲	▲	X	X	X	X	X		10		
SW0030101	"	1500	"	"	▲	▲	▲	X	X	X	X	X		10		
SW0030201	"	1550	"	"	▲									3		
SWDUP0301	"	0000	"	"	▲									3		
RB0060101	"	1630	"	"	▲	▲	▲	X	X	X		X		9		★ HOLD DO NOT ANALYZE
RB0070101	"	1630	"	FWR	▲								X	4		
TW0010101	"	1618	"	FW	▲X									3		USE
														42		▲ - LOW DETECTION LIMITS

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/22/99 1700	01-22-99 [illegible] 17:00			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

L.P. W.O. _____

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

Project: INDIANHEAD NSWC #7129
Client: TETNUS
Send Results To: GEORGE LAT
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-7090

Turnaround Time	STD	STD										
# of Containers												
Container Type	40 ml vials											
Preservative Used	4°	4°										
Type of Analysis	TCL VOC	TOC								TOTALS	Lab Cooler No.	C.O.C # 11

	Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC	TOC							TOTALS		CLIENT COMMENTS
$57	$B0020601	1-22-99	0850	SO	FLR	✓	✓							1		
$57	$BLUP002	1-22-99	0000	SO	FLR	✓	✓							1		$57B0020601
$57	$$LUP001	1-22-99	0000	SO	FLR	✓								1		57LUP001
$57	$$B0090101	1-22-99	1145	SO	FLR	✓								1		
														4		

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1/22/99 1100	[illegible] 01-22-99 17:00			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P.W.O.

~~GP ENVIRONMENTAL SERVICES, INC.~~

ACKENHEIL ENGINEERS INC

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

_____ of _____ Pgs.

Project: INDIANHEAD SITE 57 Job#7129
Client: TETRA TECH
Send Results To: GEORGE LATOURETTE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-8684

Turnaround Time: STD
Preservative Used: — — — —

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Grain Size Dist.	Moisture Content	Bulk Density	Specific Gravity	Lab Cooler No. #13 / CLIENT COMMENTS
$57 SB00501001	1-12-99	1545	SO	FWR	✓	✓	✓	✓	3x8oz WMG (VD)
$57 SB00201001	1-7-99	0800	SO	FWR	✓	✓	✓	✓	2x8oz WMG (VD)
$57 SB00205001	1-7-99	0945	SO	FWR	✓	✓	✓	✓	1x8oz WMG (CU)
$57 SB00501001	1-12-99	1145	SO	FWR	✓	✓	✓	✓	3x8oz WMG (CU)

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Greg Manor	1/29/99 1400	FED EX			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

GPWO

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

_____ of _____ Pgs.

Project: INDIAN HEAD NSWC
Client: TETRA TECH NUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSON DRIVE
PITTSBURGH PA 15220
Phone: 412-921-8684

	Sample ID#	Date Sampled 99	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC + CC	TCL SVOC	TAL Metals (Total)	TAL METALS (dissolved)	Cyanide	TOTAL Dissolved Solids	TCL Pest/PCB	Explosives	NO, NO2, NO3	TOC	Hardness	Ammonium Perchlorate	CLIENT COMMENTS
Turnaround Time																		
# of Containers																		
Container Type						40ml	1L AC	500 ml	500 ml	500 ml	125ml	1L AD	1 liter	1 liter				
Preservative Used						HCL	4°C	HNO_3	HNO_3	NaOH	4°C	4°C	4°C	H_2SO_4				
$57	TC0070001	1-25	0730	AQ	FCW	X▲												
57	MW0020101	1-25	0903	"	"	3X▲					X●							
$57	MW0010101	"	1051	"	"	3X▲					X●							
$57	MW0030101	1-25	1000	AQ	GFS	3▲	1▲	1●	1●	1●	1●	1▲	2●	1●			(12)	
$57	MW0040101	1-25	1205	AQ	GFS	3▲	1▲	1●	1●	1●	1●	1▲	2●	1●			(12)	
$57	PW0070101	1-25	1145	AQ	FWR	3▲										1▲		
$57	MW0130101	1-25	1252	AQ	FCW	3▲	1▲	1●	1●	1●	1●	1▲	2●	1●				
$57	MW0070101	1-25	1542	AQ	GFS	3▲					1●						(4)	
$57	MW0120101	1-25	1625	AQ	FCW	3▲	1▲	1●	1●	1●	1●	1●	1●	1●	1●			
$57	MWDUP001	1-25	0000	AQ	FCW	3▲	1▲	1●	1●	1●	1●	1●	1●	1●	1●			

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	1/25/99 1800	[signature] 1/25-00 18:00			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:
			▲ = LOW-CONCENTRATION DET. LIMITS ● = MID-CONCENTRATION DET. LIMITS	

G.P.W.O.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

_____ of _____ Pgs.

Project: INDIANHEAD NSWC #7129
Client: TtNUS
Send Results To: GEORGE LAVOLIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-8684

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOCs + EE	TOC	HARDNESS	PH, TURB, TDS, TSS, CL, FL, NITRATE, NITRITE, SO4, SALIN								CLIENT COMMENTS
Turnaround Time					STD	←	→	STD								
# of Containers					3	1	1	1								
Container Type					40ml	250ml	500ml	500ml								
Preservative Used					HCL	H_2SO_4	—	—								
$57 SW0130101	12/29	1200	AQ	FWR	▲	●	●	●								

Lab Cooler No. #15

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 3

To: LEE LECK
Dept./Agency: TtNUS
Fax #: 412-921-4040

From: FRED WRAMSER
Phone #:
Fax #:

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Fred Wramser	1/25/99 1800	01-25-99 Fin Ey 18:00			
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:
Relinquished By:	Date/Time	Received By:	Lab Comments: ▲ = LOW-LEVEL CONCENTRATION DET. LIMITS ● = MID-CONCENTRATION DET. LIMITS		Temp:

G.P.W.O.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

1 of 1 Pgs.

Project: INDIAN HEAD - NSWC #7129
Client: Tetra Tech NUS
Send Results To: George Latulippe
Address: 661 Anderson Dr.
PITTSBURGH, PA. 15220
Phone: 412-921-8684

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOCs w/ TIC	TDS / pH	TCL / SVOC	TAL Metals (Total)	TAL Metals (Dissolved)	Cyanide	TCL Pest / PCB	EXPLOSIVES NC, NG, NG	TOC	HARDNESS	AMMONIA NITROGEN 125ml H2SO4	CLIENT COMMENTS
Turnaround Time																
# of Containers					17	5	4	4	4	4	4	4	4	4	4	
Container Type					40ml	125ml	1l	500ml	500ml	500ml	1l	1l	125ml	250ml		
Preservative Used					HCl	4°C	4°C	HNO_3	HNO_3	$NaOH$	4°C	4°C	H_2SO_4			
$57 TB008001	1-26-99	0700	AQ	FR	2▲											
$57MW008010	1-26	0919	AQ	GFS	3▲	1•										
$57MW008101	1-26	1113	AQ	GFS	3▲	1•	1▲	1•	1•	1•	1▲	1/1•	1•	1•		
$57MW010101	1-26	1400	AQ	GFS	9▲	3•	3▲	3•	3•	3•	3▲	3/3•	3•	3•	MS / MSD	

#15

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

# of pages ►

To: LEE LECK
Dept./Agency: TENUS
Fax #: 412-921-4040

From: FREDURAMSER
Phone #:
Fax #:

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible signature]	1-26-99 1800	[illegible signature] 1-26-99 18:30			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:
			▲ = LOW-CONC. DET. LIMITS • = MID-CONC. DET. LIMITS	

G.P. W.O.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference

1 of 1 Pgs.

Project: INDIAN HEAD NSWC #7129
Client: T+NUS
Send Results To: GEORGE LATULIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-8684

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOCs + 2	TDS	TAL METALS (DISSOLVED)	TAL METALS (TOTAL)	TCL PEST/PCBs	TCL SVOCs	CYANIDE	TOC	HARDNESS	EXPLOSIVE SMR	NO3	NC	AMMONIUM PERS	Lab Cooler No. #16	CLIENT COMMENTS
Turnaround Time																			
# of Containers																			
Container Type					40ml	125ml	500ml	500ml	1L/8oz	1L/8oz	8oz	8oz	8oz	8oz	8oz				
Preservative Used					HCl	ICE 24°C	HNO_3	HNO_3	ICE	ICE	NaOH	H_2SO_4	ICE	ICE	ICE				
$57 TB009	1-27-99	0800	AQ	FWR	2▲														
$57 MW01001	1-27	0842	AQ	GFS	3▲	1•													
$57 MWDUP0002	1-27	0000	AQ	GFS	3▲	1•													
$57 MW0050101	1-27	1047	AQ	GFS	3▲	1•													
$57 MW0060101	1-27	1407	AQ	GFS	3▲	1•													
$57 SW0070101	1-27-99	1430	AQ	FWR			1•												
$57 RB0080101	1-27-99	1100	AQ	FW	3▲	1*•		1•	1▲	1▲	1•	1•	1•	1•	1•			*NO pH*	
$57 SW0020101	1-27	1330	AQ	GFS	9▲	3	3•	3•	3/4	3/4	3•	3•	3/4	3•				MS/MSD*	
$57 SW0010101	1-27	1515	AQ	GFS	~~6~~ 3 ▲														
						Ø													

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	1-27 1730	[illegible] 01-27-99 17:30			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments: ▲ = LOW-CONC. DET. LIMITS • = MID-CONC. DET. LIMITS	Temp:
		*MS/MSD	*PEST/PCB AND SVOC AND NO, NG ARE IN 8OZ CLEAR GLASS JARS	

C.P.W.C.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

_____ of _____ Pgs.

Project: INDIAN HEAD NSWC #7129
Client: TENUS
Send Results To: GEORGE LAIULIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-8689

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC + T.E.E. + TOC	SVOA/MS METALS	CLIENT COMMENTS
Turnaround Time					STD	STD	
# of Containers					1	1	
Container Type					40 ml VOA	1 liter Poly	
Preservative Used					4°C	8°C	
Lab Cooler No.					#17		
157	$DD09010111-22	[illegible]	SO	FWR	✓•	✓•	

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 2

To: LEE LECK
From: FRED W. RAMSER
Dept./Agency: TENUS
Phone #:
Fax #:
Fax #:

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
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Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments: • = MID-CONC. DET. LIMITS	Temp:

G.P. W.O.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference

Project: INDIAN HEAD SITE 57
Client: TTNUS
Send Results To: GEORGE LATUIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412-921-7090

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOC + TCL S-VOC	TAL MET.	TCL PEST/PCB	EXPLOSIVES TNC, NC + NGT	Lab Cooler No.	CLIENT COMMENTS
Turnaround Time					STD			STD		
# of Containers					1					
Container Type					4oz					
Preservative Used					4°C			4°C		
S57SB0120201	10-7-98	1705	SO	FUR	✓					
S57SB0120101		1735			✓					
S57SB0120201		1745			✓					
S57SB0030101		1810			✓					
S57SB0030201		1815			✓					
S57DUP0101		0000			✓					COLLECTED @ S57SB0030101
S57DUP0102		0000			✓					COLLECTED @ S57SB0030201
S57SB0070101		1830			✓					
S57SB0070201	↓	1835			✓					
S57TB001	10-7-98	1200	AQ	FUR	✓					FROM LAB
S57SB0040101	10-8-98	0845	SO	FUR	✓					DO MS/MSD
S57SB0040201	10-8-98	0855	SO	FUR	✓					

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	10/8/98 1700	SCOTT Garner			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P.W.O.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference

Project: INDIAN HEAD SITE 57
Client: TTNUS
Send Results To: GEORGE LATWLIPPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412 921 7090

Turnaround Time	STD										STD
# of Containers	1										
Container Type	4										
Preservative Used	4°C										4°C
Type of Analysis	TCL VOC + 8/6	TCL S-VOC	TAL METALS	TCL PESTICIDES	EXPLOSIVES + MUNITIONS						Lab Cooler No.
Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials							CLIENT COMMENTS
S57SB01010101	10-7-98	1305	SO	FUR	✓						
S57SB01020101		1320			✓						
S57SB01020201		1345			✓						
S57SB01400101		1535			✓						
S57SB01400201		1545			✓						
S57SB00700101		1455			✓	✓	✓	✓	✓		
S57SB00700101		1450			✓	✓	✓	✓	✓		
S57SB00700201		1505			✓	✓	✓	✓	✓		
S57SB00100101		1615			✓						
S57SB00100101		1615			✓						
S57SB00100201		1640			✓						
S57SB01000101	10-7-98	1700	SO	FUR	✓						

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	10/8/98 1700	[signature]			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

GPWO

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference

Project: INDIAN HEAD SITE 57
Client: TTNUS
Send Results To: GEORGE LATUILLIPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412 921 7090

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOA + 8	TCL S-VOA	TAL MET	TCL PEST/PCB	Explosives + NG/NG + NGY	TOC					Lab Cooler No. / CLIENT COMMENTS
Turnaround Time															
# of Containers															
Container Type															
Preservative Used															
Type of Analysis															
S57SS0080101	10 8 98	0915	SO	FMR	✓	✓	✓	✓	✓						
S57SB0080101	108 98	0925			✓	✓	✓	✓	✓						
S57SB0080201		0930			✓	✓	✓	✓	✓						
S57DUP003	10 8 98	0000			✓	✓	✓	✓	✓						COLLECTED FROM S57SS0080101
S57SS0020101		1015			✓					✓					DO NOT/MSD
S57SB0020101		1020			✓					✓					
S57SB0020201	10 8 98	1030		FMR	✓					✓					

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	10/8/98 1700	[illegible]			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O.

GP ENVIRONMENTAL SERVICES, INC.

202 Perry Parkway
Gaithersburg, Maryland 20877
(301) 926-6802

Contract #/Billing Reference: _____

_____ of _____ Pge.

Project: SITE 57 INDIAN HEAD
Client: TTNUS
Send Results To: GEORGI LATOUPE
Address: 661 ANDERSEN DR
PITTSBURGH PA 15220
Phone: 412 921-7090

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	TCL VOCs (see...)	TCL SVOCs	TAL METALS	TCL Pest/PCB	Explosives (Mod...)	NC	TOC				Lab Cooler No. / CLIENT COMMENTS
Turnaround Time															
# of Containers															
Container Type															
Preservative Used															
Type of Analysis															
S57RB100998	10-9-98	1000	AQ	FLR	✓	✓	✓	✓	✓	✓	✓				
S57FB100998	10-9-98	1030	AQ	FLR	✓	✓	✓	✓	✓	✓	✓				
S57FB100998-2	10-9-98	1145	AQ	FLR	✓	✓	✓	✓	✓	✓	✓				
S57TB100998-1	10-9-98	0900	AQ	FLR	✓										

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	10-9-98 / 1700	[illegible]			

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P.W.O.

Chain of Custody Record

Quanterra, Inc. - Pittsburgh PA Lab
450 William Pitt Way
Pittsburgh PA 15238

Quanterra

QUA-4124

Client	Project Manager	Date	Chain Of Custody Number
TtNUS	GEORGE LATULLIOPPE	9-27-99	64018

Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page ____ of ____
661 ANDERSON DR FOSTER PLZ #7	412 921 8684		

City	State	Zip Code	Site Contact
PITTSBURGH	PA	15220	FRED W. RAMSER

Project Name	Carrier/Waybill Number
INDIAN HEAD NSWC SITE 57	811218148986

Contract/Purchase Order/Quote No.
7129 C10245

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	Containers No.	Preservative	Condition on Receipt	TCL VOCs w/ee	Expl. w/NS	Analysis
57W0090102	9-27-99	1400	AQ				4°C/HCL		✓	✓	RUN MS/MSD
57WDUP00102	9-27-99	0000	AQ				↓		✓	✓	57W0090102
57W0080102	9-27-99	1430	AQ				HCL		✓		
57WTB00102	9-27-99	1400	AQ				HCL		✓		FROM LAB.
57W0070102	9-27-99	1525	AQ				HCL		✓	✓	
57W0060102	9-27-99	1550	AQ				HCL		✓		
57W0040302	9-27-99	1620	AQ				4°C/HCL		✓	✓	
57W0030102	9-27-99	1640	AQ				4°C/HCL		✓	✓	
57W0020102	9-27-99	1715	AQ				4°C/HCL		✓	✓	
57W0010102	9-27-99	1730	AQ				4°C/HCL		✓	✓	
57WRB0010002	9-27-99	1745	AQ				4°C/HCL		✓	✓	

Special Instructions

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

Turn Around Time Required
☐ Normal ☐ Rush

QC Level
☐ I. ☐ II. ☐ III.

Project Specific (Specify)
REPORT THE RESULTS FROM THESE SAMPLES ON ONE SDG.

1. Relinquished By	Date	Time	1. Received By	Date	Time
Fred W Ramser	9-27-99	1830			
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Stays with Sample; CANARY - Returned to Client with Report; PINK - Field Copy

APPENDIX C

Boring Log Sheets

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB001
DATE: 10-7-98
GEOLOGIST: FURAMSER
DRILLER: MARK S.

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	Sampler BZ	Borehole**	Driller BZ**
5-1 1615						BRN	TOP SOIL SAND & SILT ROOT MATL		COLL: S57001SS001 0101				
	2		100%				SAND + GRAVEL						
							CLAY, SAND + GRAV	CL/SP					
	4				DENSE		CLAY + GRAVEL	GC					
5-2 1640					MED STIFF		GRAVELLY CLAY		TWO ATTEMPTS				
	6						YEL BRN W/ SOME SAND	GC/SP	NO REC. MOVE RIG 4' SOUTH				
					LOOSE		SAND	SP					
	8												
							TD = 8'		FOOTAGE = 16'				
							H_2O ~ 6'						

* 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): ____

Remarks: S57SS001 0101 - 0-5'
S57SB001 0101 2'-4'
S57SB001 0201 4'-6'
NO PID READINGS, PID MALFUNCTIONING

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: B-61 MOBILE
BORING NUMBER: S57SB001/MW001
DATE: 1-6-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
							YEL BRN						
							SILT + SAND						
							TR CLAY						
				4									
	6			▽									
	8												
S-1 950	9	3 / 3			LOOSE		LT. GREY F-g SAND	SP	WET	0.2			
	10	5 / 5	1.2 / 2.0				TR SILT/CLAY		TR GRA IN SHOE				
S-2 955		4 / 4			MED DENSE		LT BRN TO ORG. M-g TO C-g SAND TR GRA.	SP	WET QTZ SAND	0.2			
	12	7 / 8	0.7 / 2.0						QTZ GRA.				
S-3 1000		9 / 9			DENSE		LT GREY M-g TO C-g SAND W/BRN LAYERING	SP	QTZ	0.7			0.0
	14	12 / 18	1.2 / 2.0				TR GRA.						
S-4 1005		7 / 9					AS ABOVE	SP		0.7			0.0
	16	12 / 15	1.4 / 2.0				BECOME THICKER (3") BRN LAYERS		TR SILT + CLAY				
S-5 1020		9 / 12			DENSE		AS ABOVE (LESS BRN LAYERING)	SP	IN SHOE SAND IS BEGINNING	1.0			0.0
	18	17 / 17	1.1 / 2.0				1" THICK SILTY SAND LAYER TR CLAY BLK STRING		TO RUN UP THE AUGERS				
S-6 1040		5 / 8			MED		AS ABOVE	SP					
	20	9 / 12	1.0 / 2.0		DENSE		↓						
S-7 1045		12 / 14					AS ABOVE	SP		0.7			0.0
	22	16 / 21	1.1 / 2.0										
S-8 1055		4 / 6					↓	↓		1.3			0.0
	24	8 / 8	1.3 / 2.0		STIFF		MOTTLED LT. BRN + GREENISH GRY. F-g SANDY	SP CL	SLIGHTLY PLASTIC				
S-9 1115	25	11 / 9			↓		SILT + CLAY DUSKY YEL GRN	↓	FINING DOWNWARD TO 4" DRY AT APPEARS				

* 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):

Remarks: THIS BORING TO BE CONV. TO S57MW001. AUGER TO 8' TO BEGIN S.S. SAMPLING, ALL S.S. FOR LITHOLOGIC SAMPLING. DEED WELL

Converted to Well: Yes ✓ No _____ Well I.D. #: S57MW001

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: B-61 MOBILE
BORING NUMBER: S57SB001/MW001
DATE: 1-6-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	Borehole**	Driller BZ**
	26	12/12	1.3/2.0				DUSKY YEL GRN f-g SANDY CLAY+SILT	CL	APPEARS DRY ~30% f-g SAND				
							PUSHED SHELBY		PLASTIC ~50% CLAY				
							TUBE TO 27.1'		~20% SILT				
							26-27.1 @ 600 PSI		TAKE SHELBY				
							STOP TO PREVENT CRUSHING TUBE.		TUBE AT 26-28				
							TUBE CRUSHED		TUBE DEFORMED				
							WILL NOT SEAL		THE SAMPLE IS				
							AND WILL NOT		NOT UNDISTURBED.				
							SHIP FOR ANALYSIS						
							BACK FILL w/BENTONITE		PLACE SCREEN				
							26-25.		@ 14'-24'				
							COLLECTED						
							S57SB001@301						
							@ 24-26' FOR						
							GEOPHYSICAL						
							PARAMETERS						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: CONFINING UNIT ENCOUNTERED AT 24'; S.S @

Drilling Area Background (ppm):

Converted to Well: Yes ✓ No _____ Well I.D. #: S57MW001

BORING LOG

PROJECT NAME: SITE 57, INDIAN HEAD
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE
BORING NUMBER: S57SB002/MW003
DATE: 10-8-98
GEOLOGIST: FRED WRANSER
DRILLER: MARK S.

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**
					LOOSE		ORG-BRN GRAVEL	GM	COLLECTED				
S-1	2				MED		W/SOME SAND		S57SS0020101 + MS/MSD				
1015					DENSE		TR SILT		V + TOC				
	4						INC SILT + CLAY	GC					
S-2 1020						BRN	DOWN WARD		COLLECTED S57SB0020101				
	6				DENS			GM	4'-6'				
							INC		BRICK FRAGS				
	8						SILT TR CLAY	GM	(FILL)				
						YEL BRN	SAND + GRAVEL		COLLECTED				
S-3 1030	10								S57SB0020201				
							GREY GRAVEL		8'-10' SATURATED				
	12						+ SAND						
							TD = 12						
							H_2O = ~~N.S.~~ 10'						

* 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):

Remarks: COLLECTED S57SS0020101 @ 0-.5 V + TOC (MS/MSD)
S57SB0020101 @ 4'-6' V + TOC
NO PID READINGS DUE TO RAIN

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: B-61 MOBILE
BORING NUMBER: S57SB002/MW0003
DATE: 1-7-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
	2						YEL BRN TO						
							DK BRN GRA, SAND						
	4						TR SILT.						
									BASED ON				
	6								PREVIOUS SOIL				
S-1 0800		1/2					NO RECOVERY		BORING NO				
	8	1/2	0.8/2.0				OLIVE GREY M-g SAND IN SHOE.		SHELBY TUBE WILL BE COLLECTED				
				▽			H_2O MEASURED 1-7-99		IN THE VADOSE ZONE SANDS +				
	10						0930 COLLECTED S57SB002040		GRA. WILL NOT STAY IN TUBE				
									COLLECTED A JAR SAMPLE IN LIEU				
	12								OF SHELBY TUBE				
S-2 0815		22/17			DENSE		YEL-BRN + GRY	GM	WET	6.9		4.0	0.0
	14	18/21	1.0/2.0				GRAVEL + SAND						
S-3 0825		16/21			DENSE		YEL-ORG TO LT BRN		TR CLAY	6.9			
	16	12/9	1.3/2.0				COARSE TO MED SAND	SP	WET				
S-4 0830		16/21			VERY DENSE		LT GREY GRADED SAND	SW	WET	2.9			
	18	12/20	1.7/2.0										
S-5 0835		17/26					LT GREY GRADED SAND w/ YEL BRN	SW/SP	CLAY & SAND	29			
	20	32/9	1.6/2.0				LAYERING	SW	LAYER AT 19' BGS ~3" THICK				
S-6 0840		4/4			MED		FINING DOWNWARD	SP/SC		3.3			
	22	6/8	1.8/2.0		DENSE MED STIFF		f-g SAND w/ SOME SILT + CLAY	SP/SC	WET, MOTTLED GREY + BRN				
S-7 0900		4/5					f-g SAND 90% SILT 30% + CLAY 30%		PLASTIC APPEARS WET	3.1			
	24	6/7	1.8/2.0				DUSKY YELLOW		PLASTIC				
S-8 0945	25	7/9					SILT + CLAY w/ SOME f-g SAND	SC/CL	MORE CLAY THAN ABOVE MORE PLASTIC THAN	2.1			

* 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): ____

Remarks: NO SPLIT SPOONS COLLECTED FROM 0'-6' AND 8'-12' FEET. THIS HAS BEEN LITHOLOGIC LOGGED DURING PHASE I.

Converted to Well: Yes ✓ No ____ Well I.D. #: S57MW0003

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: B-61 MOBILE
BORING NUMBER: S57SB002/MW003
DATE: 1-7-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
	26	12 / 7	1.2 / 20		STIFF		CLAY + SILT W/SOME E-G DUSKY YEL GRN SAND	CL	DRY MOTTLED BRN				
SHELBY LOOK									AT 25' BGS LOOKS				
	28						PUSHED SHELBY TUBE		LIKE CONFINING UNIT ENCOUNTERED				
							1.7' FEET		AT S57SB001				
							320PSI/6", 600PSI		SHELBY TUBE				
							FOR REMAIN SAMPLE.		SLIGHTLY DEFORMED.				
							WILL SEND	→	AND OVERPACKED WILL NOT SEND.				
							A JAR TO THE		SCREEN 17'-22'				
							LAB FOR SOIL CLASSIFICATION		SAND - 25'-15'				
							FROM 24-26'		BENTONITE 25'-28'				
									SEAL = 13'-15'				
									GROUT = 13'-3'				
							TD = 26'						
							THIS WELL HAD TO						
							BE PULLED AND REPLACED						
							BECAUSE END CAP SLIPPED OFF GRA,						
							ENTERING WELL.		ABANDONED				
									+ REPLACED 1-22-99				
							THE SECOND WELL		TD = 22.5				
							PLACED ~3 FT TO THE		SAND 15-22.5				
							EAST OF ORIGINAL		SCREEN 17-22				
							LOCATION.		SEAL 13-15				

* 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):

Remarks:

Converted to Well: Yes ✓ No

Well I.D. #: S57MW003

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB003
DATE: 10-7-98
GEOLOGIST: FRED WRAMSER
DRILLER: MARK S.

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 1810				CLEAN			ASPHALT SAND, GRAVEL						
	2					BRN	INTERLAYER WITH CLAYEY ZONES	SM/CL	FILL				
							TERRA COTTA						
	4					BRN	SILT + f-g SAND TR CLAY	SM/CL					
S-2 1815							TR GRA.						
	6						SILT + f-g SAND	SM					
							TR CLAY		WOOD FRAG				
	8												
							TD = 8'						
							H_2O = 6'						

* 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): ____

Remarks: COLLECTED @ 3-4' = S57SB0030101 S57 DUP001 VOAS
COLLECTED @ 4-6' S57SB0030201 S57 DUP002 VOAS
NO READINGS TAKEN W/ PID MALFUNCTIONING

Converted to Well: Yes ___ No X Well I.D. #: ___

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61
BORING NUMBER: S57SB004/MW007
DATE: 1-10-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	* Borehole**	Driller BZ**
S-1 0900	2	8 / 8 / 7	1.0 / 2.0				RIP RAP GRA. SURFACE		S-1 (.5-2.5) COLLECTED S57SS004010101				
							SAND+GRA						
S-2 0905	4	8 / 3 / 3 / 5	0/2.0	?			NO RECOVERY	?	S-2 (2.5-4.5)				
S-3 0910	6	6 / 3 / 2 / 4	0/2.0						S-3 (4.5-6.0)				
							NO RECOVERY						
S-4 0920	8	1 / 3 / 3 / 4	1.2 / 2.0		LOOSE		GREY LT OLIVE BRN SILTY F-g SAND	SM/SC	WET COLLECTED S57SB004010101 FROM 6'-8'				
S-5 0925	10	2 / 3 / 3 / 8	1.2 / 2.0		LOOSE		MOTTLED SILTY F-g SAND TR GRA.	SM/SC	WET				
S-6 0930	12	3 / 6 / 6 / 9	1.2 / 2.0		MED DENSE		LT GREY M-g SAND W/SOME GRA	SP					
S-7 0935	14	4 / 7 / 9 / 10	1.8 / 2.0		DENSE		GRADED SAND CLAYEY SAND LAYER @ 13'	SW	TR GRA. (FINES) IRON STAIN LAYERING				
S-8 0935	16	5 / 7 / 9 / 10	1.0 / 2.0				AS ABOVE						
							F-g SAND PALE YEL BRN	SP	W/DK YEL BRN LAYERS				
S9 0945	18	7 / 11 / 12 / 7	1.8 / 2.0		DENSE		TR SILT LT GREY GRADED SAND TR GRA.	SW	MAYBE TOP OF C.U. IRON STAIN LAYERING				
S-10 0952	20	3 / 4 / 7 / 9	1.8 / 2.0				MOTTLED BLK YEL BRN GREY F-g-M-g SAND TR CLAY	SW/SP	IRON STAINING				
S-11 1000	22	3 / 4 / 5 / 6	1.8 / 2.0		MED DENSE		AS ABOVE, LESS MOTTLEING (GREY)	SP	INC F-g SAND CONTINUE DOWNWARD TO 27'				
S-12 1005	24	4 / 8 / 8 / 8	1.8 / 2.0		MED DENSE		GREENISH GREY F-g SAND TR SILT + CLAY	SP	CLAYEY F-g SAND IN SHOE				
S-13 1010	25	5 / 7					GREENISH GREY F-g SAND W/SOME SILT + CLAY	SC					

* 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):

Remarks: * PID MALFUNCTIONING, MAYBE DUE TO COLD TEMPS

Converted to Well: Yes ✓ No ____ Well I.D. #: S57MW007

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61
BORING NUMBER: 557SB004/MW007
DATE: 1-10-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
	26	9 / 5	1.8 / 2.0		MED DENSE		AS ABOVE MOD. OLIVE BRN M-g to f-g	SC / SP	CLAY CONTENT INC DOWNWARD				
5-14 1035	27	8 / 10			DENSE		SAND. GRY GREEN CLAYEY f-g SAND	SC	TO 29.5' 2" THICK SANDY CLAY LAYER				
	28	20 / 25	1.8 / 2.0				SANDY CLAY MOD OLIVE BRN CLAYEY f-g SAND	CL/SC	PLASTIC MAYBE C.U. PINCHING OUT. OR				
5-15 1040		5 / 7					AS ABOVE, CLAY CONTENT	SC	SLIGHTLY LESS CLAY THEN UNIT UP-				
	30	9 / 7	1.8 / 2.0				INC DOWNWARD.	SC	GRADIENT AT BLDG 27R DECREASED				
									TO PLACE DEEP WELL @ 16-26				
	32								PLACE 16-26				
									BACK FILL BELOW				
									SCREEN W/BENTA TO 27' BGS				
	4												
5-16 1405		5 / 4				YEL BRN	f-g SAND W/TERRA COTTA		COLLECTED 557SB004020I				
	6	3 / 2					FRAGMENTS (FILL)		4'-5' VOC-~~VFOE~~				
5-17 1420	15	7 / 7					MED BRN C-g SAND + M-g SAND		COLLECTED				
	16	8 / 7					TR SILT.		557SB004030I				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: *PID MALFUNCTIONING MAYBE DUE TO COLD TEMPS.

Drilling Area Background (ppm):

Converted to Well: Yes ✓ No _____ Well I.D. #: 557MW007

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61
BORING NUMBER: 557SB0005/MW0009
DATE: 1-12-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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 1050		8 / 10			DENSE	YEL BRN	SAND + GRA TR SILT		3" SPLT SPOON COLLECTED 557SB0050101				
	2	12 / 16	1.5 / 2.0		LOOSE				RUN MS/MSD ON THIS SAMPLE	0.0			
S-2 1055		4 / 6			LOOSE		AS ABOVE		3" SPLIT SPOON				
	4	7 / 9	1.0 / 2.0						COLL. 557SB0050201 DUE TO LARGE	0.6			
S-3 1105		12 / 22			MED DENSE		AS ABOVE INC		GRA. VERY POOR REC. INSUFFICIENT				
	6	17 / 23	1.2 / 2.0				SAND CONTENT		VOL. FOR GEOPHY. COLL. 557SB0050201	0.8			
		14							+ 557SBDUP0101 FOR EXP. TALMET.				
	8								TCLP. VOAS				
	10												
							SEE BORING LOG FOR 557MW0010 FOR DETAILS						
	12												
	14												
S-4 1130		14 / 17			DENSE		LT. YEL GREY m-g SAND	SP	IRON STAIN LAYERING	1.2			
	16	16 / 9	1.8 / 2.0		↓		BRN ↓						
S-5 1140		7 / 9			DENSE		~~OLIVE~~ OLIVE GREEN MOTTED CLAY SAND	SC	COLLECTED 557SB0050301				
	18	12 / 16	1.9 / 2.0						16'-18'				
S-6 1145		9 / 8			STIFF		CLAY CONTENT	SC/CL	APPEARS DRY				
	20	7 / 5	1.9 / 2.0				INC DOWNWARD	CL	COLLECT 557SB0050501				
							PLACE SCREEN		FOR GEO (EU) JAR PUSH SHELBY				
	3						@ 19'-14'		TUBE .5' COLLECT				
S-7 1300	4	4 / 7			DENSE		BRN GRAVEL + SAND	GM	MOVED RIG 3' TO THE NORTH				
	5	9 / 12	1.8 / 2.0				TR SILT.		TO TAKE A SPL 3'-5' 2' FOR GEOPHY.				
									557SB0050401 S-7 3" SS 1545HR				

* 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):

Remarks: SHELBY TUBE END LOOKS LIKE f-g SAND? USE ~1/2 FOOT OF BENTONITE CHIPS TO PLUG HOLE BELOW WELL FILTER PACK. SHELBY TUBE DEFORMED QUESTION INTEGRITY SPL 18-20' FOR GEO

Converted to Well: Yes ✓ No _____ Well I.D. #: 557MW0009

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROB

BORING NUMBER: S57SB006
DATE: 10-8-98
GEOLOGIST: FURAMSER
DRILLER: MARK S.

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 0845				FILL		BRN	ASPHALT SAND-GRA SUBBASE	GP					
	2												
					LOOSE	BLK	GRAVEL+SAND	GP	SLAG (FILL)				
	4												
S-2 0850					LOOSE		YEL-BRN-BRN SAND + GRA.	GP					
	6				MED DENSE		INC SAND DOWNWAR						
	8							GP/SP	MOIST TO WET				
S-3 0851						YEL BRN	SAND + GRA						
	10												
	12						GREY SAND	GP/SP	SAT.				
							TD = 12'						
							H_2O ~ 11.5'						
									NO PID READINGS				
									TAKEN BECAUSE				
									PID IS MALFUNCTIONING				

* 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): ____

Remarks: COLLECTED MS/MSD @ S57SB006010 @ 3'-4'
S57SB006020 @ 10'-11'

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

Page ___ of ___

PROJECT NAME: SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROD

BORING NUMBER: S57SB007
DATE: 10-7-98
GEOLOGIST: PUR
DRILLER: MARK S.

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 1450					LOOSE		DK BRN SILT + SAND	SM	ROOT MALT.				
	2						GRAVEL + SAND		COLL. S57SS0070101				
							BECOMING CLAYEER						
	4						TO 4'		COLL. S57SB0070101				
S-2 1455						BRN	MOTTLED CLAY + SILT	CL	4'-5'				
	6						+ GRAVEL GRADING DOWNWARD TO SILTY		MOIST				
							f-g SAND		SLIGHTLY PLASTIC COLLECTED				
	8								* S57SB0070201				
S-3 1505							GREY SAND	SP	SATURATED @ 8' GREY				
							BECOMING CLAYEY @ 9' AND GRA. @ 10'						
	11												
							TD = 11'						
							H_2O = ~8'						
							BACKFILLED						
							WITH: GROUT						

* 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): ___

Remarks: COLLECTED: S57SB0070101 - 4'-5'
S57SB0070201 6'-8'

NO PID READINGS TO MALFUCTION

Converted to Well: Yes ___ No X Well I.D. #: ___

BORING LOG

Page ___ of ___

PROJECT NAME: SITE 52, INDIAN HEAD
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB008 8/MW011
DATE: 10-8-98
GEOLOGIST: FRED W RAMSER
DRILLER: MARK S.

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 0915						BRN	SAND+SILT	SM	TOPSOIL				
	2						GRAVEL+SAN	SM/GC	COLLECTED 003 S57SSDUP003H				
							INTERLAYER WITH CLAYEY		+S57SS0080101				
	4												
S-2 0925						YEL BRN	SAND+GRVEL	SM/GC					
	6						W/SOME (MINOR) CLAY LAYER		S57SB0080101				
									4-6'				
	8						INC GRAV	GC	TERRA COTTA				
S-3 0930								GM	SLAG (FILL ?? ASPHALT				
	10								11' FEET				
									COLLECTED				
	12						E-g SAND PALE GREY TO GREN	GW/SP	S57SB0080201				
							W/SOME GRAVEL TR CLAY/SILT		10-11 SATURATED				
							TD = 12						
							H_2O = 11.5						

* 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): ____

Remarks: COLLECT FULL SUIT ANAL + DUP003 AT S57SS0080101 @ 557

NO PID READINGS DURING DRILL

Converted to Well: Yes ~~X~~ No X Well I.D. #: ____

BORING LOG

S57SB008

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61

BORING NUMBER: S57MW011
DATE: 1-7-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
	2												
	4						YEL BRN GRA, SAND,						
							SILT + CLAY AT						
	6						CUTTINGS, THE						
							CUTTINGS SEEM WET						
	8						AT 10'						
	10												
	12												
S-1 1640		8 / 9			DENSE		LT GREY SAND+GRA.	GW	SATURATED	3.0			0
	14	17 / 19	1.0 / 2.0						MEASURED H_2O IN AUGERS AT				
S-2 1645		9 / 12			DENSE		GRADED SAND	SW	11' BGS	3.2			0
	16	16 / 12	1.2 / 2.0				TR SILT + CLAY		GREY w/ LT BRN LAYERING				
S-3 1700		9 / 11								3.0			
	18	17 / 13	1.3 / 2.0				AS ABOVE, CLAYEY SAND	SW	CLAY ~2" THICK				
S-4 1705		12 / 16					LAYER AT 17'			3.2			
	20	9 / 12	1.8 / 2.0				LT. OLIVE GREY F-g SAND	SP	TR SILT+CLAY				
							FINING DOWNWARD TO 20'		POSSIBLY TOP				
									OF CONFINING UNIT.				
							TD = 20						
							SCREEN 9'-19'						

* 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):

Remarks:

Converted to Well: Yes ✓ No

Well I.D. #: S57MW011

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD
PROJECT NUMBER: 7124
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB009
DATE: 10-7-98
GEOLOGIST: FRED WRAMSAR
DRILLER: MARK S.

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	Sampler BZ	Borehole**	Driller BZ**
S-1 1830							ASPHALT GRAVEL+SAND,	GP					
	2					BRN/BLK	CLAY+SILT CONTENT		TERRACOTTA				
							THE POUNDARD		FILL				
	4				SOFT				FILL				
S-2 1835						BRN	SAND + SILT TR CLAY	SP					
	6						TR GRA						
									WOOD FRAG				
	8								CHARRE				
S-3 1845									SATURATED				
	10					GRAY	GREY SAND TR CLAY +SILT	SP					
	12												
							TD = 12'						
							H_2O @ 8'						
									NO PID READING				
									TAKEN BECAUSE				
									INSTRUMENT IS				
									MALFUNCTIONING				

* When rock coring, enter rock brokeness.

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: COLLECT S57SB009010I @ 3-4'
S57SB009020I @ 7-8'
BORING DONE ON ASPHALT NO SURFACE SOIL COLLECTED.

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: SB S57010
DATE: 10-7-98
GEOLOGIST: FUK AMSER
DRILLER: MARK S.

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 1760							ASPHALT						
							GRAVEL	GP					
	2					YEL	GRAVEL w/ SOME SAND.	GP					
						BRN	CLAY + SILT CONTENT INC. DOWNWARD	GP/SP					
	4						↓		COLLECTED S57SB0100101 @ 3'-4'				
S-2 1705							MOTTLED YEL-BRN + GRY CLAY + SILT w/ TR GRA	GC/SC					
	6						+ SAND, SAND CONT. INC. DOWNWARD.	SP/SC					
							INC GRA DOWNWARD		COLLECTED				
	8						PALE YEL BRN w/SOME GRA.	GC/SP	S57SB0100201 7-8'				
S-3 1715					LOOSE		SAND + SILT TR GRAV		SATURATED @				
	10						SILT + f-g SAND LRS	SP/SC	8'				
							GRA.						
	12				LOOSE		CLAYEY SAND w/SOME GRA.	GC/SC					
							TD = 12'						
							H_2O = 8'						

* 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):

NO PID READING, PID MALFUNCTIONING

Converted to Well: Yes ___ No X Well I.D. #: —

BORING LOG

Page ___ of ___

PROJECT NAME: INDIANHEAD SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB011
DATE: 10-7-98
GEOLOGIST: FRED WRAMSER
DRILLER: MARK S.

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 1305					MED DENSE	PALE YEL BRN	TOP SOIL SILT + CLAY W/SOME f-g	SC/CL	COLL.S DRY S57SB011010 1	0	0	0	0
	2						SAND TR GR.		0-.5'				
					LOOSE		GRADES TO SILT + f-g BRN SAND TR GRA.	SM	DRY				
	4												
S-2 1320							INC GRAVEL CONTENT	GM SM					
	6												
							GRAVEL + SAND TR SILT	GM	DRY, SILTER MOIST				
	8												
S-3 1335							GRAVEL CLAY CONTENT INC DOWNWARD	GC	COLL. MOIST S57SB011010 1 8'				
	10												
							MOTTLE BRN + GREY CLAY, SILT + SAND + GRA.	GC/CL	SLIGHTLY PLASTIC MOIST				
	12						SILT + f-g SAND TR CLAY	CL/SC					
S-4 1345							SOME GRAVEL	SC/GC					
	14												
							PALE YEL BRN f-g SAND	SP	LESS MOTTLES				
	16						TR GRA.		WET @ 15'				
									COLLECTED S57SB011010 2				
							TD = 16'		14'-15' PCS				
							H_2O @ 15'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S57SB011010 1 - 0 - 5'

Drilling Area Background (ppm): ____

NO PID READINGS DUE TO RAIN

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB012
DATE: 10-7-98
GEOLOGIST: RWK
DRILLER: MARK S.

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	Sampler BZ	Borehole**	Driller BZ**
S-1 1735						BRN	ASPHALT SAND + GRAVEL	GP					
	2						YEL BRN SAND	SP	FILL				
							CLAY LAYER @ ~3'	SC					
	4					BLK	SAND, CLAY + GRAVEL		SLAG POSSIBLE FILL?				
S-2 1745							CHARRED WOOD		POORLY INVADED SILT STONE @ 4'				
	6						SILT + f-g SAND	ML/SM	FIBRE BOARD (FILL)				
						BRN	SAND LAYER @ 6-6.5 CLAYEY SAND	SP SC/SP	DRY				
	8								MOIST				
S-3 1750						PALE YEL	SAND + GRAVEL	GM	SATURATED				
									MAY BE NATURAL				
							TD = 10'						
							H_2O @ 8'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: COLLECTED S57SB012010 1 - 3'-4'
S57SB012020 2 - 8'

Drilling Area Background (ppm): ___

MALFUNCTIONING PID NO READINGS

Converted to Well: Yes ___ No X Well I.D. #: ___

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61
BORING NUMBER: S57SB013/MW012
DATE: 1-9-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	Borehole**	Driller BZ**
S-1 0910		8/8			MED		YEL BRN SAND		TWO SS. TAKEN FOR SAMPLE REC.				
2	2	7/6	1.0/2.0		DENSE		+ GRA.		S-2				
S-3 0915		1/3			SOFT/		LT BRN f-g SAND	SP					
	4	3/2	2.0/2.0		LOOSE		W/ TR CLAY + SILT		(COLLECTED S57SB013Q01)	.2		.7	0
S-4 0920		2/1					↓						
	6	1/1	1.0/2.0		↓		DK GREY SILT + CLAY + f-g SAND W/ SOME GRA.	SC/SM	(FILL) ASPHALT LAYER				
S-5 0930		1/2			VERY SOFT/		NO RECOVERY	?	MOIST SPOON (COLLECTED S57SB013Q02)				
	8	2/4	0.1/2.0	▽	LOOSE		H2O MEASURED 0945		(FILL) 6"-8"				
S-6 0940		6/8					POOR RECOVERY	?	(NO WATER IN HOLE)	.2			
	10	6/14	0.4/2.0		↓		SOME SAND IN SHOE		CUTTINGS GRA, SILT f-g SAND				
S-7 0945		8/12					MOD OLIVE BROWN						
	12	12/7	0.6/2.0		DENSE		SAND + GRA.	GW	GRA - QTZ + MUD STONE				
S-8 1000		9/6			DENSE		LT OLIVE GRAY f-g to	SP	TR BRN MOTTLING				
	14	16/18	1.2/2.0		↓		M-g SAND	↓					
S-9 1005		7/11					GREYISH ORG f-g to m-g	SP					
	16	12/12	1.0/2.0		↓		GRADING DOWNWARD TO A GRADED SAND	SP/SW					
S-10 1015		8/8			DENSE		GRADED SAND	SW					
	18	12/7	2.0/2.0		↓		BRN LAYERING INC DOWN	↓	FE STAIN LAYER INC				
S-11 1020		9/14											
	20	14/14	1.8/2.0		↓		AS ABOVE	↓					
S-12 1030		10/20			VERY		SLIGHTLY LESS						
	22	16/16	1.8/2.0		↓		FE STAIN LAYERING	↓					
S-13 1035		14/16			VERY		CLAYEY SAND LAYER	SC	OLIVE (THE MAY				
	24	17/17	1.9/2.0		DENSE		GRADED SAND FINING DOWN WARD TO f-g SAND + M-g SAND	SW SP	BE WHERE THE CONFINING UNIT PINCHES OUT)				
S-14 1045	25	12/17			↓		PALE YEL BRN M-g SAND	SP					

(COLLECTED 1-12-99 4' EAST OF ORIGINAL BORING 1530)

* When rock coring, enter rock brokenness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: AIR IS VERY DAMP PID MALFUNCTIONING

Converted to Well: Yes ✓ No _____ Well I.D. #: 57MW012

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61 RIG
BORING NUMBER: S57SB013/MW012
DATE: 1-9-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	Borehole**	Driller BZ**
	26	9 / 7	2.0 / 2.0		MED DENSE		PALE YEL BRN M-C SAND	SP					
S-15 1115		5 / 7			↓		AS ABOVE	↓					
	28	9 / 8	2.0 / 2.0		↓			↓					
S-16 1130		3 / 6			↓		AS ABOVE, GRADING	SP					
	30	12 / 12	1.8 / 2.0		↓		DOWNWARD TO A GRADED SAND TR SILT	SW	IRON STAIN LAYERING				
S-17 1132		6 / 16			↓		GRADED SAND	SW					
	32	18 / 20	2.0 / 2.0		↓			↓					
S-18 1150		8 / 8			↓		AS ABOVE	↓					
	34	10 / 15	2.0 / 2.0		↓			↓					
S-19 1200		8 / 12			↓		AS ABOVE COARSENING	↓					
	36	16 / 24	2.0 / 2.0		↓		DOWNWARD FINE GRAV SAND	SW/GW					
S-20 1210		8 / 10		?	DENSE		FINE GRAVEL	GP					
	38	15 / 21	1.8 / 2.0		↓		↓						
S-21 1215		8 / 9			DENSE		M-C SAND TR SILT PALE YEL BRN	SP					
	40	14 / 14	1.8 / 2.0		↓								
S-22 1345		5 / 5			DENSE		AS ABOVE	SP					
	42	17 / 17	1.0 / 2.0										
S-23 1400		7 / 12			MED STIFF		LIGHT OLIVE GREY SILTY CLAYEY F-M SAND	SC					
	44	16 / 24	1.8 / 2.0		VERY STIFF		MOTTLED MED GRAY TO OLIVE GREY CLAY & SILT	CL	THIS IS NOT				
		/					BRN		THE SAME UNIT ENCOUNTERED AT				
	6'	/							THE BLOG 212 WELLS				
S-24 1615		3 / 7					NO RECOVERY		PLACE SCREEN				
	8'	5 / 12	/ 2.0						@ 33-43				
		/							SAND: 30-43.5 SEAL: 27-30				
		/											

* 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):

Remarks: *AIR TEMP VERY CLOSE TO DEW POINT PID MALFUNCTIONING

Converted to Well: Yes ✓ No _____ Well I.D. #: S57MW012

BORING LOG

Page ___ of ___

PROJECT NAME: SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE

BORING NUMBER: S57SB014
DATE: 10-7-98
GEOLOGIST: FUK
DRILLER: MARK S.

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	Sampler BZ	Borehole**	Driller BZ**
S-1 1535							ASPHALT SUBBASE GRAVELSAND		NO SURFACE SOIL COLLECT				
	2					VEL BRN	GRAV	GP	VERIGATED				
						BLK	SAND LAYER 6" W/GRAV	SP/GP	MAY BE FILL?				
	4				DENSE		CLAY+SAND+GRAVEL	SC/GC					
S-2 1545									COLL: S57SB014 0101 3-5'				
	6		50%										
									COLLECTED				
	8								S57SB014 0201 7-8'				
	10												
							TD=8'						
							H_2O=8'						
							BACK FILL						
							HOLE PATCHE						
							ASPHALT						

* 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): ____

Remarks: NO PID READINGS DUE TO MALFUNCTIONING PID

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61
BORING NUMBER: S57SB015/MW005
DATE: 1-11-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	Borehole**	Driller BZ**
S-1 0815		5/7			MED DENSE		BRN SAND + GRA	GM	COLLECTED S57SSD015@01				
	2	5/3	1.4/2.0				TR SILT						
S-2 0820		3/4			LOOSE		BRN f-g SAND TR GRA	SP	COLLECTED S57SD015@01				
	4	2/3	1.5/2.0	▽					2-4' WET @ 4'				
S-3 0825		2/4			MED DENSE		SAND + GRA	GM	SATURATED				
	6	7/12	1.8/2.0				BRN + GREY TR SILT	SM		0.0			
S-4 0835		50/38		↑ ? ↓			NO RECOVERY		SPOON WET				
	8	27/24	0.0/2.0				(MAY ENCOUNTER LARGE GRA)						
S-5 0840		5/5			MED DENSE		LT. YEL-GREY m-g SAND	SP	WET	0.0			
	10	7/9	1.9/2.0				w/SOME f-g SAND TR SILT	↓	SOME BRN MOTTLING AT 9-10'				
S-6 0845		7/10			DENSE		AS ABOVE COARSENING	SP/SW	WET	0.0			
	12	9/7	1.9/2.0				DOWN WARD	↓ SW					
S-7 0855		12/20			DENSE		m-g SAND TR f-g	SP	WET	0.0			
	14	24/15	1.8/2.0				SAND + SILT						
S-8 0900		12/17					AS ABOVE			0.0			
	16	20/15	1.8/2.0										
S-9 0920		18/20					AS ABOVE SAND FINING DOWNWARD		GREY	0.0			
	18	16/10	1.8/2.0				TO f-g SAND w/some m-g SAND	SP					
S-10 0925		5/6					GLAUCEY SAND GRADING TO			0.0			
	20	8/8	1.8/2.0		STIFF		LIGHT OLIVE GREY f-g SANDY CLAY	CL	MED PLASTIC MOTTLED BROWN				
	10												
S-11 1050	11	6/6					LT YEL-GREY m-g SAND		COLLECTED S57SBD015@01				
	12	8/12	1.9/2.0				SCREEN 13'-18'		PLUS MS/MSD VOCS + TOC				

* 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):

Remarks:

Converted to Well: Yes ✓ No

Well I.D. #: S57MW005

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: B-61-MOBILE
BORING NUMBER: S57MW002
DATE: 1-6-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
													0
	2								NO				
							YEL BRN SILT		SPLIT SPOON>				
	4						+ SAND		COLLECTED				
							SAND CONTENT						0
	6						INC DOWNWARD						
							GRADING TO						
	8						GREY SAND						
							SEE LOG FOR						0
	10						S57SB001/MW001						
							FOR LITHOLOGIC DETAIL						
	12												0
							TD = 13.5						
							H_2O ~ 6'						
							SCREEN 3-13						
							SAND 2-13.5						
							BENTONITE 1-2						

* 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): ____

Remarks: WELL INSTALLED ~ 4' NORTH OF S57MW001

Converted to Well: Yes ✓ No ____ Well I.D. #: S57MW002

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBIL RIG B-61
BORING NUMBER: 557MW004
DATE: 1-7-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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**
	2												
	4						YEL BRN						
							GRAVEL, SAND					2.0	2.0
	6						+ CLAY + SILT						0
S-1 1150		2 / 7			LOOSE		BRN + OLIVE GREY m-g SAND TR SILT CLAY	SP		6.6			
	8	8 / 9	1.2 / 2.0										
	10												
	12												
	14												
S-2 1215						YEL	GRAVEL	GW					
	16		0.5 / 2.0				POOR RECOVERY						
							TD = 16.5						
							SCREEN 6'-16'						
							SAND 4'-16.5'						
							BENTONITE 2'-4'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: INSTALLED ADJACENT TO 557MW003

Drilling Area Background (ppm): [ ]

Converted to Well: Yes ✓ No _____ Well I.D. #: 557MW004

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE RIG B-61
BORING NUMBER: S57MW006
DATE: 1-11-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) 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**
							YEL BRN						
							TO GREY						
							CUTTINGS						
							SEE S57SB015 FOR						
							MORE LITHOLOGIC						
							DETAIL.						
							TD 12.5						
							PLACED						
							SCREEN						
							2'-12'						

* 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):

Remarks: SEE S57SB015/MW005 FOR MORE LITHOLOGIC DETAIL. THIS WELL INSTALLED 4' TO THE SOUTH OF S57MW005.

Converted to Well: Yes ✓ No _____ Well I.D. #: S57MW006

BORING LOG

PROJECT NAME: INDIANHEAD NSWC, SITE 57
PROJECT NUMBER: 7129
DRILLING COMPANY: HHE
DRILLING RIG: MOBILE B-61

BORING NUMBER: S57MW008
DATE: 1-10-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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 Re: Sample	Sampler BZ	Borehole**
							SEE BORING					
							LOG SB004					
	5						FOR LITHOLOGIC					
							DETAILS					
	10											
	15											
							TD=15.5					
							SCREEN 5-15					

* When rock coring, enter rock broken.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated response read.

Drilling Area Background (ppm):

Remarks: SHALLOW WELL INSTALLED NEXT TO S57MW007.

Converted to Well: Yes ✓ No _____ Well I.D. #: S57MW008

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE RIG B-61
BORING NUMBER: S57MW01D
DATE: 1-11-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	Borehole**	Driller BZ**
S-1 1420		4 / 8		SSSS			GRASS SURFACE SAND+SILT+GRAVEL	GM	MOIST				
	2	14 / 9	0.6 / 2.0		MED DENSE					0			
S-2 1425		2 / 2		?	LOOSE		POOR RECOVERY		GRAVELS+SAND				
	4	1 / 1	0.1 / 2.0				(FILL?)		AT CUTTINGS	0			
S-3 1427		2 / 2					YEL BRN SILT+SAND+GRA.	GM					
	6	1 / 1	1.8 / 2.0	▽	LOOSE		GREY SAND+GRA IN SHOE		SATURATED	0			
S-4 1430		1 / 1		?									
	8	1 / 1	0.1 / 2.0		SOFT/LOOSE		GREY SILTY SAND+GRA		SATURATED	0			
S-5 1435		8 / 9		?					WET SPOON				
	10	16 / 26	0.1 / 2.0							0			
S-6 1440		8 / 9		(FILL?)	LOOSE		AS ABOVE			0			
	12	16 / 21	0.2 / 2.0										
S-7 1450		7 / 9		NATURAL	MED		MED BRN M-g SAND TRE-g	SP	SATURATED	0			
	14	12 / 12	1.7 / 2.0		DENSE		GREY M-g SAND TRE g	SP					
							PLACE SCREEN		MEASURED				
							@ 4'-14'		H_2O @ 6' BGS				
							SAND 3-14.5		1-12-99 730				
							SEAL: 1'-3'						

* 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):

Converted to Well: Yes ✓ No

Well I.D. #: S57MW01D

BORING LOG

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: MOBILE B-61
BORING NUMBER: S57MW013
DATE: 1-12-99
GEOLOGIST: FRED W. RAMSER
DRILLER: BOB JORDAN

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	Sampler BZ	Borehole**	Driller BZ**
							BRN SILTY SAND +						
							GRAVEL						
							SAND CONTENT						
	5						INC DOWNWARD						
	6												
S-1 1530	7	3 / 7			LOOSE		SAND + GRAVEL	GM	3" SPLIT SPOON				
	8	5 / 12	1.8 / 2.0	▽			TR SILT		COLLECTED S57SB013D2@1				
							SEE BORING LOG		@ 6'-8'				
	10						FOR S57SB013/MW012						
							FOR LITHOLOGIC						
	12						DETAILS						
	14												
	16												
							PLACE SCREEN @						
							6'-16'						

* 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):

Remarks: INSTALLED 4' EAST OF S57MW012

Converted to Well: Yes ✓ No _____ Well I.D. #: ~~MW~~ S57MW013

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG:

BORING NUMBER: S57 TW001
DATE: 1-19-99
GEOLOGIST: FRED W. RAMSER
DRILLER: DAVE KEENAN

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 1730						DK BRN	TOP SOIL						
	2						YEL BRN GRA, SAND		(FILL)				
							+ SILT		CONCRETE				
	4		2.0/4.0						FRAGMENTS w/ GOOD FRAGS				
S-2 @ 1739				?									
1740	6				LOOSE		YEL BRN SILT						
							+ SAND						
	8		1.0/4.0										
S-3 1750							DK GREY-GREEN	GM	LOOKS NATURAL				
	10						SAND + SILT + GRA						
	12		3.0/4.0										
							PLACE						
							SCREEN 2-12						
							MEASURE WATER						
							@ 7' BGS						

* 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): ____

Remarks:

Converted to Well: Yes ✓ No ____ Well I.D. #: S57 TW001

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE MT. ATV

BORING NUMBER: S57 TW02
DATE: 1-19-99
GEOLOGIST: FRED W. RAMSER
DRILLER: DAVE KEENAN

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 1400							YEL BRN SILT, SAND	GM					
	2						AND GRAVEL						
									COLLECTED				
	4						BLK SLAG AND BRN SAND		(FILL)				
S-2 1415					SOFT								
	6			?	LOOSE		NO RECOVERY		VERY SOFT				
									MATL. SATURATED				
	8												
S-3 1430					LOOSE		SAND + GRAVEL w/	GM	FILL TO 11.5				
	10						WOOD FRAGS						
									COLLECTED				
	12						OLIVE GREY SAND	GM SP	LOOKS NATL.				
									PLACE				
									5' SCREEN				
									2'-7'				
									H_2O MEASURED				
									@ 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): ___

Remarks: TW80 LOC. ~15' WEST OF TW02; TD = 8.5 WL = 7.5

TEMPORARY WELL

Converted to Well: Yes ✓ No ___ Well I.D. #: S57TW02

BORING LOG

Page ___ of ___

PROJECT NAME: INDIAN HEAD SITE 57 RI
PROJECT NUMBER: 7129
DRILLING COMPANY: HHI
DRILLING RIG: GEOPROBE MT. ATV

BORING NUMBER: S57TW003
DATE: 1-19-99
GEOLOGIST: FRED W. RAMSER
DRILLER: DAVE KEENAN

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 1600						DK BRN	TOP SOIL SILT+SAND						
	2					BLK	GRAVEL						
						YEL BRN	f-g SAND+SILT+GRA.	GM	WOOD FRAGS				
	4		2.5/4.0				(FILL)		RED BRICK FRAGS				
S-2 1610							MOTTLED BRN, GREY, YEL						
	6						ORG. SILT+CLAY w/ SOME SAND	CL/SC	WOOD FRAGS				
									LOOK NATL.				
	8		2.5/4.6				PEAT		PEAT				
S-3 1620					LOOSE		DK BRN SAND	SP					
	10						+ SILT TR GRA.		ORGANIC (LEAVES WOOD				
									LOOKS NATL.				
	12												
							SCREEN 4.5-8.5						
							H_2O @ 6.5'						

* 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): 0.0

Remarks:

Converted to Well: Yes ✓ No ___ Well I.D. #: S57TW003

APPENDIX D

Well Construction Diagrams

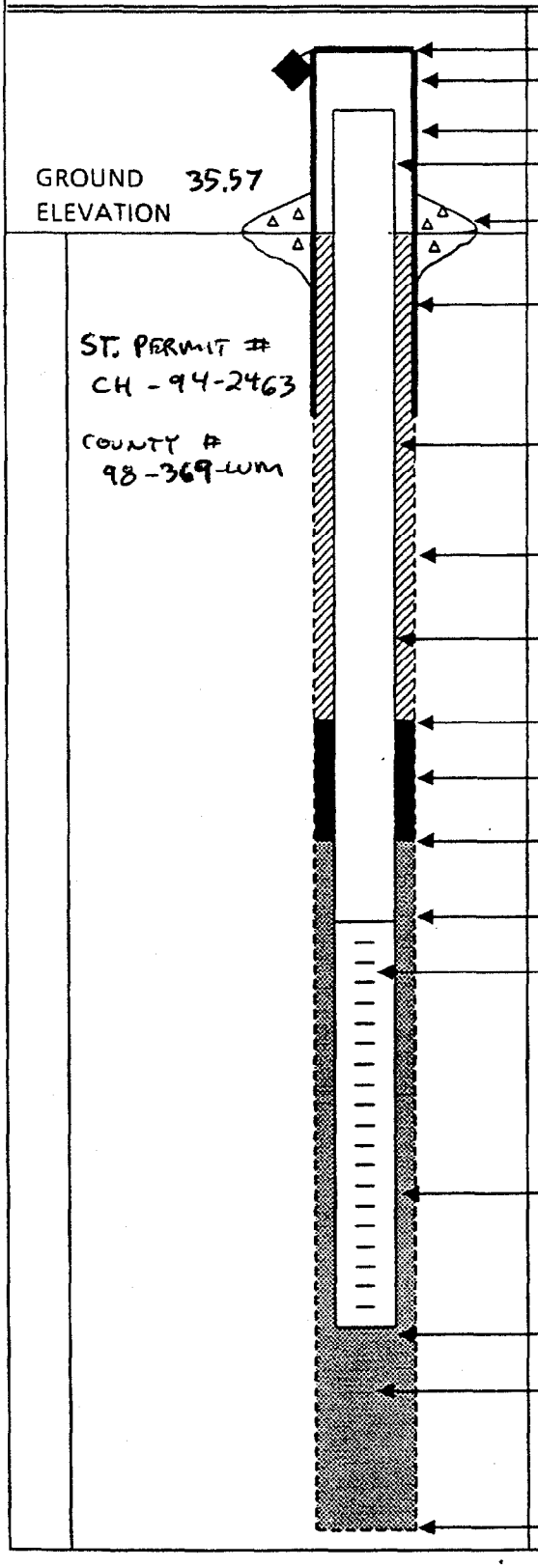
BORING NO.: S57MW001

OVERBURDEN
MONITORING WELL SHEET

PROJECT SITE 57
PROJECT NO. 7129
ELEVATION 35.57 MSL
FIELD GEOLOGIST FRED W RAMSER

LOCATION INDIAN HEAD NSWC
BORING S57MW001
DATE 1-6-99

DRILLER TOB JORDAN
DRILLING METHOD HSA 4 1/4 ID
DEVELOPMENT METHOD SURGE, BAIL, PUMP.



ELEVATION OF TOP OF SURFACE CASING: ~37.29
ELEVATION OF TOP OF RISER PIPE: 37.09
STICK - UP TOP OF SURFACE CASING: ~2.2'
STICK - UP RISER PIPE: ~2'
TYPE OF SURFACE SEAL: CONCRETE
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL W/ LOCKING LID.
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT + BENTONITE GROUT.
ELEVATION / DEPTH TOP OF SEAL: 26.57 / 9'
TYPE OF SEAL: 3/8" DSI BRAND HOLE PLUG, "SHUR-PLUG"
DEPTH TOP OF SAND PACK: 11.5'
ELEVATION / DEPTH TOP OF SCREEN: 21.57 / 14'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: MILLERSVILLE #1 DSI BRAND
ELEVATION / DEPTH BOTTOM OF SCREEN: 11.57 / 24'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 10.57 / 25'
TYPE OF BACKFILL BELOW OBSERVATION WELL: HOLE PLUG 25'-26'
ELEVATION / DEPTH OF HOLE: 9.57 / 26'

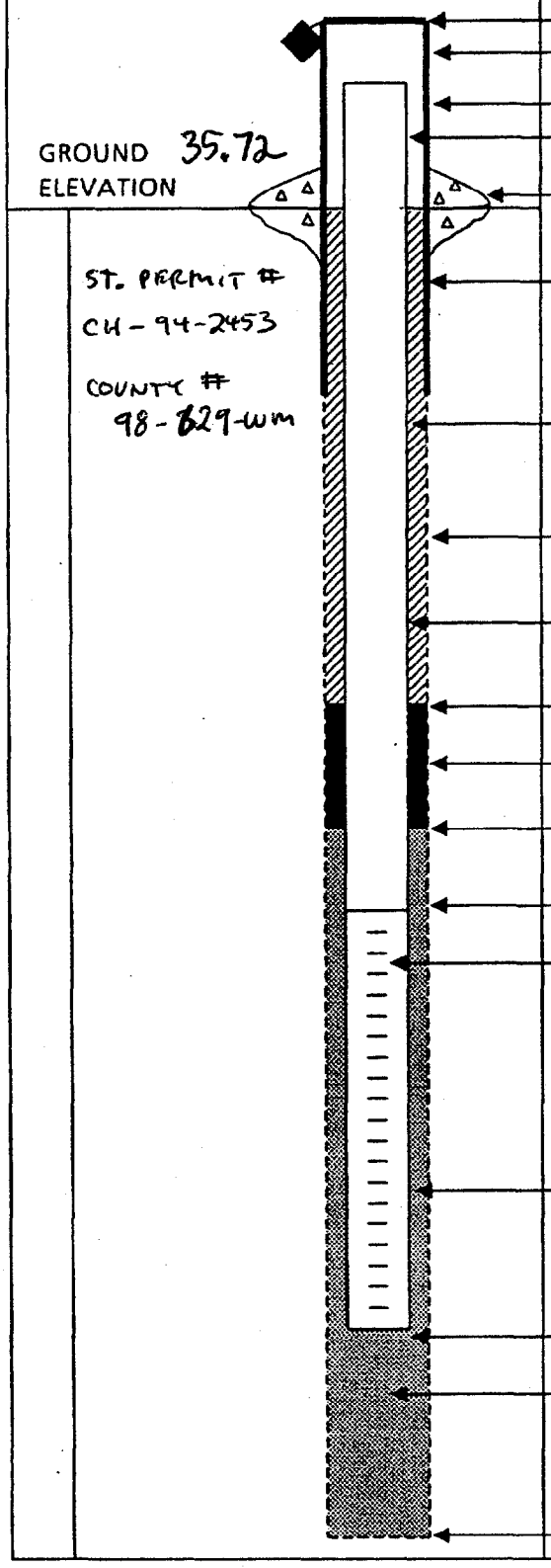
BORING NO.: S57MW002

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 35.72
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indianhead NSWC
BORING S57MW002
DATE 1-6-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4 1/4
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~37.68
ELEVATION OF TOP OF RISER PIPE: 37.58
STICK - UP TOP OF SURFACE CASING: 1.6'
STICK - UP RISER PIPE: 1.5'
TYPE OF SURFACE SEAL: Concrete w/ posts
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ locking lid
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement + Bentonite Grout
ELEVATION / DEPTH TOP OF SEAL: 34.72 / 1'
TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"
DEPTH TOP OF SAND PACK: 2'
ELEVATION / DEPTH TOP OF SCREEN: 32.72 / 3'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Millersville #1 DSI Brand
ELEVATION / DEPTH BOTTOM OF SCREEN: 22.72 / 13'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 22.22 / 13.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 22.22 / 13.5'

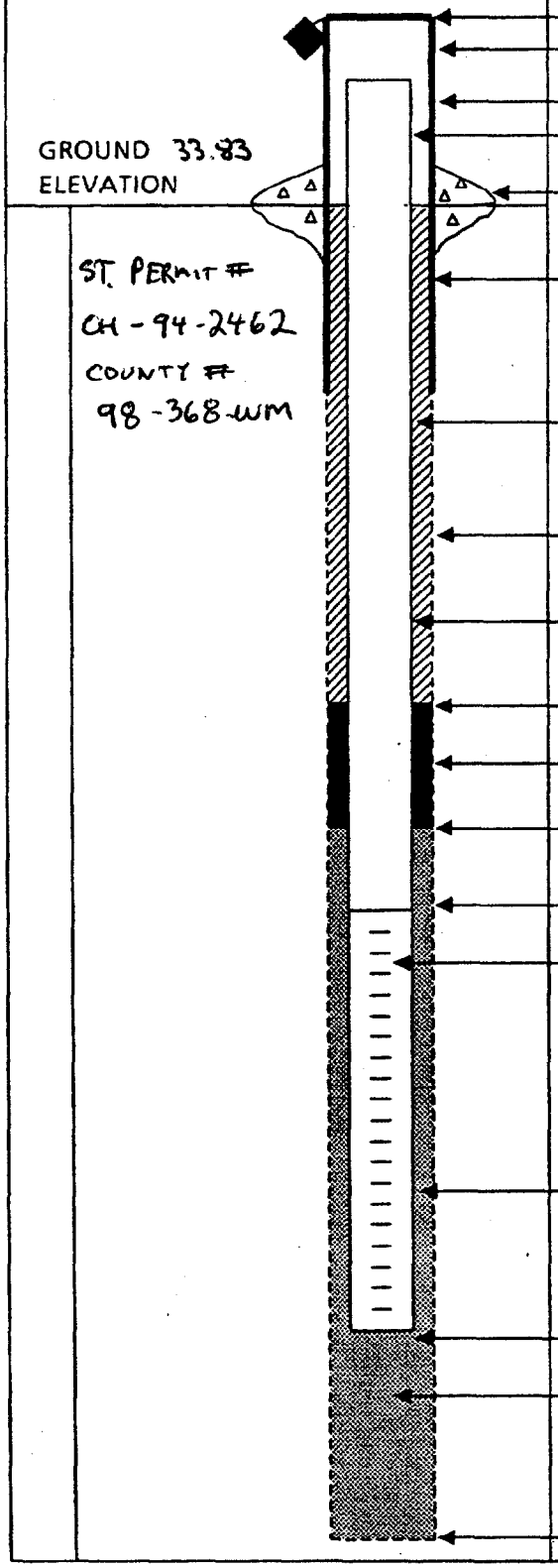
BORING NO.: S57MW003

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 33.83 MSL
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indianhead NSWC
BORING S57MW003
DATE 1-7-99/1-22-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4 1/4
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~35.96
ELEVATION OF TOP OF RISER PIPE: 35.82
STICK - UP TOP OF SURFACE CASING: 1.78'
STICK - UP RISER PIPE: 1.64'
TYPE OF SURFACE SEAL: Concrete w/ posts
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ locking lid
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement + Bentonite Grout
ELEVATION / DEPTH TOP OF SEAL: 20.83 / 13'
TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"
DEPTH TOP OF SAND PACK: 15'
ELEVATION / DEPTH TOP OF SCREEN: 16.83 / 17'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 5'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Millersville #1 DSI Brand
ELEVATION / DEPTH BOTTOM OF SCREEN: 11.83 / 22'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 11.33 / 22.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 11.33 / 22.5'

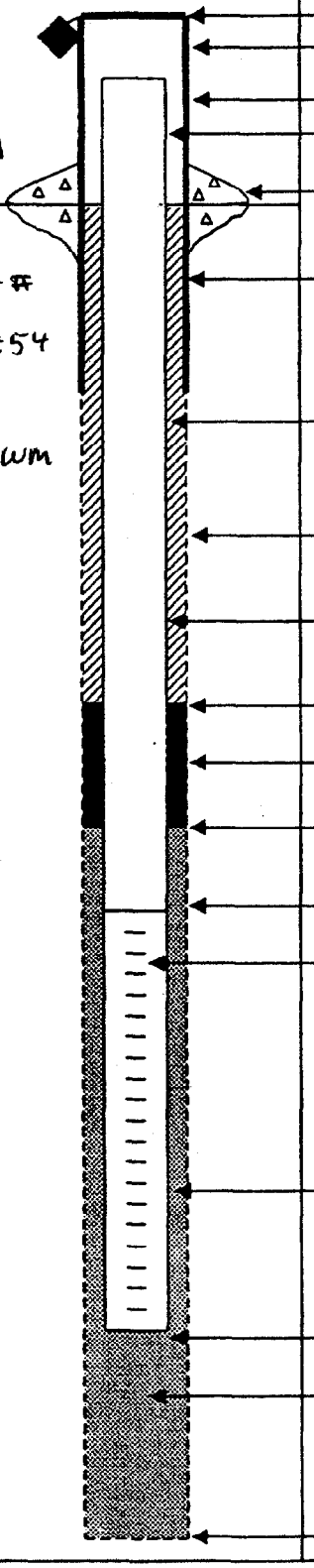
BORING NO.: S57MW004

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 33.91 msl
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW004
DATE 1-7-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4 1/4
DEVELOPMENT METHOD Surge, Bail, Pump.



GROUND ELEVATION 33.91

ST. PERMIT # CH-94-2454

COUNTY # 98-630-WM

ELEVATION OF TOP OF SURFACE CASING: ~35.92
ELEVATION OF TOP OF RISER PIPE: 35.72

STICK - UP TOP OF SURFACE CASING: 1.65'
STICK - UP RISER PIPE: 1.45'

TYPE OF SURFACE SEAL: Concrete w/ posts

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ locking lid

RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: Cement + Bentonite Grout

ELEVATION / DEPTH TOP OF SEAL: 31.91 / 2'

TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"

DEPTH TOP OF SAND PACK: 4'

ELEVATION / DEPTH TOP OF SCREEN: 27.91 / 6'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: Millersville #1 DSI Brand

ELEVATION / DEPTH BOTTOM OF SCREEN: 17.91 / 16'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 17.41 / 16.5'

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: 17.41 / 16.5'

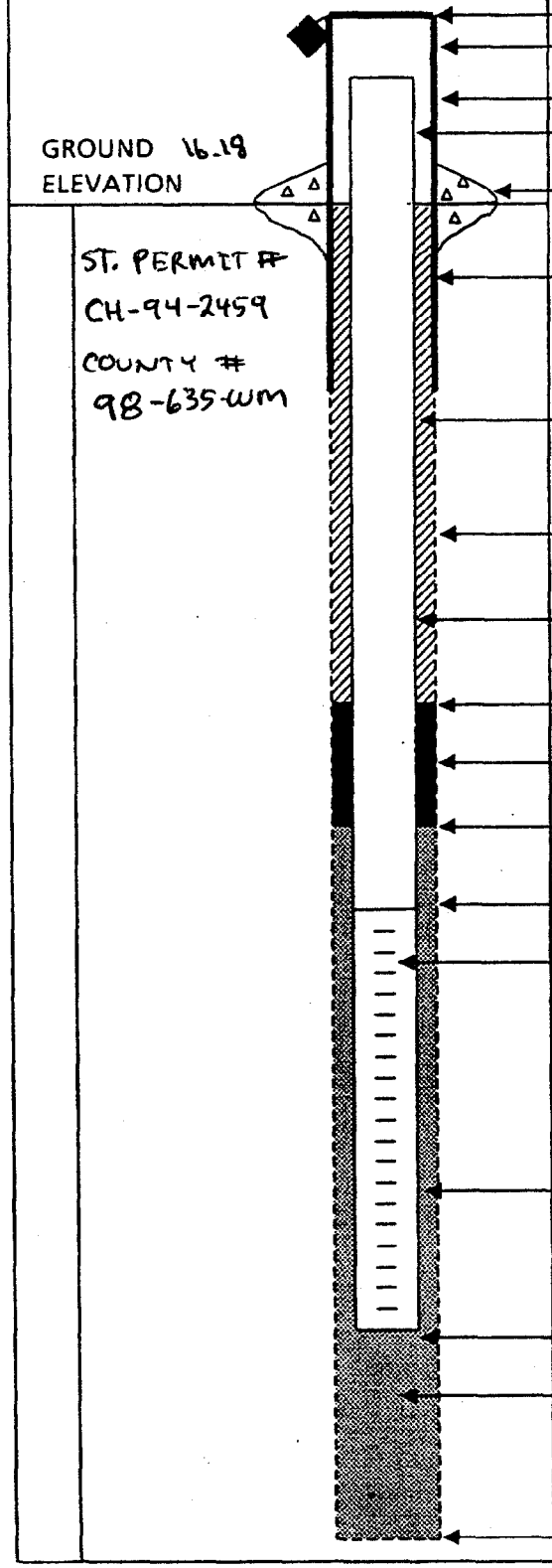
BORING NO.: S57MW005

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 16.18 MSL
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW005
DATE 1-11-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD Surge, Bail, Pump.



GROUND ELEVATION 16.18

ST. PERMIT # CH-94-2459

COUNTY # 98-635-WM

ELEVATION OF TOP OF SURFACE CASING: ~18.69
ELEVATION OF TOP OF RISER PIPE: 18.54

STICK - UP TOP OF SURFACE CASING: 2.05
STICK - UP RISER PIPE: 1.90

TYPE OF SURFACE SEAL: CONCRETE w/ POSTS

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL w/ LOCKING LID

RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: CEMENT + BENTONITE GROUT

ELEVATION / DEPTH TOP OF SEAL: 7.18 / 9'

TYPE OF SEAL: 3/8" DSI BRAND HOLE PLUG, "SUR-PLUG"

DEPTH TOP OF SAND PACK: 11'

ELEVATION / DEPTH TOP OF SCREEN: 3.18 / 13'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010" x 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: MILLERSVILLE #1 DSI BRAND

ELEVATION / DEPTH BOTTOM OF SCREEN: -1.82 / 18'

ELEVATION / DEPTH BOTTOM OF SAND PACK: -3.82 / 20'

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: -3.82 / 20'

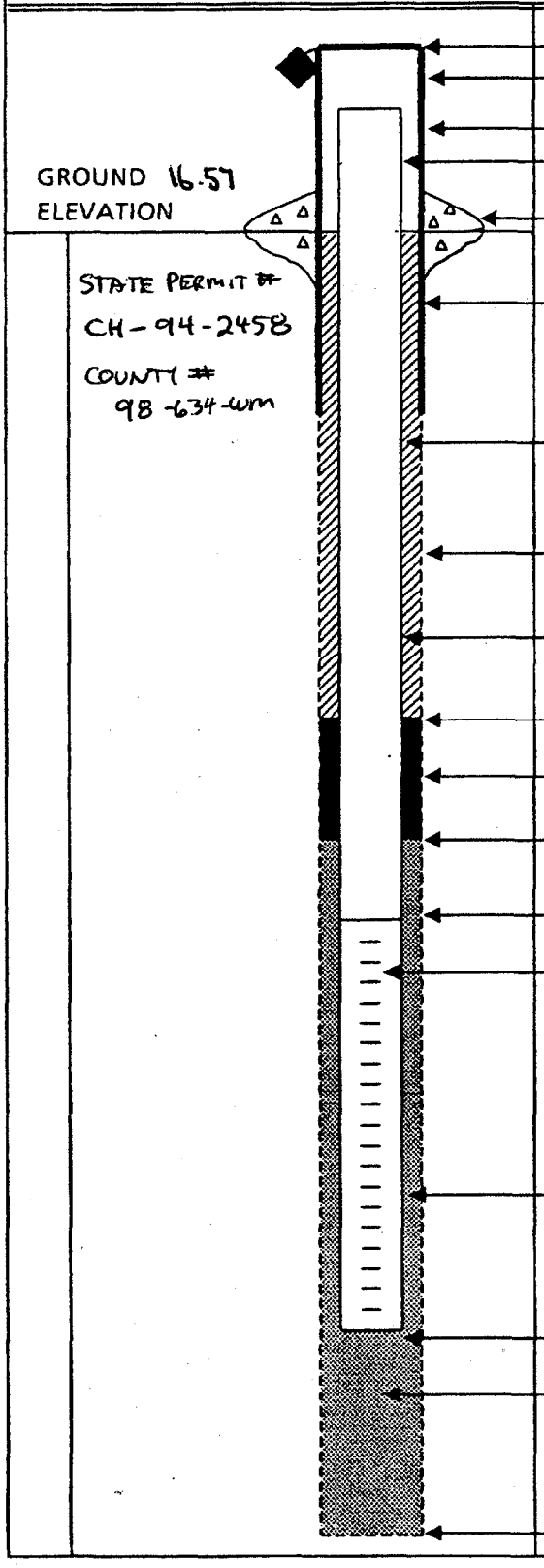
BORING NO.: S57MW006

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 16.57 msl
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW006
DATE 1-11-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4 1/4
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~18.73
ELEVATION OF TOP OF RISER PIPE: 18.57
STICK - UP TOP OF SURFACE CASING: 2.71'
STICK - UP RISER PIPE: 2.55'
TYPE OF SURFACE SEAL: Concrete w/ posts
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ locking lid
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement + Bentonite Grout
ELEVATION / DEPTH TOP OF SEAL: 15.57 / 1.0
TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"
DEPTH TOP OF SAND PACK: 1.5'
ELEVATION / DEPTH TOP OF SCREEN: 14.57 / 2'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Millersville #1 DSI Brand
ELEVATION / DEPTH BOTTOM OF SCREEN: 4.57 / 12'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 4.57 / 12'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 4.07 / 12.5'

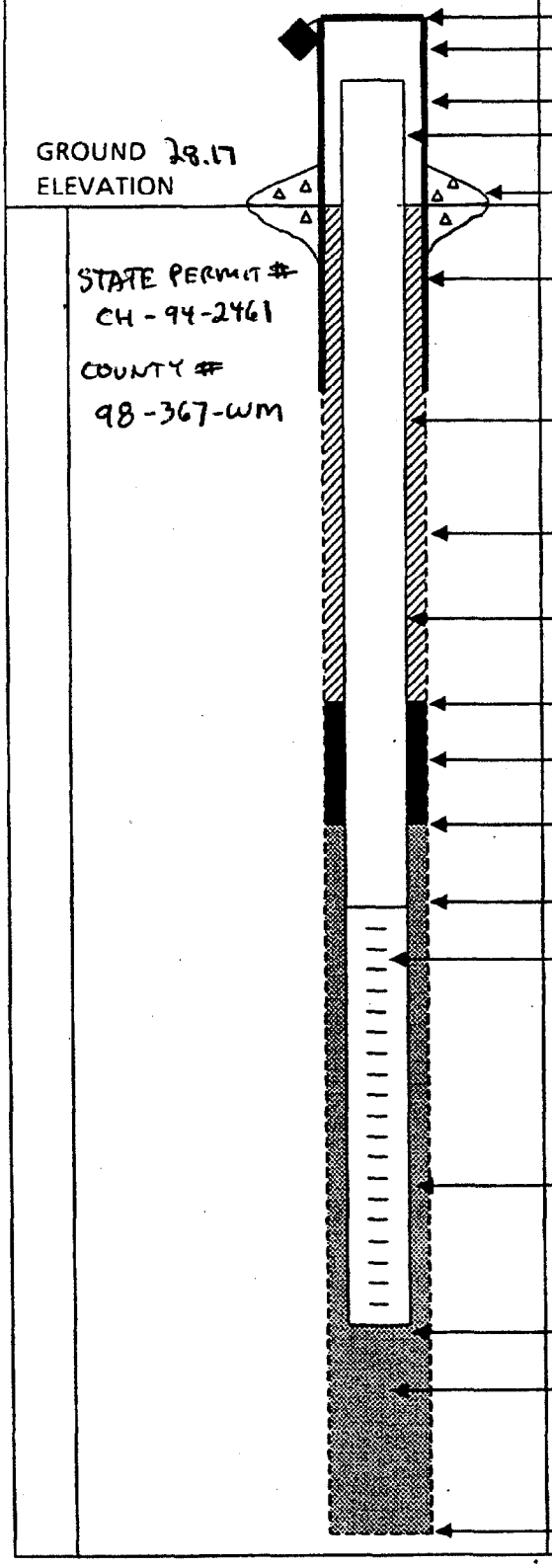
BORING NO.: S57MW007

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 28.17 MSL
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW007
DATE 1-10-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~30.90
ELEVATION OF TOP OF RISER PIPE: 30.58
STICK - UP TOP OF SURFACE CASING: 2.37
STICK - UP RISER PIPE: 2.05
TYPE OF SURFACE SEAL: CONCRETE W/ POSTS
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL w/ LOCKING LID
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT + BENTONITE GROUT
ELEVATION / DEPTH TOP OF SEAL: 16.17 / 12'
TYPE OF SEAL: 3/8" DSI BRAND HOLE PLUG, "SUR-PLUG"
DEPTH TOP OF SAND PACK: 14'
ELEVATION / DEPTH TOP OF SCREEN: 12.17 / 16'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: MILLERSVILLE #1 DSI BRAND
ELEVATION / DEPTH BOTTOM OF SCREEN: 2.17 / 26'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 1.17 / 27'
TYPE OF BACKFILL BELOW OBSERVATION WELL: BENTONITE HOLE PLUG
ELEVATION / DEPTH OF HOLE: -1.83 / 30'

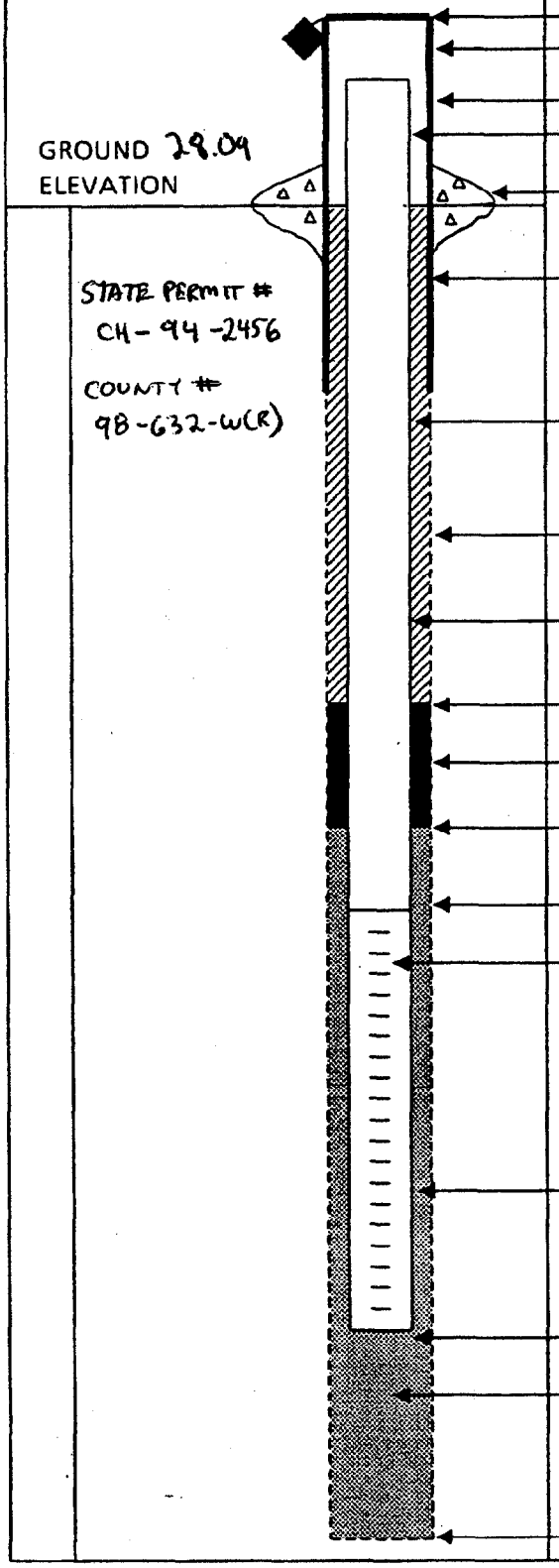
BORING NO.: S57MW008

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 28.09 MSL
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW008
DATE 1-10-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD Surge, Ball, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~30.61
ELEVATION OF TOP OF RISER PIPE: 30.26
STICK - UP TOP OF SURFACE CASING: 2.04
STICK - UP RISER PIPE: 1.69
TYPE OF SURFACE SEAL: CONCRETE w/ POSTS
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL w/ LOCKING LID
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT + BENTONITE GROUT
ELEVATION / DEPTH TOP OF SEAL: 27.09 / 1'
TYPE OF SEAL: 3/8" DSI BRAND HOLE PLUG, "SHUR-PLUG"
DEPTH TOP OF SAND PACK: 3'
ELEVATION / DEPTH TOP OF SCREEN: 23.09 / 5'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: MILLERSVILLE #1 DSI BRAND
ELEVATION / DEPTH BOTTOM OF SCREEN: 13.09 / 15'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 12.59 / 15.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 12.59 / 15.5'

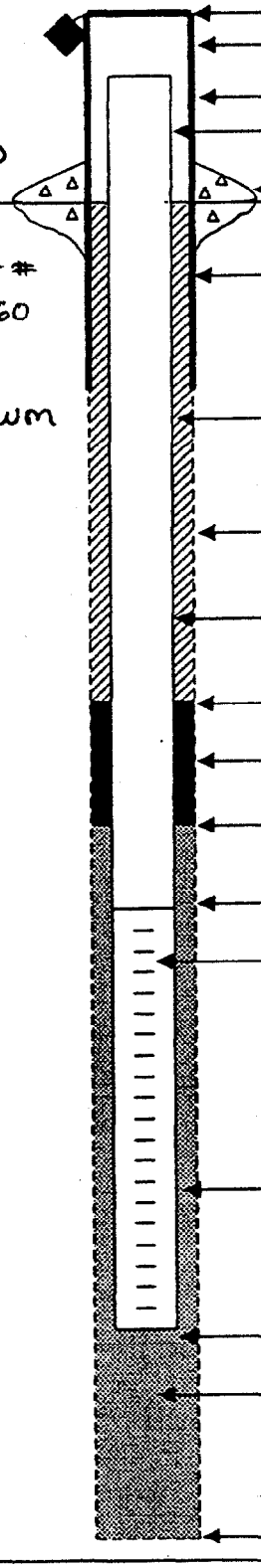
BORING NO.: S57MW009

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 23.90 MSL
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW009
DATE 1-12-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD Surge, Ball, Pump.



GROUND ELEVATION 23.90

STATE PERMIT # CH-94-2460

COUNTY # 98-366-WM

ELEVATION OF TOP OF SURFACE CASING: ~26.1
ELEVATION OF TOP OF RISER PIPE: 25.75
STICK - UP TOP OF SURFACE CASING: 1.96
STICK - UP RISER PIPE: 1.61
TYPE OF SURFACE SEAL: Concrete w/ Posts
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ Locking Hd
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement + Bentonite Grout
ELEVATION / DEPTH TOP OF SEAL: 13.90 / 10'
TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"
DEPTH TOP OF SAND PACK: 12'
ELEVATION / DEPTH TOP OF SCREEN: 9.90 / 14'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Millersville #1 DSI Brand
ELEVATION / DEPTH BOTTOM OF SCREEN: 4.90 / 19'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 3.90 / 20
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 3.90 / 20

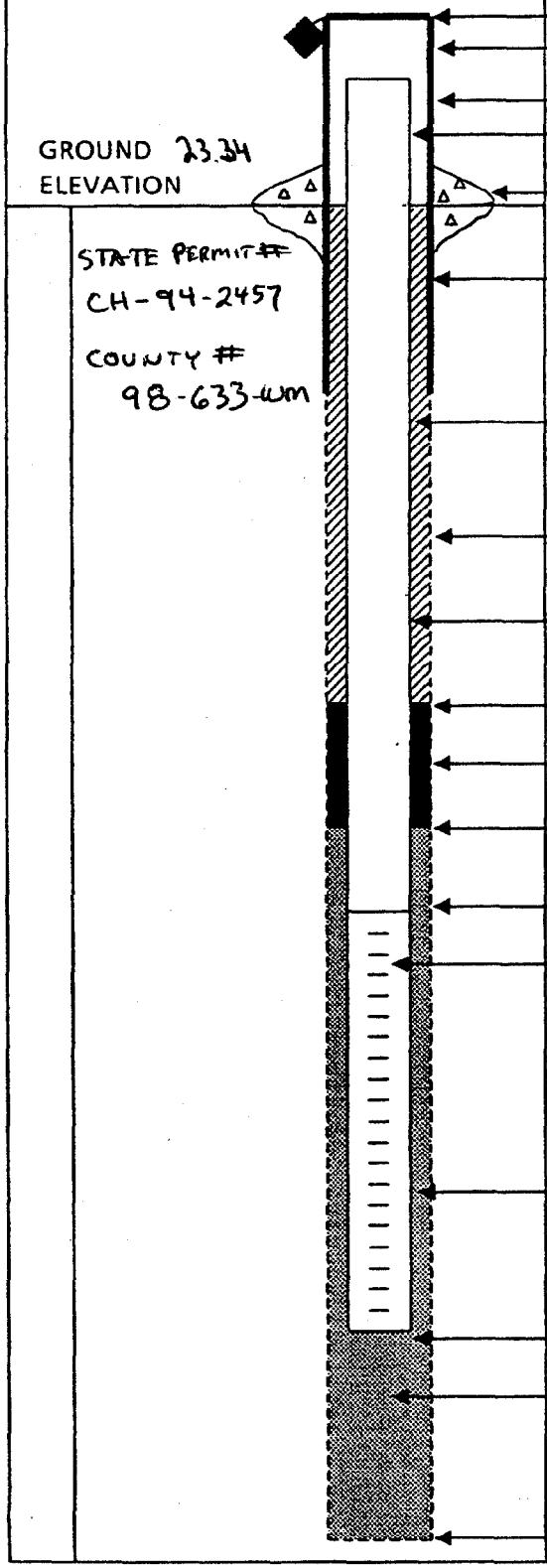
BORING NO.: S57MW01C

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 23.34 MSL
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indianhead NSWC
BORING S57MW01C
DATE 1-11-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4 1/4
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~25.91
ELEVATION OF TOP OF RISER PIPE: 25.82

STICK - UP TOP OF SURFACE CASING: 1.90'
STICK - UP RISER PIPE: 1.81'

TYPE OF SURFACE SEAL: Concrete w/posts

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ locking lid

RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: Cement + Bentonite Grout

ELEVATION / DEPTH TOP OF SEAL: 22.34 / 1'

TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"

DEPTH TOP OF SAND PACK: 3'

ELEVATION / DEPTH TOP OF SCREEN: 19.34 / 4'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: Millersville #1 DSI Brand

ELEVATION / DEPTH BOTTOM OF SCREEN: 9.34 / 14'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 8.84 / 14.5'

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: 8.84 / 14.5'

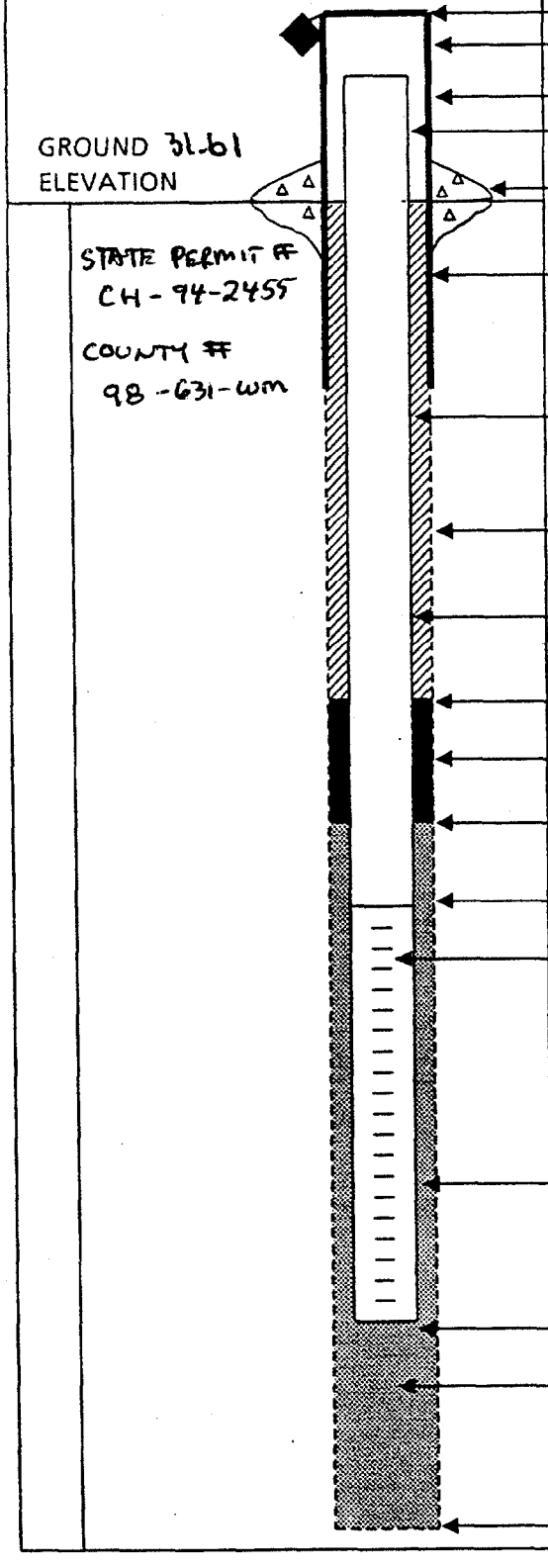
BORING NO.: S57MW011

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 31.61 MSL
FIELD GEOLOGIST FRED W. RAMSER

LOCATION INDIAN HEAD NSWC
BORING S57MW011
DATE 1-7-99

DRILLER BOB JORDAN
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD SURGE, BAIL, PUMP.



GROUND ELEVATION 31.61

STATE PERMIT # CH-94-2455

COUNTY # 98-631-WM

ELEVATION OF TOP OF SURFACE CASING: ~33.63
ELEVATION OF TOP OF RISER PIPE: 33.49

STICK - UP TOP OF SURFACE CASING: 1.70
STICK - UP RISER PIPE: 1.56

TYPE OF SURFACE SEAL: CONCRETE w/ POSTS

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL w/ LOCKING LID

RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: CEMENT + BENTONITE GROUT

ELEVATION / DEPTH TOP OF SEAL: 26.61 / 5'

TYPE OF SEAL: 3/8" DSI BRAND HOLE PLUG, "SHUR-PLUG"

DEPTH TOP OF SAND PACK: 7'

ELEVATION / DEPTH TOP OF SCREEN: 22.61 / 9'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010" x

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: MILLERSVILLE #1 DSI BRAND

ELEVATION / DEPTH BOTTOM OF SCREEN: 12.61 / 19'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 11.61 / 20'

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: 11.61 / 20'

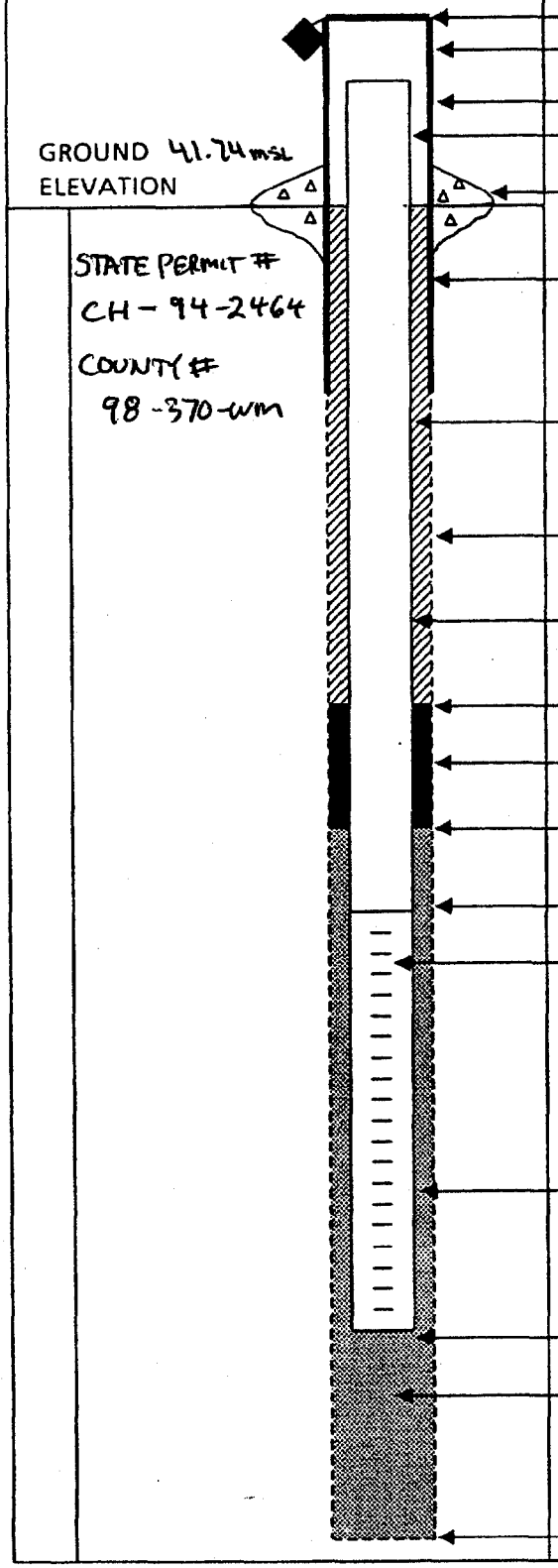
BORING NO.: S57MW012

OVERBURDEN
MONITORING WELL SHEET

PROJECT Site 57
PROJECT NO. 7129
ELEVATION 41.74 msl
FIELD GEOLOGIST Fred W. Ramser

LOCATION Indian Head NSWC
BORING S57MW012
DATE 1-9-99

DRILLER Bob Jordan
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD Surge, Bail, Pump.



ELEVATION OF TOP OF SURFACE CASING: ~43.99
ELEVATION OF TOP OF RISER PIPE: 43.82
STICK - UP TOP OF SURFACE CASING: 2.00'
STICK - UP RISER PIPE: 1.83'
TYPE OF SURFACE SEAL: Concrete w/posts
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel w/ locking lid
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement + Bentonite Grout
ELEVATION / DEPTH TOP OF SEAL: 14.74 / 27'
TYPE OF SEAL: 3/8" DSI Brand Hole Plug, "Shur-Plug"
DEPTH TOP OF SAND PACK: 30'
ELEVATION / DEPTH TOP OF SCREEN: 8.74 / 33'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Millersville #1 DSI Brand
ELEVATION / DEPTH BOTTOM OF SCREEN: -1.26 / 43'
ELEVATION / DEPTH BOTTOM OF SAND PACK: -1.26 / 43.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -1.76 / 43.5'

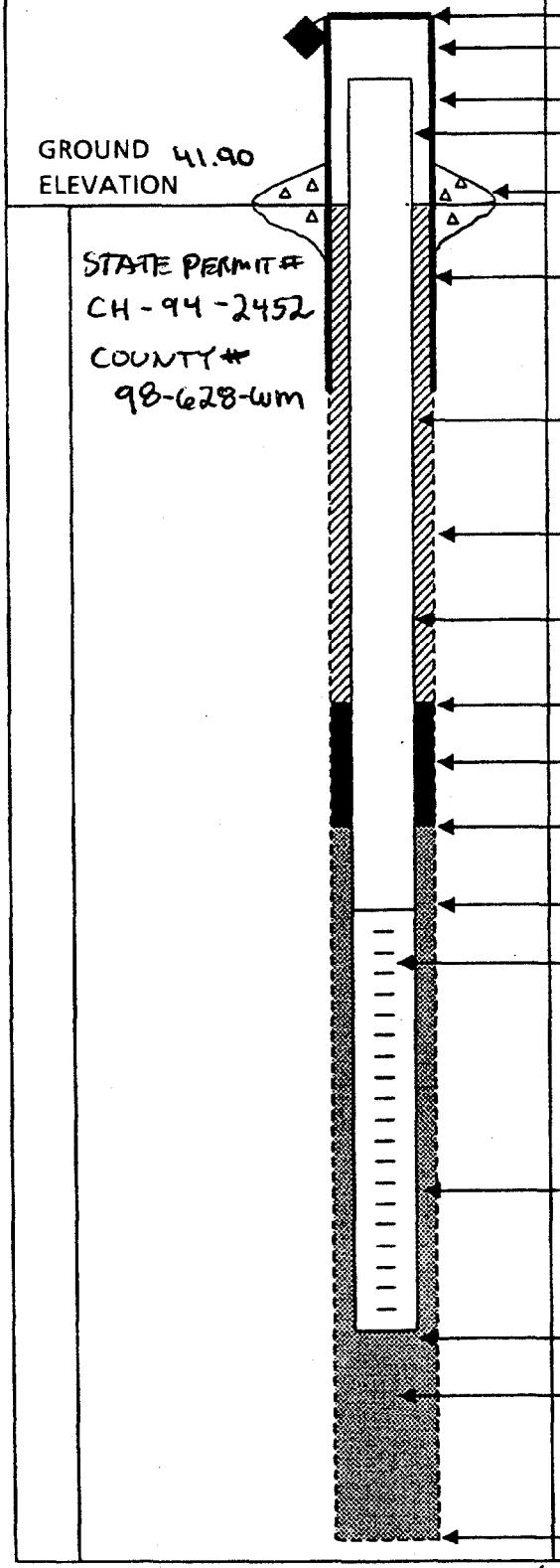
BORING NO.: S57MW013

OVERBURDEN
MONITORING WELL SHEET

PROJECT SITE 57
PROJECT NO. 7129
ELEVATION 41.90
FIELD GEOLOGIST FRED W. RAMSER

LOCATION INDIAN HEAD NSWC
BORING S57MW013
DATE 1-12-99

DRILLER BOB JORDAN
DRILLING METHOD HSA 4¼
DEVELOPMENT METHOD SURGE, BAIL, PUMP.



ELEVATION OF TOP OF SURFACE CASING: ~44.15
ELEVATION OF TOP OF RISER PIPE: 43.99
STICK - UP TOP OF SURFACE CASING: 2.04'
STICK - UP RISER PIPE: 1.87'
TYPE OF SURFACE SEAL: CONCRETE W/ POSTS
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL W/ LOCKING LID
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT + BENTONITE GROUT
ELEVATION / DEPTH TOP OF SEAL: 39.90 / 2'
TYPE OF SEAL: 3/8" DSI BRAND HOLE PLUG, "SHUR-PLUG"
DEPTH TOP OF SAND PACK: 4'
ELEVATION / DEPTH TOP OF SCREEN: 35.90 / 6'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: MILLERSVILLE #1 DSI BRAND
ELEVATION / DEPTH BOTTOM OF SCREEN: 25.90 / 16'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 25.40 / 16.5'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 25.40 / 16.5'

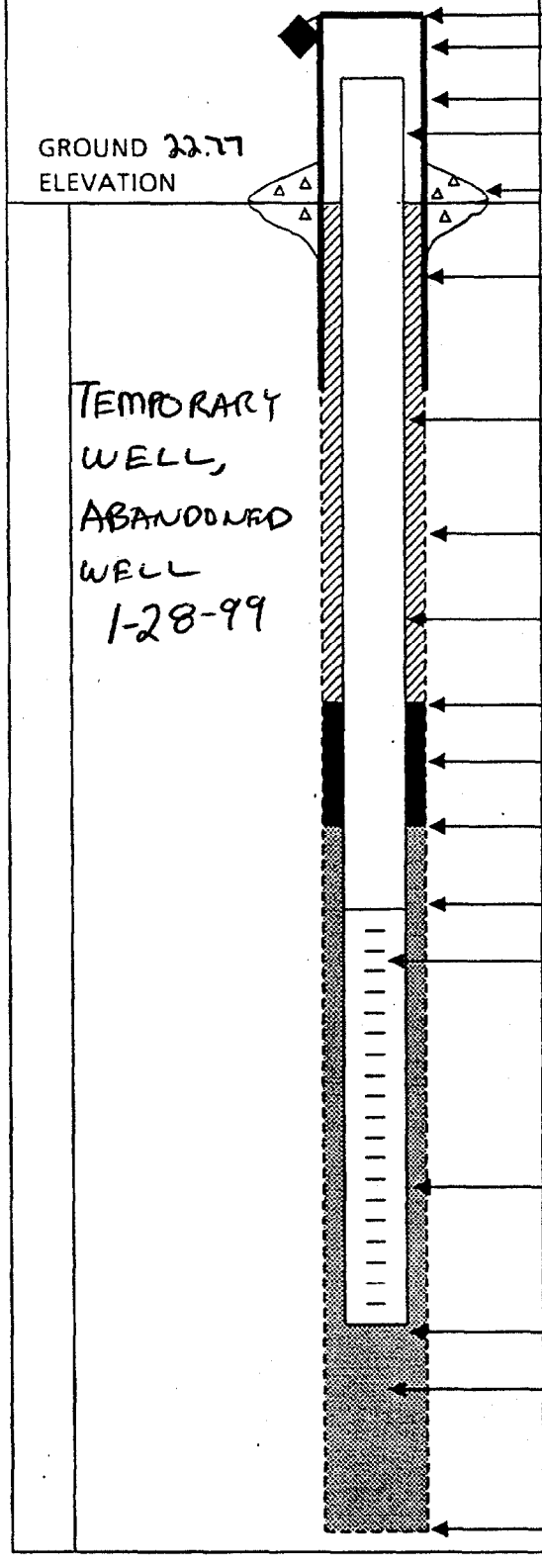
BORING NO.: S57TW001

OVERBURDEN
MONITORING WELL SHEET

PROJECT SITE 57
PROJECT NO. 7129
ELEVATION 22.77 MSL
FIELD GEOLOGIST FRED W RAMSER

LOCATION INDIANHEAD NSWC
BORING S57TW001
DATE 1-19-99

DRILLER DAVE KEENAN
DRILLING METHOD DIRECT PUSH
DEVELOPMENT METHOD PERISTALIC PUMP



ELEVATION OF TOP OF SURFACE CASING: NA
ELEVATION OF TOP OF RISER PIPE: 24.79

STICK - UP TOP OF SURFACE CASING: NA
STICK - UP RISER PIPE: ~2'

TYPE OF SURFACE SEAL: 3/8" DSI BRAND HOLE PLUG BENTONITE.

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D. 1.5"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 2"

TYPE OF BACKFILL: NONE

ELEVATION / DEPTH TOP OF SEAL: /

TYPE OF SEAL: NONE

DEPTH TOP OF SAND PACK:

ELEVATION / DEPTH TOP OF SCREEN: 20.77 / 2'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010" x 10'

I.D. OF SCREEN: 1.5"

TYPE OF SAND PACK: NONE

ELEVATION / DEPTH BOTTOM OF SCREEN: 10.77 / 12'

ELEVATION / DEPTH BOTTOM OF SAND PACK: /

TYPE OF BACKFILL BELOW OBSERVATION WELL: NATURAL MATL.

ELEVATION / DEPTH OF HOLE: 10.77 / 12'

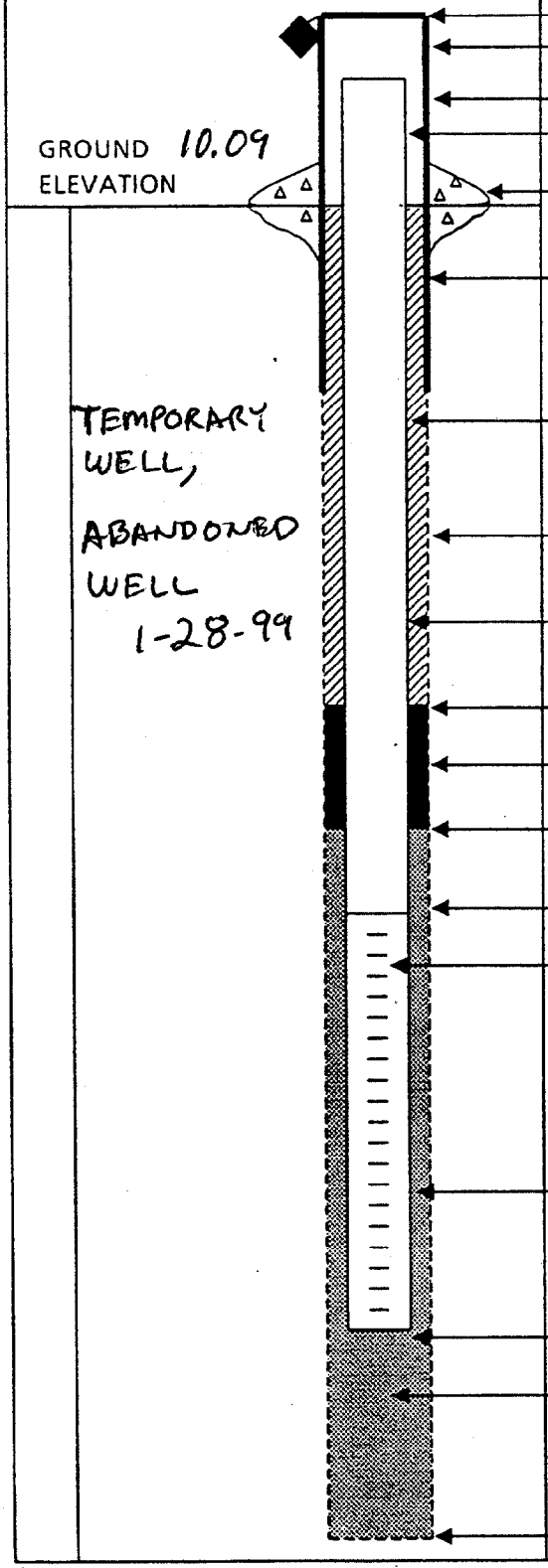
BORING NO.: S57TW002

OVERBURDEN
MONITORING WELL SHEET

PROJECT: SITE 57
PROJECT NO.: 7129
ELEVATION: 10.09
FIELD GEOLOGIST: FRED W RAMSER

LOCATION: INDIAN HEAD NSWC
BORING: S57TW002
DATE: 1-19-99

DRILLER: DAVE KEENAN
DRILLING METHOD: DIRECT PUSH
DEVELOPMENT METHOD: PERISTALTIC PUMP



ELEVATION OF TOP OF SURFACE CASING: NA
ELEVATION OF TOP OF RISER PIPE: 11.94

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: -2'

TYPE OF SURFACE SEAL: 3/8" OSI BRAND HOLE PLUG BENTONITE

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D. 1.5"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 2"

TYPE OF BACKFILL: NONE

ELEVATION / DEPTH TOP OF SEAL: /

TYPE OF SEAL: NONE

DEPTH TOP OF SAND PACK:

ELEVATION / DEPTH TOP OF SCREEN: 7.09 / 3'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010" x 5'

I.D. OF SCREEN: 1.5"

TYPE OF SAND PACK: NONE

ELEVATION / DEPTH BOTTOM OF SCREEN: 2.09 / 8'

ELEVATION / DEPTH BOTTOM OF SAND PACK: /

TYPE OF BACKFILL BELOW OBSERVATION WELL: NATURAL MATL.

ELEVATION / DEPTH OF HOLE: -1.91 / 12'

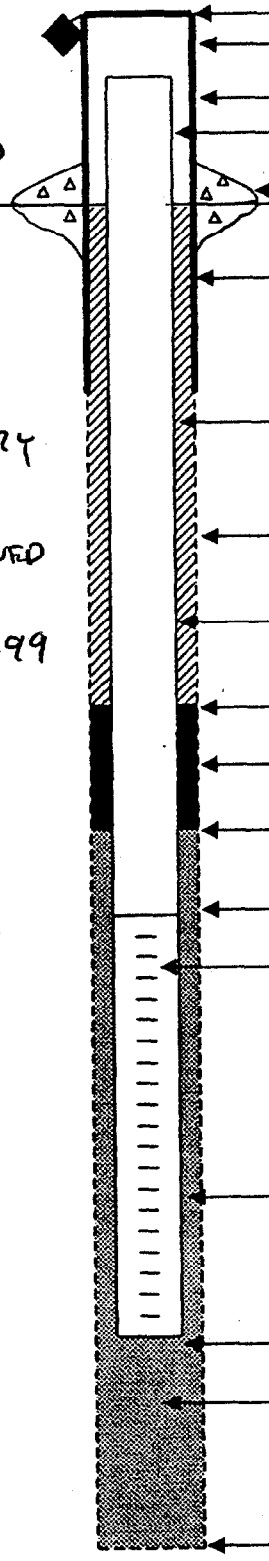
BORING NO.: S57TW003

OVERBURDEN
MONITORING WELL SHEET

PROJECT: SITE 57
PROJECT NO.: 7129
ELEVATION: 6.63
FIELD GEOLOGIST: FRED W RAMSER

LOCATION: INDIANHEAD NSWC
BORING: S57TW003
DATE: 1-19-99

DRILLER: DAVE KEENAN
DRILLING METHOD: DIRECT PUSH
DEVELOPMENT METHOD: PERISTALIC PUMP



GROUND ELEVATION 6.63

TEMPORARY WELL, ABANDONED WELL 1-28-99

ELEVATION OF TOP OF SURFACE CASING: NA
ELEVATION OF TOP OF RISER PIPE: 7.12
STICK - UP TOP OF SURFACE CASING: NA
STICK - UP RISER PIPE: ~0.5'
TYPE OF SURFACE SEAL: 3/8" DST BRAND HOLE PLUG BENTONITE.
I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 1.5"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 2"
TYPE OF BACKFILL: NONE
ELEVATION / DEPTH TOP OF SEAL: /
TYPE OF SEAL:
DEPTH TOP OF SAND PACK:
ELEVATION / DEPTH TOP OF SCREEN: 2.13 / 4.5'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010" x 5'
I.D. OF SCREEN: 1.5"
TYPE OF SAND PACK: NONE
ELEVATION / DEPTH BOTTOM OF SCREEN: -2.87 / 9.5
ELEVATION / DEPTH BOTTOM OF SAND PACK: /
TYPE OF BACKFILL BELOW OBSERVATION WELL: NATURAL MATL.
ELEVATION / DEPTH OF HOLE: -5.37 / 12

APPENDIX E

Well Development Sheets

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	INDIAN HEAD SITE 57	SITE/LOCATION	SITE 57 UPGRADIENT DERP
PROJECT NUMBER:	7129	WELL ID.:	S57MW001
WEATHER:	HEAVY SNOW	DATE:	1-8-99
STATIC WATER LEVEL:	6.95 TPVC	PERSONNEL:	FRED RAMSER, MATT WOOLFORD
TOTAL WELL DEPTH:	26.06	WELL TYPE:	(PVC), [S.S.], or
ONE CASING VOLUME:	~3 gal		OTHER
START TIME:	1430	MEASURING DEVICE:	M-SCOPE
END TIME:	1600	ADJUSTMENT FACTOR:	—

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: BEGIN SURGING W/ S.S. BAILER, WITHDRAW H_2O TILL WELL GOES DRY - SURGED FOR 1/2 HR THROUGHOUT WATER COLUMN, CONTINUE TO SURGE AND WITHDRAW WATER. WELL PUMPS DRY < 1/4 GPM

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
2 GALS	1430	tan	5.03	0.137	<999	1.73	12.5	0.00
	1440	light tan	5.08	0.110	394	2.22	10.7	0.00
	1515 ~~1450~~	light tan	5.46	0.106	732	6.56	15.1	0.00
	1520	cloudy	5.43	0.105	478	6.32	15.1	0.00
	1525	cloudy	5.54	0.107	392	6.34	15.2	0.00
	1530	little cloudy	5.44	0.108	345	6.30	15.7	0.00
	1535	" "	5.52	0.106	328	6.19	15.8	0.00
	1540	" "	5.28	0.106	302	4.65	16.0	0.00
	1545	" "	5.29	0.105	331	4.94	15.9	0.00
	1555	" "	5.20	0.123	300	5.19	15.4	0.00
55 gal	1600	" "	5.46	0.106	244	6.83	15.6	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: Recalibrated instrument @ 1550

SIGNATURE(s): Fred M Ramser

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	INDIANHEAD SITE 57	SITE/LOCATION	SITE 57, UP-GRADIENT
PROJECT NUMBER:	7129	WELL ID.:	S57MW001
WEATHER:	SUN, SNOW, RAIN, COLD	DATE:	1-8, 1-9, 1-10-99
STATIC WATER LEVEL:	6.95 TPVC	PERSONNEL:	FRED W RAMSER, MATT BOLFORD
TOTAL WELL DEPTH:	26.06	WELL TYPE:	(PVC), [S.S.], or
ONE CASING VOLUME:	~ 3 gal		OTHER _____
START TIME:	1605	MEASURING DEVICE:	M-SCOPE
END TIME:	1645	ADJUSTMENT FACTOR:	—

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER _____

METHOD & REMARKS 1-8-99 BEGAN SURGING W/S.S. BAILER + WITH DREW H_2O UNTIL WELL WENT DRY <10 L. SURGED FOR ½ HR THOUGHOUT H_2O COLUMN THEN BEGIN TO WITHDREW H_2O REPEAT THIS PROCEDURE SEVERAL TIMES. THEN 1-9-99 USED SURGE BLOCK FOR ~ 1 HR. THEN WITHDREW (CONT. BELOW)

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
30 GALS	1605	LT BRN	5.50	.106	231	6.19	15.8	0.00
	1610	LT BRN	5.50	.106	213	5.37	15.7	0.00
	1615	"	5.51	.106	182	6.14	15.7	0.00
	1620	"	5.56	.106	193	5.57	15.9	0.00
	1625	cloudy grey	5.68	.105	177	6.90	15.9	0.00
	1630	cloudy grey	5.78	.105	165	7.09	15.8	0.00
	1635	"	5.76	.105	164	6.10	15.7	0.00
	1640	"	5.51	.106	156	5.17	15.9	0.00
50 GALS	1645	"	5.30	.107	152	4.67	15.9	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: APPROXIMATELY 12 L. 1-10-99 BEGIN TO PUMP WELL H_2O USING 12 VDC SUB PUMP @ ~ 1 L/40 sec @ 1400 HRS, 750 ml/1 min = 0.2 GPM AT 1650 CONTINUE TO PUMP @ MAX. FLOW FOR WELL

SIGNATURE(s): Fred W Ramser

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	Indian Head - NSWC	SITE/LOCATION	Site 57
PROJECT NUMBER:	7129	WELL ID.:	S57MW001
WEATHER:	Partly Cloudy - 30°	DATE:	1/11/99
STATIC WATER LEVEL:	7.5' TPVC	PERSONNEL:	MW
TOTAL WELL DEPTH:	26.06	WELL TYPE:	[PVC], [S.S.], or
ONE CASING VOLUME:	~3 gal		OTHER
START TIME:	930	MEASURING DEVICE:	M-SCOPE
END TIME:	1035	ADJUSTMENT FACTOR:	—

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS PUMPED @ ~1 gal/min

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
50	930		5.09	.152	2999	2.51	13.8	0.00
	940		5.34	.112	559	2.02	14.7	0.00
	950		5.37	.111	424	1.49	15.1	0.00
	1000	Cloudy	5.38	.110	278	1.65	15.2	0.00
	1010	↓	5.36	.110	236	2.24	15.7	0.00
	1020		5.36	.110	215	2.18	15.9	0.00
100 GALS	1030		5.37	.110	195	1.64	15.9	0.00
	1035		5.36	.110	194	1.85	15.9	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Fred M Ramser

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	INDIAN HEAD SITE 57	SITE/LOCATION	SITE 57 SHALLOW UPGRADIENT
PROJECT NUMBER:	7129	WELL ID.:	S57MW002
WEATHER:	SNOW	DATE:	1-8-99
STATIC WATER LEVEL:	8.25 TPVC	PERSONNEL:	FRED WRAMSER
TOTAL WELL DEPTH:	15.15 TPVC	WELL TYPE:	(PVC) [S.S.], or OTHER
ONE CASING VOLUME:	~1 gal		
START TIME:	1445	MEASURING DEVICE:	M-SCOPE
END TIME:	1720	ADJUSTMENT FACTOR:	—

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: 1) USED SURGE BLOCK FOR 1/2 HR, 2) THEN SURGE AND WITHDREW 3 APPROXIMATELY 10 GALS W/ BAILER 3) WHEN H2O BECAME CLEAR PUMPING @ 1/4-1/2 GPM BEGAN MEASURING PARAMETERS.

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
~20GALS		BRN	—	—	—	—	—	—
~22GALS	1650	CLEAR	5.20	.126	15	8.90	12.0	0.00
~27GAL	1700	CLEAR	5.47	.099	3	3.51	12.0	0.00
~32GALS	1710	CLEAR	5.50	.096	0	3.40	12.5	0.00
~35GALS	1720	CLEAR	5.49	.095	0	3.49	12.6	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Fred Wramser

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	Indian Head - Site 57	SITE/LOCATION	SITE 57
PROJECT NUMBER:	7129	WELL ID.:	S57MW003
WEATHER:	62 Partly Cloudy	DATE:	1/11/99 - 1/12/99
STATIC WATER LEVEL:	12.60	PERSONNEL:	MW / FLR
TOTAL WELL DEPTH:	24.21	WELL TYPE:	[P]X[C], [S.S.], or OTHER
ONE CASING VOLUME:	~2 gal		
START TIME:	1100	MEASURING DEVICE:	M-SCOPE
END TIME:	SEE BELOW	ADJUSTMENT FACTOR:	—

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SCREEN BLOCKED FROM 1100 - 1200. USED STAINLESS STEEL BAILER TO REMOVE EXCESS SAND. BEGAN PURGING W/ 12 VOLT SUBMERSIBLE PUMP @ 1530

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
80 gal	1755	light tan	5.39	.096	98.0	4.03	15.7	0.00
100 gal	1805	STOPPED ON RECE						

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Fred M Ramsor

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIANHEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: S57MW003
WEATHER: OVERCAST TO CLOUDY w/ SUN
DATE: 1-23-99
STATIC WATER LEVEL: 9.42
PERSONNEL: FRED W. RAMSER
TOTAL WELL DEPTH: 24.21
WELL TYPE: (PVC) [S.S.], or OTHER
ONE CASING VOLUME: ~9 l
START TIME: 900
MEASURING DEVICE: M · SCOPE
END TIME: 1200
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [ ] MONITORING WELL, [ ] OTHER

METHOD & REMARKS SURGED + BAILED EXCESS FINES, WITHDREW ~15 GALS
BEGAN PUMPING @ 1045

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
125	—	—	—	—	—	—	—	—
127	1105		5.20	.090	221	2.38	18.9	0.00
	1125		5.13	.088	172	2.05	18.8	0.00
	1135		5.12	.089	104	2.00	18.9	0.00
	1145		5.13	.088	59	1.93	18.9	0.00
	1155		5.12	.089	59	2.31	18.9	0.00
155	1200		5.12	.089	58	2.56	18.9	0.00

NOTE All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS:

SIGNATURE(s): Fred W Ramser

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: S57MW004
WEATHER: OVERCAST, RAINY
DATE: 1-23-99
STATIC WATER LEVEL: 9.5 TPVC
PERSONNEL: FRED WRAMSER
TOTAL WELL DEPTH: 18.27
WELL TYPE: (PVC), [S.S.], or OTHER
ONE CASING VOLUME: ~6 l
START TIME: 0900
MEASURING DEVICE: O-SCOPE
END TIME: 1130
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [✓] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE + BAILER EXCESS FLUIDS. THEN PUMP w/ SUB. PUMP. 12VDC BAILED ~ 5 gals, 1000HR BEGIN TO PUMP

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
5	—	—	—	—	—	—	—	—
20	1020	BRN	5.61	.113	898	4.31	17.8	0.00
	1030	LT BRN/GR	5.60	.107	95	3.43	17.9	0.00
	1044		5.59	.103	44	3.19	18.1	0.00
	1050		5.61	.104	39	2.46	18.4	0.00
	1100		5.62	.107	30	2.79	18.5	0.00
	1110		5.60	.102	25	3.43	18.6	0.00
	1120		5.59	.103	25	2.98	18.5	0.00
60	1130		5.59	.102	25	3.12	18.6	0.00

NOTE All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS: 16.9 oz / 16 sec = FLOW RATE
$\frac{16.9\,oz}{16\,sec} = \frac{63.375\,oz}{60\,sec}$ ∴ 63.375 oz/min × $\frac{1\,gal}{128\,oz}$ = 0.49 GPM

SIGNATURE(s): Fred W Ramser

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN NSWC
PROJECT NUMBER: 7129
WEATHER: SUNY → RAIN
STATIC WATER LEVEL: 5.64
TOTAL WELL DEPTH: 19.85
ONE CASING VOLUME: ~5 l
START TIME: 1535
END TIME: 1730

SITE/LOCATION: 57
WELL ID.: B57MW0005 (DEEP)
DATE: 1-20-99
PERSONNEL: FRED W. RAMSER, FRANK W.
WELL TYPE: [PVC], [S.S.], or OTHER
MEASURING DEVICE: M-SCOPE
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGED AND WITHDREW WATER USING S.S. BAILER. WITHDREW ~20 GAL @ 45 MINS. START PUMPING 1-23-99 @ 1535

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
20	—	—	—	—	—	—	—	—
	1555		5.20	.095	217	5.88	16.1	0.00
	1601		5.21	.095	47	5.29	15.4	0.00
	1609		5.21	.095	17	4.58	15.5	0.00
	1615		5.29	.096	20	5.12	15.5	0.00
	1620		5.24	.099	44	3.02	15.3	0.00
	1630		5.24	.099	32	3.36	15.3	0.00
	1636		5.23	.098	10	3.16	15.3	0.00
	1641		5.20	.099	6	3.18	15.2	0.00
75	1646		5.21	.098	2	3.15	15.2	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Fred W Ramser

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	INDIANHEAD NSWC	SITE/LOCATION	57
PROJECT NUMBER:	7129	WELL ID.:	S57MW0006
WEATHER:	SUNY	DATE:	1-20-99
STATIC WATER LEVEL:	5.73	PERSONNEL:	FREDW.RANGER/FRANK W.
TOTAL WELL DEPTH:	14.25	WELL TYPE:	(PVC), [S.S.], or OTHER
ONE CASING VOLUME:	~5l		
START TIME:	1430	MEASURING DEVICE:	M-SCOPE
END TIME:	1605	ADJUSTMENT FACTOR:	—

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE w/ SURGE BLOCK FOR ~15 MINS, SURGE AND BAILW/S.S. BAILER WITH DREW ~ 15 GALS @ 35 MINS. START PUMPING 1-23-99 @ 1525

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
15	—	—	—	—	—	—	—	—
	1530	BR	4.82	.092	~~940~~ 951	4.33	14.6	0.00
	1535		4.95	.092	997	6.32	14.5	0.00
	1545		4.92	.085	485	5.07	14.5	0.00
	1550		4.93	.091	20	4.50	14.4	0.00
	1555		4.91	.093	3	4.31	14.3	0.00
	1600		4.92	.092	1	4.50	14.2	0.00
70 GALS	1605		4.92	.094	1	3.60	14.2	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: FLOW RATE = 16.9 oz/6.3 sec

SIGNATURE(s): Fred W Ranger

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: 57MW07
WEATHER: Cloudy 40's
DATE: 1-20, 1-22
STATIC WATER LEVEL: 10.12'
PERSONNEL: F Wudkwych
TOTAL WELL DEPTH: 28.16'
WELL TYPE: [PVC] [S.S.], or OTHER
ONE CASING VOLUME: 2.9 gallons
START TIME: 0900 1-22-99
MEASURING DEVICE: HERON
END TIME: 1550
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: Surge for 5 min
bail out sediment from bottom
flowrate 1gpm water level stable (fairly) * flowrate 0.8gpm

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
25	1459	grey	5.21	0.263	211	—	15.3	0.01
35	1509	grey	4.27	0.332	156	—	15.7	0.01
45	1519	cloudy	4.22	0.287	64	—	15.8	0.01
* 55	1529	clear	4.80	0.256	48	—	16.0	0.01
Fcw ~~65~~ 60	1534	"	4.79	0.250	11	—	16.1	0.00
Fcw ~~75~~ 65	1539	"	4.87	0.249	9	—	16.0	0.00
70	1545	"	4.89	0.248	Fcw ~~12~~ 9		16.0	0.00
75	1550	"	4.89	0.248	8		16.1	0.00

NOTE All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: Surge for 5 min 20 gallons bailed out
75 gallons taken out

SIGNATURE(s): [signature]

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: S57MW008
WEATHER: Cloudy 40's
DATE: 1-20, 22-99
STATIC WATER LEVEL: 8.29'
PERSONNEL: F. Wurkwich
TOTAL WELL DEPTH: 16.82'
WELL TYPE: [PVC], [S.S.], or OTHER
ONE CASING VOLUME: 1.4 gallons
START TIME: 0800 1-20-99
MEASURING DEVICE: HERON
END TIME: 1445 1-22-99
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE for 5 min.
bail out sediment off of bottom
Flowrate 1gpm water level fairly stable (rising slowly)

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
50	1414	brown	4.15	0.346	256	—	13.8	0.01
60	1420	"	4.93	0.261	999	—	13.8	0.01
70	1426	cloudy	4.94	0.253	103	—	13.7	0.01
75	1431	clear	4.97	0.252	6	—	13.9	0.00
80	1436	"	5.01	0.253	4		14.0	0.00
85	1441	"	4.85	0.260	0	—	14.0	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: 30 gallons bailed out 85 gallons taken out
*gallons is estimated

SIGNATURE(s):

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: S57MW009
WEATHER: Cloudy 40's
DATE: 1-20-99
STATIC WATER LEVEL: 10.36
PERSONNEL: F. WUDKWICH
TOTAL WELL DEPTH: 21.19'
WELL TYPE: [PVC], [S.S.], or OTHER
ONE CASING VOLUME: 1.7 gallons
START TIME: 1345
MEASURING DEVICE: HERON
END TIME: 1530
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: Bail out sediment off of bottom before pumping use bail to surge well

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
30								
40	1430	YEL BRN	5.23	.085	750	5.12	14.6	0.00
	1435		5.13	.081	59	6.20	15.2	0.00
	1440		5.14	.081	32	6.47	15.3	0.00
	1445		5.14	.080	32	6.11	15.3	0.00
	1450		5.17	.080	24	6.13	15.3	0.00
	1500		5.14	.080	7	5.60	15.3	0.00
	1510		5.10	.080	3	5.07	15.4	0.00
	1520		5.12	.079	2	5.05	15.3	0.00
~~90~~ 70	1530		5.12	.079	1	5.16	15.4	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: Bailed out 30 gallons, FLOW RATE = 32 oz/50 sec

$\frac{32\ oz}{50\ sec} = \frac{38.4\ oz}{60\ sec} = 38.4\ oz/min \quad \frac{1\ gal}{128\ oz} = 0.3\ gpm$

SIGNATURE(s): Fred Wkamer

PAGE 1 OF ___

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD - NSWC
SITE/LOCATION: SITE 57
PROJECT NUMBER: 7129
WELL ID.: S57 MW 010
WEATHER: Cloudy 40's
DATE: 1-20 and 1/22/99
STATIC WATER LEVEL: 8.98
PERSONNEL: F. WURKWYCH + M. WOOLFORD
TOTAL WELL DEPTH: 16.07
WELL TYPE: [PVC], [S.S.], or OTHER
ONE CASING VOLUME: 1.15 gallons
START TIME: 1050
MEASURING DEVICE: HERON
END TIME: 1105
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [ ] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE FOR 5 MIN
USE BAILER TO FIRST TO BAIL SEDIMENT OUT
1/22/99 MW BEGAN PUMPING @ 825

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
18 GALLONS	0905	NICKY NINITE	5.58	.296	<999	4.44	12.8	0.01
	0920	CLOUDY	5.59	.273	646	4.71	12.8	0.01
	0935	"	5.67	.291	144	5.16	12.6	0.01
	0950	"	5.75	.290	73	6.21	12.9	0.01
	1005	PARTLY CLOUDY	5.60	.285	53	4.52	12.5	↓
	1020	"	5.63	.287	56	5.01	12.9	↓
51 GALLONS	1035	"	5.46	.287	57	3.56	12.9	↓

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS: 18 GALLONS BAILED OUT

SIGNATURE(s): [signature]

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: 557mw011
WEATHER: sunny 40's
DATE: 1-20, 1-22-99
STATIC WATER LEVEL: 9.46'
PERSONNEL: F. Wudkwych
TOTAL WELL DEPTH: 20.69'
WELL TYPE: (PVC), [S.S.], or OTHER
ONE CASING VOLUME: 1.8
START TIME: 1500 (1-20)
MEASURING DEVICE: HERON
END TIME: 1200 (1-22)
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: use bailer to surge well
bail out sediment with SS bailer
0.5 gpm 1000ml/36sec = 0.4gpm
↳ draw down

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
35	1050	grey	5.97	0.175	164	—	14.9	0.00
50	1103	cloudy	5.96	0.170	56	—	15.2	0.00
60	1122	clear	5.71	0.178	6	—	14.6	0.00
65	1133	clear	5.94	0.181	22	—	15.1	0.00
66	1138	"	5.99	0.183	5	—	15.2	0.00
67	1146	"	6.04	0.182	4	—	13.2	0.00
68	1153	"	5.72	0.199	4	—	14.9	0.00
69	1156	"	5.92	0.191	4	—	15.3	0.00
70	120	"	6.01	0.190	0	—	15.2	0.00

pump is 1' off of bottom

NOTE All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS: 20 gallons bailed out on 1-20-99
moving pump up and down screen @ 0.4gpm, water is clearing up.
@ 0.4gpm well is recharging faster than it is being pumped out
@ 1110 flow rate 1000ml/min 70 gallons taken out

SIGNATURE(s):

PAGE 1 OF ___

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIAN HEAD NSWC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: 557MW012
WEATHER: SUNNY HIGH 40'S Low 50'S
DATE: 1-19, 1-21-99
STATIC WATER LEVEL: 6.11'
PERSONNEL: F. WUDKWYCH
TOTAL WELL DEPTH: ~~44.2'~~ 44.51
WELL TYPE: [PVC], [S.S.], or OTHER
ONE CASING VOLUME: 6.2 gallons
START TIME: 1350 → 1450 (1-19)
MEASURING DEVICE: HERON
END TIME: 1049 → 1230 (1-21)
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE for 5 min
BAIL with SS bailer to clean out sediment off of bottom
1-21-99 → START PUMP @ 1049 PUMP @ 1gpm, CUT BACK TO .5l/30 sec

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
20	—	—	—	—	—	—	—	—
30	1100		5.34	.139	829	—	14.5	0.00
	1112		5.64	.137	130	—	13.8	0.00
	1122		5.66	.138	167	—	13.5	0.00
	1130		5.68	.139	135	—	13.8	0.00
	1140		5.43	.151	278	—	14.0	0.00
	1200		5.46	.144	12	—	13.9	0.00
	1210	CLR	5.48	.139	7	2.42	14.1	0.00
	1220		5.48	.138	4	4.00	14.1	0.00
50	1230	CLR	5.45	.137	5	3.90	14.1	0.00

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: 20 gallons bailed out, 1 l/min = 16.9 oz/min
$16.9 \frac{oz}{min} \times \frac{gal}{128 oz} = 0.13 gal/min$ FLOW RATE DURING PARAMETER MEASUREMENT.
PUMP FROM BOTTOM OF WELL.

SIGNATURE(s): Fred Wudkwych

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: INDIANHEAD N3WC
SITE/LOCATION: 57
PROJECT NUMBER: 7129
WELL ID.: S57MW013
WEATHER: Sunny 50's, Rain
DATE: 1-19, 1-21-99
STATIC WATER LEVEL: 5.83
PERSONNEL: F. WUDKWYCH
TOTAL WELL DEPTH: ~~before~~ 17.98
WELL TYPE: (PVC), [S.S.], or OTHER
ONE CASING VOLUME: 1.9 gallons
START TIME: 1305 → 1408 (1-19)
MEASURING DEVICE: HERON
END TIME: 1430 → 1640 (1-21)
ADJUSTMENT FACTOR: —

[ ] DOMESTIC WELL, [X] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: Surge for 5 min
bail with SS bailer to clean up sediment off of bottom

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
35	—	—	—	—	—	—	—	—
36	1450	YEL	5.18	.135	403	5.26	13.4	0.00
	1500	YEL	5.22	.133	956	5.42	13.5	0.00
	1510		5.21	.130	894	5.54	12.7	0.00
	1520		5.22	.133	870	5.28	12.4	0.00
	1540		5.16	.130	275	4.77	12.2	0.00
	1600		5.10	.134	71	5.05	12.2	0.00
	1620		5.15	.132	19	5.66	12.2	0.00
60 GALS	1640		5.14	.132	6	5.91	12.2	0.00

NOTE. All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: 35 gallons bailed out, START PUMPING @ 1445 @ 0.13 gal/min FOR PARAMETERS

SIGNATURE(s): Fred W Ranser

PAGE 1 OF 1

APPENDIX F

Groundwater Level Data

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Site 57 RI
Project No.: 7129
Location: Indian Head NSWC
Personnel: Fred W Ramser, Frank Wudkwych
Weather Conditions: Overcast with some rain
Measuring Device: M-scope
Tidally Influenced: Yes ___ No ___
Remarks: All measurements from top of PVC.

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
S57TW02	1-24-99	1653	11.94	10.02	4.77	NONE	7.17	
S57MW06		1655	18.57	14.39	4.38		14.19	
S57MW05		1656	18.54	19.98	4.18		14.36	
S57MW10		1658	25.82	15.88	8.23		17.59	
S57MW09		1700	25.75	22.04	8.15		17.60	
S57MW07		1710	30.58	27.96	8.69		21.89	
S57MW08		1712	30.26	16.64	7.81		22.45	
S57MW11		1715	33.49	20.61	9.27		24.22	
S57MW04		1717	35.72	17.97	8.69		27.03	
S57MW03		1718	35.82	24.24	8.56		27.26	
S57MW02		1719	37.58	14.15	7.27		30.31	
S57MW01		1720	37.09	26.18	7.31		29.78	
S57MW13		1725	43.98	17.76	5.26		38.72	
S57MW12		1726	43.82	44.09	5.38		38.44	
S57TW01	1-24-99	1730	24.78	13.00	8.51	NONE	16.27	
S57TW03	1-24-99	1751	7.12	10.09	4.49	NONE	2.63	

* All measurements to the nearest 0.01 foot

APPENDIX G

Well Completion Reports and Well Abandonment Reports

C 1 | 4229 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-369-WM

ST/CO USE ONLY DATE Received MM DD YY 13

DATE WELL COMPLETED MM 01 DD 06 YY 99 (15–20)

Depth of Well 22 24' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2463 (28 29 30 31 32 33 34 35 36 37)

OWNER Naval Surface Warfare Center (7385)

STREET OR RFD Indian Head Division (last name / first name) TOWN Indian Head, Maryalnd 20640

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow/brown silt & sand	0	8	
lt grey fine sand, tr silt	8	10	
lt brown to orange to grey sand	10	12	
light grey sand, trace gravel	12	24'	
water @ approx 10'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M __ D G 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M __ D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] 44 no [N] 44

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [C M] 45 46 BENTONITE CLAY [B C] 46

NO. OF BAGS 4 NO. OF POUNDS 400

GALLONS OF WATER 28

DEPTH OF GROUT SEAL (to nearest foot) from 0 (48 TOP) ft. to 12 (54 BOTTOM 58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	14 (66 70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below

[S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	14 (11 15)	24 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 12 to 24 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

70 TELESCOPE CASING ____ 72 LOG INDICATOR ____ 74 75 76 OTHER DATA ____

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1 (8 9)

PUMPING RATE (gal. per min.) ____ (11 15)

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ (17 20) ft.

WHEN PUMPING ____ (22 25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)

[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)

[J] jet (27) [S] submersible (27) MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____ (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31 35)

PUMP HORSE POWER ____ (37 41)

PUMP COLUMN LENGTH (nearest ft.) ____ (43 47)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above (49) / [–] below (49) LAND SURFACE 02 (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

292

Hersey RD

S57MW001

C 1 | 4210 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER: 98- 629-WM

ST/CO USE ONLY — DATE Received MM DD YY (8–13)

DATE WELL COMPLETED: MM 01 DD 06 YY 99 (15–20)

Depth of Well: 22 13' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 24 (28 29 30 31 32 33 34 35 37)

OWNER: Naval Surface Warfare Center (7375)

STREET OR RFD: Indian Head Division (first name) TOWN: Indian Head, Maryland 20640

SUBDIVISION: SECTION: LOT:

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow/brown silt & sand	0	6	
grey sand	6	13'	
water @ approx 6'			

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER

- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION): Michael W. Hale

LIC. NO. M D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)

NO. OF BAGS 1 NO. OF POUNDS 100

GALLONS OF WATER 7

DEPTH OF GROUT SEAL (to nearest foot): from 0 (48 TOP 52) ft. to 2 (54 BOTTOM 58) ft. (enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PC (60 61)	2 (63 64)	3 (66 70)

EACH CASING — OTHER CASING (if used)

diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole — insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.)

EACH SCREEN

1	PC (8 9)	3 (11 15)	13 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 010 2 3

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 2 to 13 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74 75 76)

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour): 1 (8 9)

PUMPING RATE (gal. per min.): 1 (11 15)

METHOD USED TO MEASURE PUMPING RATE:

WATER LEVEL (distance from land surface)

BEFORE PUMPING: (17 20) ft.

WHEN PUMPING: (22 25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)
[J] jet (27) [S] submersible

MONITORING

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)

PUMP HORSE POWER (37 41)

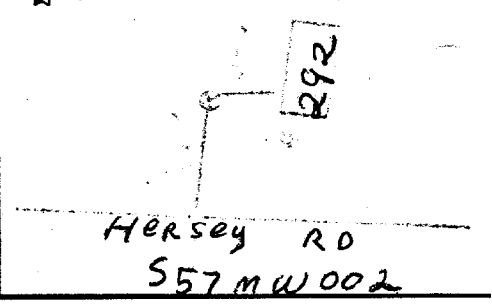
PUMP COLUMN LENGTH (nearest ft.) (43 47)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above (49) / [–] below (49) LAND SURFACE 02 (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



C 1 | 4227 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-368-WM

ST/CO USE ONLY — DATE Received MM DD YY (13)

DATE WELL COMPLETED MM 01 DD 07 YY 99 (15–20)

Depth of Well 22 (22–26) (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2463 (28–36)

OWNER Naval Surface Warfare Center (7384)

STREET OR RFD Indian Head Division (last name / first name) TOWN Indian Head, Maryland 20640

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow/brown to dark brown sand, tr silt	0	8	
olive grey sand	6	12	
yellow/brown & grey gravel & sand	12	14	
yellow/orange to lt brown sand	14	16	
lt grey sand	16	20	
lt grey sand, some silt & clay	20	22'	
water @ approx 12'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M ___ D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [C M] (45–46) BENTONITE CLAY [B C] (45–46)

NO. OF BAGS 5 NO. OF POUNDS 500

GALLONS OF WATER 35

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (48–52 TOP) ft. to 15 (54–58 BOTTOM) ft.

(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60–61)	2 (63–64)	17 (66–70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below

[S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8–9)	17 (11–15)	22 (17–21)
2	(23–24)	(26–30)	(32–36)
3	(38–39)	(41–45)	(47–51)

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (56–60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 15 to 22 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74–76)

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3 (1–2)

PUMPING TEST
HOURS PUMPED (nearest hour) ____ (8–9)

PUMPING RATE (gal. per min.) ____ (11–15)

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ (17–20) ft.

WHEN PUMPING ____ (22–25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)

[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)

[J] jet (27) [S] submersible (27)

MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____ (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31–35)

PUMP HORSE POWER ____ (37–41)

PUMP COLUMN LENGTH (nearest ft.) ____ (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above (49) / [–] below (49) LAND SURFACE ____ (50–51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

292

179

Hersey Rd

S57MW003

C 1 | 4219 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-630-WM

ST/CO USE ONLY DATE Received MM DD YY (8–13)

DATE WELL COMPLETED MM 01 DD 07 YY 99 (15–20)

Depth of Well 16' (TO NEAREST FOOT) (22–26)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 24 (28–34)

OWNER Naval Surface Warfare Center (7376)

STREET OR RFD Indian Head Division (first name) TOWN Indian Head, Maryland 20640

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow/brown gravel & sand, some silt & clay	0	6	
brown & olive/ grey sand, tr silt & clay	6	14	
gravel	14	16'	
water @ approx 6'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

Michael W. Hale

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 2 NO. OF POUNDS 200

GALLONS OF WATER 14

DEPTH OF GROUT SEAL (to nearest foot) from 0 (TOP) ft. to 4 (BOTTOM) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	6

OTHER CASING (if used) EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.) EACH SCREEN

1	PL	6	16
2			
3			

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 4 to 16

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1

PUMPING RATE (gal. per min.) 1

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ ft.

WHEN PUMPING ____ ft.

TYPE OF PUMP USED (for test)

[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

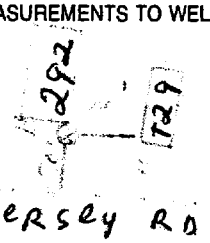
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height) [+] above [–] below LAND SURFACE (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



S57NW004

C 1 | 4224 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-635-WM

ST/CO USE ONLY DATE Received MM DD YY 13

DATE WELL COMPLETED MM 01 DD 11 YY 99 (15–20)

Depth of Well 22 18' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2459 (28–36)

OWNER Naval Surface Warfare Center (7381)

STREET OR RFD Indian Head Division (last name / first name) TOWN Indian Head, Maryland 20640

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
brown sand and gravel	0	4	
brown & grey sand, tr silt	4	6	
lt yellow/grey sand, tr silt	6	18'	
water @ approx 4'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER

- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D46

Michael W. Parker

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M ___ D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)

NO. OF BAGS 4 NO. OF POUNDS 400

GALLONS OF WATER 28

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (48 TOP 52) ft. to 11 (54 BOTTOM 58) ft.

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	13 (66–70)

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole — insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

EACH SCREEN		DEPTH (nearest ft.)	
1	PL (8 9)	13 (11–15)	18 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 11 to 18 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

70 ____ TELESCOPE CASING; 72 ____ LOG INDICATOR; 74 75 76 OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) / (8 9)

PUMPING RATE (gal. per min.) / (11–15)

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ (17–20) ft.

WHEN PUMPING ____ (22–25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)

[C] centrifugal (27) [R] rotary (27) [O] other (describ below) (27)

[J] jet (27) MONITORING [S] submersible (27)

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____ (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31–35)

PUMP HORSE POWER ____ (37–41)

PUMP COLUMN LENGTH (nearest ft.) ____ (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)

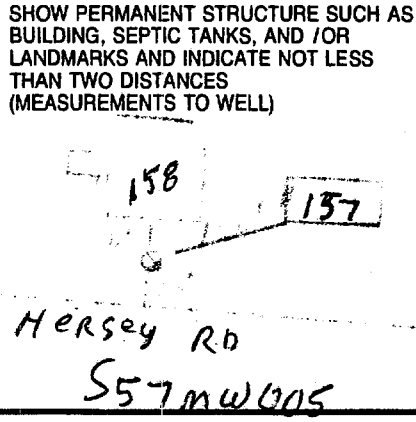
[+] above (49) LAND SURFACE

[–] below (49) ____ (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N



C 1 | 4223 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-634-WM

ST/CO USE ONLY
DATE Received MM DD YY (8–13)

DATE WELL COMPLETED: MM 01 DD 11 YY 99 (15–20)

Depth of Well: 22 12' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 2451 (28–37)

OWNER: Naval Surface Warfare Center (7380)
STREET OR RFD: Indian Head Division (last name / first name) TOWN: Indian Head, Maryland 20640
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
brown sand and gravel	0	4	
brown & grey sand, tr silt	4	6	
lt yellow/grey sand, tr silt	6	12'	
water @ approx 4'			

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M D AW0596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)

NO. OF BAGS 1 NO. OF POUNDS 100

GALLONS OF WATER 7

DEPTH OF GROUT SEAL (to nearest foot): from 0 (48 TOP 52) ft. to 1 (54 BOTTOM 58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: STEEL [ST], CONCRETE [CO], PLASTIC [PL], OTHER [OT]

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	2 (66 70)

OTHER CASING (if used) — EACH CASING

	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: STEEL [ST], BRASS BRONZE [BR], OPEN HOLE [HO], PLASTIC [PL], OTHER [OT]

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	2 (11 15)	12 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 3

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 1 to 12 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) (E.R.O.S.) (72) W Q (74 75 76)
TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3 — PUMPING TEST

HOURS PUMPED (nearest hour) (8 9)

PUMPING RATE (gal. per min.) (11 15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING (17 20) ft.

WHEN PUMPING (22 25) ft.

TYPE OF PUMP USED (for test): air [A] (27), piston [P] (27), turbine [T] (27), centrifugal [C] (27), rotary [R] (27), other (describ below) [O] (27), jet [J] (27), submersible [S] (27) MONITORING

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)

PUMP HORSE POWER (37 41)

PUMP COLUMN LENGTH (nearest ft.) (43 47)

CASING HEIGHT (circle appropriate box and enter casing height): + above (49), – below (49) LAND SURFACE 02 (50 51) (neares foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

S57NW006

C 1 | 4228 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 93-366-WM

ST/CO USE ONLY DATE Received MM DD YY 13

DATE WELL COMPLETED MM 01 DD 10 YY 99 (15–20)

Depth of Well 22 26' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2461 (28 29 30 31 32 33 34 35 36 3)

OWNER Naval Surface Warfare Center (7333) (last name, first name)

STREET OR RFD Indian Head Division TOWN Indian Head, Maryland 20640

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
rip rap, sand & gravel	0	6	
grey/lt olive/ brown silt and sand	6	8	
grey sand, some gravel	8	14	
pale yellow sand trace silt	14	16	
black/yellow & brownish grey sand	16	23	
greenish grey sand, tr silt and clay	23	26'	
water @ approx 6'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes Y no N

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M ___ D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y 44 no N 44

TYPE OF GROUTING MATERIAL (Circle one) CEMENT CM 45 46 BENTONITE CLAY BC 45 46

NO. OF BAGS 4 NO. OF POUNDS 400

GALLONS OF WATER 28

DEPTH OF GROUT SEAL (to nearest foot) from 0 (48 TOP 52) ft. to 14 (54 BOTTOM 58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	16 (66 70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below

ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	16 (11 15)	26 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 3 ____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 14 to 26 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

70 TELESCOPE CASING ____ 72 LOG INDICATOR ____ 74 75 76 OTHER DATA ____

C 3 — PUMPING TEST
HOURS PUMPED (nearest hour) ____ (8 9)

PUMPING RATE (gal. per min.) ____ (11 1)

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ (17 20) ft.

WHEN PUMPING ____ (22 25) ft.

TYPE OF PUMP USED (for test)

A air (27), P piston (27), T turbine (27), C centrifugal (27), R rotary (27), O other (descrit below) (27), J jet (27), S submersible (27)

MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31 3)

PUMP HORSE POWER ____ (37 4)

PUMP COLUMN LENGTH (nearest ft.) ____ (43 4)

CASING HEIGHT (circle appropriate box and enter casing height)

+ above (49) / – below (49) LAND SURFACE ____ (50 51) (neares foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

S57nw007

C 1 4221 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-632-W(R)

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: 01 10 99 (MM DD YY)

Depth of Well: 15' (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 245

OWNER: Naval Surface Warfare Center (7378)

STREET OR RFD: Indian Head Division (last name / first name) TOWN: Indian Head, Maryland 20640

SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
rip rap, sand & gravel	0	6	
grey/lt olive/ brown silt/sand	6	8	
grey sand, some gravel	8	15'	
water @ approx 5'			

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]

TYPE OF GROUTING MATERIAL: (Circle one) CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 1 NO. OF POUNDS 100

GALLONS OF WATER 7

DEPTH OF GROUT SEAL (to nearest foot) from 0 TOP ft. to 3 BOTTOM ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE: PL

Nominal diameter top (main) casing (nearest inch): 2

Total depth of main casing (nearest foot): 5

OTHER CASING (if used) — EACH CASING: diameter (inch), depth (feet) from / to

SCREEN RECORD
screen type or open hole insert appropriate code below: [ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.)

EACH SCREEN: 1 PL 5 15; 2; 3

SLOT SIZE 1 010 2 3

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 3 to 15

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3 — PUMPING TEST
HOURS PUMPED (nearest hour): 1

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test): [A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height): [+] above [−] below LAND SURFACE (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

S57NW 008

C 1 | 4225 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-366-WM

ST/CO USE ONLY DATE Received MM DD YY 13

DATE WELL COMPLETED MM 01 DD 12 YY 99 (15–20)

Depth of Well 22 19' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2460 (28 29 30 31 32 33 34 35 36 3)

OWNER Naval Surface Warfare Center (7382)
STREET OR RFD Indian Head Division (last name / first name) TOWN Indian Head, Maryland 20640
SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
sand & gravel, trace silt	0	6	
grey sand & gravel	6	8	
grey silty sand & gravel	8	14'	
green clay/sand	14	19'	
water @ approx 6'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M ___ D AWD 596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [C M] (45 46) BENTONITE CLAY [B C] (45 46)

NO. OF BAGS 4 NO. OF POUNDS 200

GALLONS OF WATER 28

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (48 TOP 52) ft. to 12 (54 BOTTOM 58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	14 (66 70)

EACH CASING — OTHER CASING (if used)

	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below

[S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2 (1 2)

EACH SCREEN — DEPTH (nearest ft.)

1	PL (8 9)	14 (11 15)	19 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 12 to 19 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 ____ TELESCOPE CASING; 72 ____ LOG INDICATOR; 74 75 76 OTHER DATA

C 3 (1 2)

PUMPING TEST
HOURS PUMPED (nearest hour) ____ (8 9)

PUMPING RATE (gal. per min.) ____ (11 15)

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ (17 20) ft.

WHEN PUMPING ____ (22 25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describ below) (27)
[J] jet (27) [S] submersible (27)

MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____ (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31 35)

PUMP HORSE POWER ____ (37 41)

PUMP COLUMN LENGTH (nearest ft.) ____ (43 47)

CASING HEIGHT (circle appropriate box and enter casing height)
[+] above (49) LAND SURFACE
[–] below (49) ____ (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

Hersey Rd 557 Wood

C 1 | 4222 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-633-WM

ST/CO USE ONLY DATE Received MM DD YY 8 13

DATE WELL COMPLETED MM DD YY 01 11 99 (15 20)

Depth of Well 22 14' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CR - 94 - 245 (28 29 30 31 32 33 34 35)

OWNER Naval Surface Warfare CEnter (7379)

STREET OR RFD Indian Head Division (last name / first name) TOWN Indian Head, Maryland 20640

SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
grass surface, sand & silt	0	4	
yellow/brown silt & sand	4	6	
grey silty sand	6	12	
brown sand	12	14'	
water @ approx 6'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER

- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M ___ D AHD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 1 NO. OF POUNDS 100

GALLONS OF WATER 7

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. to 3 ft. (TOP / BOTTOM)

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	4

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

EACH SCREEN		DEPTH (nearest ft.)	
1	PL	4	14
2			
3			

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 3 to 14

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING ____ LOG INDICATOR ____ OTHER DATA ____

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) 1

PUMPING RATE (gal. per min.) 1

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ ft.

WHEN PUMPING ____ ft.

TYPE OF PUMP USED (for test)

[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

MONITORING

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above LAND SURFACE [−] below (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

S57mW010

C 1 4220 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-631-WM

ST/CO USE ONLY DATE Received MM DD YY 13

DATE WELL COMPLETED MM DD YY: 01 07 99 (15–20)

Depth of Well 22 19' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2455 (28–36)

OWNER Naval Surface Warfare Center (7377)
Indian Head Division (first name)
STREET OR RFD _____ TOWN Indian Head, Maryland 20640
SUBDIVISION _____ SECTION _____ LOT _____

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow/brwon gravel, sand, silt & clay	0	12'	
lt grey sand and gravel	12	14	
lt grey sand, tr silt & clay	14	19'	
water @ approx 12'			

NUMBER OF UNSUCCESSFUL WELLS: _____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M __ D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] 44 no [N] 44

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] 45 46 BENTONITE CLAY [BC] 47 48

NO. OF BAGS 2 NO. OF POUNDS 200

GALLONS OF WATER 14

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (48 TOP 52) ft. to 7 (54 BOTTOM 58) ft.

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	9 (66 70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole — insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	9 (11 15)	19 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1: 010 2 _____ 3 _____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 7 to 19 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

70 TELESCOPE CASING; 72 LOG INDICATOR; 74 75 76 OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) 1 (8 9)

PUMPING RATE (gal. per min.) 1 (11 15)

METHOD USED TO MEASURE PUMPING RATE _____

WATER LEVEL (distance from land surface)

BEFORE PUMPING _____ (17 20) ft.

WHEN PUMPING _____ (22 25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describ below) (27)
[J] jet (27) [S] submersible (27)

MONITORING

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 3)

PUMP HORSE POWER (37 4)

PUMP COLUMN LENGTH (nearest ft.) (43 4)

CASING HEIGHT (circle appropriate box and enter casing height)
[+] above (49) / [–] below (49) LAND SURFACE (50 51) (neares foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND / OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

Hersey RD

S57MW011

C 1 | 4229 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER: 98-370-WM

ST/CO USE ONLY — DATE Received MM DD YY (8–13)

DATE WELL COMPLETED: MM 01 DD 09 YY 99 (15–20)

Depth of Well: 22 43' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": Cl - 94 - 246 (28 29 30 31 32 33 34 35 37)

OWNER: Naval Surface Warfare Center (7386)
STREET OR RFD: Indian Head Division (last name / first name) TOWN: Indian Head, Maryland 20640
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow brown sand & gravel	0	2	
lt brown sand, tr clay & silt	2	10	
olive brown sand & gravel	10	12	
lt olive grey sand	12	24	
pale yellow/ brown sand	24	38	
yellow/brown sand, tr silt	38	42	
lt olive grey silty clayey sand	42	43'	
water @ approx 8'			

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 046
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO.: M D AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] 44 no [N] 44

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] 45 46 BENTONITE CLAY [BC] 45 46

NO. OF BAGS 9 NO. OF POUNDS 900

GALLONS OF WATER 63

DEPTH OF GROUT SEAL (to nearest foot): from 0 (48 TOP 52) ft. to 29 (54 BOTTOM 58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL, [CO] CONCRETE, [PL] PLASTIC, [OT] OTHER

MAIN CASING TYPE (60 61)	Nominal diameter top (main) casing (nearest inch)! (63 64)	Total depth of main casing (nearest foot) (66 70)
PL	2	33

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: [ST] STEEL, [BR] BRASS BRONZE, [HO] OPEN HOLE, [PL] PLASTIC, [OT] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL	33	43
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 29 to 43 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 TELESCOPE CASING; 72 LOG INDICATOR; 74 75 76 OTHER DATA

C 3 (1 2)

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8 9)

PUMPING RATE (gal. per min.): / (11 15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ (17 20) ft.

WHEN PUMPING ____ (22 25) ft.

TYPE OF PUMP USED (for test): [A] air (27), [P] piston (27), [T] turbine (27), [C] centrifugal (27), [R] rotary (27), [O] other (describe below) (27), [J] jet (27), [S] submersible (27)

MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)

PUMP HORSE POWER (37 41)

PUMP COLUMN LENGTH (nearest ft.) (43 47)

CASING HEIGHT (circle appropriate box and enter casing height): [+] above (49), [–] below (49) LAND SURFACE 02 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

292

Hersey RD

57MW012

C 1 | 4217 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 98-628-WM

ST/CO USE ONLY
DATE Received MM DD YY 13

DATE WELL COMPLETED MM 01 DD 12 YY 99 (15–20)

Depth of Well 22 16' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 2452 (28 29 30 31 32 33 34 35 36)

OWNER Naval Surface Warfare Center (7374)
STREET OR RFD Indian Head Division (last name / first name) TOWN Indian Head, Maryland 20640
SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
brown silty sand & gravel	0	8	
olive brown sand & gravel	8	12	
lt olive grey sand	12	16'	
water @ approx 8'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046 ____
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO. M ____ D ____ AWD596

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] (44) no [N] (44)
TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)
NO. OF BAGS 2 NO. OF POUNDS 200
GALLONS OF WATER 14
DEPTH OF GROUT SEAL (to nearest foot)
from 0 (48) TOP (52) ft. to 4 (54) BOTTOM (58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	6 (66–70)

OTHER CASING (if used) — EACH CASING

	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	6 (11–15)	16 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 ____ 3 ____
DIAMETER OF SCREEN 2 (56–60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 4 to 16 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 TELESCOPE CASING — 72 LOG INDICATOR — 74 75 76 OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1 (8 9)
PUMPING RATE (gal. per min.) 1 (11–1)
METHOD USED TO MEASURE PUMPING RATE ____
WATER LEVEL (distance from land surface)
BEFORE PUMPING ____ (17–20) ft.
WHEN PUMPING ____ (22–25) ft.
TYPE OF PUMP USED (for test)
[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) MONITORING [R] rotary (27) [O] other (descri below) (27)
[J] jet (27) [S] submersible (27)

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31–3)
PUMP HORSE POWER ____ (37–4)
PUMP COLUMN LENGTH (nearest ft.) ____ (43–4)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above (49) / [–] below (49) LAND SURFACE (50 51) (neares foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

292

Hersey RD

S57MW013

C 1 [illegible] SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER

ST/CO USE ONLY
DATE Received

DATE WELL COMPLETED: 03 15 99

Depth of Well: 12 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": C[illegible]-9[illegible]-[illegible]5

OWNER: Naval Surface Warfare Center
STREET OR RFD: Indian Head Division (last name first name) TOWN: Indian Head
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
dark brwon top soil	0	2	
yellowish brown sand & silt	2	10	
darl grey/green sand & silt, some gravel	10	12'	
water @ approx 2'			

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes Y / no N

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD
DRILLERS LIC. NO. MGD046
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION): Michael W. Kube
LIC. NO.

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes Y (44) / no N (44)
TYPE OF GROUTING MATERIAL (Circle one): CEMENT CM (45 46) BENTONITE CLAY BC (45 46)
NO. OF BAGS 1 NO. OF POUNDS
GALLONS OF WATER
DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. (48 TOP 52) to 1 ft. (54 BOTTOM 58) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE: P L (60 61) — Nominal diameter top (main) casing (nearest inch): 2 (63 64) — Total depth of main casing (nearest foot): 2 (66 70)

OTHER CASING (if used)
EACH CASING — diameter inch — depth (feet) from — to

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

		DEPTH (nearest ft.)	
EACH SCREEN 1	P L (8 9)	2 (11 15)	12 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 3
DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK from 1 to 12'
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) TELESCOPE CASING — (E.R.O.S.) (72) LOG INDICATOR — W Q (74 75 76) OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8 9)
PUMPING RATE (gal. per min.): 1 (11 15)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING ft. (17 20)
WHEN PUMPING ft. (22 25)

TYPE OF PUMP USED (for test)
- A air (27)
- P piston (27)
- T turbine (27)
- C centrifugal (27)
- R rotary (27)
- O other (descri below) (27)
- J jet (27)
- S submersible (27)

piezometer

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)
PUMP HORSE POWER (37 41)
PUMP COLUMN LENGTH (nearest ft.) (43 47)
CASING HEIGHT (circle appropriate box and enter casing height): + above (49) / − below (49) LAND SURFACE 1 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

257TW001

C 1 [illegible]

SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 99-80-W(M)

ST/CO USE ONLY
DATE Received

DATE WELL COMPLETED 03 15 99

Depth of Well [illegible] (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH-94-25[illegible]

OWNER Naval Surface Warfare Center
STREET OR RFD Indian Head Division TOWN Indian Head
SUBDIVISION SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Yellowish/brown silt, sand & gravel	0	4	
black slag and brown sand	4	8	
water @ approx 3'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes Y no N

CIRCLE APPROPRIATE LETTER

- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD

DRILLERS LIC. NO. MGD046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. ____

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y 44 no N 44

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT CM 45 46 BENTONITE CLAY BC 45 46

NO. OF BAGS 1 NO. OF POUNDS 1

GALLONS OF WATER ____

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. to 1 ft.
48 TOP 52 54 BOTTOM 58
(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

ST STEEL CO CONCRETE PL PLASTIC OT OTHER

MAIN CASING TYPE: PL (60 61)

Nominal diameter top (main) casing (nearest inch): 2 (63 64)

Total depth of main casing (nearest foot): 3 (66 70)

OTHER CASING (if used)

EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole insert appropriate code below

ST STEEL BR BRASS BRONZE HO OPEN HOLE PL PLASTIC OT OTHER

C 2

EACH SCREEN

		DEPTH (nearest ft.)	
1	PL (8 9)	3 (11 15)	8 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 6 (56 60) (NEAREST INCH)

GRAVEL PACK from 1 to 8

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74 75 76)

TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) (8 9)

PUMPING RATE (gal. per min.) 1 • (11)

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ ft. (17 20)

WHEN PUMPING ____ ft. (22 25)

TYPE OF PUMP USED (for test)

A air (27) P piston (27) T turbin (27)
C centrifugal (27) R rotary (27) O other (desc below) (27)
J jet (27) S submersible (27)

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31)

PUMP HORSE POWER (37)

PUMP COLUMN LENGTH (nearest ft.) (43)

CASING HEIGHT (circle appropriate box and enter casing height)

+ (49) above
– (49) below

LAND SURFACE 0 (50 51) (neare foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

557TW002

C 1 [redacted]

1 2 3 6

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER

ST/CO USE ONLY
DATE Received (8–13)

DATE WELL COMPLETED: 0 3 1 5 9 9 (15–20)

Depth of Well: 9.5 (22–26) (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": C H - 9 4 - 2 6 (28–35)

OWNER: Naval Surface Warfare Center (last name) Indian Head Division (first name)

STREET OR RFD: _____ TOWN: Indian Head

SUBDIVISION: _____ SECTION: _____ LOT: _____

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top soil, silt & sand	0	2	
yellow/brwon sand, silt and gravel	2	6	
orange silt & clay, some sand	6	6	
dark brwon sand & silt	6	9.5	
water @ approx 6.5			

NUMBER OF UNSUCCESSFUL WELLS: _____

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER

- **A** A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- **E** ELECTRIC LOG OBTAINED
- **P** TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD

DRILLERS LIC. NO. MGD046

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. _____

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [C M] (45 46) BENTONITE CLAY [B C] (45 46)

NO. OF BAGS _____ NO. OF POUNDS _____

GALLONS OF WATER _____

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (48 TOP 52) ft. to 3.5 (54 BOTTOM 58) ft.

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
P L (60 61)	2 (63 64)	5.5 (66 70)

OTHER CASING (if used)

EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole insert appropriate code below

[S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2 (1 2)

EACH SCREEN		DEPTH (nearest ft.)	
1	P L (8 9)	5.5 (11 15)	9.5 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 _____ 3 _____

DIAMETER OF SCREEN 6 (56 60) (NEAREST INCH)

GRAVEL PACK from 3.5 to 9.5

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 [ ] (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T	(E.R.O.S.)	W Q
70 [ ]	72 [ ]	74 75 76 [ ]
TELESCOPE CASING	LOG INDICATOR	OTHER DATA

C 3 (1 2)

PUMPING TEST

HOURS PUMPED (nearest hour): 1 (8 9)

PUMPING RATE (gal. per min.): 1 (11 15)

METHOD USED TO MEASURE PUMPING RATE _____

WATER LEVEL (distance from land surface)

BEFORE PUMPING (17 20) ft.

WHEN PUMPING (22 25) ft.

TYPE OF PUMP USED (for test)

[A] air (27) [P] piston (27) [T] turbine (27)

[C] centrifugal (27) [R] rotary (27) [O] other (describ below) (27)

[J] jet (27) [S] submersible (27) PIEZOMETER

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. [ ] (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)

PUMP HORSE POWER (37 41)

PUMP COLUMN LENGTH (nearest ft.) (43 47)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] (49) above / [–] (49) below LAND SURFACE 0 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND / OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

N

S67TW003

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

****

WATER WELL ABANDONMENT-SEALING REPORT FORM

****

SUBMIT COPIES OF COMPLETED FORM TO:

* COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
* WELL OWNER
* MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

$57TW001

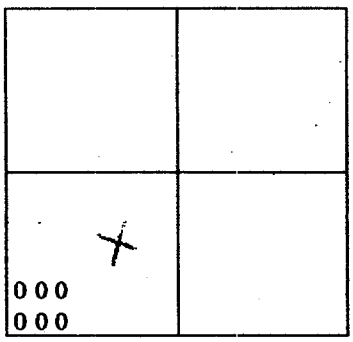
DATE WELL ABANDONED: 3/16/99 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 2598
* PERMIT NUMBER OF REPLACEMENT WELL — —
* PERSON ABANDONING WELL: Bob Jordan

WELL DRILLERS LICENSE NUMBER: AWD596
CIRCLE: MWD/MSD/MGD

* OWNER'S NAME: Naval Surface Warfare Center
* WELL LOCATION: Hersey Road
  COUNTY: Charles County
  NEAREST TOWN: Indian Head
  TAX MAP _____ BLOCK _____ PARCEL _____
  SUBDIVISION: _____
  SECTION: _____ LOT: _____
  NEAREST ROAD: Thomas Road

MARYLAND GRID COORDINATES
BOX NUMBER E 750 N 270 <



SHOW WELL LOCATION BY X WITHIN BOX

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
X BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
X TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL X PLASTIC
_____ CONCRETE _____ OTHER (specify) _____

* SIZE OF CASING: 2 INCHES IN DIAMETER
* DEPTH OF WELL: 12 FEET DEEP

WAS ANY CASING REMOVED? ____ YES X NO
if yes, length removed, in feet: _____

* WAS CASING RIPPED OR PERFORATED? ____ YES X NO

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
bentonite/cement	12	0'

Michael W. Parker MGD046 MWD/MSD/MGD 4/1/99

SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

****

WATER WELL ABANDONMENT-SEALING REPORT FORM

****

SUBMIT COPIES OF COMPLETED FORM TO:

* COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
* WELL OWNER
* MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

$57TW002

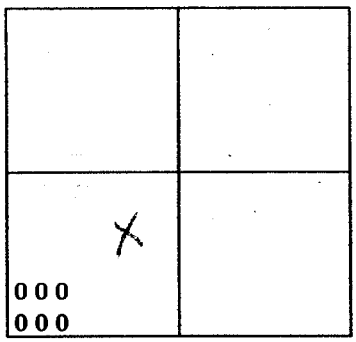
DATE WELL ABANDONED: 3/16/99 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 2599
* PERMIT NUMBER OF REPLACEMENT WELL — —
* PERSON ABANDONING WELL: Bob Jordan

WELL DRILLERS LICENSE NUMBER: AWD596
CIRCLE: MWD/MSD/MG

* OWNER'S NAME: Naval Surface Warfare Center
* WELL LOCATION: Hersey Road
COUNTY: Charles County
NEAREST TOWN: Indian Head
TAX MAP _____ BLOCK _____ PARCEL _____
SUBDIVISION: _____
SECTION: _____ LOT: _____
NEAREST ROAD: Thomas Road

MARYLAND GRID COORDINATES
BOX NUMBER E 750 N 270 <



SHOW WELL LOCATION BY X WITHIN BOX

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
__X__ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
__X__ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL __X__ PLASTIC
_____ CONCRETE _____ OTHER (specify) _____

* SIZE OF CASING: 2 INCHES IN DIAMETER
* DEPTH OF WELL: 8 FEET DEEP
* WAS ANY CASING REMOVED? ____ YES __X__ NO
if yes, length removed, in feet: _____
* WAS CASING RIPPED OR PERFORATED? ____ YES __X__ NO

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
bentonite/cement	8	0'

Michael W. Rabe MGD046 MWD/MSD/MGD 4/1/99

SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

****

WATER WELL ABANDONMENT-SEALING REPORT FORM

****

SUBMIT COPIES OF COMPLETED FORM TO:

- ★ COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
- ★ WELL OWNER
- ★ MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

$57TW003

DATE WELL ABANDONED: 3/16/99 (month/day/year)

★ PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 2600

★ PERMIT NUMBER OF REPLACEMENT WELL — —

★ PERSON ABANDONING WELL: Bob Jordan

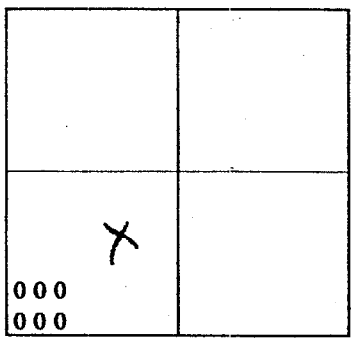
WELL DRILLERS LICENSE NUMBER: AWD596

CIRCLE: MWD/MSD/MG

★ OWNER'S NAME: Naval Surface Warfare Center

★ WELL LOCATION: Hersey Road
COUNTY: Charles County
NEAREST TOWN: Indian Head
TAX MAP _____ BLOCK _____ PARCEL _____
SUBDIVISION: _____
SECTION: _____ LOT: _____
NEAREST ROAD: Thomas Road

MARYLAND GRID COORDINATES
BOX NUMBER E 750 N 270 <



SHOW WELL LOCATION BY X WITHIN BOX

★ TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
X BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

★ USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
X TEST/OBSERVATION

★ TYPE OF CASING:

_____ STEEL X PLASTIC
_____ CONCRETE _____ OTHER (specify)
_____

★ SIZE OF CASING: 2 INCHES IN DIAMETER

★ DEPTH OF WELL: 9.5 FEET DEEP

WAS ANY CASING REMOVED? ____ YES X NO
if yes, length removed, in feet: _____

★ WAS CASING RIPPED OR PERFORATED? ____ YES X NO

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
bentonite/cement	9.5	0'

Michael W. Nelson MGD046 MWD/MSD/MGD 4/1/99

SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

DENV 828 JULY 1993 2) WELL OWNER

APPENDIX H

Analytical Database

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0010101	S57SS0020101	S57SS0040101	S57SS0050101	S57SS0070101	S57SS0080101	S57SS0080101-D	S57SS0090101
LOCATION:	S57MW001/SB001	S57MW003/SB002	S57MW007/SB004	S57MW009/SB005	S57SB007	S57MW011/SB008	S57MW011/SB008	S57SB009
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	10/7/98	10/8/98	1/10/99	1/12/99	10/7/98	10/8/98	10/8/98	1/22/99
ASSOCIATED DUPLICATE:						S57SS0080101-D	S57SS0080101	S57SS0090101-D
VOLATILES (µg/kg)								
1,1,1-TRICHLOROETHANE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
1,1,2,2-TETRACHLOROETHANE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
1,1,2-TRICHLOROETHANE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
1,1-DICHLOROETHANE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
1,1-DICHLOROETHENE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
1,2-DICHLOROETHANE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
1,2-DICHLOROPROPANE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
2-BUTANONE	11 UJ	11 UJ	11 U	11 U	14 UJ	11 UJ	11 UJ	11 U
2-HEXANONE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
4-METHYL-2-PENTANONE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
ACETONE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
BENZENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
BROMODICHLOROMETHANE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
BROMOFORM	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
BROMOMETHANE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CARBON DISULFIDE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CARBON TETRACHLORIDE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CHLOROBENZENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CHLOROETHANE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CHLOROFORM	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CHLOROMETHANE	11 U	11 U	11 U	11 U	14 U	11 U	11 U	11 U
CIS-1,2-DICHLOROETHENE	11 UJ	11 U	2 J	11 U	4 J	11 U	11 U	11 U
CIS-1,3-DICHLOROPROPENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
DIBROMOCHLOROMETHANE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
ETHYL ETHER	11 U	11 U	11 U	11 U	14 U	11 UJ	11 U	11 U
ETHYLBENZENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
METHYLENE CHLORIDE	12 B	17 B	8 B	4 B	27 B	44 B	22 B	11 B
STYRENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
TETRACHLOROETHENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
TOLUENE	11 UJ	11 U	1 J	11 U	14 U	11 U	11 U	11 U
TRANS-1,2-DICHLOROETHENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
TRANS-1,3-DICHLOROPROPENE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
TRICHLOROETHENE	13 J	11 U	10 J	11 U	93	64	34	11 U
VINYL CHLORIDE	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
XYLENES, TOTAL	11 UJ	11 U	11 U	11 U	14 U	11 U	11 U	11 U
SEMIVOLATILES (µg/kg)								
1,2,4-TRICHLOROBENZENE				370 U	480 U	380 U	370 U	
1,2-DICHLOROBENZENE				370 U	480 U	380 U	370 U	
1,3-DICHLOROBENZENE				370 U	480 U	380 U	370 U	
1,4-DICHLOROBENZENE				370 U	480 U	380 U	370 U	
2,2'-OXYBIS(1-CHLOROPROPANE				370 U	480 U	380 U	370 U	
2,4,5-TRICHLOROPHENOL				930 U	1200 U	950 U	940 U	
2,4,6-TRICHLOROPHENOL				370 U	480 U	380 U	370 U	
2,4-DICHLOROPHENOL				370 U	480 U	380 U	370 U	

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0010101	S57SS0020101	S57SS0040101	S57SS0050101	S57SS0070101	S57SS0080101	S57SS0080101-D	S57SS0090101
LOCATION:	S57MW001/SB001	S57MW003/SB002	S57MW007/SB004	S57MW009/SB005	S57SB007	S57MW011/SB008	S57MW011/SB008	S57SB009
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	10/7/98	10/8/98	1/10/99	1/12/99	10/7/98	10/8/98	10/8/98	1/22/99
ASSOCIATED DUPLICATE:						S57SS0080101-D	S57SS0080101	S57SS0090101-D
2,4-DIMETHYLPHENOL				370 U	480 U	380 U	370 U	
2,4-DINITROPHENOL				930 U	1200 UJ	950 UJ	940 UJ	
2,4-DINITROTOLUENE				370 U	480 U	380 U	370 U	
2,6-DINITROTOLUENE				370 U	480 U	380 U	370 U	
2-CHLORONAPHTHALENE				370 U	480 U	380 U	370 U	
2-CHLOROPHENOL				370 U	480 U	380 U	370 U	
2-METHYLNAPHTHALENE				37 J	480 U	380 U	370 U	
2-METHYLPHENOL				370 U	480 U	380 U	370 U	
2-NITROANILINE				930 U	1200 U	950 U	940 U	
2-NITROPHENOL				370 U	480 U	380 U	370 U	
3,3'-DICHLOROBENZIDINE				370 U	480 U	380 U	370 U	
3-NITROANILINE				930 U	1200 UJ	950 UJ	940 UJ	
4,6-DINITRO-2-METHYLPHENOL				930 U	1200 U	950 U	940 U	
4-BROMOPHENYL PHENYL ETHER				370 U	480 U	380 U	370 U	
4-CHLORO-3-METHYLPHENOL				370 U	480 U	380 U	370 U	
4-CHLOROANILINE				370 U	480 U	380 U	370 U	
4-CHLOROPHENYL PHENYL ETHER				370 U	480 U	380 U	370 U	
4-METHYLPHENOL				370 U	480 U	380 U	370 U	
4-NITROANILINE				930 U	1200 U	950 U	940 U	
4-NITROPHENOL				930 U	1200 U	950 U	940 U	
ACENAPHTHENE				370 U	480 U	380 U	370 U	
ACENAPHTHYLENE				140 J	480 U	380 U	370 U	
ANTHRACENE				240 J	51 J	380 U	370 U	
BENZO(A)ANTHRACENE				2300	200 J	150 J	370 U	
BENZO(A)PYRENE				1700	130 J	150 J	370 U	
BENZO(B)FLUORANTHENE				4200	200 J	280 J	370 U	
BENZO(G,H,I)PERYLENE				450	61 J	52 J	370 U	
BENZO(K)FLUORANTHENE				1400	83 J	98 J	370 U	
BIS(2-CHLOROETHOXY)METHANE				370 U	480 U	380 U	370 U	
BIS(2-CHLOROETHYL)ETHER				370 U	480 U	380 U	370 U	
BIS(2-ETHYLHEXYL)PHTHALATE				120 J	480 U	41 J	370 U	
BUTYLBENZYL PHTHALATE				370 U	480 U	380 U	370 U	
CARBAZOLE				99 J	480 U	380 U	370 U	
CHRYSENE				2200	200 J	180 J	370 U	
DI-N-BUTYL PHTHALATE				370 U	480 U	380 U	370 U	
DI-N-OCTYL PHTHALATE				370 U	480 U	380 U	370 U	
DIBENZO(A,H)ANTHRACENE				350 J	480 U	380 U	370 U	
DIBENZOFURAN				370 U	480 U	380 U	370 U	
DIETHYL PHTHALATE				370 U	480 U	380 U	370 U	
DIMETHYL PHTHALATE				370 U	480 U	380 U	370 U	
FLUORANTHENE				1800	310 J	300 J	370 U	
FLUORENE				39 J	480 U	380 U	370 U	
HEXACHLOROBENZENE				370 U	480 U	380 U	370 U	
HEXACHLOROBUTADIENE				370 U	480 U	380 U	370 U	
HEXACHLOROCYCLOPENTADIENE				370 U	480 UJ	380 UJ	370 UJ	

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0010101	S57SS0020101	S57SS0040101	S57SS0050101	S57SS0070101	S57SS0080101	S57SS0080101-D	S57SS0090101
LOCATION:	S57MW001/SB001	S57MW003/SB002	S57MW007/SB004	S57MW009/SB005	S57SB007	S57MW011/SB008	S57MW011/SB008	S57SB009
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	10/7/98	10/8/98	1/10/99	1/12/99	10/7/98	10/8/98	10/8/98	1/22/99
ASSOCIATED DUPLICATE:						S57SS0080101-D	S57SS0080101	S57SS0090101-D
HEXACHLOROETHANE				370 U	480 U	380 U	370 U	
INDENO(1,2,3-CD)PYRENE				970	79 J	79 J	370 U	
ISOPHORONE				370 U	480 U	380 U	370 U	
N-NITROSO-DI-N-PROPYLAMINE				370 U	480 U	380 U	370 U	
N-NITROSODIPHENYLAMINE				370 U	480 U	380 U	370 U	
NAPHTHALENE				38 J	480 U	380 U	370 U	
NITROBENZENE				370 U	480 U	380 U	370 U	
PENTACHLOROPHENOL				930 U	1200 U	950 U	940 U	
PHENANTHRENE				490	310 J	180 J	370 U	
PHENOL				370 U	480 U	380 U	370 U	
PYRENE				2500	480	310 J	370 U	
PESTICIDES/PCBs (µg/kg)								
4,4'-DDD				12	4.8 U	3.8 U	3.8 U	
4,4'-DDE				61	4.8 U	3.8 U	3.8 U	
4,4'-DDT				150 J	4.8 U	3.8 U	3.8 U	
ALDRIN				1.9 U	2.4 U	1.9 U	1.9 U	
ALPHA-BHC				1.9 U	2.4 U	1.9 U	1.9 U	
ALPHA-CHLORDANE				1.9 U	2.4 U	1.9 U	1.9 U	
AROCLOR-1016				38 U	48 U	38 U	38 U	
AROCLOR-1221				75 U	96 U	76 U	75 U	
AROCLOR-1232				38 U	48 U	38 U	38 U	
AROCLOR-1242				38 U	48 U	38 U	38 U	
AROCLOR-1248				38 U	48 U	38 U	38 U	
AROCLOR-1254				38 U	48 U	38 U	38 U	
AROCLOR-1260				38 U	48 U	38 U	38 U	
BETA-BHC				1.9 U	2.4 U	1.9 U	1.9 U	
DELTA-BHC				1.9 U	2.4 U	1.9 U	1.9 U	
DIELDRIN				3.8 U	4.8 U	3.8 U	3.8 U	
ENDOSULFAN I				1.9 U	2.4 U	1.9 U	1.9 U	
ENDOSULFAN II				3.8 U	4.8 U	3.8 U	3.8 U	
ENDOSULFAN SULFATE				3.8 U	4.8 U	3.8 U	3.8 U	
ENDRIN				3.8 U	4.8 U	3.8 U	3.8 U	
ENDRIN ALDEHYDE				3.8 U	4.8 U	3.8 U	3.8 U	
ENDRIN KETONE				3.8 U	4.8 U	3.8 U	3.8 U	
GAMMA-BHC (LINDANE)				1.9 U	2.4 U	1.9 U	1.9 U	
GAMMA-CHLORDANE				5.3 J	2.4 U	1.9 U	1.9 U	
HEPTACHLOR				1.9 U	2.4 U	1.9 U	1.9 U	
HEPTACHLOR EPOXIDE				1.9 U	2.4 U	1.9 U	1.9 U	
METHOXYCHLOR				19 U	24 U	19 U	19 U	
TOXAPHENE				190 U	240 U	190 U	190 U	
EXPLOSIVES (µg/kg)								
1,3,5-TRINITROBENZENE				250 U	250 U	250 U	250 U	
1,3-DINITROBENZENE				250 U	250 U	250 U	250 U	
2,4,6-TRINITROTOLUENE				250 U	250 U	250 U	250 U	
2,4-DINITROTOLUENE				250 U	250 U	250 U	250 U	

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0010101	S57SS0020101	S57SS0040101	S57SS0050101	S57SS0070101	S57SS0080101	S57SS0080101-D	S57SS0090101
LOCATION:	S57MW001/SB001	S57MW003/SB002	S57MW007/SB004	S57MW009/SB005	S57SB007	S57MW011/SB008	S57MW011/SB008	S57SB009
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	10/7/98	10/8/98	1/10/99	1/12/99	10/7/98	10/8/98	10/8/98	1/22/99
ASSOCIATED DUPLICATE:						S57SS0080101-D	S57SS0080101	S57SS0090101-D
2,6-DINITROTOLUENE				250 U	250 U	250 U	250 U	
2-AMINO-4,6-DINITROTOLUENE				250 U	250 U	250 U	250 U	
2-NITROTOLUENE				500 U	500 U	500 U	500 U	
3-NITROTOLUENE				500 U	500 U	500 U	500 U	
4-AMINO-2,6-DINITROTOLUENE				250 U	250 U	250 U	250 U	
4-NITROTOLUENE				500 U	500 U	500 U	500 U	
HMX				500 U	500 U	500 U	500 U	
NITROBENZENE				250 U	250 U	250 U	250 U	
NITROCELLULOSE				299000 L	191000	116000		
NITROGLYCERIN				5000 U	5000 U	5000 U	5000 U	
NITROGUANIDINE				0.51 U	0.51 U	0.51 U		
RDX				500 U	500 U	500 U	500 U	
TETRYL				500 U	500 UJ	500 UJ	500 UJ	
INORGANICS (mg/kg)								
ALUMINUM				3640 J	9170	6130		
ANTIMONY				0.88 B	0.81 B	0.74 B		
ARSENIC				33.7	103	29.3		
BARIUM				20.7	48.2	38.8		
BERYLLIUM				0.29	0.77	0.88		
CADMIUM				0.47	0.19 U	0.80		
CALCIUM				604	3270	2130		
CHROMIUM				13.1 J	14.3	12.0		
COBALT				8.1	8.3 K	6.9 K		
COPPER				10.4	14.7	20.3		
IRON				12400	24800	20500		
LEAD				487 J	25.4 K	89.2 K		
MAGNESIUM				301	796	682		
MANGANESE				134 K	101 J	97.9 J		
MERCURY				0.09	0.03	0.10		
NICKEL				6.0	6.7 K	8.4 K		
POTASSIUM				234	828	738		
SELENIUM				0.56 L	0.38 UL	0.32 UL		
SILVER				0.11 U	0.19 U	0.16 U		
SODIUM				128 B	45.7	82.0		
THALLIUM				0.50 UL	0.58 U	0.48 U		
VANADIUM				19.1	35.7	31.4		
ZINC				69.8	45.0	261		
MISCELLANEOUS PARAMETERS								
PH				6.06	8.12	7.84		
TOTAL ORGANIC CARBON mg/kg		7790 L						50600 J

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0090101-D	S57SS0110101	S57SS0130101	S57SS0150101
LOCATION:	S57SB009	S57SB011	S57MW012/SB013	S57MW005/SB015
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	1/22/99	10/7/98	1/9/99	1/11/99
ASSOCIATED DUPLICATE:	S57SS0090101			
VOLATILES (µg/kg)				
1,1,1-TRICHLOROETHANE	11 U	11 U	11 U	12 U
1,1,2,2-TETRACHLOROETHANE	11 U	11 U	11 U	12 U
1,1,2-TRICHLOROETHANE	11 U	11 U	11 U	12 U
1,1-DICHLOROETHANE	11 U	11 U	11 U	12 U
1,1-DICHLOROETHENE	11 U	11 U	11 U	12 U
1,2-DICHLOROETHANE	11 U	11 U	11 U	12 U
1,2-DICHLOROPROPANE	11 U	11 U	11 U	12 U
2-BUTANONE	11 U	11 UJ	11 U	12 U
2-HEXANONE	11 U	11 U	11 U	12 U
4-METHYL-2-PENTANONE	11 U	11 U	11 U	12 U
ACETONE	11 U	11 U	11 U	12 U
BENZENE	11 U	11 U	11 U	12 U
BROMODICHLOROMETHANE	11 U	11 U	11 U	12 U
BROMOFORM	11 U	11 U	11 U	12 U
BROMOMETHANE	11 U	11 U	11 U	12 U
CARBON DISULFIDE	11 U	11 U	11 U	12 U
CARBON TETRACHLORIDE	11 U	11 U	11 U	12 U
CHLOROBENZENE	11 U	11 U	11 U	12 U
CHLOROETHANE	11 U	11 U	11 U	12 U
CHLOROFORM	11 U	11 U	11 U	12 U
CHLOROMETHANE	11 U	11 U	11 U	12 U
CIS-1,2-DICHLOROETHENE	11 U	11 U	11 U	12 U
CIS-1,3-DICHLOROPROPENE	11 U	11 U	11 U	12 U
DIBROMOCHLOROMETHANE	11 U	11 U	11 U	12 U
ETHYL ETHER	11 U	11 U	11 U	12 U
ETHYLBENZENE	11 U	11 U	11 U	12 U
METHYLENE CHLORIDE	12 B	11 B	8 B	7 B
STYRENE	11 U	11 U	11 U	12 U
TETRACHLOROETHENE	11 U	11 U	11 U	12 U
TOLUENE	11 U	11 U	11 U	12 U
TRANS-1,2-DICHLOROETHENE	11 U	11 U	11 U	12 U
TRANS-1,3-DICHLOROPROPENE	11 U	11 U	11 U	12 U
TRICHLOROETHENE	11 U	11 U	11 U	12 U
VINYL CHLORIDE	11 U	11 U	11 U	12 U
XYLENES, TOTAL	11 U	11 U	11 U	12 U
SEMIVOLATILES (µg/kg)				
1,2,4-TRICHLOROBENZENE			380 U	
1,2-DICHLOROBENZENE			380 U	
1,3-DICHLOROBENZENE			380 U	
1,4-DICHLOROBENZENE			380 U	
2,2'-OXYBIS(1-CHLOROPROPANE			380 U	
2,4,5-TRICHLOROPHENOL			950 U	
2,4,6-TRICHLOROPHENOL			380 U	
2,4-DICHLOROPHENOL			380 U	

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0090101-D	S57SS0110101	S57SS0130101	S57SS0150101
LOCATION:	S57SB009	S57SB011	S57MW012/SB013	S57MW005/SB015
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	1/22/99	10/7/98	1/9/99	1/11/99
ASSOCIATED DUPLICATE:	S57SS0090101			
2,4-DIMETHYLPHENOL			380 U	
2,4-DINITROPHENOL			950 U	
2,4-DINITROTOLUENE			380 U	
2,6-DINITROTOLUENE			380 U	
2-CHLORONAPHTHALENE			380 U	
2-CHLOROPHENOL			380 U	
2-METHYLNAPHTHALENE			380 U	
2-METHYLPHENOL			380 U	
2-NITROANILINE			950 U	
2-NITROPHENOL			380 U	
3,3'-DICHLOROBENZIDINE			380 U	
3-NITROANILINE			950 U	
4,6-DINITRO-2-METHYLPHENOL			950 U	
4-BROMOPHENYL PHENYL ETHER			380 U	
4-CHLORO-3-METHYLPHENOL			380 U	
4-CHLOROANILINE			380 U	
4-CHLOROPHENYL PHENYL ETHER			380 U	
4-METHYLPHENOL			380 U	
4-NITROANILINE			950 U	
4-NITROPHENOL			950 U	
ACENAPHTHENE			380 U	
ACENAPHTHYLENE			380 U	
ANTHRACENE			380 U	
BENZO(A)ANTHRACENE			380 U	
BENZO(A)PYRENE			380 U	
BENZO(B)FLUORANTHENE			63 J	
BENZO(G,H,I)PERYLENE			380 U	
BENZO(K)FLUORANTHENE			380 U	
BIS(2-CHLOROETHOXY)METHANE			380 U	
BIS(2-CHLOROETHYL)ETHER			380 U	
BIS(2-ETHYLHEXYL)PHTHALATE			120 J	
BUTYLBENZYL PHTHALATE			380 U	
CARBAZOLE			380 U	
CHRYSENE			380 U	
DI-N-BUTYL PHTHALATE			380 U	
DI-N-OCTYL PHTHALATE			380 U	
DIBENZO(A,H)ANTHRACENE			380 U	
DIBENZOFURAN			380 U	
DIETHYL PHTHALATE			380 U	
DIMETHYL PHTHALATE			380 U	
FLUORANTHENE			55 J	
FLUORENE			380 U	
HEXACHLOROBENZENE			380 U	
HEXACHLOROBUTADIENE			380 U	
HEXACHLOROCYCLOPENTADIENE			380 U	

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0090101-D	S57SS0110101	S57SS0130101	S57SS0150101
LOCATION:	S57SB009	S57SB011	S57MW012/SB013	S57MW005/SB015
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	1/22/99	10/7/98	1/9/99	1/11/99
ASSOCIATED DUPLICATE:	S57SS0090101			
HEXACHLOROETHANE			380 U	
INDENO(1,2,3-CD)PYRENE			380 U	
ISOPHORONE			380 U	
N-NITROSO-DI-N-PROPYLAMINE			380 U	
N-NITROSODIPHENYLAMINE			380 U	
NAPHTHALENE			380 U	
NITROBENZENE			380 U	
PENTACHLOROPHENOL			950 U	
PHENANTHRENE			380 U	
PHENOL			380 U	
PYRENE			50 J	
PESTICIDES/PCBs (µg/kg)				
4,4'-DDD			3.8 U	
4,4'-DDE			3.8 U	
4,4'-DDT			3.8 U	
ALDRIN			1.9 U	
ALPHA-BHC			1.9 U	
ALPHA-CHLORDANE			1.9 U	
AROCLOR-1016			38 U	
AROCLOR-1221			76 U	
AROCLOR-1232			38 U	
AROCLOR-1242			38 U	
AROCLOR-1248			38 U	
AROCLOR-1254			38 U	
AROCLOR-1260			38 U	
BETA-BHC			1.9 U	
DELTA-BHC			1.9 U	
DIELDRIN			3.8 U	
ENDOSULFAN I			1.9 U	
ENDOSULFAN II			3.8 U	
ENDOSULFAN SULFATE			3.8 UJ	
ENDRIN			3.8 U	
ENDRIN ALDEHYDE			3.8 U	
ENDRIN KETONE			3.8 U	
GAMMA-BHC (LINDANE)			1.9 U	
GAMMA-CHLORDANE			1.9 U	
HEPTACHLOR			1.9 U	
HEPTACHLOR EPOXIDE			1.9 U	
METHOXYCHLOR			19 U	
TOXAPHENE			190 U	
EXPLOSIVES (µg/kg)				
1,3,5-TRINITROBENZENE			227.3 U	
1,3-DINITROBENZENE			227.3 U	
2,4,6-TRINITROTOLUENE			227.3 U	
2,4-DINITROTOLUENE			227.3 U	

ANALYTICAL RESULTS - SURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SS0090101-D	S57SS0110101	S57SS0130101	S57SS0150101
LOCATION:	S57SB009	S57SB011	S57MW012/SB013	S57MW005/SB015
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
SAMPLE DATE:	1/22/99	10/7/98	1/9/99	1/11/99
ASSOCIATED DUPLICATE:	S57SS0090101			
2,6-DINITROTOLUENE			227.3 U	
2-AMINO-4,6-DINITROTOLUENE			227.3 U	
2-NITROTOLUENE			454.5 U	
3-NITROTOLUENE			454.5 U	
4-AMINO-2,6-DINITROTOLUENE			227.3 U	
4-NITROTOLUENE			454.5 U	
HMX			454.5 U	
NITROBENZENE			227.3 U	
NITROCELLULOSE			41000 UR	
NITROGLYCERIN			4545.4 U	
NITROGUANIDINE			0.51 U	
RDX			454.5 U	
TETRYL			454.5 U	
INORGANICS (mg/kg)				
ALUMINUM			6660	
ANTIMONY			0.87 L	
ARSENIC			9.6	
BARIUM			26.8	
BERYLLIUM			0.27	
CADMIUM			0.21	
CALCIUM			1580	
CHROMIUM			22.7	
COBALT			10.3	
COPPER			15.0	
IRON			13000	
LEAD			120	
MAGNESIUM			9150 J	
MANGANESE			124 L	
MERCURY			0.08	
NICKEL			135 J	
POTASSIUM			398	
SELENIUM			0.33 U	
SILVER			0.14 U	
SODIUM			144	
THALLIUM			0.71 U	
VANADIUM			20.7	
ZINC			94.4	
MISCELLANEOUS PARAMETERS				
PH			8.36	
TOTAL ORGANIC CARBON **mg/kg**	39600 J			

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0010101	S57SB0010201	S57SB0020101	S57SB0020201	S57SB0020301	S57SB0020401	S57SB0020501
LOCATION:	S57MW001/SB001	S57MW001/SB001	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002
DEPTH INTERVAL (FEET):	2 - 4	4 - 6	4 - 6	8 - 10	14 - 16	6 - 8	24 - 25
SAMPLE DATE:	10/7/98	10/7/98	10/8/98	10/8/98	1/7/99	1/7/99	1/7/99
ASSOCIATED DUPLICATE:							
VOLATILES (µg/kg)							
1,1,1-TRICHLOROETHANE	12 U	13 U	14 U	12 U	2 J		
1,1,2,2-TETRACHLOROETHANE	12 U	13 U	14 U	12 U	11 UJ		
1,1,2-TRICHLOROETHANE	12 U	13 U	14 U	12 U	11 UJ		
1,1-DICHLOROETHANE	12 U	13 U	14 U	12 U	11 UJ		
1,1-DICHLOROETHENE	12 U	13 U	14 U	12 U	11 UJ		
1,2-DICHLOROETHANE	12 U	13 U	14 U	12 U	11 UJ		
1,2-DICHLOROPROPANE	12 U	13 U	14 U	12 U	11 UJ		
2-BUTANONE	12 UJ	13 UJ	14 UJ	12 UJ	11 UJ		
2-HEXANONE	12 U	13 U	14 U	12 U	11 UJ		
4-METHYL-2-PENTANONE	12 U	13 U	14 U	12 U	11 UJ		
ACETONE	16 J	13 U	14 U	12 U	11 UJ		
BENZENE	12 U	13 U	14 U	12 U	11 UJ		
BROMODICHLOROMETHANE	12 U	13 U	14 U	12 U	11 UJ		
BROMOFORM	12 U	13 U	14 U	12 U	11 UJ		
BROMOMETHANE	12 U	13 U	14 U	12 U	11 UJ		
CARBON DISULFIDE	1 J	13 U	14 U	12 U	11 UJ		
CARBON TETRACHLORIDE	12 U	13 U	14 U	12 U	11 UJ		
CHLOROBENZENE	12 U	13 U	14 U	12 U	11 UJ		
CHLOROETHANE	12 U	13 U	14 U	12 U	11 UJ		
CHLOROFORM	12 U	13 U	14 U	12 U	11 UJ		
CHLOROMETHANE	6 B	13 U	14 U	12 U	11 UJ		
CIS-1,2-DICHLOROETHENE	12 U	3 J	33	12 U	1300 J		
CIS-1,3-DICHLOROPROPENE	12 U	13 U	14 U	12 U	11 UJ		
DIBROMOCHLOROMETHANE	12 U	13 U	14 U	12 U	11 UJ		
ETHYL ETHER	12 U	13 UJ	14 U	12 U	12 J		
ETHYLBENZENE	12 U	13 U	14 U	12 U	11 UJ		
METHYLENE CHLORIDE	18 B	29 B	32 B	17 B	8 B		
STYRENE	12 U	13 U	14 U	12 U	11 UJ		
TETRACHLOROETHENE	12 U	13 U	14 U	12 U	11 UJ		
TOLUENE	12 U	13 U	14 U	12 U	11 UJ		
TRANS-1,2-DICHLOROETHENE	12 U	13 U	14 U	12 U	3 J		
TRANS-1,3-DICHLOROPROPENE	12 U	13 U	14 U	12 U	11 UJ		
TRICHLOROETHENE	12 U	3 J	810 J	12 U	20000 J		
VINYL CHLORIDE	12 U	13 U	14 U	12 U	8 J		
XYLENES, TOTAL	12 U	13 U	14 U	12 U	11 UJ		
SEMIVOLATILES (µg/kg)							
1,2,4-TRICHLOROBENZENE							
1,2-DICHLOROBENZENE							
1,3-DICHLOROBENZENE							
1,4-DICHLOROBENZENE							
2,2'-OXYBIS(1-CHLOROPROPANE							
2,4,5-TRICHLOROPHENOL							
2,4,6-TRICHLOROPHENOL							
2,4-DICHLOROPHENOL							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0010101	S57SB0010201	S57SB0020101	S57SB0020201	S57SB0020301	S57SB0020401	S57SB0020501
LOCATION:	S57MW001/SB001	S57MW001/SB001	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002
DEPTH INTERVAL (FEET):	2 - 4	4 - 6	4 - 6	8 - 10	14 - 16	6 - 8	24 - 25
SAMPLE DATE:	10/7/98	10/7/98	10/8/98	10/8/98	1/7/99	1/7/99	1/7/99
ASSOCIATED DUPLICATE:							
2,4-DIMETHYLPHENOL							
2,4-DINITROPHENOL							
2,4-DINITROTOLUENE							
2,6-DINITROTOLUENE							
2-CHLORONAPHTHALENE							
2-CHLOROPHENOL							
2-METHYLNAPHTHALENE							
2-METHYLPHENOL							
2-NITROANILINE							
2-NITROPHENOL							
3,3'-DICHLOROBENZIDINE							
3-NITROANILINE							
4,6-DINITRO-2-METHYLPHENOL							
4-BROMOPHENYL PHENYL ETHER							
4-CHLORO-3-METHYLPHENOL							
4-CHLOROANILINE							
4-CHLOROPHENYL PHENYL ETHER							
4-METHYLPHENOL							
4-NITROANILINE							
4-NITROPHENOL							
ACENAPHTHENE							
ACENAPHTHYLENE							
ANTHRACENE							
BENZO(A)ANTHRACENE							
BENZO(A)PYRENE							
BENZO(B)FLUORANTHENE							
BENZO(G,H,I)PERYLENE							
BENZO(K)FLUORANTHENE							
BIS(2-CHLOROETHOXY)METHANE							
BIS(2-CHLOROETHYL)ETHER							
BIS(2-ETHYLHEXYL)PHTHALATE							
BUTYLBENZYL PHTHALATE							
CARBAZOLE							
CHRYSENE							
DI-N-BUTYL PHTHALATE							
DI-N-OCTYL PHTHALATE							
DIBENZO(A,H)ANTHRACENE							
DIBENZOFURAN							
DIETHYL PHTHALATE							
DIMETHYL PHTHALATE							
FLUORANTHENE							
FLUORENE							
HEXACHLOROBENZENE							
HEXACHLOROBUTADIENE							
HEXACHLOROCYCLOPENTADIENE							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0010101	S57SB0010201	S57SB0020101	S57SB0020201	S57SB0020301	S57SB0020401	S57SB0020501
LOCATION:	S57MW001/SB001	S57MW001/SB001	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002
DEPTH INTERVAL (FEET):	2 - 4	4 - 6	4 - 6	8 - 10	14 - 16	6 - 8	24 - 25
SAMPLE DATE:	10/7/98	10/7/98	10/8/98	10/8/98	1/7/99	1/7/99	1/7/99
ASSOCIATED DUPLICATE:							
HEXACHLOROETHANE							
INDENO(1,2,3-CD)PYRENE							
ISOPHORONE							
N-NITROSO-DI-N-PROPYLAMINE							
N-NITROSODIPHENYLAMINE							
NAPHTHALENE							
NITROBENZENE							
PENTACHLOROPHENOL							
PHENANTHRENE							
PHENOL							
PYRENE							
PESTICIDES/PCBs (µg/kg)							
4,4'-DDD							
4,4'-DDE							
4,4'-DDT							
ALDRIN							
ALPHA-BHC							
ALPHA-CHLORDANE							
AROCLOR-1016							
AROCLOR-1221							
AROCLOR-1232							
AROCLOR-1242							
AROCLOR-1248							
AROCLOR-1254							
AROCLOR-1260							
BETA-BHC							
DELTA-BHC							
DIELDRIN							
ENDOSULFAN I							
ENDOSULFAN II							
ENDOSULFAN SULFATE							
ENDRIN							
ENDRIN ALDEHYDE							
ENDRIN KETONE							
GAMMA-BHC (LINDANE)							
GAMMA-CHLORDANE							
HEPTACHLOR							
HEPTACHLOR EPOXIDE							
METHOXYCHLOR							
TOXAPHENE							
EXPLOSIVES (µg/kg)							
1,3,5-TRINITROBENZENE							
1,3-DINITROBENZENE							
2,4,6-TRINITROTOLUENE							
2,4-DINITROTOLUENE							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0010101	S57SB0010201	S57SB0020101	S57SB0020201	S57SB0020301	S57SB0020401	S57SB0020501
LOCATION:	S57MW001/SB001	S57MW001/SB001	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002	S57MW003/SB002
DEPTH INTERVAL (FEET):	2 - 4	4 - 6	4 - 6	8 - 10	14 - 16	6 - 8	24 - 25
SAMPLE DATE:	10/7/98	10/7/98	10/8/98	10/8/98	1/7/99	1/7/99	1/7/99
ASSOCIATED DUPLICATE:							
2,6-DINITROTOLUENE							
2-AMINO-4,6-DINITROTOLUENE							
2-NITROTOLUENE							
3-NITROTOLUENE							
4-AMINO-2,6-DINITROTOLUENE							
4-NITROTOLUENE							
HMX							
NITROBENZENE							
NITROCELLULOSE							
NITROGLYCERIN							
NITROGUANIDINE							
RDX							
TETRYL							
INORGANICS (mg/kg)							
ALUMINUM							
ANTIMONY							
ARSENIC							
BARIUM							
BERYLLIUM							
CADMIUM							
CALCIUM							
CHROMIUM							
COBALT							
COPPER							
IRON							
LEAD							
MAGNESIUM							
MANGANESE							
MERCURY							
NICKEL							
POTASSIUM							
SELENIUM							
SILVER							
SODIUM							
THALLIUM							
VANADIUM							
ZINC							
MISCELLANEOUS PARAMETERS							
PH							
TOTAL ORGANIC CARBON mg/kg			8120 L	4440 UL	2260 L	10200 L	4110 UR

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0020601	S57SB0020601-D	S57SB0030101	S57SB0030101-D	S57SB0030201	S57SB0030201-D	S57SB0040101
LOCATION:	S57MW003/SB002	S57MW003/SB002	S57SB003	S57SB003	S57SB003	S57SB003	S57MW007/SB004
DEPTH INTERVAL (FEET):	18 - 20	18 - 20	3 - 4	3 - 4	4 - 6	4 - 6	6 - 8
SAMPLE DATE:	1/22/99	1/22/99	10/7/98	10/7/98	10/7/98	10/7/98	1/10/99
ASSOCIATED DUPLICATE:	S57SB0020601-D	S57SB0020601	S57SB0030101-D	S57SB0030101	S57SB0030201-D	S57SB0030201	
VOLATILES (µg/kg)							
1,1,1-TRICHLOROETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
1,1,2,2-TETRACHLOROETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
1,1,2-TRICHLOROETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
1,1-DICHLOROETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
1,1-DICHLOROETHENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
1,2-DICHLOROETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
1,2-DICHLOROPROPANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
2-BUTANONE	11 U	12 U	12 UJ	13 UJ	12 UJ	12 UJ	12 U
2-HEXANONE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
4-METHYL-2-PENTANONE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
ACETONE	11 U	12 U	12 U	13 UJ	12 U	12 U	100
BENZENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
BROMODICHLOROMETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
BROMOFORM	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
BROMOMETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CARBON DISULFIDE	11 U	12 U	12 U	13 UJ	12 U	12 U	4 J
CARBON TETRACHLORIDE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CHLOROBENZENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CHLOROETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CHLOROFORM	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CHLOROMETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CIS-1,2-DICHLOROETHENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
CIS-1,3-DICHLOROPROPENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
DIBROMOCHLOROMETHANE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
ETHYL ETHER	11 U	12 U	12 UJ	13 UJ	12 UJ	12 UJ	12 U
ETHYLBENZENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
METHYLENE CHLORIDE	11 B	11 B	23 B	23 B	26 B	45 B	8 B
STYRENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
TETRACHLOROETHENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
TOLUENE	1 J	2 J	12 U	13 UJ	12 U	12 U	12 U
TRANS-1,2-DICHLOROETHENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
TRANS-1,3-DICHLOROPROPENE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
TRICHLOROETHENE	11 U	12 U	12 U	13 UJ	12 U	12 U	2 J
VINYL CHLORIDE	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
XYLENES, TOTAL	11 U	12 U	12 U	13 UJ	12 U	12 U	12 U
SEMIVOLATILES (µg/kg)							
1,2,4-TRICHLOROBENZENE							
1,2-DICHLOROBENZENE							
1,3-DICHLOROBENZENE							
1,4-DICHLOROBENZENE							
2,2'-OXYBIS(1-CHLOROPROPANE							
2,4,5-TRICHLOROPHENOL							
2,4,6-TRICHLOROPHENOL							
2,4-DICHLOROPHENOL							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0020601	S57SB0020601-D	S57SB0030101	S57SB0030101-D	S57SB0030201	S57SB0030201-D	S57SB0040101
LOCATION:	S57MW003/SB002	S57MW003/SB002	S57SB003	S57SB003	S57SB003	S57SB003	S57MW007/SB004
DEPTH INTERVAL (FEET):	18 - 20	18 - 20	3 - 4	3 - 4	4 - 6	4 - 6	6 - 8
SAMPLE DATE:	1/22/99	1/22/99	10/7/98	10/7/98	10/7/98	10/7/98	1/10/99
ASSOCIATED DUPLICATE:	S57SB0020601-D	S57SB0020601	S57SB0030101-D	S57SB0030101	S57SB0030201-D	S57SB0030201	
2,4-DIMETHYLPHENOL							
2,4-DINITROPHENOL							
2,4-DINITROTOLUENE							
2,6-DINITROTOLUENE							
2-CHLORONAPHTHALENE							
2-CHLOROPHENOL							
2-METHYLNAPHTHALENE							
2-METHYLPHENOL							
2-NITROANILINE							
2-NITROPHENOL							
3,3'-DICHLOROBENZIDINE							
3-NITROANILINE							
4,6-DINITRO-2-METHYLPHENOL							
4-BROMOPHENYL PHENYL ETHER							
4-CHLORO-3-METHYLPHENOL							
4-CHLOROANILINE							
4-CHLOROPHENYL PHENYL ETHER							
4-METHYLPHENOL							
4-NITROANILINE							
4-NITROPHENOL							
ACENAPHTHENE							
ACENAPHTHYLENE							
ANTHRACENE							
BENZO(A)ANTHRACENE							
BENZO(A)PYRENE							
BENZO(B)FLUORANTHENE							
BENZO(G,H,I)PERYLENE							
BENZO(K)FLUORANTHENE							
BIS(2-CHLOROETHOXY)METHANE							
BIS(2-CHLOROETHYL)ETHER							
BIS(2-ETHYLHEXYL)PHTHALATE							
BUTYLBENZYL PHTHALATE							
CARBAZOLE							
CHRYSENE							
DI-N-BUTYL PHTHALATE							
DI-N-OCTYL PHTHALATE							
DIBENZO(A,H)ANTHRACENE							
DIBENZOFURAN							
DIETHYL PHTHALATE							
DIMETHYL PHTHALATE							
FLUORANTHENE							
FLUORENE							
HEXACHLOROBENZENE							
HEXACHLOROBUTADIENE							
HEXACHLOROCYCLOPENTADIENE							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0020601	S57SB0020601-D	S57SB0030101	S57SB0030101-D	S57SB0030201	S57SB0030201-D	S57SB0040101
LOCATION:	S57MW003/SB002	S57MW003/SB002	S57SB003	S57SB003	S57SB003	S57SB003	S57MW007/SB004
DEPTH INTERVAL (FEET):	18 - 20	18 - 20	3 - 4	3 - 4	4 - 6	4 - 6	6 - 8
SAMPLE DATE:	1/22/99	1/22/99	10/7/98	10/7/98	10/7/98	10/7/98	1/10/99
ASSOCIATED DUPLICATE:	S57SB0020601-D	S57SB0020601	S57SB0030101-D	S57SB0030101	S57SB0030201-D	S57SB0030201	
HEXACHLOROETHANE							
INDENO(1,2,3-CD)PYRENE							
ISOPHORONE							
N-NITROSO-DI-N-PROPYLAMINE							
N-NITROSODIPHENYLAMINE							
NAPHTHALENE							
NITROBENZENE							
PENTACHLOROPHENOL							
PHENANTHRENE							
PHENOL							
PYRENE							
PESTICIDES/PCBs (µg/kg)							
4,4'-DDD							
4,4'-DDE							
4,4'-DDT							
ALDRIN							
ALPHA-BHC							
ALPHA-CHLORDANE							
AROCLOR-1016							
AROCLOR-1221							
AROCLOR-1232							
AROCLOR-1242							
AROCLOR-1248							
AROCLOR-1254							
AROCLOR-1260							
BETA-BHC							
DELTA-BHC							
DIELDRIN							
ENDOSULFAN I							
ENDOSULFAN II							
ENDOSULFAN SULFATE							
ENDRIN							
ENDRIN ALDEHYDE							
ENDRIN KETONE							
GAMMA-BHC (LINDANE)							
GAMMA-CHLORDANE							
HEPTACHLOR							
HEPTACHLOR EPOXIDE							
METHOXYCHLOR							
TOXAPHENE							
EXPLOSIVES (µg/kg)							
1,3,5-TRINITROBENZENE							
1,3-DINITROBENZENE							
2,4,6-TRINITROTOLUENE							
2,4-DINITROTOLUENE							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0020601	S57SB0020601-D	S57SB0030101	S57SB0030101-D	S57SB0030201	S57SB0030201-D	S57SB0040101
LOCATION:	S57MW003/SB002	S57MW003/SB002	S57SB003	S57SB003	S57SB003	S57SB003	S57MW007/SB004
DEPTH INTERVAL (FEET):	18 - 20	18 - 20	3 - 4	3 - 4	4 - 6	4 - 6	6 - 8
SAMPLE DATE:	1/22/99	1/22/99	10/7/98	10/7/98	10/7/98	10/7/98	1/10/99
ASSOCIATED DUPLICATE:	S57SB0020601-D	S57SB0020601	S57SB0030101-D	S57SB0030101	S57SB0030201-D	S57SB0030201	
2,6-DINITROTOLUENE							
2-AMINO-4,6-DINITROTOLUENE							
2-NITROTOLUENE							
3-NITROTOLUENE							
4-AMINO-2,6-DINITROTOLUENE							
4-NITROTOLUENE							
HMX							
NITROBENZENE							
NITROCELLULOSE							
NITROGLYCERIN							
NITROGUANIDINE							
RDX							
TETRYL							
INORGANICS (mg/kg)							
ALUMINUM							
ANTIMONY							
ARSENIC							
BARIUM							
BERYLLIUM							
CADMIUM							
CALCIUM							
CHROMIUM							
COBALT							
COPPER							
IRON							
LEAD							
MAGNESIUM							
MANGANESE							
MERCURY							
NICKEL							
POTASSIUM							
SELENIUM							
SILVER							
SODIUM							
THALLIUM							
VANADIUM							
ZINC							
MISCELLANEOUS PARAMETERS							
PH							
TOTAL ORGANIC CARBON mg/kg	6790 J	1630 UJ					

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0040201	S57SB0040301	S57SB0040301-D	S57SB0050101	S57SB0050201	S57SB0050201-D	S57SB0050301
LOCATION:	S57MW007/SB004	S57MW007/SB004	S57MW007/SB004	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005
DEPTH INTERVAL (FEET):	4 - 5	14 - 16	14 - 16	2 - 4	4 - 6	4 - 6	16 - 18
SAMPLE DATE:	1/10/99	1/10/99	1/10/99	1/12/99	1/12/99	1/12/99	1/12/99
ASSOCIATED DUPLICATE:		S57SB0040301-D	S57SB0040301		S57SB0050201-D	S57SB0050201	
VOLATILES (µg/kg)							
1,1,1-TRICHLOROETHANE	12 U	13 U	14 U	12 U	12 U		13 U
1,1,2,2-TETRACHLOROETHANE	12 U	13 U	14 U	12 U	12 U		13 U
1,1,2-TRICHLOROETHANE	12 U	13 U	14 U	12 U	12 U		13 U
1,1-DICHLOROETHANE	12 U	13 U	14 U	12 U	12 U		13 U
1,1-DICHLOROETHENE	12 U	13 U	14 U	12 U	12 U		13 U
1,2-DICHLOROETHANE	12 U	13 U	14 U	12 U	12 U		13 U
1,2-DICHLOROPROPANE	12 U	13 U	14 U	12 U	12 U		13 U
2-BUTANONE	12 U	13 U	14 U	12 U	12 U		13 U
2-HEXANONE	12 U	13 U	14 U	12 U	12 U		13 U
4-METHYL-2-PENTANONE	12 U	13 U	14 U	12 U	12 U		13 U
ACETONE	20 J	21 J	14 U	12 U	2200 J		13 U
BENZENE	12 U	13 U	14 U	12 U	12 U		13 U
BROMODICHLOROMETHANE	12 U	13 U	14 U	12 U	12 U		13 U
BROMOFORM	12 U	13 U	14 U	12 U	12 U		13 U
BROMOMETHANE	12 U	13 U	14 U	12 U	12 U		13 U
CARBON DISULFIDE	1 J	13 U	14 U	12 U	12 U		13 U
CARBON TETRACHLORIDE	12 U	13 U	14 U	12 U	12 U		13 U
CHLOROBENZENE	12 U	13 U	14 U	12 U	12 U		13 U
CHLOROETHANE	12 U	13 U	14 U	12 U	12 U		13 U
CHLOROFORM	12 U	13 U	14 U	12 U	12 U		13 U
CHLOROMETHANE	12 U	13 U	14 U	12 U	12 U		13 U
CIS-1,2-DICHLOROETHENE	12 U	13 U	14 U	12 U	12 U		13 U
CIS-1,3-DICHLOROPROPENE	12 U	13 U	14 U	12 U	12 U		13 U
DIBROMOCHLOROMETHANE	12 U	13 U	14 U	12 U	12 U		13 U
ETHYL ETHER	12 U	80 J	120 J	12 U	12 U		13 U
ETHYLBENZENE	12 U	13 U	14 U	12 U	12 U		13 U
METHYLENE CHLORIDE	8 B	8 B	7 B	6 B	5 B		6 B
STYRENE	12 U	13 U	14 U	12 U	12 U		13 U
TETRACHLOROETHENE	12 U	13 U	14 U	12 U	12 U		13 U
TOLUENE	12 U	13 U	14 U	12 U	12 U		13 U
TRANS-1,2-DICHLOROETHENE	12 U	13 U	14 U	12 U	12 U		13 U
TRANS-1,3-DICHLOROPROPENE	12 U	13 U	14 U	12 U	12 U		13 U
TRICHLOROETHENE	1 J	1 J	14 U	12 U	12 U		7 J
VINYL CHLORIDE	12 U	13 U	14 U	12 U	12 U		13 U
XYLENES, TOTAL	12 U	13 U	14 U	12 U	12 U		13 U
SEMIVOLATILES (µg/kg)							
1,2,4-TRICHLOROBENZENE				390 U	400 U	400 U	430 U
1,2-DICHLOROBENZENE				390 U	400 U	400 U	430 U
1,3-DICHLOROBENZENE				390 U	400 U	400 U	430 U
1,4-DICHLOROBENZENE				390 U	400 U	400 U	430 U
2,2'-OXYBIS(1-CHLOROPROPANE				390 U	400 U	400 U	430 U
2,4,5-TRICHLOROPHENOL				970 U	1000 U	1000 U	1100 U
2,4,6-TRICHLOROPHENOL				390 U	400 U	400 U	430 U
2,4-DICHLOROPHENOL				390 U	400 U	400 U	430 U

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0040201	S57SB0040301	S57SB0040301-D	S57SB0050101	S57SB0050201	S57SB0050201-D	S57SB0050301
LOCATION:	S57MW007/SB004	S57MW007/SB004	S57MW007/SB004	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005
DEPTH INTERVAL (FEET):	4 - 5	14 - 16	14 - 16	2 - 4	4 - 6	4 - 6	16 - 18
SAMPLE DATE:	1/10/99	1/10/99	1/10/99	1/12/99	1/12/99	1/12/99	1/12/99
ASSOCIATED DUPLICATE:		S57SB0040301-D	S57SB0040301		S57SB0050201-D	S57SB0050201	
2,4-DIMETHYLPHENOL				390 U	400 U	400 U	430 U
2,4-DINITROPHENOL				970 U	1000 U	1000 U	1100 U
2,4-DINITROTOLUENE				390 U	400 U	400 U	430 U
2,6-DINITROTOLUENE				390 U	400 U	400 U	430 U
2-CHLORONAPHTHALENE				390 U	400 U	400 U	430 U
2-CHLOROPHENOL				390 U	400 U	400 U	430 U
2-METHYLNAPHTHALENE				390 U	400 U	400 U	430 U
2-METHYLPHENOL				390 U	400 U	400 U	430 U
2-NITROANILINE				970 U	1000 U	1000 U	1100 U
2-NITROPHENOL				390 U	400 U	400 U	430 U
3,3'-DICHLOROBENZIDINE				390 U	400 U	400 U	430 U
3-NITROANILINE				970 U	1000 U	1000 U	1100 U
4,6-DINITRO-2-METHYLPHENOL				970 U	1000 U	1000 U	1100 U
4-BROMOPHENYL PHENYL ETHER				390 U	400 U	400 U	430 U
4-CHLORO-3-METHYLPHENOL				390 U	400 U	400 U	430 U
4-CHLOROANILINE				390 U	400 U	400 U	430 U
4-CHLOROPHENYL PHENYL ETHER				390 U	400 U	400 U	430 U
4-METHYLPHENOL				390 U	400 U	400 U	430 U
4-NITROANILINE				970 U	1000 U	1000 U	1100 U
4-NITROPHENOL				970 U	1000 U	1000 U	1100 U
ACENAPHTHENE				390 U	400 U	400 U	430 U
ACENAPHTHYLENE				390 U	400 U	400 U	430 U
ANTHRACENE				390 U	400 U	400 U	430 U
BENZO(A)ANTHRACENE				360 J	400 U	85 J	430 U
BENZO(A)PYRENE				270 J	400 U	61 J	430 U
BENZO(B)FLUORANTHENE				510	400 U	85 J	430 U
BENZO(G,H,I)PERYLENE				70 J	400 U	400 U	430 U
BENZO(K)FLUORANTHENE				200 J	400 U	400 U	430 U
BIS(2-CHLOROETHOXY)METHANE				390 U	400 U	400 U	430 U
BIS(2-CHLOROETHYL)ETHER				390 U	400 U	400 U	430 U
BIS(2-ETHYLHEXYL)PHTHALATE				92 J	400 U	400 U	430 U
BUTYLBENZYL PHTHALATE				390 U	400 U	400 U	430 U
CARBAZOLE				390 U	400 U	400 U	430 U
CHRYSENE				350 J	400 U	76 J	430 U
DI-N-BUTYL PHTHALATE				390 U	400 U	400 U	430 U
DI-N-OCTYL PHTHALATE				390 U	400 U	400 U	430 U
DIBENZO(A,H)ANTHRACENE				60 J	400 U	400 U	430 U
DIBENZOFURAN				390 U	400 U	400 U	430 U
DIETHYL PHTHALATE				390 U	400 U	400 U	430 U
DIMETHYL PHTHALATE				390 U	400 U	400 U	430 U
FLUORANTHENE				380 J	400 U	140 J	430 U
FLUORENE				390 U	400 U	400 U	430 U
HEXACHLOROBENZENE				390 U	400 U	400 U	430 U
HEXACHLOROBUTADIENE				390 U	400 U	400 U	430 U
HEXACHLOROCYCLOPENTADIENE				390 U	400 U	400 U	430 U

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0040201	S57SB0040301	S57SB0040301-D	S57SB0050101	S57SB0050201	S57SB0050201-D	S57SB0050301
LOCATION:	S57MW007/SB004	S57MW007/SB004	S57MW007/SB004	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005
DEPTH INTERVAL (FEET):	4 - 5	14 - 16	14 - 16	2 - 4	4 - 6	4 - 6	16 - 18
SAMPLE DATE:	1/10/99	1/10/99	1/10/99	1/12/99	1/12/99	1/12/99	1/12/99
ASSOCIATED DUPLICATE:		S57SB0040301-D	S57SB0040301		S57SB0050201-D	S57SB0050201	
HEXACHLOROETHANE				390 U	400 U	400 U	430 U
INDENO(1,2,3-CD)PYRENE				160 J	400 U	43 J	430 U
ISOPHORONE				390 U	400 U	400 U	430 U
N-NITROSO-DI-N-PROPYLAMINE				390 U	400 U	400 U	430 U
N-NITROSODIPHENYLAMINE				390 U	400 U	400 U	430 U
NAPHTHALENE				390 U	400 U	400 U	430 U
NITROBENZENE				390 U	400 U	400 U	430 U
PENTACHLOROPHENOL				970 U	1000 U	1000 U	1100 U
PHENANTHRENE				110 J	400 U	110 J	430 U
PHENOL				390 U	400 U	400 U	430 U
PYRENE				380 J	400 U	140 J	430 U
PESTICIDES/PCBs (µg/kg)							
4,4'-DDD				3.9 U	4.0 U	4.0 U	4.3 U
4,4'-DDE				17	4.0 U	4.0 U	4.3 U
4,4'-DDT				20	4.0 U	4.0 U	4.3 U
ALDRIN				1.9 U	2.0 U	2.0 U	2.1 U
ALPHA-BHC				1.9 U	2.0 U	2.0 U	2.1 U
ALPHA-CHLORDANE				1.9 U	2.0 U	2.0 U	2.1 U
AROCLOR-1016				39 U	40 U	40 U	43 U
AROCLOR-1221				77 U	81 U	80 U	86 U
AROCLOR-1232				39 U	40 U	40 U	43 U
AROCLOR-1242				39 U	40 U	40 U	43 U
AROCLOR-1248				39 U	40 U	40 U	43 U
AROCLOR-1254				39 U	40 U	40 U	43 U
AROCLOR-1260				39 U	40 U	40 U	43 U
BETA-BHC				1.9 U	2.0 U	2.0 U	2.1 U
DELTA-BHC				1.9 U	2.0 U	2.0 U	2.1 U
DIELDRIN				3.9 U	4.0 U	4.0 U	4.3 U
ENDOSULFAN I				1.9 U	2.0 U	2.0 U	2.1 U
ENDOSULFAN II				3.9 U	4.0 U	4.0 U	4.3 U
ENDOSULFAN SULFATE				3.9 U	4.0 U	4.0 U	4.3 U
ENDRIN				3.9 U	4.0 U	4.0 U	4.3 U
ENDRIN ALDEHYDE				3.9 U	4.0 U	4.0 U	4.3 U
ENDRIN KETONE				3.9 U	4.0 U	4.0 U	4.3 U
GAMMA-BHC (LINDANE)				1.9 U	2.0 U	2.0 U	2.1 U
GAMMA-CHLORDANE				1.9 U	2.0 U	2.0 U	2.1 U
HEPTACHLOR				1.9 U	2.0 U	2.0 U	2.1 U
HEPTACHLOR EPOXIDE				1.9 U	2.0 U	2.0 U	2.1 U
METHOXYCHLOR				19 U	20 U	20 U	21 U
TOXAPHENE				190 U	200 U	200 U	210 U
EXPLOSIVES (µg/kg)							
1,3,5-TRINITROBENZENE				250 U	250 U	250 U	250 U
1,3-DINITROBENZENE				250 U	250 U	250 U	250 U
2,4,6-TRINITROTOLUENE				250 U	250 U	250 U	250 U
2,4-DINITROTOLUENE				250 U	250 U	250 U	250 U

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0040201	S57SB0040301	S57SB0040301-D	S57SB0050101	S57SB0050201	S57SB0050201-D	S57SB0050301
LOCATION:	S57MW007/SB004	S57MW007/SB004	S57MW007/SB004	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005	S57MW009/SB005
DEPTH INTERVAL (FEET):	4 - 5	14 - 16	14 - 16	2 - 4	4 - 6	4 - 6	16 - 18
SAMPLE DATE:	1/10/99	1/10/99	1/10/99	1/12/99	1/12/99	1/12/99	1/12/99
ASSOCIATED DUPLICATE:		S57SB0040301-D	S57SB0040301		S57SB0050201-D	S57SB0050201	
2,6-DINITROTOLUENE				250 U	250 U	250 U	250 U
2-AMINO-4,6-DINITROTOLUENE				250 U	250 U	250 U	250 U
2-NITROTOLUENE				500 U	500 U	500 U	500 U
3-NITROTOLUENE				500 U	500 U	500 U	500 U
4-AMINO-2,6-DINITROTOLUENE				250 U	250 U	250 U	250 U
4-NITROTOLUENE				500 U	500 U	500 U	500 U
HMX				500 U	500 U	500 U	500 U
NITROBENZENE				250 U	250 U	250 U	250 U
NITROCELLULOSE				95100 L	53900 L	123000 L	64900 L
NITROGLYCERIN				5000 U	5000 U	5000 U	5000 U
NITROGUANIDINE				0.51 U	0.51 U	0.51 U	0.5 U
RDX				500 U	500 U	500 U	500 U
TETRYL				500 U	500 U	500 U	500 U
INORGANICS (mg/kg)							
ALUMINUM				8060 J	10200 J	8260 J	2030 J
ANTIMONY				0.48 B	0.56 UL	0.57 B	0.59 B
ARSENIC				21.3	17.4	50.0	2.9 L
BARIUM				24.7	27.9	39.8	19.1
BERYLLIUM				0.32	0.45	0.33	0.31
CADMIUM				0.27 B	0.20 B	0.19 B	0.14 B
CALCIUM				914	415	328	494
CHROMIUM				12.5 J	14.1 J	12.9 J	5.6 J
COBALT				3.1	3.2	2.7	9.2
COPPER				9.5	9.1	8.9	5.8
IRON				16000	17600	15600	7360
LEAD				18.6 J	100 J	54.9 J	3.9 J
MAGNESIUM				314	463	368	352
MANGANESE				89.3 K	59.8 K	48.7 K	98.1 K
MERCURY				0.25	0.07	0.10	0.02 U
NICKEL				4.4	3.9	3.8	2.0
POTASSIUM				334	504	470	360
SELENIUM				0.59 L	0.70 L	0.69 L	0.55 UL
SILVER				0.10 U	0.15 U	0.15 U	0.16 U
SODIUM				231 B	133 B	170 B	77.0 B
THALLIUM				0.47 UL	0.71 UL	0.69 UL	0.73 UL
VANADIUM				22.1	30.4	27.1	12.7
ZINC				35.1	52.0	42.2	20.0
MISCELLANEOUS PARAMETERS							
PH				7.10	5.35	5.40	5.22
TOTAL ORGANIC CARBON mg/kg		5180 U	10900 U	22000	12600		10300 U

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0060101	S57SB0060201	S57SB0070101	S57SB0070201	S57SB0080101	S57SB0080101-D	S57SB0080201
LOCATION:	S57SB006	S57SB006	S57SB007	S57SB007	S57MW011/SB008	S57MW011/SB008	S57MW011/SB008
DEPTH INTERVAL (FEET):	3 - 4	10 - 11	4 - 5	6 - 8	4 - 6	4 - 6	10 - 11
SAMPLE DATE:	10/8/98	10/8/98	10/7/98	10/7/98	10/8/98	10/8/98	10/8/98
ASSOCIATED DUPLICATE:					S57SB0080101-D	S57SB0080101	
VOLATILES (µg/kg)							
1,1,1-TRICHLOROETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
1,1,2,2-TETRACHLOROETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
1,1,2-TRICHLOROETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
1,1-DICHLOROETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
1,1-DICHLOROETHENE	12 UJ	11 U	13 U	11 U	12 U		12 U
1,2-DICHLOROETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
1,2-DICHLOROPROPANE	12 UJ	11 U	13 U	11 U	12 U		12 U
2-BUTANONE	12 UJ	11 UJ	13 UJ	11 UJ	12 UJ		12 UJ
2-HEXANONE	12 UJ	11 U	13 U	11 U	12 U		12 U
4-METHYL-2-PENTANONE	12 UJ	11 U	13 U	11 U	12 U		12 U
ACETONE	12 UJ	11 U	13 U	11 U	12 U		41 J
BENZENE	12 UJ	11 U	13 U	11 U	12 U		12 U
BROMODICHLOROMETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
BROMOFORM	12 UJ	11 U	13 U	11 U	12 U		12 U
BROMOMETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
CARBON DISULFIDE	12 UJ	2 J	13 U	11 U	12 U		12 U
CARBON TETRACHLORIDE	12 UJ	11 U	13 U	11 U	12 U		12 U
CHLOROBENZENE	12 UJ	11 U	13 U	11 U	12 U		12 U
CHLOROETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
CHLOROFORM	12 UJ	11 U	13 U	11 U	12 U		12 U
CHLOROMETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
CIS-1,2-DICHLOROETHENE	77000	11 U	11 J	11 U	12 U		22
CIS-1,3-DICHLOROPROPENE	12 UJ	11 U	13 U	11 U	12 U		12 U
DIBROMOCHLOROMETHANE	12 UJ	11 U	13 U	11 U	12 U		12 U
ETHYL ETHER	12 UJ	11 U	13 U	11 U	12 UJ		12 U
ETHYLBENZENE	12 UJ	11 U	13 U	11 U	12 U		12 U
METHYLENE CHLORIDE	21000	11 B	13 B	12 B	44 B		21 B
STYRENE	12 UJ	11 U	13 U	11 U	12 U		12 U
TETRACHLOROETHENE	12 UJ	11 U	13 U	11 U	12 U		12 U
TOLUENE	4 J	11 U	13 U	11 U	12 U		12 U
TRANS-1,2-DICHLOROETHENE	4 J	11 U	13 U	11 U	12 U		20
TRANS-1,3-DICHLOROPROPENE	12 UJ	11 U	13 U	11 U	12 U		12 U
TRICHLOROETHENE	220000	4 J	50	13	48		41
VINYL CHLORIDE	12 UJ	11 U	13 U	11 U	12 U		12 U
XYLENES, TOTAL	8 J	11 U	13 U	11 U	12 U		12 U
SEMIVOLATILES (µg/kg)							
1,2,4-TRICHLOROBENZENE			420 U	420 U	390 U		410 U
1,2-DICHLOROBENZENE			420 U	420 U	390 U		410 U
1,3-DICHLOROBENZENE			420 U	420 U	390 U		410 U
1,4-DICHLOROBENZENE			420 U	420 U	390 U		410 U
2,2'-OXYBIS(1-CHLOROPROPANE			420 U	420 U	390 U		410 U
2,4,5-TRICHLOROPHENOL			1100 U	1100 U	970 U		1000 U
2,4,6-TRICHLOROPHENOL			420 U	420 U	390 U		410 U
2,4-DICHLOROPHENOL			420 U	420 U	390 U		410 U

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0060101	S57SB0060201	S57SB0070101	S57SB0070201	S57SB0080101	S57SB0080101-D	S57SB0080201
LOCATION:	S57SB006	S57SB006	S57SB007	S57SB007	S57MW011/SB008	S57MW011/SB008	S57MW011/SB008
DEPTH INTERVAL (FEET):	3 - 4	10 - 11	4 - 5	6 - 8	4 - 6	4 - 6	10 - 11
SAMPLE DATE:	10/8/98	10/8/98	10/7/98	10/7/98	10/8/98	10/8/98	10/8/98
ASSOCIATED DUPLICATE:					S57SB0080101-D	S57SB0080101	
2,4-DIMETHYLPHENOL			420 U	420 U	390 U		410 U
2,4-DINITROPHENOL			1100 UJ	1100 UJ	970 UJ		1000 UJ
2,4-DINITROTOLUENE			420 U	420 U	390 U		410 U
2,6-DINITROTOLUENE			420 U	420 U	390 U		410 U
2-CHLORONAPHTHALENE			420 U	420 U	390 U		410 U
2-CHLOROPHENOL			420 U	420 U	390 U		410 U
2-METHYLNAPHTHALENE			420 U	420 U	390 U		410 U
2-METHYLPHENOL			420 U	420 U	390 U		410 U
2-NITROANILINE			1100 U	1100 U	970 U		1000 U
2-NITROPHENOL			420 U	420 U	390 U		410 U
3,3'-DICHLOROBENZIDINE			420 U	420 U	390 U		410 U
3-NITROANILINE			1100 UJ	1100 UJ	970 UJ		1000 UJ
4,6-DINITRO-2-METHYLPHENOL			1100 U	1100 U	970 U		1000 U
4-BROMOPHENYL PHENYL ETHER			420 U	420 U	390 U		410 U
4-CHLORO-3-METHYLPHENOL			420 U	420 U	390 U		410 U
4-CHLOROANILINE			420 U	420 U	390 U		410 U
4-CHLOROPHENYL PHENYL ETHER			420 U	420 U	390 U		410 U
4-METHYLPHENOL			420 U	420 U	390 U		410 U
4-NITROANILINE			1100 U	1100 U	970 U		1000 U
4-NITROPHENOL			1100 U	1100 U	970 U		1000 U
ACENAPHTHENE			420 U	420 U	390 U		410 U
ACENAPHTHYLENE			420 U	420 U	390 U		410 U
ANTHRACENE			420 U	420 U	390 U		410 U
BENZO(A)ANTHRACENE			420 U	160 J	390 U		410 U
BENZO(A)PYRENE			420 U	120 J	390 UJ		410 U
BENZO(B)FLUORANTHENE			420 U	200 J	390 UJ		410 U
BENZO(G,H,I)PERYLENE			420 U	420 U	390 UJ		410 U
BENZO(K)FLUORANTHENE			420 U	120 J	390 UJ		410 U
BIS(2-CHLOROETHOXY)METHANE			420 U	420 U	390 U		410 U
BIS(2-CHLOROETHYL)ETHER			420 U	420 U	390 U		410 U
BIS(2-ETHYLHEXYL)PHTHALATE			420 U	420 U	390 U		410 U
BUTYLBENZYL PHTHALATE			420 U	420 U	390 U		410 U
CARBAZOLE			420 U	420 U	390 U		410 U
CHRYSENE			420 U	170 J	390 U		410 U
DI-N-BUTYL PHTHALATE			420 U	420 U	390 U		410 U
DI-N-OCTYL PHTHALATE			420 U	420 U	390 UJ		410 U
DIBENZO(A,H)ANTHRACENE			420 U	420 U	390 UJ		410 U
DIBENZOFURAN			420 U	420 U	390 U		410 U
DIETHYL PHTHALATE			420 U	420 U	390 U		410 U
DIMETHYL PHTHALATE			420 U	420 U	390 U		410 U
FLUORANTHENE			420 U	200 J	390 U		410 U
FLUORENE			420 U	420 U	390 U		410 U
HEXACHLOROBENZENE			420 U	420 U	390 U		410 U
HEXACHLOROBUTADIENE			420 U	420 U	390 U		410 U
HEXACHLOROCYCLOPENTADIENE			420 UJ	420 UJ	390 UJ		410 UJ

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0060101	S57SB0060201	S57SB0070101	S57SB0070201	S57SB0080101	S57SB0080101-D	S57SB0080201
LOCATION:	S57SB006	S57SB006	S57SB007	S57SB007	S57MW011/SB008	S57MW011/SB008	S57MW011/SB008
DEPTH INTERVAL (FEET):	3 - 4	10 - 11	4 - 5	6 - 8	4 - 6	4 - 6	10 - 11
SAMPLE DATE:	10/8/98	10/8/98	10/7/98	10/7/98	10/8/98	10/8/98	10/8/98
ASSOCIATED DUPLICATE:					S57SB0080101-D	S57SB0080101	
HEXACHLOROETHANE			420 U	420 U	390 U		410 U
INDENO(1,2,3-CD)PYRENE			420 U	63 J	390 UJ		410 U
ISOPHORONE			420 U	420 U	390 U		410 U
N-NITROSO-DI-N-PROPYLAMINE			420 U	420 U	390 U		410 U
N-NITROSODIPHENYLAMINE			420 U	420 U	390 U		410 U
NAPHTHALENE			420 U	420 U	390 U		410 U
NITROBENZENE			420 U	420 U	390 U		410 U
PENTACHLOROPHENOL			1100 U	1100 U	970 U		1000 U
PHENANTHRENE			420 U	420 U	390 U		410 U
PHENOL			420 U	420 U	390 U		410 U
PYRENE			420 U	180 J	52 J		410 U
PESTICIDES/PCBs (µg/kg)							
4,4'-DDD			4.2 U	4.2 U	3.9 U		4.1 U
4,4'-DDE			4.2 U	4.2 U	3.9 U		4.1 U
4,4'-DDT			4.2 U	4.2 U	3.9 U		4.1 U
ALDRIN			2.1 U	2.1 U	1.9 U		2.1 U
ALPHA-BHC			2.1 U	2.1 U	1.9 U		2.1 U
ALPHA-CHLORDANE			2.1 U	2.1 U	1.9 U		2.1 U
AROCLOR-1016			42 U	42 U	39 U		41 U
AROCLOR-1221			84 U	85 U	77 U		82 U
AROCLOR-1232			42 U	42 U	39 U		41 U
AROCLOR-1242			42 U	42 U	39 U		41 U
AROCLOR-1248			42 U	42 U	39 U		41 U
AROCLOR-1254			42 U	42 U	39 U		41 U
AROCLOR-1260			42 U	42 U	39 U		41 U
BETA-BHC			2.1 U	2.1 U	1.9 U		2.1 U
DELTA-BHC			2.1 U	2.1 U	1.9 U		2.1 U
DIELDRIN			4.2 U	4.2 U	3.9 U		4.1 U
ENDOSULFAN I			2.1 U	2.1 U	1.9 U		2.1 U
ENDOSULFAN II			4.2 U	4.2 U	3.9 U		4.1 U
ENDOSULFAN SULFATE			4.2 U	4.2 U	3.9 U		4.1 U
ENDRIN			4.2 U	4.2 U	3.9 U		4.1 U
ENDRIN ALDEHYDE			4.2 U	4.2 U	3.9 U		4.1 U
ENDRIN KETONE			4.2 U	4.2 U	3.9 U		4.1 U
GAMMA-BHC (LINDANE)			2.1 U	2.1 U	1.9 U		2.1 U
GAMMA-CHLORDANE			2.1 U	2.1 U	1.9 U		2.1 U
HEPTACHLOR			2.1 U	2.1 U	1.9 U		2.1 U
HEPTACHLOR EPOXIDE			2.1 U	2.1 U	1.9 U		2.1 U
METHOXYCHLOR			21 U	21 U	19 U		21 U
TOXAPHENE			210 U	210 U	190 U		210 U
EXPLOSIVES (µg/kg)							
1,3,5-TRINITROBENZENE			250 U	250 U	250 U		250 U
1,3-DINITROBENZENE			250 U	250 U	250 U		250 U
2,4,6-TRINITROTOLUENE			250 U	250 U	250 U		250 U
2,4-DINITROTOLUENE			250 U	250 U	250 U		250 U

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0060101	S57SB0060201	S57SB0070101	S57SB0070201	S57SB0080101	S57SB0080101-D	S57SB0080201
LOCATION:	S57SB006	S57SB006	S57SB007	S57SB007	S57MW011/SB008	S57MW011/SB008	S57MW011/SB008
DEPTH INTERVAL (FEET):	3 - 4	10 - 11	4 - 5	6 - 8	4 - 6	4 - 6	10 - 11
SAMPLE DATE:	10/8/98	10/8/98	10/7/98	10/7/98	10/8/98	10/8/98	10/8/98
ASSOCIATED DUPLICATE:					S57SB0080101-D	S57SB0080101	
2,6-DINITROTOLUENE			250 U	250 U	250 U		250 U
2-AMINO-4,6-DINITROTOLUENE			250 U	250 U	250 U		250 U
2-NITROTOLUENE			500 U	500 U	500 U		500 U
3-NITROTOLUENE			500 U	500 U	500 U		500 U
4-AMINO-2,6-DINITROTOLUENE			250 U	250 U	250 U		250 U
4-NITROTOLUENE			500 UJ	500 U	500 U		500 U
HMX			500 U	500 U	500 U		500 U
NITROBENZENE			250 U	250 U	250 U		250 U
NITROCELLULOSE			59200	27000 U	37600	66000	205000
NITROGLYCERIN			5000 U	5000 U	5000 U		5000 U
NITROGUANIDINE			0.51 U	0.51 U	0.51 U	0.51 U	0.51 U
RDX			500 U	500 U	500 U		500 U
TETRYL			500 UJ	500 UJ	500 UJ		500 UJ
INORGANICS (mg/kg)							
ALUMINUM			11500	13200	4700	5300	8650
ANTIMONY			0.41 B	0.38 UR	0.61 B	0.37 B	0.39 B
ARSENIC			36.2	2.6	9.7	16.2	15.3
BARIUM			58.2	93.5	25.5	32.3	46.1
BERYLLIUM			2.5	0.95	0.62	0.63	1.0
CADMIUM			0.16 U	0.19 U	0.13 U	0.15 U	0.14 U
CALCIUM			1650	338	8840	1300	2510
CHROMIUM			21.0	17.4	7.3	9.1	14.0
COBALT			34.6 K	9.6 K	6.1 K	7.7 K	5.3 K
COPPER			17.5	10.4	10.6	11.0	15.6
IRON			46300	22100	14000	17200	28800
LEAD			8.6 K	10.9 K	14.2 K	43.6 K	47.4 K
MAGNESIUM			1440	1020	401	505	902
MANGANESE			253 J	76.6 J	101 J	108 J	60.9 J
MERCURY			0.03	0.02	0.04	0.04	0.05
NICKEL			13.0 K	8.0 K	6.3 K	5.7 K	6.4 K
POTASSIUM			1330	796	482	586	1140
SELENIUM			0.74 L	0.38 UL	0.26 UL	0.29 UL	0.27 UL
SILVER			0.16 U	0.19 U	0.13 U	0.15 U	0.14 U
SODIUM			55.1	63.0	56.8	51.1	39.4
THALLIUM			0.47 U	0.57 U	0.39 U	0.44 U	0.47 B
VANADIUM			60.8	36.4	16.2	21.8	42.6
ZINC			48.9 K	27.0 K	53.8	158	36.0 K
MISCELLANEOUS PARAMETERS							
PH			6.85	5.75	8.31	7.47	8.34
TOTAL ORGANIC CARBON mg/kg							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0090101	S57SB0090201	S57SB0100101	S57SB0100201	S57SB0110101	S57SB0110201	S57SB0120101
LOCATION:	S57SB009	S57SB009	S57SB010	S57SB010	S57SB011	S57SB011	S57SB012
DEPTH INTERVAL (FEET):	7- 8	7- 8	3 - 4	7- 8	6 - 8	14 - 15	3 - 4
SAMPLE DATE:	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98
ASSOCIATED DUPLICATE:							
VOLATILES (µg/kg)							
1,1,1-TRICHLOROETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
1,1,2,2-TETRACHLOROETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
1,1,2-TRICHLOROETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
1,1-DICHLOROETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
1,1-DICHLOROETHENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
1,2-DICHLOROETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
1,2-DICHLOROPROPANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
2-BUTANONE	12 UJ	29 J	13 UJ	13 UJ	12 UJ	13 UJ	12 UJ
2-HEXANONE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
4-METHYL-2-PENTANONE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
ACETONE	12 U	86 J	13 U	13 U	12 U	13 U	12 U
BENZENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
BROMODICHLOROMETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
BROMOFORM	12 U	12 U	13 U	13 U	12 U	13 U	12 U
BROMOMETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
CARBON DISULFIDE	12 U	2 J	13 U	13 U	12 U	13 U	12 U
CARBON TETRACHLORIDE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
CHLOROBENZENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
CHLOROETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
CHLOROFORM	12 U	12 U	13 U	13 U	12 U	13 U	12 U
CHLOROMETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
CIS-1,2-DICHLOROETHENE	12 U	12 U	13 U	13 U	12 U	7 J	12 U
CIS-1,3-DICHLOROPROPENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
DIBROMOCHLOROMETHANE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
ETHYL ETHER	12 UJ	12 U	13 UJ	13 U	12 U	13 U	12 UJ
ETHYLBENZENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
METHYLENE CHLORIDE	41 B	10 B	25 B	16 B	8 B	13 B	18 B
STYRENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
TETRACHLOROETHENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
TOLUENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
TRANS-1,2-DICHLOROETHENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
TRANS-1,3-DICHLOROPROPENE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
TRICHLOROETHENE	12 U	12 U	13 U	13 U	12 U	31	35
VINYL CHLORIDE	12 U	12 U	13 U	13 U	12 U	13 U	12 U
XYLENES, TOTAL	12 U	12 U	13 U	13 U	12 U	13 U	12 U
SEMIVOLATILES (µg/kg)							
1,2,4-TRICHLOROBENZENE							
1,2-DICHLOROBENZENE							
1,3-DICHLOROBENZENE							
1,4-DICHLOROBENZENE							
2,2'-OXYBIS(1-CHLOROPROPANE							
2,4,5-TRICHLOROPHENOL							
2,4,6-TRICHLOROPHENOL							
2,4-DICHLOROPHENOL							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0090101	S57SB0090201	S57SB0100101	S57SB0100201	S57SB0110101	S57SB0110201	S57SB0120101
LOCATION:	S57SB009	S57SB009	S57SB010	S57SB010	S57SB011	S57SB011	S57SB012
DEPTH INTERVAL (FEET):	7- 8	7- 8	3 - 4	7- 8	6 - 8	14 - 15	3 - 4
SAMPLE DATE:	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98
ASSOCIATED DUPLICATE:							
2,4-DIMETHYLPHENOL							
2,4-DINITROPHENOL							
2,4-DINITROTOLUENE							
2,6-DINITROTOLUENE							
2-CHLORONAPHTHALENE							
2-CHLOROPHENOL							
2-METHYLNAPHTHALENE							
2-METHYLPHENOL							
2-NITROANILINE							
2-NITROPHENOL							
3,3'-DICHLOROBENZIDINE							
3-NITROANILINE							
4,6-DINITRO-2-METHYLPHENOL							
4-BROMOPHENYL PHENYL ETHER							
4-CHLORO-3-METHYLPHENOL							
4-CHLOROANILINE							
4-CHLOROPHENYL PHENYL ETHER							
4-METHYLPHENOL							
4-NITROANILINE							
4-NITROPHENOL							
ACENAPHTHENE							
ACENAPHTHYLENE							
ANTHRACENE							
BENZO(A)ANTHRACENE							
BENZO(A)PYRENE							
BENZO(B)FLUORANTHENE							
BENZO(G,H,I)PERYLENE							
BENZO(K)FLUORANTHENE							
BIS(2-CHLOROETHOXY)METHANE							
BIS(2-CHLOROETHYL)ETHER							
BIS(2-ETHYLHEXYL)PHTHALATE							
BUTYLBENZYL PHTHALATE							
CARBAZOLE							
CHRYSENE							
DI-N-BUTYL PHTHALATE							
DI-N-OCTYL PHTHALATE							
DIBENZO(A,H)ANTHRACENE							
DIBENZOFURAN							
DIETHYL PHTHALATE							
DIMETHYL PHTHALATE							
FLUORANTHENE							
FLUORENE							
HEXACHLOROBENZENE							
HEXACHLOROBUTADIENE							
HEXACHLOROCYCLOPENTADIENE							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: DEPTH INTERVAL (FEET): SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SB0090101 S57SB009 7- 8 10/7/98	S57SB0090201 S57SB009 7- 8 10/7/98	S57SB0100101 S57SB010 3 - 4 10/7/98	S57SB0100201 S57SB010 7- 8 10/7/98	S57SB0110101 S57SB011 6 - 8 10/7/98	S57SB0110201 S57SB011 14 - 15 10/7/98	S57SB0120101 S57SB012 3 - 4 10/7/98
HEXACHLOROETHANE							
INDENO(1,2,3-CD)PYRENE							
ISOPHORONE							
N-NITROSO-DI-N-PROPYLAMINE							
N-NITROSODIPHENYLAMINE							
NAPHTHALENE							
NITROBENZENE							
PENTACHLOROPHENOL							
PHENANTHRENE							
PHENOL							
PYRENE							
PESTICIDES/PCBs (µg/kg)							
4,4'-DDD							
4,4'-DDE							
4,4'-DDT							
ALDRIN							
ALPHA-BHC							
ALPHA-CHLORDANE							
AROCLOR-1016							
AROCLOR-1221							
AROCLOR-1232							
AROCLOR-1242							
AROCLOR-1248							
AROCLOR-1254							
AROCLOR-1260							
BETA-BHC							
DELTA-BHC							
DIELDRIN							
ENDOSULFAN I							
ENDOSULFAN II							
ENDOSULFAN SULFATE							
ENDRIN							
ENDRIN ALDEHYDE							
ENDRIN KETONE							
GAMMA-BHC (LINDANE)							
GAMMA-CHLORDANE							
HEPTACHLOR							
HEPTACHLOR EPOXIDE							
METHOXYCHLOR							
TOXAPHENE							
EXPLOSIVES (µg/kg)							
1,3,5-TRINITROBENZENE							
1,3-DINITROBENZENE							
2,4,6-TRINITROTOLUENE							
2,4-DINITROTOLUENE							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0090101	S57SB0090201	S57SB0100101	S57SB0100201	S57SB0110101	S57SB0110201	S57SB0120101
LOCATION:	S57SB009	S57SB009	S57SB010	S57SB010	S57SB011	S57SB011	S57SB012
DEPTH INTERVAL (FEET):	7- 8	7- 8	3 - 4	7- 8	6 - 8	14 - 15	3 - 4
SAMPLE DATE:	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98	10/7/98
ASSOCIATED DUPLICATE:							
2,6-DINITROTOLUENE							
2-AMINO-4,6-DINITROTOLUENE							
2-NITROTOLUENE							
3-NITROTOLUENE							
4-AMINO-2,6-DINITROTOLUENE							
4-NITROTOLUENE							
HMX							
NITROBENZENE							
NITROCELLULOSE							
NITROGLYCERIN							
NITROGUANIDINE							
RDX							
TETRYL							
INORGANICS (mg/kg)							
ALUMINUM							
ANTIMONY							
ARSENIC							
BARIUM							
BERYLLIUM							
CADMIUM							
CALCIUM							
CHROMIUM							
COBALT							
COPPER							
IRON							
LEAD							
MAGNESIUM							
MANGANESE							
MERCURY							
NICKEL							
POTASSIUM							
SELENIUM							
SILVER							
SODIUM							
THALLIUM							
VANADIUM							
ZINC							
MISCELLANEOUS PARAMETERS							
PH							
TOTAL ORGANIC CARBON mg/kg							

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0120201	S57SB0130101	S57SB0130201	S57SB0140101	S57SB0140201	S57SB0150101	S57SB0150201
LOCATION:	S57SB012	S57MW012/SB013	S57MW012/SB013	S57SB014	S57SB014	S57MW005/SB015	S57MW005/SB015
DEPTH INTERVAL (FEET):	7 - 8	3 - 4	6 - 8	3 - 5	7 - 8	2 - 4	10 - 12
SAMPLE DATE:	10/7/98	1/9/99	1/12/99	10/7/98	10/7/98	1/11/99	1/11/99
ASSOCIATED DUPLICATE:							
VOLATILES (µg/kg)							
1,1,1-TRICHLOROETHANE	4 J	12 U	12 U	11 U	12 U	12 U	12 U
1,1,2,2-TETRACHLOROETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
1,1,2-TRICHLOROETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
1,1-DICHLOROETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
1,1-DICHLOROETHENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
1,2-DICHLOROETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
1,2-DICHLOROPROPANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
2-BUTANONE	13 UJ	12 U	12 U	11 UJ	12 UJ	12 U	12 U
2-HEXANONE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
4-METHYL-2-PENTANONE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
ACETONE	13 UJ	26	12 U	11 U	14 J	12 U	12 U
BENZENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
BROMODICHLOROMETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
BROMOFORM	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
BROMOMETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CARBON DISULFIDE	13 UJ	12 U	12 U	11 U	12 U	12 U	2 J
CARBON TETRACHLORIDE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CHLOROBENZENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CHLOROETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CHLOROFORM	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CHLOROMETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CIS-1,2-DICHLOROETHENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
CIS-1,3-DICHLOROPROPENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
DIBROMOCHLOROMETHANE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
ETHYL ETHER	13 UJ	12 U	54	11 U	12 U	12 U	12 U
ETHYLBENZENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
METHYLENE CHLORIDE	110 J	7 B	5 B	17 B	11 B	7 B	8 B
STYRENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
TETRACHLOROETHENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
TOLUENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
TRANS-1,2-DICHLOROETHENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
TRANS-1,3-DICHLOROPROPENE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
TRICHLOROETHENE	8 J	12 U	12 U	11 U	12 U	12 U	2 J
VINYL CHLORIDE	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
XYLENES, TOTAL	13 UJ	12 U	12 U	11 U	12 U	12 U	12 U
SEMIVOLATILES (µg/kg)							
1,2,4-TRICHLOROBENZENE		400 U	410 U				
1,2-DICHLOROBENZENE		400 U	410 U				
1,3-DICHLOROBENZENE		400 U	410 U				
1,4-DICHLOROBENZENE		400 U	410 U				
2,2'-OXYBIS(1-CHLOROPROPANE		400 U	410 U				
2,4,5-TRICHLOROPHENOL		1000 U	1000 U				
2,4,6-TRICHLOROPHENOL		400 U	410 U				
2,4-DICHLOROPHENOL		400 U	410 U				

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0120201	S57SB0130101	S57SB0130201	S57SB0140101	S57SB0140201	S57SB0150101	S57SB0150201
LOCATION:	S57SB012	S57MW012/SB013	S57MW012/SB013	S57SB014	S57SB014	S57MW005/SB015	S57MW005/SB015
DEPTH INTERVAL (FEET):	7 - 8	3 - 4	6 - 8	3 - 5	7 - 8	2 - 4	10 - 12
SAMPLE DATE:	10/7/98	1/9/99	1/12/99	10/7/98	10/7/98	1/11/99	1/11/99
ASSOCIATED DUPLICATE:							
2,4-DIMETHYLPHENOL		400 U	410 U				
2,4-DINITROPHENOL		1000 U	1000 U				
2,4-DINITROTOLUENE		400 U	410 U				
2,6-DINITROTOLUENE		400 U	410 U				
2-CHLORONAPHTHALENE		400 U	410 U				
2-CHLOROPHENOL		400 U	410 U				
2-METHYLNAPHTHALENE		400 U	410 U				
2-METHYLPHENOL		400 U	410 U				
2-NITROANILINE		1000 U	1000 U				
2-NITROPHENOL		400 U	410 U				
3,3'-DICHLOROBENZIDINE		400 U	410 U				
3-NITROANILINE		1000 U	1000 U				
4,6-DINITRO-2-METHYLPHENOL		1000 U	1000 U				
4-BROMOPHENYL PHENYL ETHER		400 U	410 U				
4-CHLORO-3-METHYLPHENOL		400 U	410 U				
4-CHLOROANILINE		400 U	410 U				
4-CHLOROPHENYL PHENYL ETHER		400 U	410 U				
4-METHYLPHENOL		400 U	410 U				
4-NITROANILINE		1000 U	1000 U				
4-NITROPHENOL		1000 U	1000 U				
ACENAPHTHENE		400 U	410 U				
ACENAPHTHYLENE		400 U	410 U				
ANTHRACENE		400 U	410 U				
BENZO(A)ANTHRACENE		400 U	410 U				
BENZO(A)PYRENE		400 U	410 U				
BENZO(B)FLUORANTHENE		400 U	410 U				
BENZO(G,H,I)PERYLENE		400 U	410 U				
BENZO(K)FLUORANTHENE		400 U	410 U				
BIS(2-CHLOROETHOXY)METHANE		400 U	410 U				
BIS(2-CHLOROETHYL)ETHER		400 U	410 U				
BIS(2-ETHYLHEXYL)PHTHALATE		400 U	89 J				
BUTYLBENZYL PHTHALATE		400 U	410 U				
CARBAZOLE		400 U	410 U				
CHRYSENE		400 U	410 U				
DI-N-BUTYL PHTHALATE		200 J	410 U				
DI-N-OCTYL PHTHALATE		400 U	410 U				
DIBENZO(A,H)ANTHRACENE		400 U	410 U				
DIBENZOFURAN		400 U	410 U				
DIETHYL PHTHALATE		400 U	410 U				
DIMETHYL PHTHALATE		400 U	410 U				
FLUORANTHENE		400 U	410 U				
FLUORENE		400 U	410 U				
HEXACHLOROBENZENE		400 U	410 U				
HEXACHLOROBUTADIENE		400 U	410 U				
HEXACHLOROCYCLOPENTADIENE		400 U	410 U				

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0120201	S57SB0130101	S57SB0130201	S57SB0140101	S57SB0140201	S57SB0150101	S57SB0150201
LOCATION:	S57SB012	S57MW012/SB013	S57MW012/SB013	S57SB014	S57SB014	S57MW005/SB015	S57MW005/SB015
DEPTH INTERVAL (FEET):	7 - 8	3 - 4	6 - 8	3 - 5	7 - 8	2 - 4	10 - 12
SAMPLE DATE:	10/7/98	1/9/99	1/12/99	10/7/98	10/7/98	1/11/99	1/11/99
ASSOCIATED DUPLICATE:							
HEXACHLOROETHANE		400 U	410 U				
INDENO(1,2,3-CD)PYRENE		400 U	410 U				
ISOPHORONE		400 U	410 U				
N-NITROSO-DI-N-PROPYLAMINE		400 U	410 U				
N-NITROSODIPHENYLAMINE		400 U	410 U				
NAPHTHALENE		400 U	410 U				
NITROBENZENE		400 U	410 U				
PENTACHLOROPHENOL		1000 U	1000 U				
PHENANTHRENE		400 U	410 U				
PHENOL		400 U	410 U				
PYRENE		400 U	410 U				
PESTICIDES/PCBs (µg/kg)							
4,4'-DDD		4.0 U	4.1 U				
4,4'-DDE		4.0 U	4.1 U				
4,4'-DDT		4.0 U	4.1 U				
ALDRIN		2.0 U	2.0 U				
ALPHA-BHC		2.0 U	2.0 U				
ALPHA-CHLORDANE		2.0 U	2.0 U				
AROCLOR-1016		40 U	41 U				
AROCLOR-1221		80 U	81 U				
AROCLOR-1232		40 U	41 U				
AROCLOR-1242		40 U	41 U				
AROCLOR-1248		40 U	41 U				
AROCLOR-1254		40 U	41 U				
AROCLOR-1260		40 U	41 U				
BETA-BHC		2.0 U	2.0 U				
DELTA-BHC		2.0 U	2.0 U				
DIELDRIN		4.0 U	4.1 U				
ENDOSULFAN I		2.0 U	2.0 U				
ENDOSULFAN II		4.0 U	4.1 U				
ENDOSULFAN SULFATE		4.0 UJ	4.1 U				
ENDRIN		4.0 U	4.1 U				
ENDRIN ALDEHYDE		4.0 U	4.1 U				
ENDRIN KETONE		4.0 U	4.1 U				
GAMMA-BHC (LINDANE)		2.0 U	2.0 U				
GAMMA-CHLORDANE		2.0 U	2.0 U				
HEPTACHLOR		2.0 U	2.0 U				
HEPTACHLOR EPOXIDE		2.0 U	2.0 U				
METHOXYCHLOR		20 U	20 U				
TOXAPHENE		200 U	200 U				
EXPLOSIVES (µg/kg)							
1,3,5-TRINITROBENZENE		227.3 U	250 U				
1,3-DINITROBENZENE		227.3 U	250 U				
2,4,6-TRINITROTOLUENE		227.3 U	250 U				
2,4-DINITROTOLUENE		227.3 U	250 U				

ANALYTICAL RESULTS - SUBSURFACE SOIL
OCTOBER 1998 AND JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SB0120201	S57SB0130101	S57SB0130201	S57SB0140101	S57SB0140201	S57SB0150101	S57SB0150201
LOCATION:	S57SB012	S57MW012/SB013	S57MW012/SB013	S57SB014	S57SB014	S57MW005/SB015	S57MW005/SB015
DEPTH INTERVAL (FEET):	7 - 8	3 - 4	6 - 8	3 - 5	7 - 8	2 - 4	10 - 12
SAMPLE DATE:	10/7/98	1/9/99	1/12/99	10/7/98	10/7/98	1/11/99	1/11/99
ASSOCIATED DUPLICATE:							
2,6-DINITROTOLUENE		227.3 U	250 U				
2-AMINO-4,6-DINITROTOLUENE		227.3 U	250 U				
2-NITROTOLUENE		454.5 U	500 U				
3-NITROTOLUENE		454.5 U	500 U				
4-AMINO-2,6-DINITROTOLUENE		227.3 U	250 U				
4-NITROTOLUENE		454.5 U	500 U				
HMX		454.5 U	500 U				
NITROBENZENE		227.3 U	250 U				
NITROCELLULOSE		38900 UR	50400 L				
NITROGLYCERIN		4545.4 U	5000 U				
NITROGUANIDINE		0.51 U	0.51 U				
RDX		454.5 U	500 U				
TETRYL		454.5 U	500 U				
INORGANICS (mg/kg)							
ALUMINUM		7780	5410 J				
ANTIMONY		0.98 UR	0.52 UL				
ARSENIC		2.9	2.6 L				
BARIUM		24.5	34.2				
BERYLLIUM		0.22	0.52				
CADMIUM		0.09 U	0.18 B				
CALCIUM		573	796				
CHROMIUM		9.8	10.9 J				
COBALT		1.4	6.2				
COPPER		7.5	6.2				
IRON		9360	10600				
LEAD		8.4	8.2 J				
MAGNESIUM		549 J	350				
MANGANESE		26.0 L	42.3 K				
MERCURY		0.02	0.03				
NICKEL		4.1 J	3.0				
POTASSIUM		743	370				
SELENIUM		0.82 K	0.50 UL				
SILVER		0.19 U	0.14 U				
SODIUM		95.2	70.8 B				
THALLIUM		0.96 U	0.65 UL				
VANADIUM		21.9	20.6				
ZINC		15.3	13.8				
MISCELLANEOUS PARAMETERS							
PH		7.79	6.57				
TOTAL ORGANIC CARBON **mg/kg**							8840

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0010101	S57MW0020101	S57MW0030101	S57MW0040101	S57MW0050101	S57MW0060101	S57MW0070101	S57MW0080101
LOCATION:	S57MW001/SB001	S57MW002	S57MW003/SB002	S57MW004	S57MW005/SB015	S57MW006	S57MW007/SB004	S57MW008
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER
SAMPLE DATE:	1/25/99	1/25/99	1/25/99	1/25/99	1/27/99	1/27/99	1/25/99	1/26/99
ASSOCIATED DUPLICATE:								
VOLATILES (µg/L)								
1,1,1-TRICHLOROETHANE	1 U	2.5	0.6 J	29.5 J	6	6 J	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1.8	4.4	1 U	2	1	2 J	1 U	1 U
1,1-DICHLOROETHENE	1 U	1 U	2.9	10.3	12	11 J	1 U	1 U
1,2 DICHLOROBENZENE								
1,2,4-TRICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMOETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3 DICHLOROBENZENE								
1,3-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4 DICHLOROBENZENE								
1,4-DICHLOROBENZENE	1 U	1 U	1 UR	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
ACETONE	5 UR	5 UR	5 U	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	1 U	1 U	1 UR	1 UR	1 U	1 U
CIS-1,2-DICHLOROETHENE	1 U	5.1	54.2 J	528 J	23	32 J	0.5 J	0.7 J
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ETHYL ETHER	678.8 J	1 J	292.5 J	296.6 J	5 L	5 UR	1930.6 J	1089 J
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	1 U	9.5	1 U	1 U	1 U	1 U
TOLUENE	1 U	1 U	1 U	0.5 J	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U	0.6 J	8.3	1 U	1 U	1 U	1 U

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0010101	S57MW0020101	S57MW0030101	S57MW0040101	S57MW0050101	S57MW0060101	S57MW0070101	S57MW0080101
LOCATION:	S57MW001/SB001	S57MW002	S57MW003/SB002	S57MW004	S57MW005/SB015	S57MW006	S57MW007/SB004	S57MW008
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER
SAMPLE DATE:	1/25/99	1/25/99	1/25/99	1/25/99	1/27/99	1/27/99	1/25/99	1/26/99
ASSOCIATED DUPLICATE:								
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	2.4	86.7 J	247.4 J	611.7 J	249	213 J	2.2	1 U
VINYL CHLORIDE	1 U	2.9	3.1	47.9 J	1 U	1 U	1 U	1 U
XYLENES, TOTAL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
SEMIVOLATILES (µg/L)								
2,2'-OXYBIS(1-CHLOROPROPANE			6 U	6 U				
2,4,5-TRICHLOROPHENOL			23 U	22 U				
2,4,6-TRICHLOROPHENOL			6 U	6 U				
2,4-DICHLOROPHENOL			6 U	6 U				
2,4-DIMETHYLPHENOL			6 U	6 U				
2,4-DINITROPHENOL			23 U	22 U				
2,4-DINITROTOLUENE			6 U	6 U				
2,6-DINITROTOLUENE			6 U	6 U				
2-CHLORONAPHTHALENE			6 U	6 U				
2-CHLOROPHENOL			6 U	6 U				
2-METHYLNAPHTHALENE			6 U	6 U				
2-METHYLPHENOL			6 U	6 U				
2-NITROANILINE			23 U	22 U				
2-NITROPHENOL			6 U	6 U				
3,3'-DICHLOROBENZIDINE			6 U	6 U				
3-NITROANILINE			23 U	22 U				
4,6-DINITRO-2-METHYLPHENOL			23 U	22 U				
4-BROMOPHENYL PHENYL ETHER			6 U	6 U				
4-CHLORO-3-METHYLPHENOL			6 U	6 U				
4-CHLOROANILINE			6 U	6 U				
4-CHLOROPHENYL PHENYL ETHER			6 U	6 U				
4-METHYLPHENOL			6 U	6 U				
4-NITROANILINE			23 U	22 U				
4-NITROPHENOL			23 U	22 U				
ACENAPHTHENE			6 U	6 U				
ACENAPHTHYLENE			6 U	6 U				
ANTHRACENE			6 U	6 U				
BENZO(A)ANTHRACENE			6 U	6 U				
BENZO(A)PYRENE			6 U	6 U				
BENZO(B)FLUORANTHENE			6 U	6 U				
BENZO(G,H,I)PERYLENE			6 U	6 U				
BENZO(K)FLUORANTHENE			6 U	6 U				
BIS(2-CHLOROETHOXY)METHANE			6 U	6 U				
BIS(2-CHLOROETHYL)ETHER			6 U	6 U				
BIS(2-ETHYLHEXYL)PHTHALATE			6 U	2 J				
BUTYLBENZYL PHTHALATE			6 U	6 U				
CHRYSENE			6 U	6 U				

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0010101	S57MW0020101	S57MW0030101	S57MW0040101	S57MW0050101	S57MW0060101	S57MW0070101	S57MW0080101
LOCATION:	S57MW001/SB001	S57MW002	S57MW003/SB002	S57MW004	S57MW005/SB015	S57MW006	S57MW007/SB004	S57MW008
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER
SAMPLE DATE:	1/25/99	1/25/99	1/25/99	1/25/99	1/27/99	1/27/99	1/25/99	1/26/99
ASSOCIATED DUPLICATE:								
DI-N-BUTYL PHTHALATE			7	6 U				
DI-N-OCTYL PHTHALATE			6 U	6 U				
DIBENZO(A,H)ANTHRACENE			6 U	6 U				
DIBENZOFURAN			6 U	6 U				
DIETHYL PHTHALATE			6 U	6 U				
DIMETHYL PHTHALATE			6 U	6 U				
FLUORANTHENE			6 U	6 U				
FLUORENE			6 U	6 U				
HEXACHLOROBENZENE			6 U	6 U				
HEXACHLOROBUTADIENE			6 U	6 U				
HEXACHLOROCYCLOPENTADIENE			6 U	6 U				
HEXACHLOROETHANE			6 U	6 U				
INDENO(1,2,3-CD)PYRENE			6 U	6 U				
ISOPHORONE			6 U	6 U				
N-NITROSO-DI-N-PROPYLAMINE			6 U	6 U				
N-NITROSODIPHENYLAMINE			6 U	6 U				
NAPHTHALENE			6 U	6 U				
NITROBENZENE			6 U	6 U				
PENTACHLOROPHENOL			23 U	22 U				
PHENANTHRENE			6 U	6 U				
PHENOL			6 U	6 U				
PYRENE			6 U	6 U				
PESTICIDES/PCBs (µg/L)								
4,4'-DDD			0.023 U	0.024 U				
4,4'-DDE			0.023 U	0.024 U				
4,4'-DDT			0.023 U	0.024 U				
ALDRIN			0.012 U	0.012 U				
ALPHA-BHC			0.012 U	0.012 U				
ALPHA-CHLORDANE			0.012 U	0.012 U				
AROCLOR-1016			0.23 U	0.24 U				
AROCLOR-1221			0.47 U	0.47 U				
AROCLOR-1232			0.23 U	0.24 U				
AROCLOR-1242			0.23 U	0.24 U				
AROCLOR-1248			0.23 U	0.24 U				
AROCLOR-1254			0.23 U	0.24 U				
AROCLOR-1260			0.23 U	0.24 U				
BETA-BHC			0.012 U	0.012 U				
DELTA-BHC			0.012 U	0.012 U				
DIELDRIN			0.023 U	0.024 U				
ENDOSULFAN I			0.012 U	0.012 U				
ENDOSULFAN II			0.023 U	0.024 U				
ENDOSULFAN SULFATE			0.023 U	0.024 U				

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0010101	S57MW0020101	S57MW0030101	S57MW0040101	S57MW0050101	S57MW0060101	S57MW0070101	S57MW0080101
LOCATION:	S57MW001/SB001	S57MW002	S57MW003/SB002	S57MW004	S57MW005/SB015	S57MW006	S57MW007/SB004	S57MW008
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER
SAMPLE DATE:	1/25/99	1/25/99	1/25/99	1/25/99	1/27/99	1/27/99	1/25/99	1/26/99
ASSOCIATED DUPLICATE:								
ENDRIN			0.023 U	0.024 U				
ENDRIN ALDEHYDE			0.023 U	0.024 U				
ENDRIN KETONE			0.023 U	0.024 U				
GAMMA-BHC (LINDANE)			0.012 U	0.012 U				
GAMMA-CHLORDANE			0.012 U	0.012 U				
HEPTACHLOR			0.012 U	0.012 U				
HEPTACHLOR EPOXIDE			0.012 U	0.012 U				
METHOXYCHLOR			0.12 U	0.12 U				
TOXAPHENE			1.2 U	1.2 U				
EXPLOSIVES (µg/L)								
1,3,5-TRINITROBENZENE			1.2 U	1.2 U				
1,3-DINITROBENZENE			1.2 U	1.2 U				
2,4,6-TRINITROTOLUENE			1.2 U	1.2 U				
2,4-DINITROTOLUENE			1.2 U	1.2 U				
2,6-DINITROTOLUENE			1.2 U	1.2 U				
2-AMINO-4,6-DINITROTOLUENE			1.2 U	1.2 U				
2-NITROTOLUENE			2.6 U	2.6 U				
3-NITROTOLUENE			2.6 U	2.6 U				
4-AMINO-2,6-DINITROTOLUENE			1.2 U	1.2 U				
4-NITROTOLUENE			2.6 U	2.6 U				
HMX			2.6 U	2.6 U				
NITROBENZENE			1.2 U	1.2 U				
NITROCELLULOSE			148 L	141 UR				
NITROGLYCERIN			13 U	13 U				
NITROGUANIDINE			5.0 U	5.0 U				
RDX			2.6 U	2.6 U				
TETRYL			2.6 U	2.6 U				
INORGANICS (µg/L)								
ALUMINUM			263 B	69.9 B				
ANTIMONY			2.6 U	2.6 U				
ARSENIC			3.6 U	3.6 U				
BARIUM			38.1	35.3				
BERYLLIUM			0.20	0.10				
CADMIUM			0.30 U	0.30 U				
CALCIUM			1910	2380				
CHROMIUM			0.60 U	0.60 U				
COBALT			31.9	30.7				
COPPER			2.7 B	2.4 B				
CYANIDE			5.0 U	5.0 U				
IRON			454 J	215 J				
LEAD			1.0 U	1.3				
MAGNESIUM			1340	1380				

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0010101	S57MW0020101	S57MW0030101	S57MW0040101	S57MW0050101	S57MW0060101	S57MW0070101	S57MW0080101
LOCATION:	S57MW001/SB001	S57MW002	S57MW003/SB002	S57MW004	S57MW005/SB015	S57MW006	S57MW007/SB004	S57MW008
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER
SAMPLE DATE:	1/25/99	1/25/99	1/25/99	1/25/99	1/27/99	1/27/99	1/25/99	1/26/99
ASSOCIATED DUPLICATE:								
MANGANESE			257 J	256 J				
MERCURY			0.10 U	0.10 U				
NICKEL			7.3	10.3				
POTASSIUM			4170	3110				
SELENIUM			2.5 U	2.5 U				
SILVER			0.70 U	0.70 U				
SODIUM			11600 J	14300 J				
THALLIUM			3.3 U	3.3 U				
VANADIUM			1.3 B	0.71 B				
ZINC			22.3	28.5				
MISCELLANEOUS PARAMETERS								
AMMONIUM PERCHLORATE µg/L								
HARDNESS AS CaCO3 mg/L			11.9	13.9				
PH	5.29	6.23	5.44	5.62			5.87	5.78
TOTAL DISSOLVED SOLIDS mg/L	20.0 U	150	24.0	44.0	80 L	74 L	170	184
TOTAL ORGANIC CARBON mg/L			1.0 U	1.0 U				

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0090101	S57MW0100101	S57MW0110101	S57MW0110101-D	S57MW0120101	S57MW0120101-D	S57MW0130101	S57TW0010101
LOCATION:	S57MW009/SB005	S57MW010	S57MW011/SB008	S57MW011/SB008	S57MW012/SB013	S57MW012/SB013	S57MW013	S57TW001
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	UPPER	UPPER	LOWER	LOWER	UPPER	SHALLOW
SAMPLE DATE:	1/26/99	1/26/99	1/27/99	1/27/99	1/25/99	1/25/99	1/25/99	1/22/99
ASSOCIATED DUPLICATE:			S57MW0110101-D	S57MW0110101	S57MW0120101-D	S57MW0120101		
VOLATILES (µg/L)								
1,1,1-TRICHLOROETHANE	13.7	3.1	1 U	1 U	1 U	1 U	14.6	1 J
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
1,1-DICHLOROETHANE	5.2	3.1	1 U	1 U	5.2	5.2	0.8 J	3 J
1,1-DICHLOROETHENE	29 J	6.6	1 U	1 U	1.8	1.7	77.5 J	4 J
1,2 DICHLOROBENZENE								
1,2,4-TRICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
1,2-DIBROMOETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
1,2-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	2.7	10 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
1,3 DICHLOROBENZENE								
1,3-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
1,4 DICHLOROBENZENE								
1,4-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	10 U
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	10 U
4-METHYL-2-PENTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	10 U
ACETONE	5 UR	29.4 J	5 UR	5 UR	12 J	5 UR	5 UR	10 U
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
BROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
CHLOROFORM	1.3	0.6 J	1 U	1 U	1 U	1 U	1.3	10 U
CHLOROMETHANE	1 U	1 U	1 UR	1 UR	1 U	1 U	1 U	10 U
CIS-1,2-DICHLOROETHENE	79	44.8	5	5	2.3	2.2	1 U	75
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
ETHYL ETHER	2.8 J	5 UR	3950 L	3780 L	3.6 J	2 J	5 UR	10 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U	2 U	4 B
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
TETRACHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
TRANS-1,2-DICHLOROETHENE	0.6 J	1 U	1 U	1 U	1 U	1 U	1 U	10 U

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0090101	S57MW0100101	S57MW0110101	S57MW0110101-D	S57MW0120101	S57MW0120101-D	S57MW0130101	S57TW0010101
LOCATION:	S57MW009/SB005	S57MW010	S57MW011/SB008	S57MW011/SB008	S57MW012/SB013	S57MW012/SB013	S57MW013	S57TW001
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	UPPER	UPPER	LOWER	LOWER	UPPER	SHALLOW
SAMPLE DATE:	1/26/99	1/26/99	1/27/99	1/27/99	1/25/99	1/25/99	1/25/99	1/22/99
ASSOCIATED DUPLICATE:			S57MW0110101-D	S57MW0110101	S57MW0120101-D	S57MW0120101		
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
TRICHLOROETHENE	566	157.8	51 J	50 J	2.3	2.2	2.2	54
VINYL CHLORIDE	1 U	3.8	1 U	1 U	1 U	1 U	1 U	13
XYLENES, TOTAL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	10 U
SEMIVOLATILES (µg/L)								
2,2'-OXYBIS(1-CHLOROPROPANE	6 U	6 U			6 U	5 U	5 U	
2,4,5-TRICHLOROPHENOL	23 U	23 U			22 U	22 U	21 U	
2,4,6-TRICHLOROPHENOL	6 U	6 U			6 U	5 U	5 U	
2,4-DICHLOROPHENOL	6 U	6 U			6 U	5 U	5 U	
2,4-DIMETHYLPHENOL	6 U	6 U			6 U	5 U	5 U	
2,4-DINITROPHENOL	23 U	23 U			22 U	22 U	21 U	
2,4-DINITROTOLUENE	6 U	6 U			6 U	5 U	5 U	
2,6-DINITROTOLUENE	6 U	6 U			6 U	5 U	5 U	
2-CHLORONAPHTHALENE	6 U	6 U			6 U	5 U	5 U	
2-CHLOROPHENOL	6 U	6 U			6 U	5 U	5 U	
2-METHYLNAPHTHALENE	6 U	6 U			6 U	5 U	5 U	
2-METHYLPHENOL	6 U	6 U			6 U	5 U	5 U	
2-NITROANILINE	23 U	23 U			22 U	22 U	21 U	
2-NITROPHENOL	6 U	6 U			6 U	5 U	5 U	
3,3'-DICHLOROBENZIDINE	6 U	6 U			6 U	5 U	5 U	
3-NITROANILINE	23 U	23 U			22 U	22 U	21 U	
4,6-DINITRO-2-METHYLPHENOL	23 U	23 U			22 U	22 U	21 U	
4-BROMOPHENYL PHENYL ETHER	6 U	6 U			6 U	5 U	5 U	
4-CHLORO-3-METHYLPHENOL	6 U	6 U			6 U	5 U	5 U	
4-CHLOROANILINE	6 U	6 U			6 U	5 U	5 U	
4-CHLOROPHENYL PHENYL ETHER	6 U	6 U			6 U	5 U	5 U	
4-METHYLPHENOL	6 U	6 U			6 U	5 U	5 U	
4-NITROANILINE	23 U	23 U			22 U	22 U	21 U	
4-NITROPHENOL	23 U	23 U			22 U	22 U	21 U	
ACENAPHTHENE	6 U	6 U			6 U	5 U	5 U	
ACENAPHTHYLENE	6 U	6 U			6 U	5 U	5 U	
ANTHRACENE	6 U	6 U			6 U	5 U	5 U	
BENZO(A)ANTHRACENE	6 U	6 U			6 U	5 U	5 U	
BENZO(A)PYRENE	6 U	6 U			6 U	5 U	5 U	
BENZO(B)FLUORANTHENE	6 U	6 U			6 U	5 U	5 U	
BENZO(G,H,I)PERYLENE	6 U	6 U			6 U	5 U	5 U	
BENZO(K)FLUORANTHENE	6 U	6 U			6 U	5 U	5 U	
BIS(2-CHLOROETHOXY)METHANE	6 U	6 U			6 U	5 U	5 U	
BIS(2-CHLOROETHYL)ETHER	6 U	6 U			6 U	5 U	5 U	
BIS(2-ETHYLHEXYL)PHTHALATE	3 J	6 U			2 J	2 J	5 U	
BUTYLBENZYL PHTHALATE	6 U	6 U			6 U	5 U	5 U	
CHRYSENE	6 U	6 U			6 U	5 U	5 U	

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0090101	S57MW0100101	S57MW0110101	S57MW0110101-D	S57MW0120101	S57MW0120101-D	S57MW0130101	S57TW0010101
LOCATION:	S57MW009/SB005	S57MW010	S57MW011/SB008	S57MW011/SB008	S57MW012/SB013	S57MW012/SB013	S57MW013	S57TW001
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	UPPER	UPPER	LOWER	LOWER	UPPER	SHALLOW
SAMPLE DATE:	1/26/99	1/26/99	1/27/99	1/27/99	1/25/99	1/25/99	1/25/99	1/22/99
ASSOCIATED DUPLICATE:			S57MW0110101-D	S57MW0110101	S57MW0120101-D	S57MW0120101		
DI-N-BUTYL PHTHALATE	6 U	5 J			6 U	5 U	5 U	
DI-N-OCTYL PHTHALATE	6 U	6 U			6 U	5 U	5 U	
DIBENZO(A,H)ANTHRACENE	6 U	6 U			6 U	5 U	5 U	
DIBENZOFURAN	6 U	6 U			6 U	5 U	5 U	
DIETHYL PHTHALATE	6 U	6 U			6 U	5 U	5 U	
DIMETHYL PHTHALATE	6 U	6 U			6 U	5 U	5 U	
FLUORANTHENE	6 U	6 U			6 U	5 U	5 U	
FLUORENE	6 U	6 U			6 U	5 U	5 U	
HEXACHLOROBENZENE	6 U	6 U			6 U	5 U	5 U	
HEXACHLOROBUTADIENE	6 U	6 U			6 U	5 U	5 U	
HEXACHLOROCYCLOPENTADIENE	6 U	6 U			6 U	5 U	5 U	
HEXACHLOROETHANE	6 U	6 U			6 U	5 U	5 U	
INDENO(1,2,3-CD)PYRENE	6 U	6 U			6 U	5 U	5 U	
ISOPHORONE	6 U	6 U			6 U	5 U	5 U	
N-NITROSO-DI-N-PROPYLAMINE	6 U	6 U			6 U	5 U	5 U	
N-NITROSODIPHENYLAMINE	6 U	6 U			6 U	5 U	5 U	
NAPHTHALENE	6 U	6 U			6 U	5 U	5 U	
NITROBENZENE	6 U	6 U			6 U	5 U	5 U	
PENTACHLOROPHENOL	23 U	23 U			22 U	22 U	21 U	
PHENANTHRENE	6 U	6 U			6 U	5 U	5 U	
PHENOL	6 U	6 U			6 U	5 U	5 U	
PYRENE	6 U	6 U			6 U	5 U	5 U	
PESTICIDES/PCBs (µg/L)								
4,4'-DDD	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
4,4'-DDE	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
4,4'-DDT	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
ALDRIN	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
ALPHA-BHC	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
ALPHA-CHLORDANE	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
AROCLOR-1016	0.22 U	0.23 U			0.22 U	0.22 U	0.22 U	
AROCLOR-1221	0.45 U	0.47 U			0.44 U	0.43 U	0.43 U	
AROCLOR-1232	0.22 U	0.23 U			0.22 U	0.22 U	0.22 U	
AROCLOR-1242	0.22 U	0.23 U			0.22 U	0.22 U	0.22 U	
AROCLOR-1248	0.22 U	0.23 U			0.22 U	0.22 U	0.22 U	
AROCLOR-1254	0.22 U	0.23 U			0.22 U	0.22 U	0.22 U	
AROCLOR-1260	0.22 U	0.23 U			0.22 U	0.22 U	0.22 U	
BETA-BHC	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
DELTA-BHC	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
DIELDRIN	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
ENDOSULFAN I	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
ENDOSULFAN II	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
ENDOSULFAN SULFATE	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0090101	S57MW0100101	S57MW0110101	S57MW0110101-D	S57MW0120101	S57MW0120101-D	S57MW0130101	S57TW0010101
LOCATION:	S57MW009/SB005	S57MW010	S57MW011/SB008	S57MW011/SB008	S57MW012/SB013	S57MW012/SB013	S57MW013	S57TW001
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	UPPER	UPPER	LOWER	LOWER	UPPER	SHALLOW
SAMPLE DATE:	1/26/99	1/26/99	1/27/99	1/27/99	1/25/99	1/25/99	1/25/99	1/22/99
ASSOCIATED DUPLICATE:			S57MW0110101-D	S57MW0110101	S57MW0120101-D	S57MW0120101		
ENDRIN	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
ENDRIN ALDEHYDE	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
ENDRIN KETONE	0.022 U	0.023 U			0.022 U	0.022 U	0.022 U	
GAMMA-BHC (LINDANE)	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
GAMMA-CHLORDANE	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
HEPTACHLOR	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
HEPTACHLOR EPOXIDE	0.011 U	0.012 U			0.011 U	0.011 U	0.011 U	
METHOXYCHLOR	0.11 U	0.12 U			0.11 U	0.11 U	0.11 U	
TOXAPHENE	1.1 U	1.2 U			1.1 U	1.1 U	1.1 U	
EXPLOSIVES (µg/L)								
1,3,5-TRINITROBENZENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
1,3-DINITROBENZENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
2,4,6-TRINITROTOLUENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
2,4-DINITROTOLUENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
2,6-DINITROTOLUENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
2-AMINO-4,6-DINITROTOLUENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
2-NITROTOLUENE	2.6 UR	2.6 UR			2.6 U	2.6 U	2.6 U	
3-NITROTOLUENE	2.6 UR	2.6 UR			2.6 U	2.6 U	2.6 U	
4-AMINO-2,6-DINITROTOLUENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
4-NITROTOLUENE	2.6 UR	2.6 UR			2.6 U	2.6 U	2.6 U	
HMX	2.6 UR	2.6 UR			2.6 U	2.6 U	2.6 U	
NITROBENZENE	1.2 UR	1.2 UR			1.2 U	1.2 U	1.2 U	
NITROCELLULOSE	143 UR	148 L			195 L	223 L	150 UR	
NITROGLYCERIN	13 UR	13 UR			13 U	13 U	13 U	
NITROGUANIDINE	5 UR	5 UR			5.0 U	5.0 U	5.0 U	
RDX	2.6 UR	2.6 UR			2.6 U	2.6 U	2.6 U	
TETRYL	2.6 UR	2.6 UR			2.6 U	2.6 U	2.6 U	
INORGANICS (µg/L)								
ALUMINUM	134 B	167 B			72.6 B	121 B	117 B	
ANTIMONY	2.6 U	2.6 U			2.6 U	2.6 U	2.6 U	
ARSENIC	3.6 U	7.0 B			3.6 U	3.6 U	3.6 U	
BARIUM	27.7	57.4			58.9	30.9	72.7	
BERYLLIUM	0.25	0.10 U			0.10 U	0.10 U	0.39	
CADMIUM	0.30 U	0.30 U			0.38	0.30 U	0.30 U	
CALCIUM	1920	15600			8090	4240	2530	
CHROMIUM	0.60 U	0.60 U			0.60 U	0.60 U	0.60 U	
COBALT	14.5	10.5			17.5	9.5	22.9	
COPPER	2.9 B	6.6 B			3.4 B	2.9 B	3.2 B	
CYANIDE	5.0 U	5.0 U			5.0 U	5.0 U	5.0 U	
IRON	111	4330			2220 J	1240 J	102 J	
LEAD	1.0 U	1.2			1.0 U	1.0 U	1.0 U	
MAGNESIUM	1390	2360			1880	983	1500	

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0090101	S57MW0100101	S57MW0110101	S57MW0110101-D	S57MW0120101	S57MW0120101-D	S57MW0130101	S57TW0010101
LOCATION:	S57MW009/SB005	S57MW010	S57MW011/SB008	S57MW011/SB008	S57MW012/SB013	S57MW012/SB013	S57MW013	S57TW001
MATRIX:	GW	GW	GW	GW	GW	GW	GW	GW
AQUIFER:	LOWER	UPPER	UPPER	UPPER	LOWER	LOWER	UPPER	SHALLOW
SAMPLE DATE:	1/26/99	1/26/99	1/27/99	1/27/99	1/25/99	1/25/99	1/25/99	1/22/99
ASSOCIATED DUPLICATE:			S57MW0110101-D	S57MW0110101	S57MW0120101-D	S57MW0120101		
MANGANESE	41.6	311			271 J	140 J	179 J	
MERCURY	0.10 U	0.10 U			0.10 U	0.10 U	0.10 U	
NICKEL	5.2	5.7			7.9	4.2	7.0	
POTASSIUM	2860	4760			6940	3910	2490	
SELENIUM	2.5 U	2.5 U			2.5 U	2.5 U	2.5 U	
SILVER	0.70 U	0.70 U			0.70 U	0.70 U	0.70 U	
SODIUM	9260 L	38200			24100 J	12300 J	21900 J	
THALLIUM	3.3 U	3.3 U			3.3 U	3.3 U	3.3 U	
VANADIUM	0.82 B	1.4 B			0.94 B	0.70 U	0.70 U	
ZINC	26.2	73.3			64.1	40.0	23.8	
MISCELLANEOUS PARAMETERS								
AMMONIUM PERCHLORATE µg/L	5 U	5 U			5.0 U	5.0 U	8.78	
HARDNESS AS CaCO3 mg/L	9.91	51.5			35.7	31.7	11.9	
PH	5.35	6.39			6.04	5.94	4.96	
TOTAL DISSOLVED SOLIDS mg/L	40	152	120 L	109 L	58.0	90.0	68.0	
TOTAL ORGANIC CARBON mg/L	1 U	3.6			1.0 U	3.26	1.0 U	

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57TW0020101	S57TW0030101	S57PW0070101
LOCATION:	S57TW002	S57TW003	PW-07
MATRIX:	GW	GW	GW
AQUIFER:	SHALLOW	SHALLOW	
SAMPLE DATE:	1/21/99	1/21/99	1/25/99
ASSOCIATED DUPLICATE:			
VOLATILES (µg/L)			
1,1,1-TRICHLOROETHANE	10 U	10 U	1 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	1 U
1,1,2-TRICHLOROETHANE	10 U	10 U	1 U
1,1-DICHLOROETHANE	10 U	10 U	1 U
1,1-DICHLOROETHENE	10 U	10 U	1 U
1,2 DICHLOROBENZENE			1 U
1,2,4-TRICHLOROBENZENE			1 U
1,2-DIBROMO-3-CHLOROPROPANE			1 U
1,2-DIBROMOETHANE			1 U
1,2-DICHLOROBENZENE			
1,2-DICHLOROETHANE	10 U	10 U	1 U
1,2-DICHLOROPROPANE	10 U	10 U	1 U
1,3 DICHLOROBENZENE			1 U
1,3-DICHLOROBENZENE			
1,4 DICHLOROBENZENE			1 U
1,4-DICHLOROBENZENE			
2-BUTANONE	10 U	10 U	5 UR
2-HEXANONE	10 U	10 U	5 UR
4-METHYL-2-PENTANONE	10 U	10 U	5 UR
ACETONE	10 U	10 U	5 UR
BENZENE	10 U	10 U	1 U
BROMOCHLOROMETHANE			1 U
BROMODICHLOROMETHANE	10 U	10 U	1 U
BROMOFORM	10 U	10 U	1 U
BROMOMETHANE	10 U	10 U	1 U
CARBON DISULFIDE	10 U	10 U	1 U
CARBON TETRACHLORIDE	10 U	10 U	1 U
CHLOROBENZENE	10 U	10 U	1 U
CHLOROETHANE	10 U	10 U	1 U
CHLOROFORM	10 U	10 U	1 U
CHLOROMETHANE	10 U	10 U	1 U
CIS-1,2-DICHLOROETHENE	10 U	260	1 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U	1 U
DIBROMOCHLOROMETHANE	10 U	10 U	1 U
ETHYL ETHER	10 U	10 U	5 UR
ETHYLBENZENE	10 U	10 U	1 U
METHYLENE CHLORIDE	3 B	3 B	2 U
STYRENE	10 U	10 U	1 U
TETRACHLOROETHENE	10 U	10 U	1 U
TOLUENE	10 U	10 U	1 U
TRANS-1,2-DICHLOROETHENE	10 U	2 J	1 U

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: MATRIX: AQUIFER: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57TW0020101 S57TW002 GW SHALLOW 1/21/99	S57TW0030101 S57TW003 GW SHALLOW 1/21/99	S57PW0070101 PW-07 GW 1/25/99
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	1 U
TRICHLOROETHENE	10 U	10 U	7.2 J
VINYL CHLORIDE	10 U	85	1 U
XYLENES, TOTAL	10 U	10 U	1 U
SEMIVOLATILES (µg/L)			
2,2'-OXYBIS(1-CHLOROPROPANE			
2,4,5-TRICHLOROPHENOL			
2,4,6-TRICHLOROPHENOL			
2,4-DICHLOROPHENOL			
2,4-DIMETHYLPHENOL			
2,4-DINITROPHENOL			
2,4-DINITROTOLUENE			
2,6-DINITROTOLUENE			
2-CHLORONAPHTHALENE			
2-CHLOROPHENOL			
2-METHYLNAPHTHALENE			
2-METHYLPHENOL			
2-NITROANILINE			
2-NITROPHENOL			
3,3'-DICHLOROBENZIDINE			
3-NITROANILINE			
4,6-DINITRO-2-METHYLPHENOL			
4-BROMOPHENYL PHENYL ETHER			
4-CHLORO-3-METHYLPHENOL			
4-CHLOROANILINE			
4-CHLOROPHENYL PHENYL ETHER			
4-METHYLPHENOL			
4-NITROANILINE			
4-NITROPHENOL			
ACENAPHTHENE			
ACENAPHTHYLENE			
ANTHRACENE			
BENZO(A)ANTHRACENE			
BENZO(A)PYRENE			
BENZO(B)FLUORANTHENE			
BENZO(G,H,I)PERYLENE			
BENZO(K)FLUORANTHENE			
BIS(2-CHLOROETHOXY)METHANE			
BIS(2-CHLOROETHYL)ETHER			
BIS(2-ETHYLHEXYL)PHTHALATE			
BUTYLBENZYL PHTHALATE			
CHRYSENE			

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57TW0020101	S57TW0030101	S57PW0070101
LOCATION:	S57TW002	S57TW003	PW-07
MATRIX:	GW	GW	GW
AQUIFER:	SHALLOW	SHALLOW	
SAMPLE DATE:	1/21/99	1/21/99	1/25/99
ASSOCIATED DUPLICATE:			
DI-N-BUTYL PHTHALATE			
DI-N-OCTYL PHTHALATE			
DIBENZO(A,H)ANTHRACENE			
DIBENZOFURAN			
DIETHYL PHTHALATE			
DIMETHYL PHTHALATE			
FLUORANTHENE			
FLUORENE			
HEXACHLOROBENZENE			
HEXACHLOROBUTADIENE			
HEXACHLOROCYCLOPENTADIENE			
HEXACHLOROETHANE			
INDENO(1,2,3-CD)PYRENE			
ISOPHORONE			
N-NITROSO-DI-N-PROPYLAMINE			
N-NITROSODIPHENYLAMINE			
NAPHTHALENE			
NITROBENZENE			
PENTACHLOROPHENOL			
PHENANTHRENE			
PHENOL			
PYRENE			
PESTICIDES/PCBs (µg/L)			
4,4'-DDD			
4,4'-DDE			
4,4'-DDT			
ALDRIN			
ALPHA-BHC			
ALPHA-CHLORDANE			
AROCLOR-1016			
AROCLOR-1221			
AROCLOR-1232			
AROCLOR-1242			
AROCLOR-1248			
AROCLOR-1254			
AROCLOR-1260			
BETA-BHC			
DELTA-BHC			
DIELDRIN			
ENDOSULFAN I			
ENDOSULFAN II			
ENDOSULFAN SULFATE			

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57TW0020101	S57TW0030101	S57PW0070101
LOCATION:	S57TW002	S57TW003	PW-07
MATRIX:	GW	GW	GW
AQUIFER:	SHALLOW	SHALLOW	
SAMPLE DATE:	1/21/99	1/21/99	1/25/99
ASSOCIATED DUPLICATE:			
ENDRIN			
ENDRIN ALDEHYDE			
ENDRIN KETONE			
GAMMA-BHC (LINDANE)			
GAMMA-CHLORDANE			
HEPTACHLOR			
HEPTACHLOR EPOXIDE			
METHOXYCHLOR			
TOXAPHENE			
EXPLOSIVES (µg/L)			
1,3,5-TRINITROBENZENE			
1,3-DINITROBENZENE			
2,4,6-TRINITROTOLUENE			
2,4-DINITROTOLUENE			
2,6-DINITROTOLUENE			
2-AMINO-4,6-DINITROTOLUENE			
2-NITROTOLUENE			
3-NITROTOLUENE			
4-AMINO-2,6-DINITROTOLUENE			
4-NITROTOLUENE			
HMX			
NITROBENZENE			
NITROCELLULOSE			
NITROGLYCERIN			
NITROGUANIDINE			
RDX			
TETRYL			
INORGANICS (µg/L)			
ALUMINUM			
ANTIMONY			
ARSENIC			
BARIUM			
BERYLLIUM			
CADMIUM			
CALCIUM			
CHROMIUM			
COBALT			
COPPER			
CYANIDE			
IRON			
LEAD			
MAGNESIUM			

ANALYTICAL RESULTS - GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57TW0020101	S57TW0030101	S57PW0070101
LOCATION:	S57TW002	S57TW003	PW-07
MATRIX:	GW	GW	GW
AQUIFER:	SHALLOW	SHALLOW	
SAMPLE DATE:	1/21/99	1/21/99	1/25/99
ASSOCIATED DUPLICATE:			
MANGANESE			
MERCURY			
NICKEL			
POTASSIUM			
SELENIUM			
SILVER			
SODIUM			
THALLIUM			
VANADIUM			
ZINC			
MISCELLANEOUS PARAMETERS			
AMMONIUM PERCHLORATE µg/L			5 U
HARDNESS AS CaCO3 mg/L			
PH			
TOTAL DISSOLVED SOLIDS mg/L			
TOTAL ORGANIC CARBON mg/L			

ANALYTICAL RESULTS - FILTERED GROUNDWATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57MW0030101-F	S57MW0040101-F	S57MW0090101-F	S57MW0100101-F	S57MW0120101-F	S57MW0120101-F-D	S57MW0130101-F
LOCATION:	S57MW003/SB002	S57MW004	S57MW009/SB005	S57MW010	S57MW012/SB013	S57MW012/SB013	S57MW013
AQUIFER:	LOWER	UPPER	LOWER	UPPER	LOWER	LOWER	UPPER
SAMPLE DATE:	1/25/99	1/25/99	1/26/99	1/26/99	1/25/99	1/25/99	1/25/99
ASSOCIATED DUPLICATE:					S57MW0120101-F-D	S57MW0120101-F	
DISSOLVED INORGANICS (µg/L)							
ALUMINUM	173 B	85.9 B	83.1 B	192 B	88.1 B	53.8 B	108 B
ANTIMONY	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U
ARSENIC	3.6 U	3.6 U	3.6 U	8.3 B	3.6 U	4.1 B	3.6 U
BARIUM	35.2	33.1	27.0	55.0	59.4	59.4	73.5
BERYLLIUM	0.11	0.10 U	0.26	0.10 U	0.10 U	0.12	0.37
CADMIUM	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.37	0.30 U
CALCIUM	1870	2310	1980	19700	7810	7540	2640
CHROMIUM	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
COBALT	31.9	30.2	16.8	10.2	20.7	17.7	27.6
COPPER	2.1 B	3.0 B	2.9 B	5.2 B	4.1 B	2.8 B	4.1 B
IRON	174	154	28.0 B	3810	2180	2260	131
LEAD	1.0 U	1.0 U	1.0 U	1.3	1.0	1.0 U	1.0 U
MAGNESIUM	1250	1310	1400	2390	1920	1890	1510
MANGANESE	250	244	48.5	301	281	275	205
MERCURY	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
NICKEL	6.3	10.2	5.4	6.9	8.0	7.5	8.0
POTASSIUM	3980	3000	2900	5690	6950	6810	2570
SELENIUM	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
SILVER	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U
SODIUM	11300 J	13900 J	9400 L	41700	24600 J	24100 J	22100 J
THALLIUM	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
VANADIUM	0.70 U	0.70 U	0.70 U	1.7 B	0.70 U	0.75 B	0.70 U
ZINC	19.4	44.1	23.1	81.2	61.9	54.8	27.1

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010101	S57SW0020101	S57SW0030101	S57SW0030101-D	S57SW0030201	S57SW0040101	S57SW0060101
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-01 (MH-430)	MH-01 (MH-430)	MH-02 (MH-431)	MH-487
SAMPLE DATE:	1/27/99	1/27/99	1/22/99	1/22/99	1/22/99	1/22/99	1/21/99
ASSOCIATED DUPLICATE:			S57SW0030101-D	S57SW0030101			S57SW0060101-D
VOLATILES (µg/L)							
1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,1-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,1-DICHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
1,2,4-TRICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,2-DIBROMOETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,2-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,3-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
1,4-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
2-BUTANONE	17 L	21 L	17.1 J	16.8 J	5 UR	18 J	17.8 L
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5.0 UJ
4-METHYL-2-PENTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5.0 UJ
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	741.1 J
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
BROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U	0.6 J
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U	0.3 B
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
CHLOROETHANE	1 UR	1 U	1 U	1 U	1 U	1 U	1.0 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
CHLOROMETHANE	1 U	1 UR	1 U	1 U	1 U	1 U	1.0 U
CIS-1,2-DICHLOROETHENE	1 U	15 J	4.3	4.6	7.1	6.7	8.8
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	0.4 J
ETHYL ETHER	145 J	197 L	147 J	147.3 J	18.5 J	140.8 J	98.7 J
ETHYLBENZENE	1 U	4 J	0.8 J	0.9 J	1 U	0.9 J	1.0 J
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U	0.8 B
STYRENE	1 U	4 J	1 U	1 U	1 U	0.6 J	1.5
TETRACHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
TRICHLOROETHENE	1 U	9 J	5.9	6.5	6.9	10.1	20.6
VINYL CHLORIDE	1 U	2 J	1 U	1 U	1 U	1 U	0.5 J
XYLENES, TOTAL	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U
SEMIVOLATILES (µg/L)							
2,2'-OXYBIS(1-CHLOROPROPANE		6 U	5 U			5 U	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0010101 MH-427 1/27/99	S57SW0020101 MH-429 1/27/99	S57SW0030101 MH-01 (MH-430) 1/22/99 S57SW0030101-D	S57SW0030101-D MH-01 (MH-430) 1/22/99 S57SW0030101	S57SW0030201 MH-01 (MH-430) 1/22/99	S57SW0040101 MH-02 (MH-431) 1/22/99	S57SW0060101 MH-487 1/21/99 S57SW0060101-D
2,4,5-TRICHLOROPHENOL		22 U	21 U			21 U	
2,4,6-TRICHLOROPHENOL		6 U	5 U			5 U	
2,4-DICHLOROPHENOL		6 U	5 U			5 U	
2,4-DIMETHYLPHENOL		6 U	5 U			5 U	
2,4-DINITROPHENOL		22 U	21 U			21 U	
2,4-DINITROTOLUENE		6 U	5 U			5 U	
2,6-DINITROTOLUENE		6 U	5 U			5 U	
2-CHLORONAPHTHALENE		6 U	5 U			5 U	
2-CHLOROPHENOL		6 U	5 U			5 U	
2-METHYLNAPHTHALENE		6 U	5 U			5 U	
2-METHYLPHENOL		6 U	5 U			5 U	
2-NITROANILINE		22 U	21 U			21 U	
2-NITROPHENOL		6 U	5 U			5 U	
3,3'-DICHLOROBENZIDINE		6 U	5 U			5 U	
3-NITROANILINE		22 U	21 U			21 U	
4,6-DINITRO-2-METHYLPHENOL		22 U	21 U			21 U	
4-BROMOPHENYL PHENYL ETHER		6 U	5 U			5 U	
4-CHLORO-3-METHYLPHENOL		6 U	5 U			5 U	
4-CHLOROANILINE		6 U	5 UR			5 UR	
4-CHLOROPHENYL PHENYL ETHER		6 U	5 U			5 U	
4-METHYLPHENOL		6 U	5 U			5 U	
4-NITROANILINE		22 U	21 U			21 U	
4-NITROPHENOL		22 U	21 U			21 U	
ACENAPHTHENE		6 U	5 U			5 U	
ACENAPHTHYLENE		6 U	5 U			5 U	
ANTHRACENE		6 U	5 U			5 U	
BENZO(A)ANTHRACENE		6 U	5 U			5 U	
BENZO(A)PYRENE		6 U	5 U			5 U	
BENZO(B)FLUORANTHENE		6 U	5 U			5 U	
BENZO(G,H,I)PERYLENE		6 U	5 U			5 U	
BENZO(K)FLUORANTHENE		6 U	5 U			5 U	
BIS(2-CHLOROETHOXY)METHANE		6 U	5 U			5 U	
BIS(2-CHLOROETHYL)ETHER		6 U	5 U			5 U	
BIS(2-ETHYLHEXYL)PHTHALATE		6 U	3 B			5 B	
BUTYLBENZYL PHTHALATE		6 U	5 U			5 U	
CHRYSENE		6 U	5 U			5 U	
DI-N-BUTYL PHTHALATE		6 U	5 U			5 U	
DI-N-OCTYL PHTHALATE		6 U	5 U			5 U	
DIBENZO(A,H)ANTHRACENE		6 U	5 U			5 U	
DIBENZOFURAN		6 U	5 U			5 U	
DIETHYL PHTHALATE		6 U	5 U			5 U	
DIMETHYL PHTHALATE		6 U	5 U			5 U	
FLUORANTHENE		6 U	5 U			5 U	
FLUORENE		6 U	5 U			5 U	
HEXACHLOROBENZENE		6 U	5 U			5 U	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010101	S57SW0020101	S57SW0030101	S57SW0030101-D	S57SW0030201	S57SW0040101	S57SW0060101
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-01 (MH-430)	MH-01 (MH-430)	MH-02 (MH-431)	MH-487
SAMPLE DATE:	1/27/99	1/27/99	1/22/99	1/22/99	1/22/99	1/22/99	1/21/99
ASSOCIATED DUPLICATE:			S57SW0030101-D	S57SW0030101			S57SW0060101-D
HEXACHLOROBUTADIENE		6 U	5 U			5 U	
HEXACHLOROCYCLOPENTADIENE		6 U	5 U			5 U	
HEXACHLOROETHANE		6 U	5 U			5 U	
INDENO(1,2,3-CD)PYRENE		6 U	5 U			5 U	
ISOPHORONE		6 U	5 U			5 U	
N-NITROSO-DI-N-PROPYLAMINE		6 U	5 U			5 U	
N-NITROSODIPHENYLAMINE		6 U	5 U			5 U	
NAPHTHALENE		6 U	5 U			5 U	
NITROBENZENE		6 U	5 U			5 U	
PENTACHLOROPHENOL		22 U	21 U			21 U	
PHENANTHRENE		6 U	5 U			5 U	
PHENOL		6 U	5 U			5 U	
PYRENE		6 U	5 U			5 U	
PESTICIDES/PCBs (µg/L)							
4,4'-DDD		0.022 U	0.021 U			0.021 U	
4,4'-DDE		0.022 U	0.021 U			0.021 U	
4,4'-DDT		0.022 U	0.021 U			0.021 U	
ALDRIN		0.011 U	0.011 U			0.011 U	
ALPHA-BHC		0.011 U	0.011 U			0.011 U	
ALPHA-CHLORDANE		0.011 U	0.011 U			0.011 U	
AROCLOR-1016		0.22 U	0.21 U			0.21 U	
AROCLOR-1221		0.43 U	0.42 U			0.43 U	
AROCLOR-1232		0.22 U	0.21 U			0.21 U	
AROCLOR-1242		0.22 U	0.21 U			0.21 U	
AROCLOR-1248		0.22 U	0.21 U			0.21 U	
AROCLOR-1254		0.22 U	0.21 U			0.21 U	
AROCLOR-1260		0.22 U	0.21 U			0.21 U	
BETA-BHC		0.011 U	0.011 U			0.011 U	
DELTA-BHC		0.011 U	0.011 U			0.011 U	
DIELDRIN		0.022 U	0.021 U			0.021 U	
ENDOSULFAN I		0.011 U	0.011 U			0.011 U	
ENDOSULFAN II		0.022 U	0.021 U			0.021 U	
ENDOSULFAN SULFATE		0.022 U	0.021 U			0.021 U	
ENDRIN		0.022 U	0.021 U			0.021 U	
ENDRIN ALDEHYDE		0.022 U	0.021 U			0.021 U	
ENDRIN KETONE		0.022 U	0.021 U			0.021 U	
GAMMA-BHC (LINDANE)		0.011 U	0.011 U			0.011 U	
GAMMA-CHLORDANE		0.011 U	0.011 U			0.011 U	
HEPTACHLOR		0.011 U	0.011 U			0.011 U	
HEPTACHLOR EPOXIDE		0.011 U	0.011 U			0.011 U	
METHOXYCHLOR		0.11 U	0.11 U			0.11 U	
TOXAPHENE		1.1 U	1.1 U			1.1 U	
EXPLOSIVES (µg/L)							
1,3,5-TRINITROBENZENE		1.2 U	1.2 U			1.2 U	
1,3-DINITROBENZENE		1.2 U	1.2 U			1.2 U	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0010101 MH-427 1/27/99	S57SW0020101 MH-429 1/27/99	S57SW0030101 MH-01 (MH-430) 1/22/99 S57SW0030101-D	S57SW0030101-D MH-01 (MH-430) 1/22/99 S57SW0030101	S57SW0030201 MH-01 (MH-430) 1/22/99	S57SW0040101 MH-02 (MH-431) 1/22/99	S57SW0060101 MH-487 1/21/99 S57SW0060101-D
2,4,6-TRINITROTOLUENE		1.2 U	1.2 U			1.2 U	
2,4-DINITROTOLUENE		1.2 U	1.2 U			1.2 U	
2,6-DINITROTOLUENE		1.2 U	1.2 U			1.2 U	
2-AMINO-4,6-DINITROTOLUENE		1.2 U	1.2 U			1.2 U	
2-NITROTOLUENE		2.6 U	2.6 U			2.6 U	
3-NITROTOLUENE		2.6 U	2.6 U			2.6 U	
4-AMINO-2,6-DINITROTOLUENE		1.2 U	1.2 U			1.2 U	
4-NITROTOLUENE		2.6 U	2.6 U			2.6 U	
HMX		2.6 U	2.6 U			2.6 U	
NITROBENZENE		1.2 U	1.2 U			1.2 U	
NITROCELLULOSE		144 L	1120 L			1230 L	
NITROGLYCERIN		13.0 U	13 U			13 U	
NITROGUANIDINE		5.0 U	5 U			5 U	
RDX		2.6 U	2.6 U			2.6 U	
TETRYL		2.6 UJ	2.6 U			2.6 U	
INORGANICS (µg/L)							
ALUMINUM		148 B	715 J			924 J	
ANTIMONY		2.6 U	4.3 B			4.2 B	
ARSENIC		3.6 U	3.6 U			3.6 U	
BARIUM		22.2 K	27.3			28.7	
BERYLLIUM		0.10 U	0.10 U			0.10 U	
CADMIUM		0.30 U	0.53 B			0.53 B	
CALCIUM		9820 K	12700			13200	
CHROMIUM		0.60 U	1.4			2.2	
COBALT		3.9 K	2.8			2.6	
COPPER		14.8 B	21.8			25.2	
CYANIDE		5 U	5.0 U			5.0 U	
IRON		925 K	1320			1510	
LEAD		4.4 B	4.1 L			5.4 L	
MAGNESIUM		2010	2710			2820	
MANGANESE		85.3 K	71.9			73.8	
MERCURY		0.10 U	0.10 U			0.10 U	
NICKEL		2.8 K	3.2			5.1	
POTASSIUM		2840	2800			2890	
SELENIUM		2.5 U	2.5 U			2.5 U	
SILVER		0.70 U	0.72 B			0.70 U	
SODIUM		50100	49700			50800	
THALLIUM		3.3 U	3.3 U			3.3 U	
VANADIUM		1.6 K	5.4 B			7.1	
ZINC		84.2 K	83.4			90.4	
MISCELLANEOUS PARAMETERS							
CHLORIDE mg/L							
DISSOLVED OXYGEN mg/L							
FLUORIDE mg/L							
HARDNESS AS CaCO3 mg/L		35.7					

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0010101 MH-427 1/27/99	S57SW0020101 MH-429 1/27/99	S57SW0030101 MH-01 (MH-430) 1/22/99 S57SW0030101-D	S57SW0030101-D MH-01 (MH-430) 1/22/99 S57SW0030101	S57SW0030201 MH-01 (MH-430) 1/22/99	S57SW0040101 MH-02 (MH-431) 1/22/99	S57SW0060101 MH-487 1/21/99 S57SW0060101-D
NITRATE/NITRITE mg/L							
PH							
SALINITY SI							
SULFATE mg/L							
TOTAL DISSOLVED SOLIDS mg/L							
TOTAL ORGANIC CARBON mg/L		2.32					
TOTAL SUSPENDED SOLIDS mg/L							
TURBIDITY NTU							

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0060101-D	S57SW0060201	S57SW0070101	S57SW0070201	S57SW0080101	S57SW0080201	S57SW0080301
LOCATION:	MH-487	MH-487	IW-80 (MH-489)	IW-80 (MH-489)	MH-497	MH-497	MH-497
SAMPLE DATE:	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99
ASSOCIATED DUPLICATE:	S57SW0060101						
VOLATILES (µg/L)							
1,1,1-TRICHLOROETHANE	0.1 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-TETRACHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-TRICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-DICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-DICHLOROETHENE	0.2 J	1.0 U	0.1 J	0.1 J	1.0 U	1.0 U	1.0 U
1,2,4-TRICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-DIBROMOETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-DICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-DICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-DICHLOROPROPANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-DICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-DICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-BUTANONE	17 L	14.9 L	17.3 L	17.0 L	13.3 L	16.7 L	5.0 UR
2-HEXANONE	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
4-METHYL-2-PENTANONE	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
ACETONE	725.1 J	84.4 B	272.6 J	478.5 J	37.1 B	255.3 J	5.0 UR
BENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
BROMOCHLOROMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
BROMODICHLOROMETHANE	0.1 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
BROMOFORM	0.6 J	0.3 J	0.6 J	0.7 J	0.6 J	0.4 J	1.0 U
BROMOMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
CARBON DISULFIDE	0.3 B	0.1 B	0.1 B	0.3 B	0.4 B	0.2 B	1.8 B
CARBON TETRACHLORIDE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
CHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
CHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
CHLOROFORM	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
CHLOROMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
CIS-1,2-DICHLOROETHENE	8.9	4.7	9.4	11.3	6.0	6.0	0.3 J
CIS-1,3-DICHLOROPROPENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
DIBROMOCHLOROMETHANE	0.4 J	0.2 J	0.4 J	0.4 J	0.4 J	0.2 J	1.0 U
ETHYL ETHER	96.4 J	47.3 J	98.9 J	103.1 J	74.2 J	70.3 J	1.9
ETHYLBENZENE	0.9 J	0.5 J	0.9 J	1.0 J	0.5 J	0.5 J	1.0 U
METHYLENE CHLORIDE	0.8 B	0.8 B	0.7 B	0.7 B	0.7 B	0.7 B	0.7 B
STYRENE	1.7	1.1	1.6	0.6 J	0.3 J	0.2 J	1.0 U
TETRACHLOROETHENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
TOLUENE	0.1 J	0.1 J	0.1 J	0.1 J	1.0 U	1.0 U	1.0 U
TRANS-1,2-DICHLOROETHENE	1.0 U	1.0 U	0.1 J	0.1 J	1.0 U	0.1 J	1.0 U
TRANS-1,3-DICHLOROPROPENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
TRICHLOROETHENE	20.6	11.5	19.9	21.3	14.9	14.7	0.4 J
VINYL CHLORIDE	0.5 J	0.2 J	0.4 J	0.4 J	0.3 J	0.2 J	1.0 U
XYLENES, TOTAL	0.2 J	0.1 J	0.6 J	0.5 J	0.3 J	0.2 J	1.0 U
SEMIVOLATILES (µg/L)							
2,2'-OXYBIS(1-CHLOROPROPANE			5 U				

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0060101-D MH-487 1/21/99 S57SW0060101	S57SW0060201 MH-487 1/21/99	S57SW0070101 IW-80 (MH-489) 1/21/99	S57SW0070201 IW-80 (MH-489) 1/21/99	S57SW0080101 MH-497 1/21/99	S57SW0080201 MH-497 1/21/99	S57SW0080301 MH-497 1/21/99
2,4,5-TRICHLOROPHENOL			21 U				
2,4,6-TRICHLOROPHENOL			5 U				
2,4-DICHLOROPHENOL			5 U				
2,4-DIMETHYLPHENOL			5 U				
2,4-DINITROPHENOL			21 U				
2,4-DINITROTOLUENE			5 U				
2,6-DINITROTOLUENE			5 U				
2-CHLORONAPHTHALENE			5 U				
2-CHLOROPHENOL			5 U				
2-METHYLNAPHTHALENE			5 U				
2-METHYLPHENOL			5 U				
2-NITROANILINE			21 U				
2-NITROPHENOL			5 U				
3,3'-DICHLOROBENZIDINE			5 U				
3-NITROANILINE			21 U				
4,6-DINITRO-2-METHYLPHENOL			21 U				
4-BROMOPHENYL PHENYL ETHER			5 U				
4-CHLORO-3-METHYLPHENOL			5 U				
4-CHLOROANILINE			5 U				
4-CHLOROPHENYL PHENYL ETHER			5 U				
4-METHYLPHENOL			5 U				
4-NITROANILINE			21 U				
4-NITROPHENOL			21 U				
ACENAPHTHENE			5 U				
ACENAPHTHYLENE			5 U				
ANTHRACENE			5 U				
BENZO(A)ANTHRACENE			5 U				
BENZO(A)PYRENE			5 U				
BENZO(B)FLUORANTHENE			5 U				
BENZO(G,H,I)PERYLENE			5 U				
BENZO(K)FLUORANTHENE			5 U				
BIS(2-CHLOROETHOXY)METHANE			5 U				
BIS(2-CHLOROETHYL)ETHER			5 U				
BIS(2-ETHYLHEXYL)PHTHALATE			2 B				
BUTYLBENZYL PHTHALATE			5 U				
CHRYSENE			5 U				
DI-N-BUTYL PHTHALATE			5 U				
DI-N-OCTYL PHTHALATE			5 U				
DIBENZO(A,H)ANTHRACENE			5 U				
DIBENZOFURAN			5 U				
DIETHYL PHTHALATE			5 U				
DIMETHYL PHTHALATE			5 U				
FLUORANTHENE			5 U				
FLUORENE			5 U				
HEXACHLOROBENZENE			5 U				

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0060101-D	S57SW0060201	S57SW0070101	S57SW0070201	S57SW0080101	S57SW0080201	S57SW0080301
LOCATION:	MH-487	MH-487	IW-80 (MH-489)	IW-80 (MH-489)	MH-497	MH-497	MH-497
SAMPLE DATE:	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99
ASSOCIATED DUPLICATE:	S57SW0060101						
HEXACHLOROBUTADIENE			5 U				
HEXACHLOROCYCLOPENTADIENE			5 U				
HEXACHLOROETHANE			5 U				
INDENO(1,2,3-CD)PYRENE			5 U				
ISOPHORONE			5 U				
N-NITROSO-DI-N-PROPYLAMINE			5 U				
N-NITROSODIPHENYLAMINE			5 U				
NAPHTHALENE			5 U				
NITROBENZENE			5 U				
PENTACHLOROPHENOL			21 U				
PHENANTHRENE			5 U				
PHENOL			5 U				
PYRENE			5 U				
PESTICIDES/PCBs (µg/L)							
4,4'-DDD			0.021 U				
4,4'-DDE			0.021 U				
4,4'-DDT			0.021 U				
ALDRIN			0.011 U				
ALPHA-BHC			0.011 U				
ALPHA-CHLORDANE			0.011 U				
AROCLOR-1016			0.21 U				
AROCLOR-1221			0.42 U				
AROCLOR-1232			0.21 U				
AROCLOR-1242			0.21 U				
AROCLOR-1248			0.21 U				
AROCLOR-1254			0.21 U				
AROCLOR-1260			0.21 U				
BETA-BHC			0.011 U				
DELTA-BHC			0.011 U				
DIELDRIN			0.021 U				
ENDOSULFAN I			0.011 U				
ENDOSULFAN II			0.021 U				
ENDOSULFAN SULFATE			0.021 U				
ENDRIN			0.021 U				
ENDRIN ALDEHYDE			0.021 U				
ENDRIN KETONE			0.021 U				
GAMMA-BHC (LINDANE)			0.011 U				
GAMMA-CHLORDANE			0.011 U				
HEPTACHLOR			0.011 U				
HEPTACHLOR EPOXIDE			0.011 U				
METHOXYCHLOR			0.11 U				
TOXAPHENE			1.1 U				
EXPLOSIVES (µg/L)							
1,3,5-TRINITROBENZENE			1.2 U				
1,3-DINITROBENZENE			1.2 U				

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0060101-D MH-487 1/21/99 S57SW0060101	S57SW0060201 MH-487 1/21/99	S57SW0070101 IW-80 (MH-489) 1/21/99	S57SW0070201 IW-80 (MH-489) 1/21/99	S57SW0080101 MH-497 1/21/99	S57SW0080201 MH-497 1/21/99	S57SW0080301 MH-497 1/21/99
2,4,6-TRINITROTOLUENE			1.2 U				
2,4-DINITROTOLUENE			1.2 U				
2,6-DINITROTOLUENE			1.2 U				
2-AMINO-4,6-DINITROTOLUENE			1.2 U				
2-NITROTOLUENE			2.6 U				
3-NITROTOLUENE			2.6 U				
4-AMINO-2,6-DINITROTOLUENE			1.2 U				
4-NITROTOLUENE			2.6 U				
HMX			2.6 U				
NITROBENZENE			1.2 U				
NITROCELLULOSE			136 UR				
NITROGLYCERIN			13.0 U				
NITROGUANIDINE			5.0 U				
RDX			2.6 U				
TETRYL			2.6 U				
INORGANICS (µg/L)							
ALUMINUM			277				
ANTIMONY			3.1 B				
ARSENIC			3.6 U				
BARIUM			25.7				
BERYLLIUM			0.10 U				
CADMIUM			0.38 B				
CALCIUM			11400				
CHROMIUM			1.1				
COBALT			3.7				
COPPER			14.9				
CYANIDE			5.0 U				
IRON			929				
LEAD			3.2 L				
MAGNESIUM			2890				
MANGANESE			114				
MERCURY			0.10 U				
NICKEL			2.3				
POTASSIUM			3200				
SELENIUM			2.5 U				
SILVER			0.70 U				
SODIUM			60900				
THALLIUM			3.3 U				
VANADIUM			5.7 B				
ZINC			58.3				
MISCELLANEOUS PARAMETERS							
CHLORIDE mg/L							
DISSOLVED OXYGEN mg/L							
FLUORIDE mg/L							
HARDNESS AS CaCO3 mg/L							

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0060101-D MH-487 1/21/99 S57SW0060101	S57SW0060201 MH-487 1/21/99	S57SW0070101 IW-80 (MH-489) 1/21/99	S57SW0070201 IW-80 (MH-489) 1/21/99	S57SW0080101 MH-497 1/21/99	S57SW0080201 MH-497 1/21/99	S57SW0080301 MH-497 1/21/99
NITRATE/NITRITE mg/L							
PH							
SALINITY SI							
SULFATE mg/L							
TOTAL DISSOLVED SOLIDS mg/L							
TOTAL ORGANIC CARBON mg/L							
TOTAL SUSPENDED SOLIDS mg/L							
TURBIDITY NTU							

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0090101 S57SW009/SD005 1/20/99	S57SW0100101 S57SW010/SD006 1/20/99	S57SW0110101 S57SW011/SD007 1/9/99	S57SW0120101 S57SW012/SD008 1/9/99	S57SW0130101 S57SW013/SD009 1/25/99	S57SW0140101 S57SW014/SD010 1/7/99	S57SW0150101 S57SW015/SD011 1/7/99
VOLATILES (µg/L)							
1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-TRICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	0.7 J
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 UR	1 UR
1,2-DIBROMOETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	10.7 J	9.4 J	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	7 J	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	0.9 J	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	10.8	40.1	1 U	0.5 J	1 U	1 U	1 U
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ETHYL ETHER	70.2	69.4	5 UR	5 UR	5 UR	5 UR	5 UR
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	0.8 B	0.8 B	2 U	0.7 B	1.2 B
STYRENE	0.8 J	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	16.1	16.5	1 U	0.7 J	1 U	1 U	1.4
VINYL CHLORIDE	1.1	3.5	1 U	1 U	1 U	1 U	1 U
XYLENES, TOTAL	1 U	1 U	1 U	1 U	1 U	1 U	1 U
SEMIVOLATILES (µg/L)							
2,2'-OXYBIS(1-CHLOROPROPANE	5 U					5 U	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0090101 S57SW009/SD005 1/20/99	S57SW0100101 S57SW010/SD006 1/20/99	S57SW0110101 S57SW011/SD007 1/9/99	S57SW0120101 S57SW012/SD008 1/9/99	S57SW0130101 S57SW013/SD009 1/25/99	S57SW0140101 S57SW014/SD010 1/7/99	S57SW0150101 S57SW015/SD011 1/7/99
2,4,5-TRICHLOROPHENOL	20 U					21 U	
2,4,6-TRICHLOROPHENOL	5 U					5 U	
2,4-DICHLOROPHENOL	5 U					5 U	
2,4-DIMETHYLPHENOL	5 U					5 U	
2,4-DINITROPHENOL	20 U					21 U	
2,4-DINITROTOLUENE	5 U					5 U	
2,6-DINITROTOLUENE	5 U					5 U	
2-CHLORONAPHTHALENE	5 U					5 U	
2-CHLOROPHENOL	5 U					5 U	
2-METHYLNAPHTHALENE	5 U					5 U	
2-METHYLPHENOL	5 U					5 U	
2-NITROANILINE	20 U					21 U	
2-NITROPHENOL	5 U					5 U	
3,3'-DICHLOROBENZIDINE	5 U					5 U	
3-NITROANILINE	20 U					21 U	
4,6-DINITRO-2-METHYLPHENOL	20 U					21 U	
4-BROMOPHENYL PHENYL ETHER	5 U					5 U	
4-CHLORO-3-METHYLPHENOL	5 U					5 U	
4-CHLOROANILINE	5 U					5 U	
4-CHLOROPHENYL PHENYL ETHER	5 U					5 U	
4-METHYLPHENOL	5 U					5 U	
4-NITROANILINE	20 U					21 U	
4-NITROPHENOL	20 U					21 U	
ACENAPHTHENE	5 U					5 U	
ACENAPHTHYLENE	5 U					5 U	
ANTHRACENE	5 U					5 U	
BENZO(A)ANTHRACENE	5 U					5 U	
BENZO(A)PYRENE	5 U					5 U	
BENZO(B)FLUORANTHENE	5 U					5 U	
BENZO(G,H,I)PERYLENE	5 U					5 U	
BENZO(K)FLUORANTHENE	5 U					5 U	
BIS(2-CHLOROETHOXY)METHANE	5 U					5 U	
BIS(2-CHLOROETHYL)ETHER	5 U					5 U	
BIS(2-ETHYLHEXYL)PHTHALATE	2 B					2 B	
BUTYLBENZYL PHTHALATE	5 U					5 U	
CHRYSENE	5 U					5 U	
DI-N-BUTYL PHTHALATE	5 U					5 U	
DI-N-OCTYL PHTHALATE	5 U					5 U	
DIBENZO(A,H)ANTHRACENE	5 U					5 U	
DIBENZOFURAN	5 U					5 U	
DIETHYL PHTHALATE	5 U					5 U	
DIMETHYL PHTHALATE	5 U					5 U	
FLUORANTHENE	5 U					5 U	
FLUORENE	5 U					5 U	
HEXACHLOROBENZENE	5 U					5 U	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0090101 S57SW009/SD005 1/20/99	S57SW0100101 S57SW010/SD006 1/20/99	S57SW0110101 S57SW011/SD007 1/9/99	S57SW0120101 S57SW012/SD008 1/9/99	S57SW0130101 S57SW013/SD009 1/25/99	S57SW0140101 S57SW014/SD010 1/7/99	S57SW0150101 S57SW015/SD011 1/7/99
HEXACHLOROBUTADIENE	5 U					5 U	
HEXACHLOROCYCLOPENTADIENE	5 U					5 U	
HEXACHLOROETHANE	5 U					5 U	
INDENO(1,2,3-CD)PYRENE	5 U					5 U	
ISOPHORONE	5 U					5 U	
N-NITROSO-DI-N-PROPYLAMINE	5 U					5 U	
N-NITROSODIPHENYLAMINE	5 U					5 U	
NAPHTHALENE	5 U					5 U	
NITROBENZENE	5 U					5 U	
PENTACHLOROPHENOL	20 U					21 U	
PHENANTHRENE	5 U					5 U	
PHENOL	5 U					5 U	
PYRENE	5 U					5 U	
PESTICIDES/PCBs (µg/L)							
4,4'-DDD	0.020 U					0.022 U	
4,4'-DDE	0.020 U					0.022 U	
4,4'-DDT	0.020 U					0.022 U	
ALDRIN	0.010 U					0.011 U	
ALPHA-BHC	0.010 U					0.011 U	
ALPHA-CHLORDANE	0.010 U					0.011 U	
AROCLOR-1016	0.20 U					0.22 U	
AROCLOR-1221	0.40 U					0.44 U	
AROCLOR-1232	0.20 U					0.22 U	
AROCLOR-1242	0.20 U					0.22 U	
AROCLOR-1248	0.20 U					0.22 U	
AROCLOR-1254	0.20 U					0.22 U	
AROCLOR-1260	0.20 U					0.22 U	
BETA-BHC	0.010 U					0.011 U	
DELTA-BHC	0.010 U					0.011 U	
DIELDRIN	0.020 U					0.022 U	
ENDOSULFAN I	0.010 U					0.011 U	
ENDOSULFAN II	0.020 U					0.022 U	
ENDOSULFAN SULFATE	0.020 U					0.022 U	
ENDRIN	0.020 U					0.022 U	
ENDRIN ALDEHYDE	0.020 U					0.022 U	
ENDRIN KETONE	0.020 U					0.022 U	
GAMMA-BHC (LINDANE)	0.010 U					0.011 U	
GAMMA-CHLORDANE	0.010 U					0.011 U	
HEPTACHLOR	0.010 U					0.011 U	
HEPTACHLOR EPOXIDE	0.010 U					0.011 U	
METHOXYCHLOR	0.10 U					0.11 U	
TOXAPHENE	1.0 U					1.10 U	
EXPLOSIVES (µg/L)							
1,3,5-TRINITROBENZENE	1.2 U					1.2 U	
1,3-DINITROBENZENE	1.2 U					1.2 U	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0090101 S57SW009/SD005 1/20/99	S57SW0100101 S57SW010/SD006 1/20/99	S57SW0110101 S57SW011/SD007 1/9/99	S57SW0120101 S57SW012/SD008 1/9/99	S57SW0130101 S57SW013/SD009 1/25/99	S57SW0140101 S57SW014/SD010 1/7/99	S57SW0150101 S57SW015/SD011 1/7/99
2,4,6-TRINITROTOLUENE	1.2 U					1.2 U	
2,4-DINITROTOLUENE	1.2 U					1.2 U	
2,6-DINITROTOLUENE	1.2 U					1.2 U	
2-AMINO-4,6-DINITROTOLUENE	1.2 U					1.2 U	
2-NITROTOLUENE	2.6 U					2.6 U	
3-NITROTOLUENE	2.6 U					2.6 U	
4-AMINO-2,6-DINITROTOLUENE	1.2 U					1.2 U	
4-NITROTOLUENE	2.6 U					2.6 U	
HMX	2.6 U					2.6 U	
NITROBENZENE	1.2 U					1.2 U	
NITROCELLULOSE	135 UR					1440 UL	
NITROGLYCERIN	13 U					13 U	
NITROGUANIDINE	5 U					5.0 U	
RDX	2.6 U					2.6 U	
TETRYL	2.6 U					2.6 U	
INORGANICS (µg/L)							
ALUMINUM	481					319	
ANTIMONY	2.9 B					4.2 U	
ARSENIC	3.6 U					3.0 U	
BARIUM	34.0					17.3	
BERYLLIUM	0.10 U					0.20 U	
CADMIUM	0.36 B					0.40 U	
CALCIUM	13800					9450	
CHROMIUM	0.73					1.0	
COBALT	4.0					0.87 B	
COPPER	17.1					7.2 B	
CYANIDE	8.6					6.5	
IRON	1570					785	
LEAD	4.2 L					7.9	
MAGNESIUM	3680					1580	
MANGANESE	119					22.1	
MERCURY	0.10 U					0.10 U	
NICKEL	3.7					3.1	
POTASSIUM	3160					1290	
SELENIUM	2.5 U					1.9 UJ	
SILVER	0.70 U					0.80 U	
SODIUM	63700 J					7660 K	
THALLIUM	3.3 U					4.1 U	
VANADIUM	5.1 B					1.4	
ZINC	78.5					119	
MISCELLANEOUS PARAMETERS							
CHLORIDE mg/L	43.0 L				150 U	10.2	127
DISSOLVED OXYGEN mg/L	9.7				10.6	11	10.6
FLUORIDE mg/L	0.10 U				0.10 U	0.174 K	2.17 K
HARDNESS AS CaCO3 mg/L	59.5				17.8	27.3	

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:		S57SW0090101 S57SW009/SD005 1/20/99	S57SW0100101 S57SW010/SD006 1/20/99	S57SW0110101 S57SW011/SD007 1/9/99	S57SW0120101 S57SW012/SD008 1/9/99	S57SW0130101 S57SW013/SD009 1/25/99	S57SW0140101 S57SW014/SD010 1/7/99	S57SW0150101 S57SW015/SD011 1/7/99
NITRATE/NITRITE	mg/L	0.452 L				0.686	0.121	0.294
PH		7.35				5.54	7.0	7.16
SALINITY	SI	5.0 UR				5.0 U	5.0 U	5.0 U
SULFATE	mg/L	38.0 L				8.1 U	8.96	454 J
TOTAL DISSOLVED SOLIDS	mg/L	224 L				178	64	921
TOTAL ORGANIC CARBON	mg/L	2.08				3.28	2.32	
TOTAL SUSPENDED SOLIDS	mg/L	5.0 UL				30.0	7	5 U
TURBIDITY	NTU	7.71 L				25.7	3.99	6.03

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0160101	S57SW0160101-D
LOCATION:	S57SW016/SD012	S57SW016/SD012
SAMPLE DATE:	1/20/99	1/20/99
ASSOCIATED DUPLICATE:	S57SW0160101-D	S57SW0160101
VOLATILES (µg/L)		
1,1,1-TRICHLOROETHANE	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U
1,1-DICHLOROETHANE	1 U	1 U
1,1-DICHLOROETHENE	1 U	1 U
1,2,4-TRICHLOROBENZENE	1 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U
1,2-DIBROMOETHANE	1 U	1 U
1,2-DICHLOROBENZENE	1 U	1 U
1,2-DICHLOROETHANE	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U
1,3-DICHLOROBENZENE	1 U	1 U
1,4-DICHLOROBENZENE	1 U	1 U
2-BUTANONE	5 UR	5 UR
2-HEXANONE	5 UR	5 UR
4-METHYL-2-PENTANONE	5 UR	5 UR
ACETONE	5 UR	5 UR
BENZENE	1 U	1 U
BROMOCHLOROMETHANE	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U
BROMOFORM	1 U	1 U
BROMOMETHANE	1 U	1 U
CARBON DISULFIDE	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U
CHLOROBENZENE	1 U	1 U
CHLOROETHANE	1 U	1 U
CHLOROFORM	1 U	1 U
CHLOROMETHANE	1 U	1 U
CIS-1,2-DICHLOROETHENE	1 U	1 U
CIS-1,3-DICHLOROPROPENE	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U
ETHYL ETHER	5 UR	5 UR
ETHYLBENZENE	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U
STYRENE	1 U	1 U
TETRACHLOROETHENE	1 U	1 U
TOLUENE	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U
TRICHLOROETHENE	1 U	1 U
VINYL CHLORIDE	1 U	1 U
XYLENES, TOTAL	1 U	1 U
SEMIVOLATILES (µg/L)		
2,2'-OXYBIS(1-CHLOROPROPANE	5 U	5 U

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0160101 S57SW016/SD012 1/20/99 S57SW0160101-D	S57SW0160101-D S57SW016/SD012 1/20/99 S57SW0160101
2,4,5-TRICHLOROPHENOL	20 U	20 U
2,4,6-TRICHLOROPHENOL	5 U	5 U
2,4-DICHLOROPHENOL	5 U	5 U
2,4-DIMETHYLPHENOL	5 U	5 U
2,4-DINITROPHENOL	20 U	20 U
2,4-DINITROTOLUENE	5 U	5 U
2,6-DINITROTOLUENE	5 U	5 U
2-CHLORONAPHTHALENE	5 U	5 U
2-CHLOROPHENOL	5 U	5 U
2-METHYLNAPHTHALENE	5 U	5 U
2-METHYLPHENOL	5 U	5 U
2-NITROANILINE	20 U	20 U
2-NITROPHENOL	5 U	5 U
3,3'-DICHLOROBENZIDINE	5 U	5 U
3-NITROANILINE	20 U	20 U
4,6-DINITRO-2-METHYLPHENOL	20 U	20 U
4-BROMOPHENYL PHENYL ETHER	5 U	5 U
4-CHLORO-3-METHYLPHENOL	5 U	5 U
4-CHLOROANILINE	5 U	5 U
4-CHLOROPHENYL PHENYL ETHER	5 U	5 U
4-METHYLPHENOL	5 U	5 U
4-NITROANILINE	20 U	20 U
4-NITROPHENOL	20 U	20 U
ACENAPHTHENE	5 U	5 U
ACENAPHTHYLENE	5 U	5 U
ANTHRACENE	5 U	5 U
BENZO(A)ANTHRACENE	5 U	5 U
BENZO(A)PYRENE	5 U	5 U
BENZO(B)FLUORANTHENE	5 U	5 U
BENZO(G,H,I)PERYLENE	5 U	5 U
BENZO(K)FLUORANTHENE	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	5 U	5 U
BIS(2-CHLOROETHYL)ETHER	5 U	5 U
BIS(2-ETHYLHEXYL)PHTHALATE	2 B	2 B
BUTYLBENZYL PHTHALATE	5 U	5 U
CHRYSENE	5 U	5 U
DI-N-BUTYL PHTHALATE	5 U	5 U
DI-N-OCTYL PHTHALATE	5 U	5 U
DIBENZO(A,H)ANTHRACENE	5 U	5 U
DIBENZOFURAN	5 U	5 U
DIETHYL PHTHALATE	5 U	5 U
DIMETHYL PHTHALATE	5 U	5 U
FLUORANTHENE	5 U	5 U
FLUORENE	5 U	5 U
HEXACHLOROBENZENE	5 U	5 U

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0160101 S57SW016/SD012 1/20/99 S57SW0160101-D	S57SW0160101-D S57SW016/SD012 1/20/99 S57SW0160101
HEXACHLOROBUTADIENE	5 U	5 U
HEXACHLOROCYCLOPENTADIENE	5 U	5 U
HEXACHLOROETHANE	5 U	5 U
INDENO(1,2,3-CD)PYRENE	5 U	5 U
ISOPHORONE	5 U	5 U
N-NITROSO-DI-N-PROPYLAMINE	5 U	5 U
N-NITROSODIPHENYLAMINE	5 U	5 U
NAPHTHALENE	5 U	5 U
NITROBENZENE	5 U	5 U
PENTACHLOROPHENOL	20 U	20 U
PHENANTHRENE	5 U	5 U
PHENOL	5 U	5 U
PYRENE	5 U	5 U
PESTICIDES/PCBs (µg/L)		
4,4'-DDD	0.020 U	0.020 U
4,4'-DDE	0.020 U	0.020 U
4,4'-DDT	0.020 U	0.020 U
ALDRIN	0.010 U	0.010 U
ALPHA-BHC	0.010 U	0.010 U
ALPHA-CHLORDANE	0.010 U	0.010 U
AROCLOR-1016	0.20 U	0.20 U
AROCLOR-1221	0.40 U	0.40 U
AROCLOR-1232	0.20 U	0.20 U
AROCLOR-1242	0.20 U	0.20 U
AROCLOR-1248	0.20 U	0.20 U
AROCLOR-1254	0.20 U	0.20 U
AROCLOR-1260	0.20 U	0.20 U
BETA-BHC	0.010 U	0.010 U
DELTA-BHC	0.010 U	0.010 U
DIELDRIN	0.020 U	0.020 U
ENDOSULFAN I	0.010 U	0.010 U
ENDOSULFAN II	0.020 U	0.020 U
ENDOSULFAN SULFATE	0.020 U	0.020 U
ENDRIN	0.020 U	0.020 U
ENDRIN ALDEHYDE	0.020 U	0.020 U
ENDRIN KETONE	0.020 U	0.020 U
GAMMA-BHC (LINDANE)	0.010 U	0.010 U
GAMMA-CHLORDANE	0.010 U	0.010 U
HEPTACHLOR	0.010 U	0.010 U
HEPTACHLOR EPOXIDE	0.010 U	0.010 U
METHOXYCHLOR	0.10 U	0.10 U
TOXAPHENE	1.0 U	1.0 U
EXPLOSIVES (µg/L)		
1,3,5-TRINITROBENZENE	1.2 U	1.2 U
1,3-DINITROBENZENE	1.2 U	1.2 U

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.: LOCATION: SAMPLE DATE: ASSOCIATED DUPLICATE:	S57SW0160101 S57SW016/SD012 1/20/99 S57SW0160101-D	S57SW0160101-D S57SW016/SD012 1/20/99 S57SW0160101
2,4,6-TRINITROTOLUENE	1.2 U	1.2 U
2,4-DINITROTOLUENE	1.2 U	1.2 U
2,6-DINITROTOLUENE	1.2 U	1.2 U
2-AMINO-4,6-DINITROTOLUENE	1.2 U	1.2 U
2-NITROTOLUENE	2.6 U	2.6 U
3-NITROTOLUENE	2.6 U	2.6 U
4-AMINO-2,6-DINITROTOLUENE	1.2 U	1.2 U
4-NITROTOLUENE	2.6 U	2.6 U
HMX	2.6 U	2.6 U
NITROBENZENE	1.2 U	1.2 U
NITROCELLULOSE	221 L	136 UR
NITROGLYCERIN	13 U	13 U
NITROGUANIDINE	5 U	5 U
RDX	2.6 U	2.6 U
TETRYL	2.6 U	2.6 U
INORGANICS (µg/L)		
ALUMINUM	449	447
ANTIMONY	2.6 U	4.1 B
ARSENIC	3.6 U	3.6 U
BARIUM	17.6	19.7
BERYLLIUM	0.26	0.26
CADMIUM	0.39 B	0.51 B
CALCIUM	28300	30200
CHROMIUM	0.63	0.60 U
COBALT	19.5	21.1
COPPER	4.5 B	5.8 B
CYANIDE	8.6	10.6
IRON	438	461
LEAD	1.5 L	1.0 UL
MAGNESIUM	13900	14900
MANGANESE	340	363
MERCURY	0.10 U	0.10 U
NICKEL	21.9	23.4
POTASSIUM	6470	6710
SELENIUM	2.8 K	2.5 U
SILVER	0.70 U	0.70 U
SODIUM	151000 J	160000 J
THALLIUM	3.3 U	3.3 U
VANADIUM	1.4 B	2.1 B
ZINC	58.5	63.1
MISCELLANEOUS PARAMETERS		
CHLORIDE mg/L	220 L	170 L
DISSOLVED OXYGEN mg/L	9.6	9.4
FLUORIDE mg/L	0.27	0.52
HARDNESS AS CaCO3 mg/L	143	143

ANALYTICAL RESULTS - SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:		S57SW0160101	S57SW0160101-D
LOCATION:		S57SW016/SD012	S57SW016/SD012
SAMPLE DATE:		1/20/99	1/20/99
ASSOCIATED DUPLICATE:		S57SW0160101-D	S57SW0160101
NITRATE/NITRITE	mg/L	2.85 L	0.952 L
PH		7.59	7.5
SALINITY	SI	5.0 UR	5.0 UR
SULFATE	mg/L	270 L	210 L
TOTAL DISSOLVED SOLIDS	mg/L	488 L	666 L
TOTAL ORGANIC CARBON	mg/L	1.92	3.52
TOTAL SUSPENDED SOLIDS	mg/L	10.0 UL	5.0 UL
TURBIDITY	NTU	5.09 L	4.89 L

ANALYTICAL RESULTS - FILTERED SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0020101-F	S57SW0030101-F	S57SW0040101-F	S57SW0070101-F	S57SW0090101-F	S57SW0140101-F	S57SW0160101-F
LOCATION:	MH-429	MH-01 (MH-430)	MH-02 (MH-431)	IW-80 (MH-489)	S57SW009/SD005	S57SW014/SD010	S57SW016/SD012
SAMPLE DATE:	1/27/99	1/22/99	1/22/99	1/27/99	1/20/99	1/7/99	1/20/99
ASSOCIATED DUPLICATE:							S57SW0160101-F-D
DISSOLVED INORGANICS (µg/L)							
ALUMINUM	17.4 UL	189 B	674 J	17.4 UL	69.9 B	59.8	69.7 B
ANTIMONY	2.6 U	2.7 B	2.7 B	2.6 U	2.9 B	4.2 U	2.6 U
ARSENI	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.0 U	3.6 U
BARIUM	19.0	25.1	23.7	21.2 K	23.1	13.3	16.4
BERYLLIUM	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.20 U	0.10 U
CADMIUM	0.30 U	0.41 B	0.45 B	0.30 U	0.38 B	0.40 U	0.36 B
CALCIUM	9070 K	13400	12600	9910 K	14100	8560	28700
CHROMIUM	0.6 U	0.67	0.89	0.60 U	0.60 U	0.70 U	0.60 U
COBALT	5.5 K	6.0	5.8	4.3 K	7.6	4.1 B	22.5
COPPER	8.6 B	12.5	12.2	9.8 B	4.9 B	5.1 B	3.4 B
IRON	609 K	601	653	595 K	267	205	22.1 B
LEAD	2.6 B	3.1 L	2.7 L	1.9 B	1.3 L	1.7 U	1.0 UL
MAGNESIUM	1850	2810	2690	2080	3750	1360	14100
MANGANESE	80.6 K	79.5	73.6	99.0 K	121	41.9	351
MERCURY	0.10 U	0.10 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U
NICKEL	1.6	1.1 U	1.5	2.5 K	2.6	2.2	22.2
POTASSIUM	2690	2920	2750	2730	3100	1210	6420
SELENIUM	2.5 U	3.1 K	2.5 U	2.5 U	2.5 K	1.9 UJ	2.5 U
SILVER	0.70 U	0.70 U	0.73 B	0.70 U	0.70 U	0.80 U	0.70 U
SODIUM	47900	52300	49000	50500	65700 J	7830 K	156000 J
THALLIUM	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	4.1 U	3.3 U
VANADIUM	0.93 K	3.9 B	4.6 B	0.72 K	3.4 B	0.80 U	1.1 B
ZINC	72.0 K	60.7	50.8	52.3 K	36.3 K	61.2	43.3

ANALYTICAL RESULTS - FILTERED SURFACE WATER
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0160101-F-D
LOCATION:	S57SW016/SD012
SAMPLE DATE:	1/20/99
ASSOCIATED DUPLICATE:	S57SW0160101-F
DISSOLVED INORGANICS (µg/L)	
ALUMINUM	78.6 B
ANTIMONY	2.6 U
ARSENI	3.6 U
BARIUM	17.3
BERYLLIUM	0.10 U
CADMIUM	0.44 B
CALCIUM	30400
CHROMIUM	0.60 U
COBALT	21.0
COPPER	3.6 B
IRON	8.9 B
LEAD	1.0 UL
MAGNESIUM	15000
MANGANESE	364
MERCURY	0.10 U
NICKEL	23.2
POTASSIUM	6720
SELENIUM	2.5 U
SILVER	0.70 U
SODIUM	164000 J
THALLIUM	3.3 U
VANADIUM	1.3 B
ZINC	46.6

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0050101	S57SD0060101	S57SD0070101	S57SD0080101	S57SD0090101	S57SD0100101	S57SD0110101	S57SD0120101
LOCATION:	S57SW009/SD005	S57SW010/SD006	S57SW011/SD007	S57SW012/SD008	S57SW013/SD009	S57SW014/SD010	S57SW015/SD011	S57SW016/SD012
SAMPLE DATE:	01/20/99	01/20/99	01/09/99	01/09/99	01/27/99	01/07/99	01/07/99	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
ASSOCIATED DUPLICATE:								S57SD0120101-D
VOLATILES (µg/kg)								
1,1,1-TRICHLOROETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
1,1,2,2-TETRACHLOROETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
1,1,2-TRICHLOROETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
1,1-DICHLOROETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
1,1-DICHLOROETHENE	9 J	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
1,2-DICHLOROETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
1,2-DICHLOROPROPANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
2-BUTANONE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
2-HEXANONE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
4-METHYL-2-PENTANONE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
ACETONE	28 J	34 J	12 U	12 U	12 U	13 UJ	13 UJ	31
BENZENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
BROMODICHLOROMETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
BROMOFORM	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
BROMOMETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CARBON DISULFIDE	13 UJ	16 UJ	12 U	3 J	12 U	13 UJ	13 UJ	14 U
CARBON TETRACHLORIDE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CHLOROBENZENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CHLOROETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CHLOROFORM	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CHLOROMETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CIS-1,2-DICHLOROETHENE	6300	4 J	12 U	12 U	12 U	13 UJ	13 UJ	14 U
CIS-1,3-DICHLOROPROPENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
DIBROMOCHLOROMETHANE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
ETHYL ETHER	14 J	7 J	12 U	12 U	12 U	13 UJ	13 UJ	14 U
ETHYLBENZENE	2 J	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
METHYLENE CHLORIDE	16 B	15 B	3 B	9 B	8 B	9 B	11 B	16 B
STYRENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
TETRACHLOROETHENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
TOLUENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
TRANS-1,2-DICHLOROETHENE	14 J	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
TRANS-1,3-DICHLOROPROPENE	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
TRICHLOROETHENE	18 J	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
VINYL CHLORIDE	1000 J	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
XYLENES, TOTAL	13 UJ	16 UJ	12 U	12 U	12 U	13 UJ	13 UJ	14 U
SEMIVOLATILES (µg/kg)								
1,2,4-TRICHLOROBENZENE	430 U					420 U		460 U
1,2-DICHLOROBENZENE	430 U					420 U		460 U
1,3-DICHLOROBENZENE	430 U					420 U		460 U
1,4-DICHLOROBENZENE	430 U					420 U		460 UR
2,2'-OXYBIS(1-CHLOROPROPANE)	430 U					420 U		460 U
2,4,5-TRICHLOROPHENOL	1100 U					1100 U		1100 U
2,4,6-TRICHLOROPHENOL	430 U					420 U		460 U
2,4-DICHLOROPHENOL	430 U					420 U		460 U

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0050101	S57SD0060101	S57SD0070101	S57SD0080101	S57SD0090101	S57SD0100101	S57SD0110101	S57SD0120101
LOCATION:	S57SW009/SD005	S57SW010/SD006	S57SW011/SD007	S57SW012/SD008	S57SW013/SD009	S57SW014/SD010	S57SW015/SD011	S57SW016/SD012
SAMPLE DATE:	01/20/99	01/20/99	01/09/99	01/09/99	01/27/99	01/07/99	01/07/99	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
ASSOCIATED DUPLICATE:								S57SD0120101-D
2,4-DIMETHYLPHENOL	430 U					420 U		460 U
2,4-DINITROPHENOL	1100 U					1100 U		1100 U
2,4-DINITROTOLUENE	430 U					420 U		460 U
2,6-DINITROTOLUENE	430 U					420 U		460 U
2-CHLORONAPHTHALENE	430 U					420 U		460 U
2-CHLOROPHENOL	430 U					420 U		460 U
2-METHYLNAPHTHALENE	90 J					420 U		460 U
2-METHYLPHENOL	430 U					420 U		460 U
2-NITROANILINE	1100 U					1100 U		1100 U
2-NITROPHENOL	430 U					420 U		460 U
3,3'-DICHLOROBENZIDINE	430 U					420 U		460 U
3-NITROANILINE	1100 U					1100 U		1100 U
4,6-DINITRO-2-METHYLPHENOL	1100 U					1100 U		1100 U
4-BROMOPHENYL PHENYL ETHER	430 U					420 U		460 U
4-CHLORO-3-METHYLPHENOL	430 U					420 U		460 U
4-CHLOROANILINE	430 U					420 U		460 U
4-CHLOROPHENYL PHENYL ETHER	430 U					420 U		460 U
4-METHYLPHENOL	430 U					420 U		460 U
4-NITROANILINE	1100 U					1100 U		1100 U
4-NITROPHENOL	1100 U					1100 U		1100 U
ACENAPHTHENE	84 J					420 U		460 U
ACENAPHTHYLENE	430 U					420 U		460 U
ANTHRACENE	190 J					59 J		460 U
BENZO(A)ANTHRACENE	420 J					180 J		460 U
BENZO(A)PYRENE	300 J					120 J		460 U
BENZO(B)FLUORANTHENE	500					290 J		460 U
BENZO(G,H,I)PERYLENE	190 J					57 J		460 U
BENZO(K)FLUORANTHENE	140 J					77 J		460 U
BIS(2-CHLOROETHOXY)METHANE	430 U					420 U		460 U
BIS(2-CHLOROETHYL)ETHER	430 U					420 U		460 U
BIS(2-ETHYLHEXYL)PHTHALATE	180 J					46 J		460 U
BUTYLBENZYL PHTHALATE	430 U					420 U		460 U
CARBAZOLE	82 J					420 U		460 U
CHRYSENE	340 J					160 J		460 U
DI-N-BUTYL PHTHALATE	430 U					61 J		460 U
DI-N-OCTYL PHTHALATE	430 U					420 UJ		460 U
DIBENZO(A,H)ANTHRACENE	50 J					420 UJ		460 U
DIBENZOFURAN	80 J					420 U		460 U
DIETHYL PHTHALATE	430 U					420 U		460 U
DIMETHYL PHTHALATE	430 U					420 U		460 U
FLUORANTHENE	750					380 J		460 U
FLUORENE	130 J					44 J		460 U
HEXACHLOROBENZENE	430 U					420 U		460 U
HEXACHLOROBUTADIENE	430 U					420 U		460 U
HEXACHLOROCYCLOPENTADIENE	430 U					420 U		460 U

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0050101	S57SD0060101	S57SD0070101	S57SD0080101	S57SD0090101	S57SD0100101	S57SD0110101	S57SD0120101
LOCATION:	S57SW009/SD005	S57SW010/SD006	S57SW011/SD007	S57SW012/SD008	S57SW013/SD009	S57SW014/SD010	S57SW015/SD011	S57SW016/SD012
SAMPLE DATE:	01/20/99	01/20/99	01/09/99	01/09/99	01/27/99	01/07/99	01/07/99	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
ASSOCIATED DUPLICATE:								S57SD0120101-D
HEXACHLOROETHANE	430 U					420 U		460 U
INDENO(1,2,3-CD)PYRENE	160 J					84 J		460 U
ISOPHORONE	430 U					420 U		460 U
N-NITROSO-DI-N-PROPYLAMINE	430 U					420 U		460 U
N-NITROSODIPHENYLAMINE	50 J					420 U		460 U
NAPHTHALENE	180 J					420 U		460 U
NITROBENZENE	430 U					420 U		460 U
PENTACHLOROPHENOL	1100 U					1100 U		1100 U
PHENANTHRENE	810					280 J		460 U
PHENOL	430 U					420 U		460 U
PYRENE	720					330 J		460 U
PESTICIDES/PCBs (µg/kg)								
4,4'-DDD	4.3 U					4.2 U		4.6 U
4,4'-DDE	4.3 U					4.2 U		4.6 U
4,4'-DDT	4.3 U					4.2 U		4.6 U
ALDRIN	2.2 U					2.1 U		2.3 U
ALPHA-BHC	2.2 U					2.1 U		2.3 U
ALPHA-CHLORDANE	2.2 U					2.1 U		2.3 U
AROCLOR-1016	43 U					42 U		46 U
AROCLOR-1221	86 U					84 U		91 U
AROCLOR-1232	43 U					42 U		46 U
AROCLOR-1242	43 U					42 U		46 U
AROCLOR-1248	43 U					42 U		46 U
AROCLOR-1254	43 U					42 U		46 U
AROCLOR-1260	43 U					42 U		46 U
BETA-BHC	2.2 U					2.1 U		2.3 U
DELTA-BHC	2.2 U					2.1 U		2.3 U
DIELDRIN	4.3 U					4.2 U		4.6 U
ENDOSULFAN I	2.2 U					2.1 U		2.3 U
ENDOSULFAN II	4.3 U					4.2 U		4.6 U
ENDOSULFAN SULFATE	4.3 U					4.2 U		4.6 U
ENDRIN	4.3 U					4.2 U		4.6 U
ENDRIN ALDEHYDE	4.3 U					4.2 U		4.6 U
ENDRIN KETONE	4.3 U					4.2 U		4.6 U
GAMMA-BHC (LINDANE)	2.2 U					2.1 U		2.3 U
GAMMA-CHLORDANE	2.1 J					2.1 U		2.3 U
HEPTACHLOR	2.2 U					2.1 U		2.3 U
HEPTACHLOR EPOXIDE	2.2 U					2.1 U		2.3 U
METHOXYCHLOR	22 U					21 U		23 U
TOXAPHENE	220 U					210 U		230 U
EXPLOSIVES (µg/kg)								
1,3,5-TRINITROBENZENE	250 U					250 U		250 U
1,3-DINITROBENZENE	250 U					250 U		250 U
2,4,6-TRINITROTOLUENE	250 U					250 U		250 U
2,4-DINITROTOLUENE	250 U					250 U		250 U

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0050101	S57SD0060101	S57SD0070101	S57SD0080101	S57SD0090101	S57SD0100101	S57SD0110101	S57SD0120101
LOCATION:	S57SW009/SD005	S57SW010/SD006	S57SW011/SD007	S57SW012/SD008	S57SW013/SD009	S57SW014/SD010	S57SW015/SD011	S57SW016/SD012
SAMPLE DATE:	01/20/99	01/20/99	01/09/99	01/09/99	01/27/99	01/07/99	01/07/99	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
ASSOCIATED DUPLICATE:								S57SD0120101-D
2,6-DINITROTOLUENE	250 U					250 U		250 U
2-AMINO-4,6-DINITROTOLUENE	250 U					250 U		250 U
2-NITROTOLUENE	500 U					500 U		500 U
3-NITROTOLUENE	500 U					500 U		500 U
4-AMINO-2,6-DINITROTOLUENE	250 U					250 U		250 U
4-NITROTOLUENE	500 U					500 U		500 U
HMX	500 U					500 U		500 U
NITROBENZENE	250 U					250 U		250 U
NITROCELLULOSE	31800 UR					45100 UR		46500 UR
NITROGLYCERIN	5000 U					5000 U		5000 U
NITROGUANIDINE	0.51 U					0.51 U		0.51 U
RDX	500 U					500 U		500 U
TETRYL	500 U					500 U		500 U
INORGANICS (mg/kg)								
ALUMINUM	2260	3540				1480		586
ANTIMONY	3.0 K	0.63 K				0.70 U		0.45 U
ARSENIC	8.4	13.9				4.7		1.4 B
BARIUM	23.2	52.5				7.4		8.0
BERYLLIUM	0.27 L	0.50 L				0.16		0.15
CADMIUM	0.76 K	0.69 K			0.10	0.26		0.10 B
CALCIUM	2870 J	2660 J				696		113 B
CHROMIUM	12.6	13.0				10.7		1.2
COBALT	7.7	8.6				5.0		1.7
COPPER	103	135			2.9 B	6.9		1.7 B
CYANIDE	0.76	1.0				0.55		0.45
IRON	20800	24200				7440		1360
LEAD	182 K	88.9 K			21.7	18.8 J		2.5 B
MAGNESIUM	2070	1720				1180		66.6
MANGANESE	150	239				96.4 J		15.6
MERCURY	0.45	0.89			.031 U	1.9 L		0.02 U
NICKEL	24.9	19.8			0.74	10.0		0.70
POTASSIUM	187	400				152		190
SELENIUM	0.82 B	1.5 B				0.32 U		0.43 U
SILVER	0.15 K	0.38 K				0.13 U		0.12 U
SODIUM	118 L	298 L				67.8		208 L
THALLIUM	0.53 UL	0.71 UL				0.69 U		0.57 UL
VANADIUM	118	32.6				9.0		4.7
ZINC	183	633			13.5 B	126		7.6
SIMULTANEOUSLY EXTRACTED METALS (mg/kg)								
CADMIUM(SEM)	0.25	0.49				0.16		0.03 B
COPPER(SEM)	62.9	77.7				2.1		0.78 B
LEAD(SEM)	140 J	80.2 J				12.7		3.1 J
MERCURY(SEM)	0.006 L	0.016 L				0.0137 B		0.012 L
NICKEL(SEM)	3.9	5.8				1.7		0.54
ZINC(SEM)	78.0	129				48.0		4.8

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0050101	S57SD0060101	S57SD0070101	S57SD0080101	S57SD0090101	S57SD0100101	S57SD0110101	S57SD0120101
LOCATION:	S57SW009/SD005	S57SW010/SD006	S57SW011/SD007	S57SW012/SD008	S57SW013/SD009	S57SW014/SD010	S57SW015/SD011	S57SW016/SD012
SAMPLE DATE:	01/20/99	01/20/99	01/09/99	01/09/99	01/27/99	01/07/99	01/07/99	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
ASSOCIATED DUPLICATE:								S57SD0120101-D
ACID VOLATILES SULFIDE (mg/kg)								
ACID VOLATILE SULFIDE	64.4	80.8			80.1 K	57.1 U		53.4 U
MISCELLANEOUS PARAMETERS								
PH	7.21					7.51		7.44
TOTAL ORGANIC CARBON mg/kg	16000 J	36900 J			16900 J	18800 L		10700 J

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0120101-D
LOCATION:	S57SW016/SD012
SAMPLE DATE:	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5
ASSOCIATED DUPLICATE:	S57SD0120101
VOLATILES (µg/kg)	
1,1,1-TRICHLOROETHANE	13 UJ
1,1,2,2-TETRACHLOROETHANE	13 UJ
1,1,2-TRICHLOROETHANE	13 UJ
1,1-DICHLOROETHANE	13 UJ
1,1-DICHLOROETHENE	13 UJ
1,2-DICHLOROETHANE	13 UJ
1,2-DICHLOROPROPANE	13 UJ
2-BUTANONE	13 UJ
2-HEXANONE	13 UJ
4-METHYL-2-PENTANONE	13 UJ
ACETONE	23 J
BENZENE	13 UJ
BROMODICHLOROMETHANE	13 UJ
BROMOFORM	13 UJ
BROMOMETHANE	13 UJ
CARBON DISULFIDE	13 UJ
CARBON TETRACHLORIDE	13 UJ
CHLOROBENZENE	13 UJ
CHLOROETHANE	13 UJ
CHLOROFORM	13 UJ
CHLOROMETHANE	13 UJ
CIS-1,2-DICHLOROETHENE	13 UJ
CIS-1,3-DICHLOROPROPENE	13 UJ
DIBROMOCHLOROMETHANE	13 UJ
ETHYL ETHER	13 UJ
ETHYLBENZENE	13 UJ
METHYLENE CHLORIDE	16 B
STYRENE	13 UJ
TETRACHLOROETHENE	13 UJ
TOLUENE	13 UJ
TRANS-1,2-DICHLOROETHENE	13 UJ
TRANS-1,3-DICHLOROPROPENE	13 UJ
TRICHLOROETHENE	13 UJ
VINYL CHLORIDE	13 UJ
XYLENES, TOTAL	13 UJ
SEMIVOLATILES (µg/kg)	
1,2,4-TRICHLOROBENZENE	440 U
1,2-DICHLOROBENZENE	440 U
1,3-DICHLOROBENZENE	440 U
1,4-DICHLOROBENZENE	440 U
2,2'-OXYBIS(1-CHLOROPROPANE)	440 U
2,4,5-TRICHLOROPHENOL	1100 U
2,4,6-TRICHLOROPHENOL	440 U
2,4-DICHLOROPHENOL	440 U

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0120101-D
LOCATION:	S57SW016/SD012
SAMPLE DATE:	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5
ASSOCIATED DUPLICATE:	S57SD0120101
2,4-DIMETHYLPHENOL	440 U
2,4-DINITROPHENOL	1100 U
2,4-DINITROTOLUENE	440 U
2,6-DINITROTOLUENE	440 U
2-CHLORONAPHTHALENE	440 U
2-CHLOROPHENOL	440 U
2-METHYLNAPHTHALENE	440 U
2-METHYLPHENOL	440 U
2-NITROANILINE	1100 U
2-NITROPHENOL	440 U
3,3'-DICHLOROBENZIDINE	440 U
3-NITROANILINE	1100 U
4,6-DINITRO-2-METHYLPHENOL	1100 U
4-BROMOPHENYL PHENYL ETHER	440 U
4-CHLORO-3-METHYLPHENOL	440 U
4-CHLOROANILINE	440 U
4-CHLOROPHENYL PHENYL ETHER	440 U
4-METHYLPHENOL	440 U
4-NITROANILINE	1100 U
4-NITROPHENOL	1100 U
ACENAPHTHENE	440 U
ACENAPHTHYLENE	440 U
ANTHRACENE	440 U
BENZO(A)ANTHRACENE	440 U
BENZO(A)PYRENE	440 U
BENZO(B)FLUORANTHENE	440 U
BENZO(G,H,I)PERYLENE	440 U
BENZO(K)FLUORANTHENE	440 U
BIS(2-CHLOROETHOXY)METHANE	440 U
BIS(2-CHLOROETHYL)ETHER	440 U
BIS(2-ETHYLHEXYL)PHTHALATE	440 U
BUTYLBENZYL PHTHALATE	440 U
CARBAZOLE	440 U
CHRYSENE	440 U
DI-N-BUTYL PHTHALATE	440 U
DI-N-OCTYL PHTHALATE	440 U
DIBENZO(A,H)ANTHRACENE	440 U
DIBENZOFURAN	440 U
DIETHYL PHTHALATE	440 U
DIMETHYL PHTHALATE	440 U
FLUORANTHENE	440 U
FLUORENE	440 U
HEXACHLOROBENZENE	440 U
HEXACHLOROBUTADIENE	440 U
HEXACHLOROCYCLOPENTADIENE	440 U

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0120101-D
LOCATION:	S57SW016/SD012
SAMPLE DATE:	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5
ASSOCIATED DUPLICATE:	S57SD0120101
HEXACHLOROETHANE	440 U
INDENO(1,2,3-CD)PYRENE	440 U
ISOPHORONE	440 U
N-NITROSO-DI-N-PROPYLAMINE	440 U
N-NITROSODIPHENYLAMINE	440 U
NAPHTHALENE	440 U
NITROBENZENE	440 U
PENTACHLOROPHENOL	1100 U
PHENANTHRENE	440 U
PHENOL	440 U
PYRENE	440 U
PESTICIDES/PCBs (µg/kg)	
4,4'-DDD	1.4 J
4,4'-DDE	0.34 J
4,4'-DDT	0.96 J
ALDRIN	2.2 U
ALPHA-BHC	2.2 U
ALPHA-CHLORDANE	2.2 U
AROCLOR-1016	43 U
AROCLOR-1221	87 U
AROCLOR-1232	43 U
AROCLOR-1242	43 U
AROCLOR-1248	43 U
AROCLOR-1254	43 U
AROCLOR-1260	43 U
BETA-BHC	2.2 U
DELTA-BHC	2.2 U
DIELDRIN	4.3 U
ENDOSULFAN I	2.2 U
ENDOSULFAN II	4.3 U
ENDOSULFAN SULFATE	4.3 U
ENDRIN	4.3 U
ENDRIN ALDEHYDE	4.3 U
ENDRIN KETONE	4.3 U
GAMMA-BHC (LINDANE)	2.2 U
GAMMA-CHLORDANE	2.2 U
HEPTACHLOR	2.2 U
HEPTACHLOR EPOXIDE	2.2 U
METHOXYCHLOR	22 U
TOXAPHENE	220 U
EXPLOSIVES (µg/kg)	
1,3,5-TRINITROBENZENE	250 U
1,3-DINITROBENZENE	250 U
2,4,6-TRINITROTOLUENE	250 U
2,4-DINITROTOLUENE	250 U

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SD0120101-D
LOCATION:	S57SW016/SD012
SAMPLE DATE:	01/20/99
DEPTH INTERVAL (FEET):	0 - 0.5
ASSOCIATED DUPLICATE:	S57SD0120101
2,6-DINITROTOLUENE	250 U
2-AMINO-4,6-DINITROTOLUENE	250 U
2-NITROTOLUENE	500 U
3-NITROTOLUENE	500 U
4-AMINO-2,6-DINITROTOLUENE	250 U
4-NITROTOLUENE	500 U
HMX	500 U
NITROBENZENE	250 U
NITROCELLULOSE	44900 UR
NITROGLYCERIN	5000 U
NITROGUANIDINE	0.51 U
RDX	500 U
TETRYL	500 U
INORGANICS (mg/kg)	
ALUMINUM	599
ANTIMONY	0.46 U
ARSENIC	1.5 B
BARIUM	6.8
BERYLLIUM	0.16
CADMIUM	0.08 B
CALCIUM	109 B
CHROMIUM	1.3
COBALT	1.7
COPPER	2.0 B
CYANIDE	0.61
IRON	1830
LEAD	2.8 B
MAGNESIUM	62.7
MANGANESE	15.1
MERCURY	0.02 U
NICKEL	0.94
POTASSIUM	214
SELENIUM	0.44 U
SILVER	0.12 U
SODIUM	189 L
THALLIUM	0.58 UL
VANADIUM	5.4
ZINC	9.1
SIMULTANEOUSLY EXTRACTED METALS (	
CADMIUM(SEM)	0.02 B
COPPER(SEM)	0.58 B
LEAD(SEM)	1.1 J
MERCURY(SEM)	0.003 UL
NICKEL(SEM)	0.31
ZINC(SEM)	3.8

ANALYTICAL RESULTS - SEDIMENT
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	**S57SD0120101-D**
LOCATION:	**S57SW016/SD012**
SAMPLE DATE:	**01/20/99**
DEPTH INTERVAL (FEET):	**0 - 0.5**
ASSOCIATED DUPLICATE:	**S57SD0120101**
ACID VOLATILES SULFIDE (mg/kg)	
ACID VOLATILE SULFIDE	81.3
MISCELLANEOUS PARAMETERS	
PH	7.85
TOTAL ORGANIC CARBON **mg/kg**	8000 J

ANALYTICAL RESULTS - STORM SEWER ROUND 2
SEPTEMBER 1999
SITE 57 - FORMER DRUM LOADING AREA

IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010102	S57SW0020102	S57SW0030102	S57SW0040302	S57SW0060102	S57SW0070102	S57SW0080102	S57SW0090102	S57SW0090102-D
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-02 (MH-431)	MH-487	IW-80 (MH-489)	MH-497	S57SW009/SD005	S57SW009/SD005
SAMPLE DATE:	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99
DEPTH INTERVAL (FEET):									
ASSOCIATED DUPLICATE:								S57SW0090102-D	S57SW0090102
VOLATILES (µg/L)									
1,1,1-TRICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	0.18 J	0.18 J	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2,4-TRICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1 UR	1 UR	2 UR	2 UR	1 UR	1 UR	1 UR	1 UR	1 UR
1,2-DIBROMOETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,3-DICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,4-DICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U
ACETONE	1.5 B	1.1 B	10 U	10 U	1.2 B	1.1 B	1.4 B	1.1 B	1.3 B
BENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
BROMOCHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	2 U	2 U	1 U	1 U	1 U	0.3 J	1 U
BROMOMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 UJ	1 UJ	2 UJ	2 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
CHLOROFORM	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	1 U	0.28 J	3	20	17	11	6.3	10	9.1
CIS-1,3-DICHLOROPROPENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
ETHYL ETHER	71	69	40	49	18	9.5	8.4	4.6	4.1
ETHYLBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	4 U	4 U	2 U	2 U	2 U	2 U	2 U
STYRENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TOLUENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U	2 U	2 U	0.13 J	0.22 J	0.47 J	1 U	0.12 J
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	0.34 J	0.31 J	2.3	21	37	24	16	12	11
VINYL CHLORIDE	1 U	1 U	0.37 J	1.4 J	1.1	0.49 J	0.25 J	1.3	1.2
XYLENES, TOTAL	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U

ANALYTICAL RESULTS - STORM SEWER ROUND 2
SEPTEMBER 1999
SITE 57 - FORMER DRUM LOADING AREA

IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010102	S57SW0020102	S57SW0030102	S57SW0040302	S57SW0060102	S57SW0070102	S57SW0080102	S57SW0090102	S57SW0090102-D
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-02 (MH-431)	MH-487	IW-80 (MH-489)	MH-497	S57SW009/SD005	S57SW009/SD005
SAMPLE DATE:	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99
DEPTH INTERVAL (FEET):									
ASSOCIATED DUPLICATE:								S57SW0090102-D	S57SW0090102
EXPLOSIVES (µg/L)									
1,3,5-TRINITROBENZENE		0.3 U	0.3 U	0.3 U		0.3 U		0.3 U	0.3 U
1,3-DINITROBENZENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2,4,6-TRINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2,4-DINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2,6-DINITROTOLUENE		0.3 U	0.3 U	0.3 U		0.3 U		0.3 U	0.3 U
2-AMINO-4,6-DINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2-NITROTOLUENE		1 U	1 U	1 U		1 U		1 U	1 U
3-NITROTOLUENE		1 U	1 U	1 U		1 U		1 U	1 U
4-AMINO-2,6-DINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
4-NITROTOLUENE		1 U	1 U	1 U		1 U		1 U	1 U
HMX		1 U	1 U	1 U		1 U		1 U	1 U
NITROBENZENE		1 U	1 U	1 U		1 U		1 U	1 U
NITROCELLULOSE		500 U	500 U	500 U		500 U		620	500
NITROGLYCERIN		0.65 UJ	0.65 UJ	0.65 UJ		0.65 UJ		0.65 UJ	0.65 UJ
NITROGUANIDINE		20 U	20 U	20 U		20 U		20 U	20 U
RDX		0.8 U	0.8 U	0.8 U		0.8 U		0.8 U	0.8 U
TETRYL		1 U	1 U	1 U		1 U		1 U	1 U

APPENDIX I

Data Validation Memoranda

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-11-8-163

TO :	**G. LATULIPPE**	**DATE:**	**JANUARY 7, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **MISCELLANEOUS DATA VALIDATION –AMMONIUM PERCHLORATE, NITROGUANIDINE, NITROCELLUOSE AND TOTAL ORGANIC CARBON CTO 245- NSWC INDIAN HEAD, MARYLAND SAMPLE DELIVERY GROUP SDG – 9810053**

SAMPLES: 14/Aqueous/

RB-100998	S41DUP300
S41MW001U004	S41MW002U004
S41MW004U004	S42DUP300
S42MW002U004	S42MW003U003
S42MW004U004	S42MW006U004
S42MW007U004	S57FB100998-1
S57FB100998-2	S57RB100998

Overview

The sample set for SDG 9810053, NSWC Indian Head, consists of ten (10) aqueous environmental samples. Two (2) rinsate blanks (RB-100998 and S57RB100998), two (2) field blanks (S57FB100998-1 and S57FB100998-2) and two (2) field duplicate pairs were included within this SDG.

All samples, with the exception of S57FB100998-1, S57FB100998-2 and S57RB100998, were analyzed for ammonium perchlorate. Samples RB-100998, S41DUP300, S41MW001U004, S41MW002U004, S41MW004U004, S57FB100998-1, S57FB100998-2 and S57RB100998 were analyzed for nitroguanidine and nitrocellulose. Samples S57FB100998-1, S57FB100998-2 and S57RB100998 were analyzed for Total Organic Carbon (TOC). The samples were collected by Tetra Tech NUS on October 7, 8 and 9, 1998 and analyzed by GP Environmental Services under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data,

laboratory method/preparation blanks, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Notes

Ammonium Perchlorate analyses were conducted between 32 and 34 days after collection. No holding time for ammonium perchlorate analyses is defined, therefore no validation action was taken.

Several dilutions were used for Ammonia Perchlorate analyses. No reference to the logic for the dilutions was included in the Case Narrative. The laboratory was contacted for an explanation, but was unable to provide one. The laboratory reviewed the raw data and stated that the most concentrated sample results should be used.

The following samples were ran for Ammonia Perchlorate with elevated detection limits: S42MW003U003, S42MW004U004, S42MW006U004 and S42MW007U004.

Executive Summary

Laboratory Performance: None.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic and Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-11-8-203

TO :	**G. LATULIPPE**	**DATE:**	**NOVEMBER 30, 1998**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	
SUBJECT:	**INORGANIC DATA VALIDATION –TAL METALS CTO 245- NSWC INDIAN HEAD, MARYLAND SAMPLE DELIVERY GROUP SDG – 9810062**		
SAMPLES:	7/Soils/		

S57DUP003	S57SB0070101	S57SB0070201
S57SB0080101	S57SB0080201	S57SS0070101
S57SS0080101		

Overview

The sample set for SDG 9810062, NSWC Indian Head, consists of seven (7) soil environmental samples. One (1) duplicate pair (S57SB0080101/ S57DUP003) was included within this SDG.

All samples were analyzed for Target Analyte List (TAL) metals. The sample were collected by Tetra Tech NUS on October 7 and 8, 1998 and analyzed by GP Environmental Services under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. TAL metals analyses were conducted using Contract Laboratory Program (CLP) methodologies.

Summary

All analytes, with the exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, post digestion spike recovery results, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- The interfering analyte iron was present in samples S57SS0070101, S57DUP003, S57SB0080101 and S57SS0080101 at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely antimony, chromium, cobalt, lead, manganese, nickel, selenium, vanadium and zinc were present in the ICS solution at concentration which exceeded the Instrument Detection Limit (IDL). Interference affects exist for nickel and selenium. The positive results reported for nickel were qualified as biased high, "K". The nondetected results reported for selenium were qualified as biased low, "UL".

- The MS %R's for cobalt and lead were >125% quality control limit. The positive results reported for cobalt and lead were qualified as biased high, "K".

- The MS %R for selenium was <75% quality control limit. The positive and nondetected results reported for selenium were qualified as biased low, "L" and "UL", respectively.

- The MS %R for manganese was >125% quality control limit. The positive results reported for manganese were qualified as estimated, "J", as a result of conflicting noncompliances.

- Laboratory duplicate imprecision >35% was noted for manganese. The positive results reported for manganese were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %R for thallium was >110% quality control limit. However, no validation actions were required as the sample results for thallium were either nondetects or qualified for blank contamination.

A comparison of field duplicate pairs (S57SB0080101/ S57DUP003) is included in Appendix C. However, no validation action is required per regional guidance.

Executive Summary

Laboratory Performance: The CRDL %Rs for several analytes were outside the 90-110% quality control limits. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The interfering analyte iron was present in several samples. The MS %R's for antimony, cobalt, lead, manganese and selenium were outside the 75-125% quality control limit. Laboratory duplicate imprecision was noted for manganese.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
L	-	Positive result is considered biased low, "L", as a result of validation noncompliances.
UL	-	Nondetected result is considered biased low, "UL", as a result of validation noncompliances.
K	-	Positive result is considered biased high, "K", as a result of validation noncompliances.
UR	-	Nondetected result is considered unusable, "UR", as a result of validation noncompliances.
J	-	Positive result is considered estimated, "J", as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-146

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 30, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TAL METALS, DISSOLVED TAL METALS, CYANIDE AND MISCELLANEOUS PARAMETERS**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901178

SAMPLES: 5/Aqueous/

S57MW0080101	S57MW0090101	S57MW0090101-F
S57MW010101	S57MW010101-F	

Overview

The sample set for SDG 9901178, NSWC Indian Head, consists of five (5) aqueous environmental samples.

Sample S57MW0080101 was analyzed for pH and total dissolved solids (TDS). Samples S57MW0090101 and S57MW010101 were analyzed for target analyte list (TAL) metals, cyanide, ammonium perchlorate, hardness, nitrocellulose, pH, TDS and total organic carbon (TOC). Samples S57MW0090101-F and S57MW010101-F were analyzed for dissolved TAL metals. The samples were collected by Tetra Tech NUS on January 26, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) methodologies. Ammonium perchlorate analyses were conducted using EPA method 3000. Hardness analyses were conducted using EPA method 130.2. pH analyses were conducted using EPA method 150.1. TDS analyses were conducted using EPA method 160.2. TOC analyses were conducted using SW 846 method 9060. Nitrocellulose analyses were conducted using the USATHAMA method.

Summary

All analytes, with exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- The seven (7) day holding time from collection to extraction for nitrocellulose was exceeded by thirty-one (31) days. The nondetected result reported for nitrocellulose was qualified as rejected, "UR". The positive result reported for nitrocellulose was qualified as biased low, "L".

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for sodium was <90% quality control limit. The positive results <2X CRDL reported for sodium were qualified as biased low, "L".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (aqueous)
Aluminum	53.1µg/L	265.5µg/L
Arsenic	4.3µg/L	21.5µg/L
Barium[1]	0.830µg/L	4.15µg/L
Calcium[1]	111.175µg/L	555.9µg/L
Cobalt	0.8µg/L	4.0µg/L
Copper[1]	1.575µg/L	7.875µg/L
Iron	18.8µg/L	94µg/L
Magnesium	46.6µg/L	233µg/L
Manganese[1]	0.295µg/L	1.475µg/L
Potassium[1]	22.039µg/L	110.195µg/L
Selenium	2.9µg/L	14.5µg/L
Vanadium	0.7µg/L	3.5µg/L
Zinc[1]	1.651µg/L	8.255µg/L

[1] Maximum concentration found in aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for aluminum, arsenic, copper, iron and vanadium were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects.

- The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrocellulose were <80% quality control limit. The positive result reported for nitrocellulose was qualified as biased low, "L".

Notes

The CRDL %Rs for arsenic and selenium were >110% quality control limit. However, no validation action was required as all result reported for arsenic and selenium were either nondetected or qualified, "B", as a result of blank contamination.

QC analyses were not conducted on total TAL metals.

TDS data was not included in the original data package. The laboratory was notified and provided the missing data.

Executive Summary

Laboratory Performance: The holding times for nitrocellulose was exceeded. The CRDL %Rs sodium was <90% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
UR	-	Nondetected result is considered rejected , "UR", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-11-8-204

TO : **G. LATULIPPE** **DATE:** **DECEMBER 1, 1998**

FROM: **GRETCHEN A. PHIPPS** **COPIES:** **DV FILE**

SUBJECT: **MISCELLANEOUS DATA VALIDATION –NITROCELLULOSE, NITROGUANIDINE, PH AND TOTAL ORGANIC CARBON CTO 245- NSWC INDIAN HEAD, MARYLAND SAMPLE DELIVERY GROUP SDG – 9810062**

SAMPLES: 10/Soils/

S57DUP003	S57SB0070101	S57SB0070201
S57SB0080101	S57SB0080201	S57SS0070101
S57SS0080101	S57SB0020101	S57SB0020201
S57SS0020101		

Overview

The sample set for SDG 9810062, NSWC Indian Head, consists of seven (7) soil environmental samples. One (1) duplicate pair (S57SB0080101/ S57DUP003) was included within this SDG.

All samples, with exception of samples S57SB0020101, S57SB0020201 and S57SS0020101, were analyzed for Nitrocellulose, Nitroguanidine and pH. Samples S57SB0020101, S57SB0020201 and S57SS0020101 were analyzed for Total Organic Carbon (TOC). The sample were collected by Tetra Tech NUS on October 7 and 8, 1998 and analyzed by GP Environmental Services under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Nitrocellulose analyses were conducted using USATHAMA methodologies. Nitroguanidine analyses were conducted using USAEC methodologies. TOC analyses were conducted using the Lloyd Kahn method.

Summary

All analyses were successfully conducted. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

Minor Problems

- The holding time for TOC analyses was exceeded by thirteen (13) days. The positive and nondetected results reported for TOC analyses were qualified as biased low, "L" and "UL", respectively.

Notes

A comparison of field duplicate pair (S57SB0080101/ S57DUP003) is included in Appendix C. However, no validation action is required per region guidance.

Executive Summary

Laboratory Performance: The holding time for TOC analyses was exceeded by thirteen (13) days.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
L	-	Positive result is considered biased low, "L", as a result of validation noncompliances.
UL	-	Nondetected result is considered biased low, "UL", as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-11-8-174

TO: **GEORGE LATULIPPE** **DATE: DECEMBER 10, 1998**

FROM: **JUSTIN ORBICH** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/PEST/PCB/EXP**
CTO 245 - NSWC INDIAN HEAD, MARYLAND
SDG 9810053

SAMPLES: 18/Aqueous

RB-100998*	S41DUP300*
S41MW001U004*	S41MW002U004*
S41MW004U004*	S42DUP300
S42MW002U004	S42MW003U003
S42MW004U004	S42MW006U004
S42MW007U004	S57FB100998-1*
S57FB100998-2*	S57RB100998*
S57TB100998-1	TB-100798
TB-1008898-1	TB-100898-2

Overview

The sample set for CTO 245, Naval Surface Warfare Center (NSWC), Indian Head, SDG 9810053, consists of eighteen (18) aqueous environmental samples, which includes four (4) trip blanks (designated TB), two (2) rinsate blanks (designated RB), and two (2) field blanks (designated FB). The volatile environmental samples were analyzed for Target Compound List (TCL) organic compounds including ethyl ether. The aqueous environmental samples were analyzed for TCL semivolatile and pesticide/PCB organic compounds. The explosive environmental samples were analyzed for TCL organic compounds including nitroglycerine. The trip blanks were analyzed for TCL volatiles organic compounds only. The samples designated (*) were analyzed for explosive/nitroglycerine organic compounds only. There were two (2) field duplicate pairs (S41DUP300/S41MW004U004 and S42DUP300/S42MW006U004) in this SDG.

The samples were collected by Tetra Tech, NUS on August 7th, 8th, and 9th, 1998, and analyzed by GP Environmental Services, Inc. The volatile, semivolatile, pesticide/PCB, and explosive compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The volatile, semivolatile, and pesticide/PCB analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) SOW OLC02.1 analytical and reporting protocols. The explosive and nitroglycerine analyses were conducted using SW 846 method 8330.

Summary

All compounds were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, GC/MS tuning, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, internal standard performance, compound identification and quantitation, detection limits, and Tentatively Identified Compound (TIC) evaluation.

Areas of concern with respect to data quality are listed below.

MEMO TO: GEORGE LATULIPPE
DATE: DECEMBER 10, 1998 - PAGE 2

Major Problems

- Volatile initial and continuing calibrations yielded Relative Response Factors (RRFs) below the 0.05 quality control limit for acetone, 2-butanone, and 2-hexanone. The nondetected results were qualified as rejected, (UR), in the affected samples.

- In sample S57FB100998-2, the explosive surrogate recovery yielded a zero percent recovery for 4-nitroanaline. The nondetected results were qualified as rejected, (UR).

Minor Problems

- The following compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Methylene chloride	1.5µg/L	15.0µg/L
Chloroform	1.5µg/L	5.5µg/L
2-Butanone[1]	3.1µg/L	31.0µg/L
Carbon disulfide[2]	0.7µg/L	3.5µg/L
Trichloroethene[2]	0.9µg/L	4.5µg/L
Bis(2-ethylhexyl)phthalate	2.0µg/L	20.0µg/L
Di-n-butylphthalate	1.0µg/L	10.0µg/L

[1] Rinsate Blank
[2] Trip Blank

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of all action levels. Positive results for methylene chloride, carbon disulfide, chloroform, trichloroethene, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate reported at concentrations below the action level were qualified (B) as a result of blank contamination. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination. It should be noted that the field blank (S57FB100998-2) was collected from a potable water source and was not evaluated as a field quality control blank.

- The volatile initial calibration %RSD exceeded the 50% quality control limit for methylene chloride. The nondetected results were qualified as estimated, (UJ), in the affected samples. The direction of bias is unknown.

- The volatile continuing calibration %Ds exceeded the 25% quality control limit for carbon disulfide and vinyl chloride. The positive results were qualified as estimated, (J), in the affected samples. The direction of bias is unknown.

- In sample S57RB100998, the volatile internal standard, 1,4-dichlorobenzene-d4, yielded areas below the quality control limits. The nondetected results were qualified as estimated, (UJ), in the compounds associated with 1,4-dichlorobenzene-d4. The direction of bias is unknown.

- The explosive continuing calibration %Ds exceeded the 15% quality control limits for tetryl. The nondetected results were qualified as estimated, (UJ), in the affected samples. The direction of bias is unknown.

MEMO TO: GEORGE LATULIPPE
DATE: DECEMBER 10, 1998 - PAGE 3

- Positive results reported at concentrations below the CRQL were qualified as estimated, (J). The direction of biased is unknown.

Notes

Several initial and continuing calibration %RSDs and %Ds for volatiles exceeded the validation quality control limits. Validation action is not required since the %RSDs and %Ds were less than 50%.

In the volatile fraction, sample S57FB100998-2 detected several compounds of a potable water source. The contaminants were not used to qualify data based on blank contamination.

In the volatile MS/MSD, the Relative Percent Difference (%RPD) exceeded the quality control limits for benzene in sample S42MW002U004. No action was warranted based on MS/MSD data alone, as per the Functional Guidelines.

The volatile LCS yielded a %R below the quality control limits for vinyl chloride. No action was warranted based on LCS data alone, as per the Functional Guidelines.

Sample S41DUP300 and S41MW004U004 were diluted 2X due to the concentration of trichloroethene above the instrument's linear calibration range. Results from the dilution were transposed over the undiluted sample and used for validation purposes.

Sample S42MW004U004 was diluted 500X due to the concentration of trichloroethene and cis-1,2-dichloroethene above the instrument's linear calibration range. Results from the dilution were transposed over the undiluted sample and used for validation purposes.

In the volatile fraction, ethyl ether was added to the TCL.

Several semivolatile surrogate recoveries exceeded the quality control limits. No action was taken due to the nondetected compounds.

In the semivolatile MS/MSD, the %R exceeded the quality control limits for diethylphthalate and hexachlorobenzene in sample S41MW002U004. No action was warranted based on MS/MSD data alone, as per the Functional Guidelines.

In the semivolatile MS/MSD, the %R exceeded the quality control limits for 4-chloroaniline in the method blank sample. No action was warranted based on MS/MSD data alone, as per the Functional Guidelines.

Several LCS recoveries were below the quality control limits. No action is taken on LCS data alone, as per the Functional Guidelines.

The Tentatively Identified Compound (TIC), Hexadecanoic acid, was identified in the semivolatile method blank. The presence of this compound in the following sample should be considered a false positive:

RB-100998	S41DUP300
S41MW001U004	S41MW002U004
S42DUP300	S42MW002U004
S42MW003U004	S42MW004U004
S42MW006U004	S42MW007U004
S57FB100998-1	S57FB100998-2
S57RB10098	

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The semivolatile compounds, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, and 1,2,4-trichlorobenzene were analyzed within the volatile TCL.

Several pesticide resolution recoveries were below the quality control limits for one column . No action was warranted due to only one column being outside the quality control limits.

In the pesticide fraction, the initial calibration RPD% exceeded the quality control limit for beta-BHC and 4,4'-DDT on column RTX-1701. No action was warranted due to column DB-5 being within the quality control limits for the aforementioned compounds.

The pesticide surrogate recovery exceeded the quality control limits for decachlorobiphenyl in the method blank analysis. No action was taken due to the sample being in the method blank.

The MS/MSD and LCS for nitroglycerine exceeded the quality control limits. No action was warranted due to the nondetected compounds, and no action is taken on either MS/MSD or LCS data alone, as per the Functional Guidelines.

In the explosive fraction, nitroglycerine was added to the TCL.

MEMO TO: GEORGE LATULIPPE
DATE: DECEMBER 10, 1998 - PAGE 5

Executive Summary

Laboratory Performance: Several volatile RRF noncompliances were noted. The nondetected results were qualified as rejected, (UR). Several volatile and explosive continuing calibration %Ds exceeded the quality control limit. Several pesticide resolution recoveries were below the quality control criterion. Blank contamination was detected in the laboratory method blanks for chloroform, methylene chloride, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate. Several samples were diluted due to the detection of trichloroethene and cis-1,2-dichloroethene above the instrument's linear calibration range.

Other Factors Affecting Data Quality: Several semivolatile, pesticide/PCB, and explosive surrogate recoveries were outside the quality control limits. Several MS/MSDs and LCSs noncompliances were noted in all the organic fractions. The volatile internal standard, 1,4-dichlorobenzene-d4, was below the quality control limits. Blank contamination was detected in the field quality control blanks for 2-butanone, carbon disulfide, and trichloroethene.

MEMO TO: GEORGE LATULIPPE
DATE: DECEMBER 10, 1998 - PAGE 6

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September, 1994), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP).

Justin Orbich

Tetra Tech, NUS
Chemist/Data Validator

Joseph A. Samchuck

Tetra Tech, NUS
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

DATA QUALIFIER KEY

U	-	Value is a nondetected result as reported by the laboratory and should not be considered present.
J	-	Positive result is estimated as result of a value below the CRQL or a technical noncompliance.
UJ	-	Nondetected result is considered to be estimated as a result of technical noncompliances.
UR	-	Value is rejected as a result of initial calibration RRF below the 0.05 quality control limit or internal standard with a zero percent recovery.
B	-	Nondetected blank (for Region III) as a result of blank contamination and should not be considered present.

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS (TICs)

Fraction	Named TIC
Semivolatile	Hexadecanoic acid Unknown, Dichlorobenzoic acid

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-245

TO: **GEORGE LATULIPPE** **DATE: APRIL 29, 1999**

FROM: ***JUSTIN ORBICH*** ***CC:*** ***DV FILE***

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/PEST/PCB/EXP**
CTO 245 - NSWC INDIAN HEAD
SDG 9901029

SAMPLES: 4/Aqueous

S57RB0010001* S57SW0140101
S57SW0150101* S57TB0010001*

Overview

The sample set for CTO 245, Naval Surface Warfare Center (NSWC), Indian Head, SDG 9901164, consists of four (4) aqueous environmental samples, which includes one (1) rinsate blank (designated RB) and one (1) trip blank (designated TB). One sample S57SW0140101 was analyzed for Target Compound List (TCL) semivolatile, pesticide/PCB organic compounds, and explosive organic compounds including nitroglycerine and nitroguanidine. The samples designated (*) were analyzed for TCL volatile organic compounds including ethyl ether. No field duplicate pairs were included within this SDG.

The samples were collected by Tetra Tech, NUS on January 7th, 1999, and analyzed by GPL Environmental Services, Inc. The volatile, semivolatile, pesticide/PCB, and explosive compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and were conducted using the U.S. EPA Contract Laboratory Program (CLP) SOW OLC02.1 and SW 846 method 8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, GC/MS tuning, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, internal standard performance, compound identification and quantitation, detection limits, and Tentatively Identified Compound (TIC) evaluation.

Areas of concern with respect to data quality are listed below.

Major Problems

- In the volatile fraction, the initial and continuing calibration Relative Response Factors (RRFs) were below the 0.05 quality control limit for acetone, 2-butanone, 2-hexanone, ethyl ether, and 4-methyl-2-pentanone. The nondetected results were qualified as rejected (UR), in all affected samples.

- In the volatile fraction, the continuing calibration RRF was below the 0.05 quality control limit for 1,2-dibromo-3-chloropropane. The nondetected results were qualified as rejected (UR), in all affected samples.

Minor Problems

- The following volatile compounds were detected in the field quality control blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Methylene chloride	1.6µg/L	16.0µg/L

Sample aliquot and dilution factors were taken into consideration during the application of all action levels. Positive results for methylene chloride reported at concentrations below the action level were qualified (B) as a result of blank contamination. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

- In the volatile fraction, the initial and continuing calibration RRF was below the 0.05 quality control limits for acetone. The positive results were qualified as estimated (J), in the affected samples. The direction of bias is unknown.

- In the volatile fraction, the continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for methylene chloride. The positive results were qualified as estimated (J), in the affected samples. The direction of bias is unknown.

- The following semivolatile compounds were detected in the laboratory method blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Bis(2-ethylhexyl)phthalate	1.0µg/L	10.0µg/L

Sample aliquot and dilution factors were taken into consideration during the application of all action levels. Positive results for bis(2-ethylhexyl)phthalate reported at concentrations below the action level were qualified (B) as a result of blank contamination.

- Positive results reported at concentrations below the CRQL were qualified as estimated, (J). The direction of biased is unknown.

Notes

In the volatile fraction, several continuing calibration %Ds exceeded the 25% quality control limits. No action was warranted since only nondetected results were reported and the %Ds did not exceed 50%.

It should be noted in the volatile fraction, the laboratory did not include ethyl ether in the initial and continuing calibration standards. The laboratory was notified and provided amended Form VIs and VIIs that included ethyl ether.

It should be noted 1,2,4-trichlorobenzene was analyzed within the volatile fraction.

In the volatile fraction, ethyl ether was added to the TCL.

In the volatile sample S57SW0150101, 1,2,4-trichlorobenzene was inconsistently reported on the Form I and the electronic data. The reviewer amended the electronic data to match the Form I for 1,2,4-trichlorobenzene.

In the semivolatile fraction, the Tentatively Identified Compound (TIC), unknown was detected in the semivolatile method blank. The presence of this TIC should be considered a false positive.

In the pesticide/PCB fraction, the Performance Evaluation Mixture (PEM) Relative Percent Difference (RPD exceeded the 25% quality control limit for 4,4'-DDT and Methoxychlor on 1/22/99 at 1419 on column RTX-1701. No action was warranted since only nondetected results were reported and the RPD was within the quality control limit on column DB-5.

In the explosive fraction, the Laboratory Control Sample (LCS) %Rs exceeded the quality control limits for nitroglycerine. No action was taken since no positive results were reported.

In the explosive fraction, nitroglycerine and nitroguanidine were added to the TCL.

Executive Summary

***Laboratory Performance*:** The initial and continuing calibration RRFs were below the 0.05 quality control limits for acetone, 2-butanone, 2-hexanone, ethyl ether, and 4-methyl-2-pentanone. The continuing calibration RRF was below the 0.05 quality control limit for 1,2-dibromo-3-chloropropane. Methylene chloride and bis(2-ethylhexyl)phthalate were detected as blank contaminants. Several volatile continuing calibration %Ds exceeded the 25% quality control limits. In the pesticide/PCB fraction, the PEM RPD exceeded the 25% quality control limit on column RTX-1701.

Other Factors Affecting Data Quality: The explosive LCS %R exceeded the quality control limit for nitroglycerine. In the volatile fraction, 1,2,4-trichlorobenzene was inconsistently reported on the From I and the electronic data in sample S57SW0150101.

MEMO TO: **GEORGE LATULIPPE**
DATE: **APRIL 29, 1999 – PAGE 4**

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September, 1994), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP).

Justin Orbich

Tetra Tech, NUS
Chemist/Data Validator

Joseph A. Samchuck

Tetra Tech, NUS
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 29, 1999 – PAGE 5

Summary Tentatively Identified Compounds (TICs)

Fraction	Named TIC
Volatiles	None detected.
Semivolatile	None detected.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-232

TO: **GEORGE LATULIPPE** **DATE: APRIL 28, 1999**

FROM: **DANA PIETO** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION - VOCs, SVOCs, PEST/PCBs, EXPLOSIVES, & NITROGUANIDINE**
CTO 245, NSWC INDIAN HEAD, MARYLAND
SDG 9901031

SAMPLES: 3 Solids:

S57SB0020301 S57SD0100101 S57SD0110101

The sample set for CTO 245, NSWC Indian Head, Maryland, SDG WO016, consists of three solid environmental samples. The environmental samples were analyzed for target compound list (TCL) volatile organic compounds. Sample S57SD0100101 was analyzed for TCL semivolatile, pesticide/PCB, explosives, and nitroguanidine compounds.

The samples were collected by Tetra Tech NUS on January 7, 1999, and analyzed by GPL Laboratories. The volatile, semivolatile, pesticide/PCB, explosives, and nitroguanidine compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). The volatile, semivolatile, and pesticide/PCB soil analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.2) analytical and reporting protocols. The explosive compound analyses were conducted using EPA SW-846 Method 8330. The nitroguanidine analyses were conducted using modified USAEC methodologies.

Summary

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, GC/MS tuning and calibration data, laboratory and field quality control blank results, surrogate spike recoveries, internal standards performance, compound identification and quantitation, detection limits, and tentatively identified compounds (TICs).

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 28, 1999 - PAGE 2

Minor Problems

- The following volatile compound was detected in the laboratory method blanks at the maximum concentration indicated below:

Compound	Maximum Concentration	Solid Action Level
Methylene chloride	17 µg/kg	170 µg/kg

Samples Affected: All

Sample aliquot, dilution factors, and percent solids were taken into consideration during the application of the action level. Positive results less than the action level for methylene chloride have been qualified, (B), as a result of blank contamination.

- The volatile surrogate percent recovery (%R) exceeded the quality control limit for bromofluorobenzene in samples S57SD0110101 and S57SD0100101. The volatile surrogate %Rs exceeded the quality control limits for 1,2-dichloroethane-d4 and bromofluorobenzene in sample S57SB0020301. Nondetected results were qualified as estimated, (UJ).

- The semivolatile internal standard area fell below the lower quality control limit for perylene-d12 in sample S57SD0100101. Positive results were qualified as estimated, (J), and nondetected results were qualified as estimated, (UJ).

- Positive results reported at concentrations below the Contract Required Quantitation Limits (CRQL) were qualified as estimated, (J).

Notes

- The volatile sample S570020301DL exceeded the 14-day holding time limit by 18 days. No action is warranted for because the original sample results were used in validation of this SDG.

- The volatile initial calibration relative percent standard deviation (%RSD) and the continuing calibration percent difference (%D) exceeded the 30% and 25% quality control limits, respectively, for methylene chloride. No action is warranted for methylene chloride because the compound was already qualified due to blank contamination.

- The volatile internal standard area was below the lower quality control limits for bromochloromethane in sample S57SD0100101RE. No action is warranted because the original sample results were used in validation of this SDG.

- Cis-1,2-dichloroethene and trichloroethene exceeded the linear calibration range of the instrument in sample S57SB0020301. The sample was diluted to a medium level analysis and reanalyzed. The

dilution results for these compounds only were transposed over to the original sample results and used in validation of this SDG.

- The semivolatile continuing calibration %Ds exceeded the 25% quality control limit for hexachlorocyclopentadiene and dibenz[a,h]anthracene. No action is warranted because the results were nondetects.

- The semivolatile Matrix Spike/Matrix Spike Duplicate (MS/MSD) %R exceeded the quality control limits for 4-nitrophenol and fell below the lower quality control limits for 1,4-dichlorobenzene and 1,2,4-trichlorobenzene. The MS/MSD relative percent difference (RPD) exceeded the quality control limit for 1,2,4-trichlorobenzene and acenaphthene. No action is warranted based on MS/MSD noncompliances alone.

- The pesticide MS/MSD %R exceeded the quality control limits for heptachlor. No action is warranted based on MS/MSD noncompliances alone.

- The pesticide initial calibration %D exceeded the 20% quality control limit for alpha-BHC and delta-BHC. No action is warranted because the noncompliance occurred on only one column.

- The pesticide % Endrin breakdown exceeded the 20% quality control limit. The % combined Endrin and 4,4'-DDT breakdown exceeded the 30% quality control limit. No action is warranted because the results were nondetects.

- The explosives Laboratory Control Sample (LCS) exceeded the quality control limits for nitrobenzene. No action is warranted based on LCS noncompliances alone.

Executive Summary

***Laboratory Performance*:** The volatile initial calibration %RSD and continuing calibration %D exceeded the quality control limits for methylene chloride. The volatile surrogate %R exceeded the quality control limits for bromofluorobenzene and 1,2-dichloroethane-d4. The semivolatile continuing calibration %Ds exceeded the 25% quality control limit for hexachlorocyclopentadiene and dibenz[a,h]anthracene. The semivolatile internal standard area fell below the lower quality control limits for perylene-d12. The pesticide initial calibration %RSD exceeded the 20% quality control limits for alpha-BHC and delta-BHC. The pesticide % Endrin breakdown exceeded the 20% quality control limit and the % combined Endrin and 4,4'-DDT breakdown exceeded the 30% quality control limit. The explosives LCS %R exceeded the quality control limits for nitrobenzene. Methylene chloride was detected in the volatile laboratory method blanks.

Other Factors Affecting Data Quality: The semivolatile MS/MSD %R fell below the lower quality control limits for 1,4-dichlorobenzene and 1,2,4-trichlorobenzene and exceeded the upper quality control limits for 4-nitrophenol. The semivolatile MS/MSD RPD exceeded the quality control limit for 1,2,4-trichlorobenzene and acenaphthene. The pesticide MS/MSD %R exceeded the quality control limit for Heptachlor.

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 28, 1999 - PAGE 4

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Dana L. Pieto

Tetra Tech NUS
Data Validator

Joseph A. Samchuck

Tetra Tech NUS
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Summary of Tentatively Identified Compounds (TICs)

Fraction	Named TIC
Volatiles	Unknown(s)
Semivolatiles	Unknown(s) Acetophenone Unknown phthalate Hexadecanoic acid Unknown PAH(s)

Data Qualifier Key:

U	-	Value is a nondetected result as reported by the laboratory and should not be considered present.
J	-	Positive result is estimated as result of a value below the CRQL or a technical noncompliance.
B	-	Nondetected blank (for Region III) as a result of blank contamination and should not be considered present.
UJ	-	Nondetected result is estimated as result of a technical noncompliance.

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-226

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 27, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION - TAL METALS, SEM AND CYANIDE**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDGs – 9901029 / 9901031

SAMPLES: 2/Aqueous/

S57SW0140101 S57SW0140101-F

1/Soil/

S57SD0100101

Overview

The sample set for CTO 245, NSWC Indian Head, SDGs 9901029 / 9901031, consists of two (2) aqueous and one (1) soil environmental samples. No field duplicate results were included within this SDG.

Samples S57SW0140101 and S57SD0100101 were analyzed for Target Analyte List (TAL) metals and cyanide. S[illegible]e S57SW0140101-F was analyzed for filtered TAL metals. Sample S57SD0100101 was also analyzed for Simultaneously Extracted Metals (SEM). The samples were collected by Tetra Tech NUS on January 7, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. TAL metals and cyanide analyses were conducted using ILMO4.0 methodologies. SEM analyses were conducted using an EPA draft method.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, ICP interference results, matrix spike results, post digestion spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All analyses, with the exception of cyanide and mercury were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methodologies.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for selenium affecting the aqueous matrix exhibited recoveries both above and below the 90-110% quality control limits. The nondetected results reported for selenium were qualified as estimated, "UJ". The direction of bias could not be determined.

- The CRDL %R for sodium affecting the aqueous matrix was > 110% quality control limit. Positive results <2X CRDL reported for the aforementioned analyte were qualified as biased high, "K".

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Samples Affected: Aqueous

Analyte	Maximum Concentration	Action Level - aqueous
barium[1]	0.689 ug/L	3.445 ug/L
calcium[1]	354.717 ug/L	1773.585 ug/L
cobalt	0.9 ug/L	4.5 ug/L
copper[1]	2.592 ug/L	12.96 ug/L
magnesium	47.1 ug/L	235.5 ug/L
zinc[1]	3.515 ug/L	17.575 ug/L

Samples Affected: SEM

Analyte	Maximum Concentration	Action Level - soil
cadmium	0.4 ug/L	0.05 mg/kg
copper[2]	6.5 ug/L	0.8125 mg/kg
lead[2]	1.8 ug/L	0.225 mg/kg
mercury[2]	0.83 ug/L	0.10375 mg/kg
nickel[2]	5.3 ug/L	0.6625 mg/kg
zinc[2]	22.7 ug/L	2.8375 mg/kg

Samples Affected: TAL metals (soil)

Analyte	Maximum Concentration	Action Level - soil
barium[3]	0.087 mg/kg	0.435 mg/kg
calcium[3]	24.688 mg/kg	123.44 mg/kg
copper[3]	0.364 mg/kg	1.82 mg/kg
magnesium	41.5 ug/L	41.5 mg/kg
potassium[3]	8.797 mg/kg	43.985 mg/kg
thallium	4.1 ug/L	4.1 mg/kg
zinc[3]	3.933 mg/kg	19.665 mg/kg

(1) Maximum concentration present in an aqueous preparation blank.
(2) Maximum concentration present in a SEM extraction blank.
(3) Maximum concentration present in a soil preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample percent solids, aliquot size and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for cobalt, copper and mercury have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

- The Matrix Spike (MS) Percent Recovery (%R) for mercury affecting the TAL soil samples was < 30% quality control limit. The positive results reported for the aforementioned analyte were qualified as biased low, "L".

- Laboratory duplicate imprecision (>35%) was noted for lead and manganese affecting the TAL soil samples. The positive results reported for the aforementioned analytes were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %Rs for lead and thallium affecting the aqueous matrix were > 110% quality control limit. However, no validation actions were warranted as all results were > 2X CRDL or nondetects.

The CRDL %R for lead affecting the SEM samples was < 90% quality control limit. However, no validation actions were warranted as all results were > 2X CRDL.

The CRDL %Rs for iron, lead, selenium and thallium affecting the TAL soil samples were > 110% quality contro[illegible] However, no validation actions were warranted as all results were > 2X CRDL or nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: The MS %R for mercury affecting the TAL soil samples was < 30% quality control limit. Laboratory duplicate imprecision (>35%) was noted for lead and manganese affecting the TAL soil samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
UJ	-	Nondetected result is considered estimated as a result of validation noncompliances.
J	-	Positive result is considered estimated as a result of validation noncompliances.
L	-	Positive result is considered biased low as a result of validation noncompliances.
K	-	Positive result is considered biased high as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-250

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 30, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –ACID VOLATILE SULFIDE, NITROCELLULOSE, pH AND TOTAL ORGANIC CARBON**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901031

SAMPLES: 4/Solids/

S57SB0020301 S57SB0020401 S57SB0020501 S57SD0100101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901031, consists of four (4) soil environmental samples. No field duplicate pairs were included within this SDG.

Samples S57SB0020301, S57SB0020401 and S57SB0020501 were analyzed for total organic carbon. Sample S57SD0100101 was analyzed for acid volatile sulfide, nitrocellulose, pH and total organic carbon. The samples were collected by Tetra Tech NUS on January 7, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Acid volatile sulfide analyses were performed using MCAWW EPA method 376.1. pH analyses were performed using MCAWW EPA method 150.1. Total organic carbon analyses were performed using the Lloyd Kahn method.

Summary

All analytes, with the exception of those designated, "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method blanks, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
L	-	Positive result is considered biased low as a result of validation noncompliances.
UR	-	Nondetected result is considered rejected as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-228

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 30, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TAL METALS, TOC, NITROCELLULOSE AND PH**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901047

SAMPLES: 5/Soils/

S57SB0040301	S57SB0130101	S57SB0150201
S57SBDUP0101	S57SS0130101	

Overview

The sample set for SDG 9901047, NSWC Indian Head, consists of five (5) soil environmental samples. One (1) field duplicate pair (S57SB0040301 / S57SBDUP0101) was included within this SDG.

Samples S57SB0040301, S57SB0150201 and S57SBDUP0101 were analyzed for total organic carbon (TOC). Samples S57SB0130101 and S57SS0130101 were analyzed for target analyte list (TAL) metals, nitrocellulose and pH. The samples were collected by Tetra Tech NUS on January 9-11, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All metals analyses were conducted using Contract Laboratory Program (CLP) methodologies. pH analyses were conducted using EPA method 150.1. TOC analyses were conducted using SW 846 method 9060. Nitrocellulose analyses were conducted using the USATHAMA method.

Summary

All analytes, with exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, post digestion spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- The seven (7) day holding time from collection to extraction for nitrocellulose was exceeded by thirty (30) days. The nondetected results reported for nitrocellulose were qualified as rejected, "UR".

- The Matrix Spike (MS) Percent Recovery (%R) for antimony was <30% quality control limit. The nondetected result reported for antimony was qualified as rejected, "UR". The positive result reported for antimony was qualified as biased extremely low, "L".

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for selenium was >110% quality control limit. The positive result <2X CRDL reported for selenium was qualified as biased high, "K".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (soil)
Barium[1]	0.168 mg/kg	0.84 mg/kg
Calcium[1]	22.668 mg/kg	113.34 mg/kg
Copper[1]	0.363 mg/kg	1.815 mg/kg
Iron[1]	5.643 mg/kg	28.215 mg/kg
Magnesium	41.5µg/L	41.5 mg/kg
Potassium[1]	12.380 mg/kg	61.9 mg/kg
Thallium	4.1µg/L	4.1 mg/kg
Zinc[1]	1.123 mg/kg	5.615 mg/kg

[1] Maximum concentration found in soil preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. However, no validation action was taken since all results were either the results were > than the action level or were nondetects.

- The MS %R for manganese was <75% quality control limit. The positive results reported for manganese were qualified as biased low, "L".

- The MS %R for nickel was <30% quality control limit. The positive results reported for nickel were qualified as estimated, "J", as a result of conflicting noncompliances.

- Laboratory duplicate imprecision (>35%) was noted for magnesium and nickel. The positive results reported for magnesium and nickel were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The MS %R for nitrocellulose was <75% quality control limit. However, no validation action was required as all results reported for nitrocellulose were qualified as rejected due to holding time noncompliance.

The Initial Calibration Verification (ICV) Percent Recovery (%R) for nitrocellulose was >110% quality control limit. However, no validation action was required as all results reported for nitrocellulose were qualified as rejected due to holding time noncompliance.

The field duplicate pair (S57SB040301 / S57SBDUP0101) was analyzed for TOC. Both samples reported nondetected results for TOC.

Executive Summary

Laboratory Performance: The holding time for nitrocellulose was exceeded. The CRDL %R for selenium was >110% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for antimony and nickel were <30% quality control limit. The MS %R for manganese was <75% quality control limit. Laboratory duplicate imprecision was noted for magnesium and nickel.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
UR	-	Nondetected result is considered rejected , "UR", as a result of technical noncompliances.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-230

TO: **GEORGE LATULIPPE** **DATE: APRIL 30, 1999**

FROM: **JUSTIN ORBICH** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/PEST/PCB/EXP**
CTO 245 - NSWC INDIAN HEAD
SDG 9901049

SAMPLES: 4/Aqueous

S57FB0010101	S57FB0020101
S57RB0020101	S57RB0030101*
S57RB0040101*	S57SW0110101*
S57SW0120101*	S57TB0020001*

Overview

The sample set for CTO 245, Naval Surface Warfare Center (NSWC), Indian Head, SDG 9901049, consists of eight (8) aqueous environmental samples, which includes two (2) field blanks (designated FB), three (3) rinsate blanks (designated RB), and one (1) trip blank (designated TB). The samples were analyzed for Target Compound List (TCL) volatile organic compounds including ethyl ether; semivolatiles; pesticide/PCB organic compounds; and explosive organic compounds including nitroglycerine. The samples designated (*) were analyzed for TCL volatile organic compounds including ethyl ether only. No field duplicate pairs were included within this SDG.

The samples were collected by Tetra Tech, NUS on January 9th, 10th, and 11th, 1999, and analyzed by GPL Environmental Services, Inc. The volatile, semivolatile, pesticide/PCB, and explosive compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and were conducted using the U.S. EPA Contract Laboratory Program (CLP) SOW OLC02.1 and SW 846 method 8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, GC/MS tuning, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, internal standard performance, compound identification and quantitation, detection limits, and Tentatively Identified Compound (TIC) evaluation.

Areas of concern with respect to data quality are listed below.

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 30, 1999 – PAGE 2

Major Problems

- In the volatile fraction, the initial and continuing calibration Relative Response Factors (RRFs) were below the 0.05 quality control limit for acetone, 2-butanone, 2-hexanone, ethyl ether, and 4-methyl-2-pentanone. The nondetected results were qualified as rejected (UR), in all affected samples.

- In the explosive fraction, the surrogate Percent Recovery (%R) was zero (0) for 4-nitroaniline in sample S57FB0010101. The nondetected results were qualified as rejected (UR), in the aforementioned sample.

Minor Problems

- The following volatile and semivolatile compounds were detected in the laboratory method blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Methylene chloride	3.8µg/L	38.0µg/L
Bis(2-ethylhexyl)phthalate	1.0µg/L	10.0µg/L

Sample aliquot and dilution factors were taken into consideration during the application of all action levels. Positive results for methylene chloride and bis(2-ethylhexyl)phthalate reported at concentrations below the action level were qualified (B) as a result of blank contamination.

- Positive results reported at concentrations below the CRQL were qualified as estimated, (J). The direction of biased is unknown.

Notes

The following volatile and pesticide/PCB compounds were detected in the laboratory method blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Bromodichloromethane[1]	2.4µg/L	12.0µg/L
Bromoform[1]	1.3µg/L	6.5µg/L
Carbon disulfide[1]	2.2µg/L	11.0µg/L
Chloroform[1]	1.2µg/L	6.0µg/L
Dibromochloromethane[1]	4.0µg/L	20.0µg/L
4,4'-DDT[2]	0.018µg/L	0.09µg/L

[1] Field Blank
[2] Rinsate Blank

Sample aliquot and dilution factors were taken into consideration during the application of all action levels. No action was warranted since field quality control blanks are not qualified based on field quality control blank contamination.

Several volatile continuing calibration %Ds exceeded the 25% quality control limits. No action was warranted since only non-detected results were reported and the %Ds did not exceed 50%.

In the volatile fraction, the Tentatively Identified Compound (TIC), unknown was detected in the volatile holding blank. The presence of this TIC should be considered a false positive.

It should be noted 1,2,4-trichlorobenzene was analyzed within the volatile fraction.

It should be noted in the volatile fraction, the laboratory did not include ethyl ether in the initial and continuing calibration standards. The laboratory was notified and provided amended Form VIs and VIIs that included ethyl ether.

In the volatile fraction, ethyl ether was added to the TCL.

In the pesticide/PCB fraction, the Performance Evaluation Mixture (PEM) Relative Percent Difference (RPD) exceeded the 25% quality control limit for 4,4'-DDT on 1/21/99 at 1938 on column RTX-1701. No action was warranted since the continuing calibration verification was within the quality control limits on the same column and the RPD was within the quality control limit on column DB-5.

In the pesticide/PCB fraction, the Performance Evaluation Mixture (PEM) Relative Percent Difference (RPD) exceeded the 25% quality control limit for 4,4'-DDT and Methoxychlor on 1/22/99 at 1419 on column RTX-1701. No action was warranted since the continuing calibration verification was within the quality control limits on the same column and the RPD was within the quality control limit on column DB-5.

In the pesticide/PCB fraction, the surrogate %Rs exceeded the quality control limits for tetrachloro-m-xylene on column RTX-1701 in samples, S57RB0020101, S57FB0020101, and S57FB0010101. No action was warranted since only one surrogate exceeded the quality control limits.

In the pesticide/PCB fraction, the Laboratory Control Sample (LCS) %Rs exceeded the quality control limits for Heptachlor, Endrin, and 4,4'-DDT. No action was warranted on LCS data alone.

It should be noted in the pesticide/PCB fraction, the laboratory provided the incorrect surrogate %R quality control limits. The quality control limits were corrected on the Form II and qualified based upon the corrected quality control limits.

In the explosive fraction, the Matrix Spike/Matrix Spike Duplicate (MS/MSD) and the LCS %Rs exceeded the quality control limits for 4-nitroaniline. No action is warranted on MS/MSD and LCS data alone.

In the explosive fraction, nitroglycerine was added to the TCL.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs were below the 0.05 quality control limits for acetone, 2-butanone, 2-hexanone, and 4-methyl-2-pentanone. Methylene chloride and bis(2-ethylhexyl)phthalate were detected as blank contaminants. Several volatile continuing calibration %Ds exceeded the 25% quality control limits. In the pesticide/PCB fraction, the PEM RPD exceeded the 25% quality control limit for 4,4'-DDT and Methoxychlor on column RTX-1701.

Other Factors Affecting Data Quality: Several pesticide/PCB surrogate %R exceeded the quality control limits for tetrachloro-m-xylene. The explosive surrogate %R was 0% for 4-nitroaniline in sample S57FB0010101. Several pesticide/PCB and explosives LCS %Rs exceeded the quality control limits. The explosive MS/MSD %R exceeded the quality control limit for 4-nitroaniline.

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 30, 1999 – PAGE 4

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September, 1994), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP).

Justin Orbich

Tetra Tech, NUS
Chemist/Data Validator

Joseph A. Samchuck

Tetra Tech, NUS
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 30, 1999 – PAGE 5

Summary Tentatively Identified Compounds (TICs)

Fraction	Named TIC
Volatiles	None detected.
Semivolatile	None detected.

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 28, 1999 – PAGE 5

Summary Tentatively Identified Compounds (TICs)

Fraction	Named TIC
Volatiles	None detected.
Semivolatile	None detected.

DATA QUALIFIER DEFINITIONS:

U	-	Value is a nondetected result as reported by the laboratory and should not be considered present.
J	-	Positive result is estimated as a result of a value below the CRQL or a technical noncompliance.
B	-	Nondetected blank (for Region III) as a result of blank contamination and should not be considered present.
UR	-	Compound was rejected due to severe technical noncompliances or as a result of calibration RRF noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-131

TO: **G. LATULIPPE** **DATE:** **APRIL 16, 1999**

FROM: **TERRI L. SOLOMON** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –CHLORIDE, DISSOLVED OXYGEN, FLUORIDE, HARDNESS, NITRATE / NITRITE, NITROCELLULOSE, pH, SALINITY, SULFATE, TOTAL DISSOLVED SOLIDS, TOTAL ORGANIC CARBON, TOTAL SUSPENDED SOLIDS, TURBIDITY**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDGs – 9901029 / 9901049

SAMPLES: **SDG 9901029**

3/Aqueous/

S57RB0010001 S57SW0140101 S57SW0150101

SDG 9901049

6/Aqueous/

S57FB0010101 S57FB0020101 S57RB0020101 S57RB0030101
S57RB0040101

Overview

The sample set for CTO 245, NSWC Indian Head, SDGs 9901029 / 9901049, consists of three (3) aqueous environmenta samples, two (2) field blanks (designated FB) and four (4) rinsate blanks (designated RB). No field duplicate pairs were included within this SDG.

Samples S57FB0010101, S57SW0140101 and S57FB0020101 were analyzed for chloride, dissolved oxygen, fluoride hardness, nitrate / nitrite, nitrocellulose, pH, salinity, sulfate, total dissolved solids, total organic carbon, total suspended solids and turbidity. Sample S57RB0020101 was analyzed for nitrocellulose. Samples S57RB0030101, S57RB0040101 and S57RB0010001 were analyzed for total organic carbon. Sample S57SW0150101 was analyzed for chloride, dissolved oxygen, fluoride, nitrate / nitrite, pH, salinity, sulfate, total dissolved solids, total suspended solids and turbidity. The samples were collected by Tetra Tech NUS on January 7, 10 and 11, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Chloride fluoride and sulfate analyses were conducted using EPA method 300.0. Dissolved oxygen analyses were conducted using EPA method 360.1. Hardness analyses were conducted using EPA MCAWW method 130.2. Nitrate / nitrite analyses were conducted using EPA MCAWW method 353.2. pH analyses were conducted using EPA MCAWW method 150.1 Total dissolved solids analyses were conducted using EPA method 160.1. Total organic carbon analyses were conducted using EPA MCAWW method 415.1. Total suspended solids were conducted using EPA MCAWW method 160.2. Turbidity analyses were conducted using EPA MCAWW method 180.1. Nnitrocellulose analyses were conducted using the USATHAMA method.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration results, duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The holding time for dissolved oxygen analyses affecting SDG 9901049 was marginally exceeded. The positive results reported for the aforementioned parameter were qualified as biased low, "L".
- The seven (7) day collection to extraction time for nitrocellulose was marginally exceeded. The positive and nondetected results reported for the aforementioned parameter were qualified as biased low, "L" and "UL", respectively.
- The continuing calibration percent recovery for turbidity affecting SDG 9901049 was < 90% quality control limit. The nondetected results reported for the aforementioned analyte were qualified as biased low, "UL".
- The initial and continuing calibration percent recoveries for fluoride were > 110% quality control limit. The positive results reported for the aforementioned parameter were qualified as biased high, "K".
- It was noted in the case narrative that the sulfate result reported for sample S57SW0150101 was over the calibration range. The sample could not be further diluted as there was insufficient volume for reanalysis. The positive reported for sulfate was qualified as estimated, "J".

Notes - None.

Executive Summary

Laboratory Performance: The holding time for dissolved oxygen analyses affecting SDG 9901049 was marginally exceeded. The seven (7) day collection to extraction time for nitrocellulose was marginally exceeded. The continuing calibration percent recovery for turbidity affecting SDG 9901049 was < 90% quality control limit. The initial and continuing calibration percent recoveries for fluoride were > 110% quality control limit. The sulfate result reported for sample S57SW0150101 was over the calibration range.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
UL	-	Nondetected result is considered biased low as a result of validation noncompliances.
L	-	Positive result is considered biased low as a result of validation noncompliances.
K	-	Positive result is considered biased high as a result of validation noncompliances.
J	-	Positive result is considered estimated as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-098

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 13, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION - TAL METALS AND CYANIDE**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901049

SAMPLES: 3/Aqueous/

S57FB0010101 S57FB0020101 S57RB0020101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901049, consists of two (2) field blanks (designated FB) and one (1) rinsate blank (designated RB).

The field blank samples were analyzed for Target Analyte List (TAL) metals and cyanide. The rinsate blank was analyzed for TAL metals. The samples were collected by Tetra Tech NUS on January 9 and 11, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. TAL metals and cyanide analyses were conducted using ILMO4.0 methodologies.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, ICP interference results, matrix spike results, post digestion spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All analyses, with the exception of cyanide and mercury were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Samples Affected: All

Analyte	Maximum Concentration	Action Level - Aqueous
aluminum[1]	104.3 ug/L	521.5 ug/L
barium[1]	1.2 ug/L	6.0 ug/L
calcium[1]	160.7 ug/L	803.5 ug/L
copper[1]	3.8 ug/L	19.0 ug/L
iron[1]	38.9 ug/L	194.5 ug/L
magnesium	41.5 ug/L	207.5 ug/L
thallium	4.1 ug/L	20.5 ug/L
zinc[1]	3.6 ug/L	18.0 ug/L

[1] Maximum concentration present in an aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot size and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for aluminum, barium, calcium, copper, iron, magnesium and zinc have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects. It should be noted that field quality control blanks are not qualified for field blank contamination.

Notes

The CRDL %Rs for selenium and thallium were > 110% quality control limit. However, no validation actions were warranted as all results were nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB/EXP**
CTO 245, NSWC INDIAN HEAD
SDG 9901060

SAMPLES: 2/Aqueous/

S57RB0050101 S57TB0030001

6/Solid/

S57SB0050101	S57SB0050201	S57SB0050301
S57SB0130201	S57SBDUP0101	S57SS0050101

OVERVIEW

The sample set for CTO 245, SDG 9901060, NSWC Indian Head consists of six (6) solid environmental samples and two (2) field quality control samples. All samples, except S57SBDUP0101, were analyzed for target compound list (TCL) volatile organic compounds plus ethyl ether. All environmental samples and the rinsate blank, designated RB, were also analyzed for TCL semivolatile organic compounds, pesticides/PCBs, and explosives plus nitroguanadine and nitroglycerine. One pair of field duplicates was included in the SDG: S57SB0050201 and S57SBDUP0101.

The samples were collected by Tetra Tech NUS on January 12, 1999 and analyzed by GPL Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLC02.1, OLM03.2, and SW-846 Method 8330 analytical and reporting protocols.

All samples were successfully analyzed with the exception of those results which were rejected. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- Initial and/or continuing calibration relative response factors (RRFs) fell below the 0.05 quality control limit for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, ethyl ether, and 1,2-dibromo-3-chloropropane. Nondetected results were rejected, UR, in the aqueous samples.

Minor Problems

- A continuing calibration percent difference (%D) exceeded the 25% quality control limit for methylene chloride. The positive result for methylene chloride in sample S57RB0050101 was qualified as estimated, J. The direction of bias cannot be determined.

- Sample S57SB0050201 was re-analyzed as a medium level soil due to the presence of acetone above the instrument's linear calibration range. The result from the re-analysis was transposed over the original sample result and used for validation purposes. The re-analysis occurred 21 days after sample collection. Therefore, the positive result for acetone was qualified as estimated, J. The direction of bias cannot be determined.

- The following compounds were detected in the laboratory method blanks at the maximum concentration specified:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	6 µg/Kg	60 µg/Kg
Di-n-butyl phthalate	2 µg/L	10 µg/L

  Sample aliquot, percent solids, and dilution factors were taken into consideration when applying blank action levels. Positive results for methylene chloride below the blank action level were qualified as false positives, B.

- A continuing calibration %D exceeded the 25% quality control limit on both analytical columns for 4,4'-DDT. The positive result for 4,4'-DDT in sample S57SS0050101 was qualified as estimated, J. The direction of bias cannot be determined.

- The positive result for g-Chlordane in sample S57SS0050101 exceeded the 25% relative percent difference (RPD) between columns criteria. The result was qualified as estimated, J. The direction of bias cannot be determined.

- Positive results below the Contract Required Quantitation Limit (CRQL) were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Initial calibration percent relative standard deviations (%RSD) and continuing calibration %Ds were greater than quality control limits for methylene chloride. No qualifiers were assigned on this basis since the samples were qualified due to blank contamination.

Continuing calibration %Ds exceeded 25%, but were less than 50%, for chloromethane and bromomethane. No qualifiers were applied on this basis since the compounds were not detected in the associated samples.

Initial calibration %RSD and continuing calibration %Ds were greater than quality control limits for hexachlorocyclopentadiene. Since the exceedances were less than 2X the quality control limits and the compound was not detected in the samples, no validation action was required on this basis.

Sample S57SS0050101 was re-analyzed at a 5X dilution factor due to the presence of benzo(b)fluoranthene above the instrument's linear calibration range. Results from the dilution were transposed over the original sample result and used for validation purposes.

Several compounds exceeded the quality control limits in the semivolatile matrix spike or matrix spike duplicate. No validation action was required since the compounds were not detected in the unspiked sample.

Sample S57SS0050101 was re-analyzed at a 10X dilution due to the presence of 4,4'-DDT and 4,4'-DDE above the instrument's linear calibration range. Results form the dilution were transposed over the original sample results and used as the basis for data validation.

Several performance evaluation mixtures (PEMs) exceeded the degradation criteria for Endrin and the degradation criteria for combined Endrin and 4,4'-DDT degradation. Degradation of 4,4'-DDT was less than 10% in all PEMs. Therefore, in the reviewer's judgement no qualification of 4,4'-DDT, 4,4'-DDE, or 4,4'-DDD was warranted since the combined noncompliance was caused by Endrin degradation. Endrin, Endrin aldehyde, and Endrin ketone were not detected in the samples and no validation action was taken on this basis.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several compounds failed the RRF criteria in the initial and continuing calibrations. 4,4'-DDT was qualified in one sample due to continuing calibration %Ds outside the criteria on both analytical columns. g-Chlordane was qualified in one sample due to a high RPD between analytical columns.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

FIELD DUPLICATES

PARAMETER	COMPOUND	S57SB0050201	S57SBDUP0101	%D
Semivolatile	benzo(a)anthracene	400 U	85 J	NC
	benzo(a)pyrene	400 U	61 J	NC
	benzo(b)fluoranthene	400 U	85 J	NC
	chrysene	400 U	76 J	NC
	fluoranthene	400 U	140 J	NC
	indeno(1,2,3-c,d)pyrene	400 U	43 J	NC
	phenanthrene	400 U	110 J	NC
	pyrene	400 U	140 J	NC
Pest/PCB		ND	ND	
Explosives		ND	ND	

NC - Not Calculated

ND - Not Detected

TENTATIVELY IDENTIFIED COMPOUNDS

Volatiles
- Unknown(s)

Semivolatiles
- Unknown PAH(s)
- hexadecanoic acid
- dodecanoic acid
- Unknown(s)

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-129

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 19, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TAL METALS, NITROCELLULOSE, PH AND TOC**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901060

SAMPLES: 6/Soils/

S57SB0050101	S57SB0050201	S57SB0050301
S57SB0130201	S57SBDUP0101	S57SS0050101

1/Aqueous/

S57RB0050101

Overview

The sample set for SDG 9901060, NSWC Indian Head, consists of six (6) soil environmental samples and one (1) rinsate blank (S57RB0050101). One (1) field duplicate pair (S57SB0050201 / S57SBDUP0101) was included within this SDG.

All samples were analyzed for target analyte list (TAL) metals. Samples S57SB0050101, S57SB0050201 and S57SB0050301 were also analyzed for nitrocellulose, pH and total organic carbon (TOC). Samples S57SB0130201, S57SBDUP0101 and S57SS0050101 were analyzed for nitrocellulose and pH. Sample S57RB0050101 was analyzed for nitrocellulose and TOC. The samples were collected by Tetra Tech NUS on January 12, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All metals analyses were conducted using Contract Laboratory Program (CLP) methodologies. pH analyses were conducted using EPA method 150.1. TOC analyses were conducted using SW 846 method 9060. Nitrocellulose analyses were conducted using the USATHAMA method.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

Minor Problems

- The seven (7) day holding time from collection to extraction for nitrocellulose was exceeded by thirty-five (35) to thirty-six (36) days. The positive results reported for nitrocellulose were qualified as biased low, "L".

- The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, selenium and thallium affecting the soil matrix were <90% quality control limit. The positive results <2X CRDL reported for arsenic and selenium in the affected samples were qualified as biased low, "L". The nondetected results reported for selenium and thallium in the affected samples were qualified as biased low, "UL".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (soil)	Action Level(aq)
Nitrocellulose[1]	0.444 mg/L	44.4 mg/kg	NA
TOC[1]	32.9 mg/L	1880 mg/kg	NA
Aluminum[1]	266µg/L	266 mg/kg	NA
Antimony	3.1µg/L	3.1 mg/kg	NA
Barium[2]	0.883µg/L	NA	4.415µg/L
Barium[3]	0.133 mg/kg	0.665 mg/kg	NA
Cadmium[3]	0.064 mg/kg	0.32 mg/kg	NA
Calcium[1]	162µg/L	162 mg/kg	NA
Copper[2]	2.804µg/L	NA	14.02µg/L
Copper[3]	0.486 mg/kg	2.43 mg/kg	NA
Iron[1]	82.4µg/L	82.4 mg/kg	NA
Magnesium	48.8µg/L	48.8 mg/kg	244µg/L
Manganese	0.3µg/L	0.3 mg/kg	NA
Potassium[2]	42.454µg/L	NA	212.27µg/L
Potassium[3]	4.198 mg/kg	20.99 mg/kg	NA
Sodium[1]	216µg/L	216 mg/kg	NA
Zinc[1]	4.0µg/L	4.0 mg/kg	NA

(1) Maximum concentration found in rinsate blank.
(2) Maximum concentration found in an aqueous preparation blank.
(3) Maximum concentration found in a soil preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for antimony, barium, cadmium, copper, magnesium, potassium and sodium were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects. It should be noted that field quality control samples are not qualified for field blank contamination.

- The Matrix Spike (MS) Percent Recovery (%R) for antimony affecting the soil matrix was <75% quality control limit. The nondetected results reported for antimony in the affected samples were qualified as biased low, "UL".

- The MS %R for manganese affecting the soil matrix was >125% quality control limit. The positive results reported for manganese in the affected samples were qualified as biased high, "K".

- Field duplicate imprecision (>50%) was noted for lead affecting the soil matrix. The positive results reported for lead in the affected samples were qualified as estimated, "J". The direction of bias could not be determined.

- The ICP Serial Dilution Percent Differences (%Ds) for aluminum and chromium affecting the soil matrix were >10% quality control limit. The positive results reported for aluminum and chromium in the affected samples were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %Rs for iron and lead affecting the soil matrix were >110% quality control limit. However, no validation action was required as all results reported for iron and lead in the affected samples were >2X CRDL.

The CRDL %R for lead affecting the aqueous matrix was >110% quality control limit. However, no validation action was required as the result reported for lead in the affected sample was anondetect.

A comparison of field duplicate pair (S57SB0050201 / S57SBDUP0101) is included in Appendix C.

Executive Summary

Laboratory Performance: The holding time for nitrocellulose was exceeded. The CRDL %Rs for several analytes were outside the 90-110% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: Several analytes were present in the rinsate blank. The MS %Rs for antimony and manganese affecting the soil matrix were outside the 75-125% quality control limit. Field duplicate imprecision was noted for lead affecting the soil matrix. The ICP Serial Dilution %Ds for aluminum and chromium affecting the soil matrix were >10% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III,

and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
UL	-	Nondetected result is considered biased low, "UL", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB/EXP**
CTO 245, NSWC INDIAN HEAD
SDG 9901109

SAMPLES: 5/Aqueous/

S57SW0090101*	S57SW0100101*	S57SW0160101*
S57SWDUP0101	S57TB004	

OVERVIEW

The sample set for CTO 245, SDG 9901109, NSWC Indian Head consists of four (4) aqueous environmental samples and one (1) trip blank, designated TB. All samples were analyzed for target compound list (TCL) volatile organic compounds plus ethyl ether. Samples designated * were also analyzed for TCL semivolatile organic compounds, pesticides/PCBs, and explosives plus nitroguanadine and nitroglycerine. One pair of field duplicates was included in the SDG: S57SW0160101 and S57SWDUP01001.

The samples were collected by Tetra Tech NUS on January 19-20, 1999 and analyzed by GPL Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLC02.1 and SW-846 Method 8330 analytical and reporting protocols.

All samples were successfully analyzed with the exception of those results which were rejected. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- Initial and continuing calibration relative response factors (RRFs) fell below the 0.05 quality control limit for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, and ethyl ether. Nondetected results were rejected, UR.

Minor Problems

- Initial and continuing calibration RRFs fell below the 0.05 quality control limit for 2-butanone. Positive results were qualified as estimated, J. The direction of bias cannot be determined.

- Initial calibration percent relative standard deviations (%RSD) and continuing calibration percent differences (%Ds) were greater than quality control limits for methylene chloride. The positive result for methylene chloride in the trip blank was qualified as estimated, J. The direction of bias cannot be determined.

- The following compounds were detected in the laboratory method blanks or field quality control blanks (*):

Compound	Maximum Concentration	Blank Action Level
Methylene chloride*	0.9 µg/L	9 µg/L
Bis(2-ethylhexyl)ether	4 µg/L	40 µg/L

  Dilution factors and sample aliquot were taken into consideration when applying the blank action level. Positive results for bis(2-ethylhexyl)phthalate were qualified as false positives, B.

- Positive results below the Contract Required Quantitation Limit (CRQL) were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Continuing calibration %Ds exceeded 25%, but were less than 50%, for bromomethane and ethyl ether. the compounds were not detected in the associated samples; therefore, no validation action was required on this basis.

Sample S57SW0090101 was analyzed at a 10X dilution factor due to the presence of ethyl ether above the instrument's linear calibration range. The result from the dilution was transposed over the undiluted sample result for this compound only and used for validation purposes.

Sample S57SW0100101 was analyzed at a 10X dilution factor due to the presence of ethyl ether and cis-1,2-dichloroethene above the instrument's linear calibration range. The results from the dilution was transposed over the undiluted sample result for these compounds only and used for validation purposes.

An unknown compound tentatively identified in the semivolatile method blank at 7.88 minutes was also tentatively identified in the samples. The results for this unknown compound should be considered as false positives.

Performance evaluation mixtures (PEMs) exceeded the 20% degradation criteria for Endrin and the 30% combined degradation criteria. Endrin, 4,4'-DDT, and their degradation products were not detected in the associated samples. Therefore, no qualifiers were assigned on this basis.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several compounds failed the RRF criteria in the initial and continuing calibrations. Several volatile compounds exceeded the instrument's linear calibration range.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

FIELD DUPLICATES

PARAMETER	COMPOUND	S57SMW0160101	S57SWDUP0101	%D
Volatile		ND	ND	
Semivolatile		ND	ND	
Pest/PCB		ND	ND	
Explosives		ND	ND	

ND - Not Detected

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-225

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 30, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TOTAL AND DISSOLVED TAL METALS, CYANIDE AND MISCELLANEOUS PARAMETERS**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901109

SAMPLES: 6/Aqueous/

S57SW0090101	S57SW0090101-F
S57SW0160101	S57SW0160101-F
S57SWDUP0101	S57SWDUP0101-F

Overview

The sample set for SDG 9901109, NSWC Indian Head, consists of six (6) aqueous environmental samples. Two (2) field duplicate pairs (S57SW0160101/ S57SWDUP0101 and S57SW0160101-F/ S57SWDUP0101-F) were included within this SDG.

All samples, with exception to those designated –F, were analyzed for target analyte list (TAL) metals, cyanide, chloride, dissolved oxygen (DO), fluoride, hardness, nitrate/nitrite, nitrocellulose, pH, salinity, sulfate, total dissolved solids (TDS), total organic carbon (TOC), total suspended solids (TSS) and turbidity. Those sample designated –F were analyzed for dissolved TAL metals. The sample were collected by Tetra Tech NUS on January 20, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria.

All metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) methodologies. Chloride, fluoride and sulfate analyses were conducted using EPA method 300.0. Hardness analyses were conducted using EPA method 130.2. Nitrate/Nitrite analyses were conducted using EPA method 353.2. pH analyses were conducted using EPA method 150.1. Salinity analyses were conducted using Standard Method 2520A-D. TDS analyses were conducted using EPA method 160.2. TOC analyses were conducted using SW 846 method 9060. TSS analyses were conducted using EPA method 160.1. Turbidity analyses were conducted using EPA method 180.1. Nitrocellulose analyses were conducted using the USATHAMA method. Dissolved oxygen analyses were conducted using EPA method 360.1.

Summary

All analytes, with exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- The holding time for nitrocellulose from collection to extraction was exceeded by twenty-eight (28) days. The nondetected results reported for nitrocellulose were qualified as rejected, "UR". The positive results reported for nitrocellulose were qualified as biased extremely low, "L".

- The immediate holding time for salinity was exceeded by nineteen (19) days. The nondetected results reported for salinity were qualified as rejected, "UR".

Minor Problems

- The holding times for chloride and sulfate were exceeded by one (1) day. The positive results reported for chloride and sulfate were qualified as biased low, "L".

- The holding times for TDS and TSS were exceeded by two (2) days. The positive results reported for TDS were qualified as biased low, "L". The nondetected results reported for TSS were qualified as biased low, "UL".

- The holding time for turbidity was exceeded by thirty (30) days. The positive results reported for turbidity were qualified as biased extremely low, "L".

- The Initial and Continuing Calibration Verifications for turbidity were <90% quality control limit. The positive results reported for turbidity were qualified as biased low, "L".

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for lead was <90% quality control limit. The positive results <2X CRDL and the nondetected results reported for lead were qualified as biased low, "L" and "UL", respectively.

- The CRDL %Rs for selenium and zinc were >110% quality control limit. The positive results <2X CRDL reported for selenium and zinc were qualified as biased high, "K".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

  Samples Affected: All

Analyte	Maximum Concentration	Action Level (aqueous)
Aluminum[1]	47.733µg/L	238.665µg/L
Antimony[1]	3.312µg/L	16.56µg/L
Barium[1]	0.751µg/L	3.755µg/L
Cadmium[1]	0.368µg/L	1.84µg/L
Calcium[1]	91.539µg/L	457.695µg/L
Copper	1.7µg/L	8.5µg/L
Iron[1]	26.032µg/L	130.16µg/L
Magnesium	46.3µg/L	231.5µg/L
Manganese[1]	0.413µg/L	2.065µg/L
Potassium[1]	25.261µg/L	126.305µg/L
Silver[1]	0.815µg/L	4.075µg/L
Sodium[1]	288.132µg/L	1440.66µg/L
Thallium	3.9µg/L	19.5µg/L
Vanadium[1]	1.152µg/L	5.76µg/L
Zinc[1]	4.372µg/L	21.86µg/L

[1] Maximum concentration found in aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for aluminum, antimony, cadmium, copper, iron and vanadium were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects.

- The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrate/nitrite was <50% quality control limit. The positive results reported for nitrate/nitrite were qualified as biased extremely low, "L".

- The ICP Serial Dilution Percent Difference (%D) for sodium was >10% quality control limit. The positive results reported for sodium were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %R for sodium was >110% quality control limit. However, no validation action was required as all results reported for sodium were >2X CRDL.

A comparison of field duplicate pairs (S57SW0160101/ S57SWDUP0101 and S57SW0160101-F/ S57SWDUP0101-F) is included in Appendix C.

Executive Summary

Laboratory Performance: The holding times for several miscellaneous parameters were exceeded. The ICV/CCV %Rs for turbidity were <90% quality control limit. The CRDL %Rs for several analytes were outside the 90-110% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The LSC %R for nitrate/nitrite was <50% quality control limit. The ICP Serial Dilution %D for sodium was >10% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
UL	-	Nondetected result is considered biased low, "UL", as a result of technical noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
UR	-	Nondetected result is considered rejected, "UR", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-210

TO: **GEORGE LATULIPPE** **DATE: MAY 3, 1999**

FROM: **JUSTIN ORBICH** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/PEST/PCB/EXP**
CTO 245 - NSWC INDIAN HEAD
SDG 9901116

SAMPLES: 4/Solid

S57SD0050101 S57SD0060101
S57SD0120101 S57SDDUP0101

Overview

The sample set for CTO 245, Naval Surface Warfare Center (NSWC), Indian Head, SDG 9901116, consists of four (4) solid environmental samples. The volatile samples were analyzed for Target Compound List (TCL) organic compounds including ethyl ether. The aqueous environmental samples were analyzed for TCL semivolatile and pesticide/PCB organic compounds. The explosive environmental samples were analyzed for TCL organic compounds including nitroglycerine and nitroguanidine. One (1) field duplicate pair (S57SD0120101/S57SDDUP0101) was included within this SDG.

The samples were collected by Tetra Tech, NUS on January 20th, 1999, and analyzed by GPL Environmental Services, Inc. The volatile, semivolatile, pesticide/PCB, and explosive compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and were conducted using the U.S. EPA Contract Laboratory Program (CLP) SOW OLC02.1 and SW 846 method 8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, GC/MS tuning, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, internal standard performance, compound identification and quantitation, detection limits, field duplicate precision, and Tentatively Identified Compound (TIC) evaluation.

Areas of concern with respect to data quality are listed below.

Major Problems

- In the semivolatile fraction, the Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recovery (%R) was below ten percent (10%) for 1,4-dichlorobenzene. The nondetected result was qualified as rejected (UR), in the associated MS/MSD sample S57SD0120101.

MEMO TO: GEORGE LATULIPPE
DATE: MAY 3, 1999 – PAGE 2

Minor Problems

- The following compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Methylene chloride	17.0µg/KG	170.0µg/KG
Chloroform	1.0µg/KG	5.0µg/KG

  Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of all action levels. Positive results for methylene chloride reported at concentrations below the action level were qualified (B) as a result of blank contamination.

- In the volatile fraction, the surrogate %Rs exceeded the quality control limits for bromofluorobenzene in samples S57SD0050101, S57SD0060101, and S57SDDUP0101. The samples were reanalyzed with the surrogate within the quality control limits. However, the samples were reanalyzed sixteen (16) days past the holding time until analysis. Therefore, the original analyses were used for validation purposes. The positive results were qualified as estimated (J), in the aforementioned samples. The direction of bias is unknown.

- In the pesticide/PCB fraction, the percent difference between columns exceeded the 25% quality control limits. The positive results were qualified as estimated (J), in the following samples:

Sample	Compound	%D	Qualifier
S57SD0050101	gamma-Chlordane	41.5	J
S57SDDUP0101	4,4'-DDE	36.1	J
	4,4'-DDT	70.3	J

- Positive results reported at concentrations below the CRQL were qualified as estimated, (J). The direction of biased is unknown.

Notes

Several volatile and semivolatile initial and continuing calibration %RSDs and %Ds exceeded the 30% and 25% quality control limits, respectively. No action was warranted since only non-detected results were reported and the %Ds did not exceed 50%.

In the volatile fraction, sample S57SD0050101 was analyzed at a medium-level soil due to the presence of cis-1,2-dichloroethene and vinyl chloride above the calibration range of the instrument. The result from the dilution was transposed over the undiluted sample results and used for validation purposes.

In the volatile fraction, ethyl ether was added to the TCL.

In the semivolatile fraction, the advisory surrogate %R for 1,2-dichlorobenzene-d4 was below the quality control limits in samples S57SD01200101 and S57SDDUP0101. No action was warranted since the surrogate %R was an advisory surrogate.

In the semivolatile fraction, the MS/MSD was below the quality control limit for 1,2,4-trichlorobenzene. No action was warranted since no action is taken on MS/MSD data alone.

In the semivolatile fraction, the Tentatively Identified Compound (TIC), unknown was identified in the semivolatile method blank. The presence of this compound should be considered a false positive.

In the pesticide/PCB fraction, the initial calibration %RSD exceeded the 20% quality control limits for delta-BHC on both columns. No action was warranted since only nondetected results were reported and the %RSD did not exceed 50%.

In the pesticide/PCB fraction, the initial calibration %RSD exceeded the 20% quality control limits for alpha-BHC on column DB-5. No action was warranted since only nondetected results were reported and the %RSD was within the quality control limits on column RTX-1701.

In the pesticide/PCB fraction, the Endrin % Breakdown exceeded the 20% quality control limit on both columns. No action was warranted since only nondetected results were reported.

Executive Summary

***Laboratory Performance*:** Several volatile and semivolatile initial and continuing calibration %RSDs and %Ds exceeded the quality control limits. Methylene chloride and chloroform were detected as blank contaminants. In the pesticide/PCB fraction, the initial calibration exceeded the 20% quality control limit for delta-BHC and alpha-BHC on both columns. In the pesticide/PCB fraction, the Endrin % Breakdown exceeded 20%.

Other Factors Affecting Data Quality: In the volatile fraction, the surrogate %R for bromofluorobenzene exceeded the quality control limits in several samples. In the semivolatile fraction, the advisory surrogate %R was below the quality control limit for 1,2-dichlorobenzene-d4. In the semivolatile fraction, the MS/MSD %R was below 10% for 1,4-dichlorobenzene. Several pesticide/PCB samples exceeded the percent difference between columns quality control limits.

MEMO TO: GEORGE LATULIPPE
DATE: MAY 3, 1999 – PAGE 4

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September, 1994), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP).

Justin Orbich

Tetra Tech, NUS
Chemist/Data Validator

Joseph A. Samchuck

Tetra Tech, NUS
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

MEMO TO: **GEORGE LATULIPPE**
DATE: **MAY 3, 1999 – PAGE 5**

Summary Tentatively Identified Compounds (TICs)

Fraction	Named TIC
Volatiles	Unknown
Semivolatile	Unknown PAH Unknown

DATA QUALIFIER DEFINITIONS:

U	-	Value is a nondetected result as reported by the laboratory and should not be considered present.
J	-	Positive result is estimated as a result of a value below the CRQL or a technical noncompliance.
UJ	-	Nondetected result is considered to be estimated as a result of technical noncompliances.
B	-	Nondetected blank (for Region III) as a result of blank contamination and should not be considered present.
UR	-	Compound was rejected due to severe technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-090

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 13, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION - TAL METALS, CYANIDE AND SIMULTANEOUSLY EXTRACTED METALS**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901116

SAMPLES: 4/Soils/

S57SD0050101 S57SD0060101 S57SD0120101 S57SDDUP0101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901116, consists of four (4) soil environmental samples. One (1) field duplicate pair (S57SD0120101 / S57SDDUP0101) was included within this SDG.

All samples were analyzed for Target Analyte List (TAL) metals, cyanide and Simultaneously Extracted Metals (SEM). The samples were collected by Tetra Tech NUS on January 20, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. TAL metals and cyanide analyses were conducted using ILMO4.0 methodologies. SEM analyses were conducted using an EPA draft method.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, ICP interference results, matrix spike results, post digestion spike recoveries, laboratory duplicate results, field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All analyses, with the exception of cyanide and mercury were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methodologies.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for sodium and thallium affecting the TAL metals analyses were < 90% quality control limit. Positive results <2X CRDL and nondetects reported for the aforementioned analytes were qualified as biased low, "L" and "UL", respectively.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Samples Affected: SEM

Analyte	Maximum Concentration	Action Level - Soil
cadmium	0.3 ug/L	0.0375 mg/kg
copper(1)	6.1 ug/L	0.7625 mg/kg
lead(1)	2.9 ug/L	0.3625 mg/kg
zinc(1)	14.7 ug/L	1.8375 mg/kg

Samples Affected: TAL metals

Analyte	Maximum Concentration	Action Level - Soil
aluminum	53.1 ug/L	53.1 mg/kg
arsenic	4.3 ug/L	4.3 mg/kg
barium(2)	0.091 mg/kg	0.455 mg/kg
cadmium	0.3 ug/L	0.3 mg/kg
calcium(1)	31.430 mg/kg	157.15 mg/kg
cobalt	0.8 ug/L	0.8 mg/kg
copper(1)	0.565 mg/kg	2.825 mg/kg
iron	20.1 ug/L	20.1 mg/kg
lead(1)	0.436 mg/kg	2.18 mg/kg
magnesium	46.6 ug/L	46.6 mg/kg
manganese	0.3 ug/L	0.3 mg/kg
potassium(1)	7.565 mg/kg	37.825 mg/kg
selenium	3.3 ug/L	3.3 mg/kg
vanadium	0.8 ug/L	0.8 mg/kg
zinc(1)	0.927 mg/kg	4.635 mg/kg

(1) Maximum concentration present in a SEM preparation blank.
(2) Maximum concentration present in a soil preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample percent solids, aliquot size and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for arsenic, cadmium, calcium, copper, lead and selenium have been qualified, "B", as a result of blank contamination. No actio[illegible]as taken for the remaining analytes since either the results were greater than the action level o[illegible]e nondetects.

- The interfering analyte iron was present in samples S57SD0050101 (TAL metals) and S57SD0060101 (TAL metals) at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, selenium, silver, thallium, vanadium and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony, beryllium, cadmium and silver in the affected samples. The possibility of suppressive affects may be present for beryllium in the affected samples. The positive results reported for beryllium have been qualified as biased low, "L". The positive results reported for antimony, cadmium and silver were qualified as biased high, "K".

- The Matrix Spike (MS) Percent Recovery (%R) for mercury affecting the SEM analyses was < 75% quality control limit. The positive results and nondetects reported for the aforementioned analyte were qualified as biased low, "L" and "UL", respectively.

- The MS %R for lead affecting the TAL metals analyses was > 125% quality control limit. Positive results reported for the aforementioned analyte were qualified as biased high, "K".

- Laboratory duplicate imprecision (>30%) was noted for lead affecting the SEM analyses. The positive results reported for the aforementioned analyte were qualified as estimated, "J". The direction of bias could not be determined.

- Field duplicate imprecision (>50%) was noted for lead affecting the SEM analyses. The positive results reported for the aforementioned analyte were qualified as estimated, "J". The direction of bias could not be determined

- The ICP Serial Dilution Percent Difference (%D) for calcium affecting the TAL metals analyses was greater than the 10% quality control limit. The positive results reported for the aforementioned analyte was qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %R for lead affecting the SEM analyses was > 110% quality control limit. However, no validation actions were warranted as all results were > 2X CRDL.

The CRDL %Rs for arsenic, calcium, iron, lead and selenium affecting the TAL metals analyses were > 110% quality control limit. However, no validation actions were warranted as all results were either > 2X CRDL, nondetects or were qualified as blank contamination.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: The interfering analyte iron was present in samples S57SD0050101 (TAL metals) and S57SD0060101 (TAL metals). The MS %R for mercury affecting the SEM analyses was < 75% quality control limit. The MS %R for lead affecting the TAL metals analyses was > 125% quality control limit. Laboratory duplicate imprecision (>30%) was noted for lead affecting the SEM analyses. Field duplicate imprecision (>50%) was noted for lead affecting the SEM analyses. The ICP Serial Dilution %D for calcium affecting the TAL metals analyses was greater than the 10% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated as a result of validation noncompliances.
L	-	Positive result is considered biased low as a result of validation noncompliances.
UL	-	Nondetected result is considered biased low as a result of validation noncompliances.
K	-	Positive result is considered biased high as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-093

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 13, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –ACID VOLATILE SULFIDE, NITROCELLULOSE, pH, TOTAL ORGANIC CARBON**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901116

SAMPLES: 4/Soils/

S57SD0050101 S57SD0060101 S57SD0120101 S57SDDUP0101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901116, consists of four (4) soil environmental samples. One (1) field duplicate pair (S57SD0120101 / S57SDDUP0101) was included within this SDG.

Samples S57SD0050101, S57SD0120101 and S57SDDUP0101 were analyzed for acid volatile sulfide, nitrocellulose, pH and total organic carbon. Sample S57SD0060101 was analyzed for acid volatile sulfide and total organic carbon. The samples were collected by Tetra Tech NUS on January 20, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Acid volatile sulfide analyses were conducted using an EPA draft method. pH analyses were conducted using SW-846 method 9045C. Total organic carbon analyses were conducted using SW-846 method 9060.

Summary

All analytes, with the exception of those designated, "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method blanks, matrix spike results, laboratory duplicate results, field duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems

- The 14 day holding time from collection time to extraction for nitrocellulose was exceeded by 47 days. The nondetected results were qualified as rejected, "UR".

Minor Problems

- The 28 day holding time for the total organic carbon analyses was marginally exceeded. The positive results reported for the aforementioned parameter were qualified as estimated, "J", as a result of conflicting noncompliances.

- The continuing calibration percent recovery for total organic carbon was > 110% quality control limit. The positive results reported for the aforementioned analyte were qualified as estimated, "J", as a result of conflicting noncompliances.

Notes

The laboratory control standard (LCS) recovery for nitrocellulose was < 80% quality control limit. However, no validation actions were warranted as all results reported for nitrocellulose were qualified as rejected for a more severe noncompliance.

Executive Summary

Laboratory Performance: The 14 day holding time from collection time to extraction for nitrocellulose was exceeded by 47 days. The 28 day holding time for the total organic carbon analyses was marginally exceeded. The continuing calibration percent recovery for total organic carbon was > 110% quality control limit.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
J	-	Positive result is considered estimated as a result of validation noncompliances.
UR	-	Nondetected result is considered rejected as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

C-PITT 04-9-104

TO:	**GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**SEAN NIXON**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOAS, SVOAS, PESTICIDES/PCBS, AND EXPLOSIVES**
CTO 245 NSWC INDIAN HEAD, MARYLAND
SDG – 9901151

SAMPLES: 10/Aqueous

S57RB0050101	S57SW0060101	S57SW0060201	S57SW0070101
S57SW0070201	S57SW0080101	S57SW0080201	S57SW0080301
S57SWDUP0201	TB0050001		

Overview

The Sample Delivery Group (SDG) for CTO 245 NSWC Indian Head, Maryland SDG 9901151, consists of ten (10) aqueous environmental samples including one (1) trip blank and one (1) rinse blank. One field duplicate pair, samples S57SW0060101/S57SWDUP0201, was included in this SDG.

All of the samples were to be analyzed for selected Target Compound List (TCL) Low Concentration volatiles and ethyl ether. Samples S57RB0050101 and S57SW0070101 were also analyzed for low concentration TCL semivolatiles, TCL Pesticides/PCBs, and TCL explosives plus nitroguanidine, and nitroglycerin. The samples were collected by Tetra Tech NUS on January 21, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The VOAs and SVOAs analyses were conducted according to Contract Laboratory Procedure (CLP) OLM02.0, the pesticides/PCBs according to CLP OLM03.2, and the explosives were analyzed according to SW-846 Method 8330 and modified USAEC methodology for nitroguanidine.

Summary

All analytes were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report were based upon a general review of all available data including data completeness, holding times, calibration data, laboratory and field quality control blank results, GC/MS tuning and performance, Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) analyses, surrogate spike recoveries, Laboratory Control Sample (LCS) analyses, field duplicate results, compound identification and quantification, and detection limits.

Areas of concern with respect to data quality are listed below.

MAJOR PROBLEMS

Volatiles

- Initial and continuing calibrations contained Relative Response Factors RRFs below the 0.05 quality control limit for acetone and 2-butanone. The nondetected results for the aforementioned compounds were rejected, UR, in the affected samples (all samples). The positive results for 2-butanone were qualified as biased low, L, in the affected samples.

Semivolatiles

- No major problems were noted.

Pesticides

- No major problems were noted.

Explosives

- No major problems were noted.

MINOR PROBLEMS

Volatiles

- The following contaminants were detected in the method and/or field quality control blanks:

Analyte	Maximum Concentration	Action level
Acetone	8.7 ug/L	87 ug/L
Chloromethane	0.8 ug/L	4.0 ug/L
Chloroform[1]	0.3 ug/L	1.5 ug/L
Methylene chloride	2.6 ug/L	26 ug/L
Carbon disulfide[1]	3.2 ug/L	16 ug/L

1. Maximum concentration found in rinse blank.

Samples Affected: All.

Sample aliquot and dilution factors were taken into consideration when applying the action levels. Positive results for acetone, carbon disulfide, and methylene chloride reported below the action level were considered false positives and qualified, (B). It should be noted that field quality control blanks were not qualified for field quality control blank contamination.

- A continuing calibration contained Percent Differences (%Ds) above the 50% quality control limit for 4-methyl-2-pentanone and 2-hexanone. The nondetected results for 4-methyl-2-pentanone and 2-hexanone were qualified as estimated, UJ, in the affected samples (all samples)

- Samples S57SW0060101, S57SW0060201, S57SW0070101, S57SW0070201, S57SW0080101, S57SW0080201, and S57SWDUP0201 all contained results for acetone and/or ethyl ether that exceeded the linear calibration range. The samples were reanalyzed 15 days in exceedance of the 14 day holding time. The original analyses were used for data validation and those compounds that exceeded the linear calibration range were qualified as estimated, J.

Semivolatiles

- The following contaminants were detected in the rinse blank:

Analyte	Maximum Concentration	Action level
Bis(2-ethylhexyl)phthalate	2 ug/L	20 ug/L
Diethylphthalate	6 ug/L	60 ug/L

Sample Affected: S57SW0070101

Sample aliquot and dilution factors were taken into consideration when applying the action levels. The positive result for bis(2-ethylhexyl)phthalate reported below the action level was considered a false positive and qualified, (B). It should be noted that field quality control blanks were not qualified for field quality control blank contamination.

Pesticides/PCBs

- The data were acceptable as reported by the laboratory.

Notes

Positive results reported below the Contract Required Quantitation Limits (CRQL) were qualified as estimated, (J).

Continuing calibration noncompliances were noted for the volatile compounds carbon tetrachloride and trans-1,3-dichloropropene however, the noncompliances did not affect nondetected results. Because only nondetected results were reported for the aforementioned compounds in the affected samples, no action was taken.

The semivolatile LCS yielded a poor Percent Recovery (%R) for 4-chloroanailine (3%). No action was taken for LCS noncompliance.

The pesticide/PCB LCS yielded a %R above the quality control limits for Endrin. No action was taken for LCS noncompliance.

The pesticide/PCB initial calibration on column DB-5 contained Percent Relative Standard Deviations (%RSD) above the 20% quality control limit for alpha-BHC, gamma-BHC, and delta-BHC. Because the other column did not contain %RSDs above the quality control limit, no action was taken.

The PEM analysis of 2/12/99 at 2:32 contained an Endrin breakdown that exceeded the 20% quality control limit on both analytical columns. Because only nondetected results were reported for Endrin, Endrin aldehyde, and Endrin ketone in the samples, no action was taken.

Executive Summary

Laboratory Performance: Initial and continuing calibration noncompliances resulted in the rejection of nondetected results for acetone and 2-butanone, and the low bias qualification of positive results for 2-butanone. Nondetected results for 4-methyl-2-pentanone and 2-hexanone were qualified as estimated for continuing calibration noncompliances. Blank contamination was noted for acetone, carbon disulfide, methylene chloride, and bis(2-ethylhexyl)phthalate. Positive results for several volatile compounds were qualified for exceeding the linear calibration range.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", September 1994 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Sean T. Nixon
Environmental Scientist
Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer
Tetra Tech NUS

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

DATA QUALIFIER TABLE:

U	-	Value is a nondetected result as reported by the laboratory.
UJ	-	Nondetected result is considered estimated as a result of various technical noncompliances.
B	-	Positive result is considered to be an artifact of blank contamination.
L	-	Positive result is considered biased low as a result of various technical noncompliances
J	-	Positive result is considered estimated as a result of various technical noncompliances.
UR	-	Nondetected result is rejected for gross technical noncompliances.

TENTATIVELY IDENTIFIED COMPOUND SUMMARY

Volatiles
Isopropyl alcohol

Semivolatiles
Hexadecanoic acid

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-139

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 16, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION - TAL METALS AND CYANIDE**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901151

SAMPLES: 2/Aqueous/

S57RB0050101 S57SW0070101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901151, consists of one (1) aqueous environmental samp.. .nd one (1) rinsate blank (S57RB0050101). No field duplicate results were included within this SDG.

Samples S57RB0050101 and S57SW0070101 were analyzed for Target Analyte List (TAL) metals and cyanide. The samples were collected by Tetra Tech NUS on January 21, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. TAL metals and cyanide analyses were conducted using ILMO4.0 methodologies.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of al available data including data completeness, holding times, calibration data, laboratory method / preparation / field blanks ICP interference results, matrix spike results, post digestion spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All analyses, with the exception of cyanide and mercury were conducted using Inductively Coupled Plasma (ICP methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using we chemistry methodologies.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for lead was < 90% quality control limit. Positive results <2X CRDL reported for the aforementioned analyte were qualified as biased low, "L".

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Samples Affected: All

Analyte	Maximum Concentration	Action Level - Aqueous
aluminum(1)	47.733 ug/L	238.665 ug/L
antimony(1)	3.312 ug/L	16.56 ug/L
barium(1)	0.751 ug/L	3.755 ug/L
cadmium(1)	0.368 ug/L	1.84 ug/L
calcium(1)	91.539 ug/L	457.695 ug/L
copper	1.7 ug/L	8.5 ug/L
iron(1)	26.032 ug/L	130.16 ug/L
magnesium	46.3 ug/L	231.5 ug/L
manganese(1)	0.413 ug/L	2.065 ug/L
potassium(1)	25.261 ug/L	126.305 ug/L
silver(1)	0.815 ug/L	4.075 ug/L
sodium(1)	288.132	1440.66 ug/L
thallium	3.9 ug/L	19.5 ug/L
vanadium(1)	1.152 ug/L	5.76 ug/L
zinc(1)	4.372 ug/L	21.86 ug/L

(1) Maximum concentration present in an aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample percent solids, aliquot size and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level aluminum, antimony, barium, cadmium, calcium, copper, iron, magnesium, manganese, potassium, sodium, vanadium and zinc have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

Notes

The CRDL %Rs for selenium, sodium and zinc were > 110% quality control limit. However, no validation actions were warranted as all results were > 2X CRDL or were nondetects.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
L	-	Positive result is considered biased low as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-140

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 16, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –AMMONIUM PERCHLORATE AND NITROCELLULOSE**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901151

SAMPLES: 6/Aqueous/

S44MW001U005	S44MW002U005	S44MW003U005
S44MWDUP500	S57RB0050101	S57SW0070101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901151, consists of five (5) aqueous environmental samples and one (1) rinsate blank (S57RB0050101). One (1) field duplicate pair (S44MW002U005 / S44MWDUP500) was included within this SDG.-

Samples S44MW001U005, S44MW002U005, S44MW003U005 and S44MWDUP500 were analyzed for ammonium perchlorate. Samples S57RB0050101 and S57SW0070101 were analyzed for nitrocellulose. The samples were collected by Tetra Tech NUS on January 21, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Ammonium perchlorate analyses were conducted using EPA method 3000. Nitrocellulose analyses were conducted usgin the USATHAMA method .

Summary

All analytes were successfully analyzed with the exception of those designated "UR". The findings offered in this repor are based upon a general review of all available data including data completeness, holding times, calibration data laboratory method blanks, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems

- The seven (7) day collection to extraction time for nitrocellulose was exceeded by a factor of two or more. The positive result reported for the aforementioned parameter was qualified as biased low, "L". The nondetected result reported for the aforementioned parameter was qualified as rejected, "UR".

Minor Problems

- The laboratory control standard (LCS) recovery for nitrocellulose was < 80% quality control limit. The positive result reported for the aforementioned parameter were qualified as biased low, "L".

Notes - None.

Executive Summary

Laboratory Performance: The seven (7) day collection to extraction time for nitrocellulose was exceeded by a factor of two or more. The LCS recovery for nitrocellulose was < 80% quality control limit.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
L	-	Positive result is considered biased low as a result of validation noncompliances.
UR	-	Nondetected result is considered rejected as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION- VOA CTO 245, NSWC INDIAN HEAD SDG 9901152**		
SAMPLES:	2/Aqueous/		
	S57TW0020101 S57TW0030101		

OVERVIEW

The sample set for CTO 245, SDG 9901152, NSWC Indian Head consists of two (2) aqueous environmental samples. The samples were analyzed for target compound list (TCL) volatile organic compounds plus ethyl ether.

The sample was collected by Tetra Tech NUS on January 21, 1999 and analyzed by GPL Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLM03.2 analytical and reporting protocols.

The samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- None noted.

Minor Problems

- The following compound was detected in the laboratory method blank at the following maximum concentration:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	4 µg/L	40 µg/L

Dilution factors and sample aliquot were taken into consideration when applying the blank action level. Positive results for methylene chloride below the blank action level were qualified as false positives, B.

- Positive results below the CRQL were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Sample S57TW0030101 was re-analyzed at a 2X dilution due to the presence of cis-1,2-dichloroethene above the instrument's linear calibration range. The result from the dilution was transposed over the undiluted sample result and used as the basis for data validation.

The case narrative erroneously noted that the re-analysis of sample S57TW0030101 took place outside of the sample holding time.

Surrogate recovery of toluene-d8 exceeded the upper quality control limit in S57TW0020101 MS and MSD. No qualifiers were assigned on this basis since only the quality control samples were affected.

Matrix spike recovery for toluene exceeded the upper quality control limit in S57TW0020101 MS. No validation action was taken since the compound was not detected in the unspiked sample.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Methylene chloride was detected in the laboratory method blank.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-134

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 16, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION - TAL METALS AND CYANIDE**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901164

SAMPLES: 4/Aqueous/

S57SW0030101	S57SW0030101-F
S57SW0040101	S57SW0040101-F

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901164, consists of four (4) aqueous environmental samples. No field duplicate results were included within this SDG.

Samples S57SW0030101 and S57SW0040101 were analyzed for Target Analyte List (TAL) metals and cyanide. Samples S57SW0030101-F and S57SW0040101-F were analyzed for filtered TAL metals. The samples were collected by [illegible]a Tech NUS on January 22, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service [illegible]r (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. TAL metals and cyanide analyses were conducted using ILMO4.0 methodologies.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, ICP interference results, matrix spike results, post digestion spike recoveries, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All analyses, with the exception of cyanide and mercury were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methodologies.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for lead was < 90% quality control limit. Positive results <2X CRDL reported for the aforementioned analyte were qualified as biased low, "L".

- The CRDL %R for selenium was > 110% quality control limit. Positive results <2X CRDL reported for the aforementioned analyte were qualified as biased high, "K".

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Samples Affected: All

Analyte	Maximum Concentration	Action Level - Aqueous
aluminum(1)	47.733 ug/L	238.665 ug/L
antimony(1)	3.312 ug/L	16.56 ug/L
barium(1)	0.751 ug/L	3.755 ug/L
cadmium(1)	0.368 ug/L	1.84 ug/L
calcium(1)	91.539 ug/L	457.695 ug/L
copper	1.7 ug/L	8.5 ug/L
iron(1)	26.032 ug/L	130.16 ug/L
magnesium	46.3 ug/L	231.5 ug/L
manganese(1)	0.413 ug/L	2.065 ug/L
potassium(1)	25.261 ug/L	126.305 ug/L
silver(1)	0.815 ug/L	4.075 ug/L
sodium(1)	288.132	1440.66 ug/L
thallium	3.9 ug/L	19.5 ug/L
vanadium(1)	1.152 ug/L	5.76 ug/L
zinc(1)	4.372 ug/L	21.86 ug/L

(1) Maximum concentration present in an aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample percent solids, aliquot size and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for aluminum, antimony, cadmium silver and vanadium have been qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

- The Matrix Spike (MS) Percent Recovery (%R) for aluminum was < 75% quality control limit. The positive results reported for the aforementioned analyte were qualified as estimated, "J", as a result of conflicting noncompliances.

- Laboratory duplicate imprecision (>20%) was noted for aluminum. The positive results reported for the aforementioned analyte were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %Rs for sodium and zinc were > 110% quality control limit. However, no validation actions were warranted as all results were > 2X CRDL.

Executive Summary

Laboratory Performance: The CRDL Standard analysis recoveries for several analytes were outside quality control limits. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: The MS %R for aluminum was < 75% quality control limit. Laboratory duplicate imprecision (>20%) was noted for aluminum

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Terri L. Solomon

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated as a result of validation noncompliances.
L	-	Positive result is considered biased low as a result of validation noncompliances.
K	-	Positive result is considered biased high as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-239

TO: **GEORGE LATULIPPE** **DATE: APRIL 29, 1999**

FROM: **JUSTIN ORBICH** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/PEST/PCB/EXP**
CTO 245 - NSWC INDIAN HEAD
SDG 9901164

SAMPLES: 6/Aqueous

S57RB0070101*	S57SW0030101
S57SW0030201*	S57SW0040101
S57SWDUP0301*	S57TB0060001*

Overview

The sample set for CTO 245, Naval Surface Warfare Center (NSWC), Indian Head, SDG 9901164, consists of six (6) aqueous environmental samples, which includes one (1) rinsate blank (designated RB) and one (1) trip blank (designated TB). The samples were analyzed for Target Compound List (TCL) volatile organic compounds including ethyl ether, semivolatile, pesticide/PCB organic compounds, and explosive organic compounds including nitroglycerine and nitroguanidine. The samples designated (*) were analyzed for TCL volatile organic compounds including ethyl ether. One (1) field duplicate pair (S57SW0030101/ S57SWDUP0301) in this SDG.

The samples were collected by Tetra Tech, NUS on January 21st and 22nd, 1999, and analyzed by GPL Environmental Services, Inc. The volatile, semivolatile, pesticide/PCB, and explosive compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and were conducted using the U.S. EPA Contract Laboratory Program (CLP) SOW OLC02.1 and SW 846 method 8330 analytical and reporting protocols.

Summary

All compounds were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, GC/MS tuning, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, internal standard performance, compound identification and quantitation, detection limits, field duplicate precision, and Tentatively Identified Compound (TIC) evaluation.

Areas of concern with respect to data quality are listed below.

Major Problems

- In the volatile fraction, the initial and continuing calibration Relative Response Factors (RRFs) were below the 0.05 quality control limit for acetone, 2-butanone, 2-hexanone, ethyl ether, and 4-methyl-2-pentanone. The nondetected results were qualified as rejected (UR), in all affected samples.

- In the semivolatile fraction, the Laboratory Control Sample (LCS) Percent Recovery (%R) was below ten percent for 4-chloroaniline. The nondetected results were qualified as rejected (UR), in the all samples.

Minor Problems

- In the volatile fraction, the initial and continuing calibration RRF was below the 0.05 quality control limits for 2-butanone and ethyl ether. The positive results were qualified as estimated (J), in the affected samples. The direction of bias is unknown.

- In the volatile fraction, the initial and continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for methylene chloride. The positive results were qualified as estimated (J), in the affected samples. The direction of bias is unknown.

- The following semivolatile compounds were detected in the laboratory method blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Bis(2-ethylhexyl)phthalate	1.0µg/L	10.0µg/L

  Sample aliquot and dilution factors were taken into consideration during the application of all action levels. Positive results for bis(2-ethylhexyl)phthalate reported at concentrations below the action level were qualified (B) as a result of blank contamination.

- Positive results reported at concentrations below the CRQL were qualified as estimated, (J). The direction of biased is unknown.

Notes

- The following volatile compounds were detected in the field quality control blanks at the maximum concentrations indicated below:

Compound	Concentration	Aqueous Action Level
Methylene chloride	0.6µg/L	6.0µg/L

  Sample aliquot and dilution factors were taken into consideration during the application of all action levels. No action was warranted since only nondetected results were reported. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

In the volatile fraction, samples S57SW0030101, S57SW0040101, and S57SWDUP0301 were analyzed at a 10X dilution due to the presence of ethyl ether above the calibration range of the instrument. The results from the dilution was transposed over the undiluted sample results and used for validation purposes.

It should be noted 1,2,4-trichlorobenzene was analyzed within the volatile fraction.

In the volatile fraction, ethyl ether was added to the TCL.

In the semivolatile fraction, the Tentatively Identified Compound (TIC), unknown was detected in the semivolatile method blank. The presence of this TIC should be considered a false positive.

In the pesticide/PCB fraction, the Endrin Percent Breakdown exceeded the 20% quality control limit for Endrin on 02/12/99 at 0324 on column RTX-1701. No action was warranted since only nondetected results were reported and the Endrin % breakdown was within the quality control limit on column DB-5.

In the pesticide/PCB fraction, the Laboratory Control Sample (LCS) %Rs exceeded the quality control limits for Endrin. No action is warranted on LCS data alone.

It should be noted in the pesticide/PCB fraction, the laboratory provided the incorrect surrogate %R quality control limits. The quality control limits were corrected on the Form II and qualified based upon the corrected quality control limits.

In the explosive fraction, several Matrix Spike/Matrix Spike Duplicate (MS/MSD) %Rs exceeded the quality control limits. Several MS/MSD Relative Percent Differences (RPDs) exceeded the quality control limits. No action is warranted on MS/MSD data alone.

In the explosive fraction, nitroglycerine and nitroguanidine were added to the TCL.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs were below the 0.05 quality control limits for acetone, 2-butanone, 2-hexanone, ethyl ether, and 4-methyl-2-pentanone. Methylene chloride and bis(2-ethylhexyl)phthalate were detected as blank contaminants. Several volatile continuing calibration %Ds exceeded the 25% quality control limits. In the pesticide/PCB fraction, the Endrin % breakdown exceeded the 20% quality control limit on column RTX-1701.

Other Factors Affecting Data Quality: In the semivolatile fraction, the LCS %R was below ten percent for 4-chloroaniline. Several explosives MS/SMD %Rs and RPDs exceeded the quality control limits. Several volatile samples exceeded the calibration range of the instrument due to the presence of ethyl ether.

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 29, 1999 – PAGE 4

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September, 1994), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP).

Justin Orbich

Tetra Tech, NUS
Chemist/Data Validator

Joseph A. Samchuck

Tetra Tech, NUS
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

MEMO TO: GEORGE LATULIPPE
DATE: APRIL 29, 1999 – PAGE 5

Summary Tentatively Identified Compounds (TICs)

Fraction	Named TIC
Volatiles	None detected.
Semivolatile	Hexadecanoic acid

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-137

TO:	**G. LATULIPPE**	**DATE:**	**APRIL 16, 1999**
FROM:	**TERRI L. SOLOMON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –NITROCELLULOSE AND TOTAL ORGANIC CARBON**
CTO 245 -NSWC INDIAN HEAD, MARYLAND
SDG - 9901164

SAMPLES: 3/Aqueous/

S57RB0070101 S57SW0030101 S57SW0040101

Overview

The sample set for CTO 245, NSWC Indian Head, SDG 9901164, consists of two (2) aqueous environmental samples and one (1) rinsate blank (S57RB0070101). No field duplicate pairs were included within this SDG.

Sample S57RB0070101 was analyzed for total organic carbon. Samples S57SW0030101 and S57SW0040101 were analyzed for nitrocellulose. The samples were collected by Tetra Tech NUS on January 22, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using EPA MCAWW method 415.1.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method blanks, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The seven (7) day collection to extraction holding time for nitrocellulose was exceeded by a factor of two or more. The positive results reported for the aforementioned parameter were qualified as biased low, "L".
- The laboratory control standard (LCS) recovery for nitrocellulose was < 80% quality control limit. The positive results reported for the aforementioned parameter were qualified as biased low, "L".

Notes - None.

Executive Summary

Laboratory Performance: The seven (7) day collection to extraction time for nitrocellulose was exceeded by a factor of two or more. The LCS recovery for nitrocellulose was < 80% quality control limit.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS
Terri L. Solomon
Chemist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

L - Positive result is considered biased low as a result of validation noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOLATILES**
CTO 245, NSWC INDIAN HEAD
SDG 9901165

SAMPLES: 1/Water/

S57-TW0010101

OVERVIEW

The sample set for CTO 245, SDG 9901165, NSWC Indian Head consists of one (1) aqueous environmental sample. The sample was analyzed for target compound list volatiles plus ethyl ether.

The samples were collected by Tetra Tech NUS on January 21st, 1999 and analyzed by GPL Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLM03.2 analytical and reporting protocols.

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- None.

Minor Problems

- The following compound was detected in the laboratory method blank:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	4 µg/l	40 µg/L

Sample aliquot and dilution factors were taken into consideration when applying the blank action level. The positive result for methylene chloride was qualified as a false positive, B.

- Positive results below the Contract Required Quantitation Limit (CRQL) were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Continuing calibration percent differences were greater than 25%, but less than 50%, for acetone, 2-butanone, 4-methyl-2-pentanone, and 2-hexanone. No qualifiers were assigned since the compounds were not detected in the sample.

Matrix spike and matrix spike duplicate recoveries for trichloroethene were less than 10%. No qualfiiers were assigned on this basis since the exceedance was due to the high concentration of target compound in the unspiked sample, S42MW004U005.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Methylene chloride was detected in the laboratory method blank.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**APRIL 28, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION- VOA CTO 245, NSWC INDIAN HEAD SDG 9901166**		
SAMPLES:	4/Solid/		

S57SB0020601 S57SBDUP002 S57SS0090101
S57SSDUP001

OVERVIEW

The sample set for CTO 245, SDG 9901166, NSWC Indian Head consists of four (4) solid environmental samples. The samples were analyzed for target compound list (TCL) volatile organic compounds. Two pairs of field duplicates were included in the SDG: S57SB0020601 and S57SBDUP002; and S57SS0090101 and S57SSDUP001.

The samples were collected by Tetra Tech NUS on January 22, 1999 and analyzed by GP Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLM03.2 analytical and reporting protocols.

The samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- None noted.

Minor Problems

- The following compounds were detected in the laboratory method blank at the following maximum concentrations:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	17 µg/Kg	170 µg/Kg
Chloroform	1 µg/Kg	5 µg/Kg

Dilution factors, percent solids, and sample aliquot were taken into consideration when applying the blank action level. Positive results for methylene chloride below the blank

action level were qualified as false positives, B.

- Positive results below the CRQL were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Initial calibration percent relative standard deviation (%RSD) exceeded the 25% quality control limit for methylene chloride. All positive results were qualified as false positives based on blank contamination. Therefore, no validation action was taken on this basis.

Surrogate recovery exceeded the upper quality control limit for 1,2-dichloroethane-d4 and bromofluorobenzene in samples S57SB0020601 and S57SBDUP002. The re-analyses were compliant. Therefore, the re-analyses were used as the basis for data validation.

Surrogate recovery exceeded the upper quality control limit for bromofluorobenzene in sample S57SS0090101. The re-analysis of this sample was also non-compliant. Therefore, only the original analysis was used for data validation. No positive result were reported for this sample; therefore, no validation action was required on this basis.

Surrogate recovery of 1,2-dichloroethane-d4 was high in sample S57SB0020601 MS. Surrogate recovery of bromofluorobenzene was high in sample S57SB0020601 MSD. No validation action was required on this basis since only the quality control samples were affected.

Internal standard recovery of bromochloromethane was low in sample S57SB0020601 MS. No validation action was required on this basis since only the quality control sample was affected by the noncompliance.

The case narrative erroneously noted that the re-analyses took place outside of the sample holding time.

Surrogate recovery of toluene-d8 exceeded the upper quality control limit in S57TW0020101 MS and MSD. No qualifiers were assigned on this basis since only the quality control samples were affected.

Toluene exceeded the upper quality control limit in S57TW0020101 MS. No validation action was taken since the compound was not detected in the unspiked sample.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Methylene chloride was detected in the laboratory method blank.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

FIELD DUPLICATES

COMPOUND	S57SB0020601	S57SBDUP002	%D
toluene	1 J	2 J	67%

COMPOUND	S57SS0090101	S57SSDUP001	%D
	ND	ND	

ND - Not Detected

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-229

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 28, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TOC**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901166

SAMPLES: 4/Soils/

S57SB0020601 S57SBDUP002 S57SS0090101
S57SSDUP001

Overview

The sample set for SDG 9901166, NSWC Indian Head, consists of four (4) soil environmental samples. Two (2) field duplicate pairs (S57SB0020601/ S57SBDUP002 and S57SS0090101/ S57SSDUP001) were included within this SDG.

All samples were analyzed for total organic carbon (TOC). The samples were collected by Tetra Tech NUS on January 22, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. TOC analyses were conducted using SW 846 method 9060.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method blanks, field duplicate results.

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

Minor Problems

- The holding time for TOC was exceeded by ten (10) days. The positive and nondetected results reported for TOC were qualified as estimated, "J" and "UJ", respectively, as a result of conflicting noncompliances.

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
UJ	-	Nondetected result is considered estimated, "UJ", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB/EXP**
CTO 245, NSWC INDIAN HEAD
SDG 9901174

SAMPLES: 11/Aqueous/

S57MW0010101	S57MW0020101	S57MW0030101*
S57MW0040101*	S57MW0070101	S57MW0120101*
S57MW0130101*	S57MWDUP001*	S57PW0070101
S57SW0130101	S57TB0070001	

OVERVIEW

The sample set for CTO 245, SDG 9901174, NSWC Indian Head consists of ten (10) aqueous environmental samples and one (1) trip blank, designated TB. All samples were analyzed for target compound list (TCL) volatile organic compounds plus ethyl ether. Samples designated * were also analyzed for TCL semivolatile organic compounds, pesticides/PCBs, and explosives plus nitroguanidine and nitroglycerine. One pair of field duplicates was included in the SDG: S57MW0120101 and S57MWDUP0001.

The samples were collected by Tetra Tech NUS on January 25, 1999 and analyzed by GPL Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLC02.0, OLM03.2 and SW-846 Method 8330 analytical and reporting protocols.

All samples were successfully analyzed with the exception of those results which were rejected. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- Initial and continuing calibration relative response factors (RRFs) fell below the 0.05 quality control limit for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, and ethyl ether. Nondetected results were rejected, UR, in the affected samples (all). Positive results were qualified as estimated, J. The direction of bias cannot be determined.

Minor Problems

- One or more volatile compounds exceeded the linear calibration range in the following samples: SW57MW0010101, -0020101, -0030101, -0040101, -0070101, and –0130101. The positive results were qualified as estimated, J. The direction of bias cannot be determined.

- The positive result for trichloroethene in sample S57PW0070101 may be due to carryover from sample S57MW0040101. The positive result in sample S57PW0070101 was qualified as estimated, J.

- Positive results below the Contract Required Quantitation Limit (CRQL) were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Initial calibration percent relative standard deviations (%RSD) and continuing calibration percent differences (%Ds) were greater than quality control limits for methylene chloride. No qualifiers were assigned on this basis since the compound was not detected in the samples.

The laboratory failed to analyze an instrument blank after samples were saturated the detector. The laboratory also failed to re-analyze samples at an appropriate dilution within the sample holding time. Samples were re-analyzed 32 days after sample collection. Only the original sample results were used for validation purposes.

Blank spike recovery was high for bis(2-ethylhexyl)phthalate in the semivolatile fraction. No qualifiers were assigned on this basis.

Performance evaluation mixtures (PEMs) exceeded the 20% degradation criteria for Endrin. Endrin, Endrin aldehyde, and Endrin ketone were not detected in the associated samples. Therefore, no qualifiers were assigned on this basis.

Peaks were detected, but not quantitated, in the laboratory method blank for explosives. According to the case narrative, the method blank may have been cross-contaminated with the blank spike during extraction. No explosives were detected in the samples; therefore, no validation action was required on this basis.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several compounds failed the RRF criteria in the initial and continuing calibrations. Several volatile compounds exceeded the instrument's linear calibration range. Positive results in one volatile sample may be due to carryover.

Other Factors Affecting Data Quality: The laboratory failed to analyze appropriate dilutions within the sample holding time. The laboratory failed to run instrument blanks after samples which saturated the detector.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

FIELD DUPLICATES

PARAMETER	COMPOUND	S57MW0120101	S57MWDUP0001	%D
Volatile	1,1-dichloroethane	5.2	5.2	0%
	1,1-dichloroethene	1.8	1.7	6%
	acetone	12	5 U	NC
	cis-1,2-dichloroethene	2.3	2.2	4%
	ethyl ether	3.6 J	2 J	57%
	trichloroethene	2.3	2.2	4%
Semivolatile	bis(2-ethylhexyl)phthalate	2 J	2 J	0%
Pest/PCB		ND	ND	
Explosives		ND	ND	

NC - Not Calculated

ND - Not Detected

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-103

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 19, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TOTAL AND DISSOLVED TAL METALS AND CYANIDE**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901174

SAMPLES: 10/Aqueous/

S57MW0030101	S57MW0030101-F	S57MW0040101
S57MW0040101-F	S57MW0120101	S57MW0120101-F
S75MW0130101	S57MW0130101-F	S57MWDUP001
S57MWDUP001-F		

Overview

The sample set for SDG 9901174, NSWC Indian Head, consists of ten (10) aqueous environmental samples. Two (2) field duplicate pairs (S57MW0120101 / S57MWDUP001 and S57MW0120101-F / S57MWDUP001-F) were included within this SDG.

All samples, with exception to those designated –F, were analyzed for target analyte list (TAL) metals and cyanide, Those sample designated –F were analyzed for dissolved TAL metals. The sample were collected by Tetra Tech NUS on January 25, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All metals analyses were conducted using Contract Laboratory Program (CLP) methodologies.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

Minor Problems

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (aqueous)
Aluminum	53.1µg/L	265.5µg/L
Arsenic	4.3µg/L	21.5µg/L
Barium[1]	0.830µg/L	4.15µg/L
Calcium[1]	111.175µg/L	555.9µg/L
Cobalt	0.8µg/L	4.0µg/L
Copper[1]	1.575µg/L	7.875µg/L
Iron	18.8µg/L	94.0µg/L
Magnesium	46.6µg/L	233µg/L
Manganese[1]	0.295µg/L	1.475µg/L
Potassium[1]	22.039µg/L	110.2µg/L
Selenium	2.9µg/L	14.5µg/L
Vanadium	0.7µg/L	3.5µg/L
Zinc[1]	1.651µg/L	8.255µg/L

[1] Maximum concentration found in aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for aluminum, arsenic, copper and vanadium were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects.

- Field duplicate imprecision (>30%) was noted for iron and manganese affecting the total metals. The positive results reported for iron and manganese in the affected samples were qualified as estimated, "J". The direction of bias could not be determined.

- The ICP Serial Dilution Percent Difference (%D) for sodium was >10% quality control limit. The positive results reported for sodium were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, selenium and sodium were outside the 90-110% quality control limit. However, no validation action was required as all results reported for arsenic, selenium and sodium were either nondetects or >2X CRDL.

A comparison of field duplicate pairs (S57MW0120101 / S57MWDUP001 and S57MW0120101-F / S57MWDUP001-F) is included in Appendix C.

QC analyses were not conducted on total TAL metals.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: Field duplicate imprecision was noted for iron and manganese affecting the total metals. The ICP Serial Dilution %D for sodium was >10% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

J - Positive result is considered estimated, "J", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-114

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 19, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –MISCELLANEOUS PARAMETERS**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901174

SAMPLES: 10/Aqueous/

S57MW0010101	S57MW0020101	S57MW0030101
S57MW0040101	S57MW0070101	S57MW0120101
S57MW0130101	S57MWDUP001	S57PW0070101
S57SW0130101		

Overview

The sample set for SDG 9901174, NSWC Indian Head, consists of ten (10) aqueous environmental samples. One (1) field duplicate pair (S57MW0120101 / S57MWDUP001) was included within this SDG.

Samples S57MW0010101, S57MW0020101 and S57MW0070101 were analyzed for pH and total dissolved solids (TDS). Samples S57MW0030101 and S57MW0040101 were analyzed for harness, nitrocellulose, pH, TDS and total organic carbon (TOC). Samples S57MW0120101, S57MW0130101 and S57MWDUP001 were analyzed for ammonium perchlorate, hardness, nitrocellulose, pH, TDS and TOC. Sample S57PW0070101 was analyzed for ammonium perchlorate. Sample S57SW0130101 was analyzed for chloride, dissolved oxygen, fluoride, hardness, nitrate/nitrite, pH, salinity, sulfate, TDS, TOC, total suspended solids (TSS) and turbidity. The samples were collected by Tetra Tech NUS on January 25, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria.

Ammonium perchlorate, chloride, fluoride and sulfate analyses were conducted using EPA method 3000. Hardness analyses were conducted using EPA method 130.2. Nitrate/Nitrite analyses were conducted using EPA method 353.2. pH analyses were conducted using EPA method 150.1. Salinity analyses were conducted using Standard Method 2520A-D. TDS analyses were conducted using EPA method 160.2. TOC analyses were conducted using SW 846 method 9060. TSS analyses were conducted using EPA method 160.1. Turbidity analyses were conducted using EPA method 180.1. Nitrocellulose analyses were conducted using the USATHAMA method. Dissolved oxygen analyses were conducted using EPA method 360.1.

Summary

All analytes, with exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, matrix spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems

- The seven (7) day collection to extraction holding time for nitrocellulose was exceeded by thirty-two (32) days. The nondetected results reported for nitrocellulose were qualified as rejected, "UR". The positive results reported for nitrocellulose were qualified as biased low, "L".

Minor Problems

- Field duplicate imprecision (>30%) was noted for TDS. The positive and nondetected results reported for TDS were qualified as estimated, "J" and "UJ", respectively. The direction of bias could not be determined.

- The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrocellulose was <80% quality control limit. The positive results reported for nitrocellulose were qualified as biased low, "L".

Notes

A comparison of field duplicate pair (S57MW0120101 / S57MWDUP001) is included in Appendix C.

The Form 1s were amended by data reviewer to exclude cyanide. The cyanide result and data are included in with the metals validation report.

Dissolved oxygen data, TOC data and the Form 1s were not included in the original data package. The laboratory was notified and provided the missing data and Forms.

Executive Summary

Laboratory Performance: The collection to extraction holding time for nitrocellulose was exceeded. The LCS %R for nitrocellulose was <80% quality control limit.

Other Factors Affecting Data Quality: Field duplicate imprecision was TDS.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
UR	-	Nondetected result is considered rejected, "UR", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**APRIL 29, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB/EXP**
CTO 245, NSWC INDIAN HEAD
SDG 9901178

SAMPLES: 4/Aqueous/

S57MW0080101 S57MW0090101* S57MW0100101*
S57TB0080001

OVERVIEW

The sample set for CTO 245, SDG 9901178, NSWC Indian Head consists of three (3) aqueous environmental samples and one (1) trip blank, designated TB. All samples were analyzed for target compound list (TCL) volatile organic compounds. Samples designated * were also analyzed for TCL semivolatile organic compounds, pesticides/PCBs, and explosives.

The samples were collected by Tetra Tech NUS on January 26, 1999 and analyzed by GP Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLC02.0 and SW-846 Method 8330 analytical and reporting protocols.

All samples were successfully analyzed with the exception of those results which were rejected. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- *Initial and continuing calibration relative response factors (RRFs) fell below the 0.05 quality* control limit for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, and ethyl ether. Nondetected results were rejected, UR, in the affected samples (all).

- Samples for explosive and nitroglycerine analysis were extracted thirty (30) days after sample collection. Samples for nitroguanadine were analyzed thirty (30) days after sample collection. Nondetected sample results for explosive, nitroglycerine, and nitroguanadine were rejected, UR.

Minor Problems

- Initial and continuing calibration RRFs fell below the 0.05 quality control limit for acetone and ethyl ether. Positive results were qualified as estimated, J. The direction of bias cannot be determined.

- Positive results below the Contract Required Quantitation Limit (CRQL) were qualified as estimated, J, due to uncertainty near the detection limit. The direction of bias cannot be determined.

Notes

Initial calibration percent relative standard deviations (%RSD) and continuing calibration percent differences (%Ds) were greater than quality control limits for methylene chloride. No qualifiers were assigned on this basis since the compound was not detected in the samples.

Continuing calibration %Ds exceeded 25%, but were less than 50%, for acetone, 2-butanone,a nd ethyl ether. These compounds were previously qualified for a more severe calibration noncompliance. Therefore, no further validation action was taken on this basis.

Sample S57MW0080101 was analyzed at a 100X dilution factor due to the presence of ethyl ether above the instrument's linear calibration range. The result from the dilution for this compound only was transposed over the undiluted sample result and used for validation purposes.

Sample S57MW0090101 was analyzed at a 50X dilution factor due to the presence of 1,1-dichloroethene, cis-1,2-dichloroethene, and trichloroethene above the instrument's linear calibration range. The results from the dilution for these compounds only were transposed over the undiluted sample result and used for validation purposes.

Sample S57MW0100101 was analyzed at a 20X dilution factor due to the presence of cis-1,2-dichloroethene and trichloroethene above the instrument's linear calibration range. The results from the dilution for these compounds only were transposed over the undiluted sample result and used for validation purposes.

Performance evaluation mixtures (PEMs) exceeded the 20% degradation criteria for Endrin. Endrin, Endrin aldehyde, and Endrin ketone were not detected in the associated samples. Therefore, no qualifiers were assigned on this basis.

Matrix spike duplicate recoveries were below the lower quality control limit for all explosive compounds. The relative percent difference between the matrix spike and matrix spike duplicate exceeded the upper quality control limit. Matrix spike recoveries were compliant. Since the samples were rejected based on holding time, no further qualifiers were assigned on the basis of the noncompliant matrix spike duplicate.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several compounds failed the RRF criteria in the initial and continuing calibrations. Explosive samples were extracted and/or analyzed beyond the holding time limits.

Other Factors Affecting Data Quality: The laboratory failed to analyze appropriate dilutions within the sample holding time. The laboratory failed to run instrument blanks after samples which saturated the detector.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-146

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 30, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TAL METALS, DISSOLVED TAL METALS, CYANIDE AND MISCELLANEOUS PARAMETERS**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901178

SAMPLES: 5/Aqueous/

S57MW0080101	S57MW0090101	S57MW0090101-F
S57MW010101	S57MW010101-F	

Overview

The sample set for SDG 9901178, NSWC Indian Head, consists of five (5) aqueous environmental samples.

Sample S57MW0080101 was analyzed for pH and total dissolved solids (TDS). Samples S57MW0090101 and S57MW010101 were analyzed for target analyte list (TAL) metals, cyanide, ammonium perchlorate, hardness, nitrocellulose, pH, TDS and total organic carbon (TOC). Samples S57MW0090101-F and S57MW010101-F were analyzed for dissolved TAL metals. The samples were collected by Tetra Tech NUS on January 26, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) methodologies. Ammonium perchlorate analyses were conducted using EPA method 3000. Hardness analyses were conducted using EPA method 130.2. pH analyses were conducted using EPA method 150.1. TDS analyses were conducted using EPA method 160.2. TOC analyses were conducted using SW 846 method 9060. Nitrocellulose analyses were conducted using the USATHAMA method.

Summary

All analytes, with exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory/field duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- The seven (7) day holding time from collection to extraction for nitrocellulose was exceeded by thirty-one (31) days. The nondetected result reported for nitrocellulose was qualified as rejected, "UR". The positive result reported for nitrocellulose was qualified as biased low, "L".

Minor Problems

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for sodium was <90% quality control limit. The positive results <2X CRDL reported for sodium were qualified as biased low, "L".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (aqueous)
Aluminum	53.1µg/L	265.5µg/L
Arsenic	4.3µg/L	21.5µg/L
Barium[1]	0.830µg/L	4.15µg/L
Calcium[1]	111.175µg/L	555.9µg/L
Cobalt	0.8µg/L	4.0µg/L
Copper[1]	1.575µg/L	7.875µg/L
Iron	18.8µg/L	94µg/L
Magnesium	46.6µg/L	233µg/L
Manganese[1]	0.295µg/L	1.475µg/L
Potassium[1]	22.039µg/L	110.195µg/L
Selenium	2.9µg/L	14.5µg/L
Vanadium	0.7µg/L	3.5µg/L
Zinc[1]	1.651µg/L	8.255µg/L

[1] Maximum concentration found in aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for aluminum, arsenic, copper, iron and vanadium were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects.

- The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrocellulose were <80% quality control limit. The positive result reported for nitrocellulose was qualified as biased low, "L".

Notes

The CRDL %Rs for arsenic and selenium were >110% quality control limit. However, no validation action was required as all result reported for arsenic and selenium were either nondetected or qualified, "B", as a result of blank contamination.

QC analyses were not conducted on total TAL metals.

TDS data was not included in the original data package. The laboratory was notified and provided the missing data.

Executive Summary

Laboratory Performance: The holding times for nitrocellulose was exceeded. The CRDL %Rs sodium was <90% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a nondetect as reported by the laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
UR	-	Nondetected result is considered rejected , "UR", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. GEORGE LATULIPPE**	**DATE:**	**MAY 3, 1999**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION- VOA CTO 245, NSWC INDIAN HEAD SDG 9901198**		
SAMPLES:	1/Solid/ S57SD0090101		

OVERVIEW

The sample set for CTO 245, SDG 9901198, NSWC Indian Head consists of one (1) solid environmental sample. The sample was analyzed for target compound list (TCL) volatile organic compounds plus ethyl ether.

The sample was collected by Tetra Tech NUS on January 27, 1999 and analyzed by GPL Environmental Services, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using CLP Statement of Work OLM03.2 analytical and reporting protocols.

The sample was successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, blank spike/blank spike duplicate results, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major Problems

- None noted.

Minor Problems

- The following compounds were detected in the laboratory method blank at the following maximum concentrations:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	17 µg/Kg	170 µg/Kg
Chloroform	1 µg/Kg	5 µg/Kg

Dilution factor, percent solid, and sample aliquot were taken into consideration when applying the blank action level. The positive result for methylene chloride below the blank action level was qualified as a false positive, B.

Notes

An initial calibration percent relative standard deviation (%RSD) was greater than quality control limit for methylene chloride. No qualifiers were assigned on this basis since the compound was qualified as a false positive due to blank contamination.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Methylene chloride was detected in the laboratory method blank.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as amended by Region III and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-231

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 28, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SEM METALS, AVS AND TOC**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901198

SAMPLES: 1/Soil/

S57SD0090101

Overview

The sample set for SDG 9901198, NSWC Indian Head, consists of one (1) soil environmental sample.

The sample was analyzed for simultaneously extracted metals (SEM) namely cadmium, copper, lead, mercury, nickel and zinc. The sample was also analyzed for acid volatile sulfide (AVS) and total organic carbon (TOC). The sample was collected by Tetra Tech NUS on January 27, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. SEM analyses were conducted using SW 846 method 3010. AVS analyses were conducted using EPA MCAWW method 376.1. TOC analyses were conducted using SW 846 method 9060.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

Minor Problems

- The holding time for TOC was exceeded by five (5) days. The positive result reported for TOC was qualified as estimated, "J", as a result of conflicting noncompliances.

- Initial and Continuing Calibration Verification (ICV/CCV) Percent Recoveries (%Rs) for AVS were >110% quality control limit. The positive result reported for AVS was qualified as biased high, "K".

- CCV %Rs for TOC were >110% quality control limit. The positive result reported for TOC was qualified as estimated, "J", as a result of conflicting noncompliances.

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (soil)
Cadmium	0.3µg/L	0.0375 mg/kg
Copper[1]	1.691 mg/kg	8.455 mg/kg
Lead[2]	2.9µg/L	0.3625 mg/kg
Zinc[1]	3.067 mg/kg	15.355 mg/kg

(1) Maximum concentration found in soil preparation blank.
(2) Maximum concentration found in SEM blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results < the action level for copper and zinc were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects.

Notes

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for lead was >110% quality control limit. However, no validation action was required as the result reported for lead was >2X CRDL.

The Matrix Spike (MS) Percent Recovery (%R) for mercury was <75% quality control limit. Laboratory duplicate imprecision (>35%) was noted for mercury. No validation action was taken on this basis as the sample used for analyses was not included in this SDG.

Executive Summary

Laboratory Performance: The holding time for TOC was exceeded. ICV and CCV %Rs for AVS were >110% quality control limit. CCV %Rs for TOC were >110% quality control limit. Several analytes were present in laboratory method/preparation blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

K - Positive result is considered biased high, "K", as a result of technical noncompliances.

J - Positive result is considered estimated, "J", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-04-9-136

TO :	**G. LATULIPPE**	**DATE:**	**APRIL 19, 1999**
FROM:	**GRETCHEN A. PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –TAL METALS, DISSOLVED TAL METALS, CYANIDE AND MISCELLANEOUS PARAMETERS**
CTO 245- NSWC INDIAN HEAD, MARYLAND
SAMPLE DELIVERY GROUP SDG – 9901199

SAMPLES: 9/Aqueous/

S57MW0050101	S57MW0060101	S57MW0110101
S57MWDUP002	S57RB0080101	S57SW0020101
S57SW0020101-F	S57SW0070101	

Overview

The sample set for SDG 9901199, NSWC Indian Head, consists of eight (8) aqueous environmental samples and one (1) rinsate blank (S57RB0080101). One (1) field duplicate pair (S57MW0110101 / S57MWDUP002) was included within this SDG.

Samples S57MW0050101, S57MW0060101, S57MW0110101 and S57MWDUP002 were analyzed for total dissolved solids (TDS). Sample S57RB0080101 was analyzed for ammonium perchlorate, hardness, nitrocellulose, pH, TDS and total organic carbon (TOC). Sample S57SW0020101 was analyzed for hardness, nitrocellulose and TOC. Samples S57RB0080101, S57SW0020101 and S57SW0070101 were analyzed for target analyte list (TAL) metals. Sample S57SW0020101-F was analyzed for dissolved TAL metals. Samples S57RB0080101 and S57SW0020101 were analyzed for cyanide. The samples were collected by Tetra Tech NUS on January 27, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. All metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) methodologies. Ammonium perchlorate analyses were conducted using EPA method 300.0. Hardness analyses were conducted using EPA method 130.2. pH analyses were conducted using EPA method 150.1. TDS analyses were conducted using EPA method 160.2. TOC analyses were conducted using SW 846 method 9060. Nitrocellulose analyses were conducted using the USATHAMA method.

Summary

All analytes, with exception to those qualified as "UR", were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, post digestion spike results, laboratory/field

duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of Mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using cold vapor AA.

Areas of concern with respect to data quality are listed below.

Major Problems

- The seven (7) day holding time from collection to extraction for nitrocellulose was exceeded by thirty (30) days. The nondetected results reported for nitrocellulose were qualified as rejected, "UR". The positive results reported for nitrocellulose were qualified as biased low, "L".

Minor Problems

- The holding time for TDS was exceeded by two (2) days. The positive and nondetected results reported for TDS were qualified as biased low, "L" and "UL", respectively.

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for calcium was >110% quality control limit. The positive results <2X CRDL reported for calcium were qualified as biased high, "K".

- The CRDL %R for aluminum was <90% quality control limit. The nondetected results reported for aluminum were qualified as biased low, "UL".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations :

Samples Affected: All

Analyte	Maximum Concentration	Action Level (aqueous)
Aluminum	44.1µg/L	220.5µg/L
Barium[1]	0.483µg/L	2.415µg/L
Calcium[1]	153.317µg/L	766.585µg/L
Cobalt	0.6µg/L	3.0µg/L
Copper[1]	3.674µg/L	18.37µg/L
Iron	30.9µg/L	154.5µg/L
Lead	1.6µg/L	8.0µg/L
Magnesium	52.8µg/L	264µg/L
Manganese[1]	0.499µg/L	2.495µg/L
Potassium[1]	93.457µg/L	467.285µg/L
Sodium[1]	335.644µg/L	1678µg/L
Thallium	3.5µg/L	12.25µg/L
Zinc[1]	2.564µg/L	12.82µg/L

[1] Maximum concentration found in aqueous preparation blank.

An action level of 5x the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results

< the action level for aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium and zinc were qualified, "B", as a result of blank contamination. No action was taken for the remaining analytes since either the results were > than the action level or were nondetects.

- The Matrix Spike (MS) Percent Recoveries (%Rs) for barium, cobalt, copper, iron, manganese, nickel, vanadium and zinc affecting the total metals were >125% quality control limit. The positive results reported for barium, cobalt, copper, iron, manganese, nickel, vanadium and zinc in the affected samples were qualified as biased high, "K".

- The MS %Rs for cobalt, iron, manganese, vanadium and zinc affecting the dissolved metals were >125% quality control limit. The positive results reported for cobalt, iron, manganese, vanadium and zinc in the affected sample were qualified as biased high, "K".

- The Laboratory Control Sample (LCS) Percent Recovery (%R) for nitrocellulose were <80% quality control limit. The positive result reported for nitrocellulose was qualified as biased low, "L".

Notes

The CRDL %Rs for arsenic, copper, lead, iron, sodium, selenium, thallium and zinc were >110% quality control limit. However, no validation action was required as all results reported for arsenic, copper, lead, iron, sodium, selenium, thallium and zinc were either nondetects or >2X CRDL.

The MS %Rs for aluminum, antimony, arsenic, beryllium, copper, chromium, lead and selenium affecting the total metals were >125% quality control limit. However, no validation action was required as all result reported for aluminum, antimony, arsenic, beryllium, copper, chromium, lead and selenium in the affected samples were nondetects.

The MS %Rs for arsenic, beryllium, chromium, copper, lead and selenium affecting the dissolved metals were >125% quality control limit. However, no validaiton action was required as all results reported for arsenic, beryllium chromium, copper, lead and selenium in the affected sample were nondetects.

A comparison of field duplicate pair (S57MW0110101 / S57MWDUP002) is included in Appendix C.

A Chain of Custody Report was not available.

Executive Summary

Laboratory Performance: The holding times for nitrocellulose and TDS were exceeded. The CRDL %Rs for several analytes were outside the 90-110% quality control limit. Several analytes were present in the laboratory method / preparation blanks. The LCS %R for nitrocellulose was <80% quality control limit.

Other Factors Affecting Data Quality: Several analytes were present in the rinsate blank. The MS %Rs for several analyte affecting total and dissolved metals were >125% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

K - Positive result is considered biased high, "K", as a result of technical noncompliances.

UL - Nondetected result is considered biased low, "UL", as a result of technical noncompliances.

UR - Nondetected result is considered rejected , "UR", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT 11-9-170

TO:	**GEORGE LATULIPPE**	**DATE:**	**DECEMBER 16, 1999**
FROM:	**SEAN NIXON**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOAS AND EXPLOSIVES**
CTO 245 NSWC INDIAN HEAD, MARYLAND
SDG – IH003

SAMPLES: 11/Aqueous

S57SW0010102	S57SW0020102	S57SW0030102	S57SW0040302
S57SW0060102	S57SW0070102	S57SW0080102	S57SW0090102
S57SWDUP00102	S57SWRB0010002	S57SWTB00102	

Overview

The Sample Delivery Group (SDG) for CTO 245 NSWC Indian Head, Maryland SDG IH003, consists of eleven (11) aqueous environmental samples including one (1) trip blank and one (1) rinse blank. One field duplicate pair, samples S57SW0090102/S57SWDUP00102, was included in this SDG.

All of the samples were to be analyzed for selected Target Compound List (TCL) Low Concentration volatiles and ethyl ether. All of the samples except S57SW0010102, S57SWTB00102, S57SW0060102, and S57SW0080102 were analyzed for TCL explosives plus nitrocellulose, nitroguanidine, and nitroglycerin. The samples were collected by Tetra Tech NUS on September 27, 1999 and analyzed by Quanterra – Pittsburgh (volatiles)/West Sacramento (explosives) under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The VOAs analyses were conducted according to Contract Laboratory Procedure (CLP) OLM02.0, and the explosives were analyzed according to SW-846 Method 8330 and Methods for Chemical Analysis of Wastes and Wastewater Method 353.2 for nitrocellulose.

Summary

All analytes were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report were based upon a general review of all available data including data completeness, holding times, calibration data, laboratory and field quality control blank results, GC/MS tuning and performance, Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) analyses, surrogate spike recoveries, internal standard areas, Laboratory Control Sample (LCS) analyses, field duplicate results, compound identification and quantification, and detection limits.

Areas of concern with respect to data quality are listed below.

MAJOR PROBLEMS

Volatiles

- Initial and continuing calibrations contained Relative Response Factors RRFs below the 0.05 quality control limit for 1,2-dibromo-3-chloropropane. The nondetected results for the aforementioned compound were rejected, UR, in the affected samples (all samples).

MINOR PROBLEMS

Volatiles

- The following contaminants were detected in the method and/or field quality control blanks:

Analyte	Maximum Concentration	Action level
Acetone[1]	2.7 ug/L	27 ug/L
Chloromethane[1]	0.1 ug/L	0.5 ug/L
Chloroform	0.14 ug/L	0.70 ug/L
Ethyl ether[1]	0.17 ug/L	0.85
Styrene[1]	0.51 ug/L	2.2 ug/L
Toluene[1]	0.23 ug/L	1.2 ug/L

1. Maximum concentration found in rinse blank.

Samples Affected: All.

Sample aliquot and dilution factors were taken into consideration when applying the action levels. Positive results for acetone reported below the action level were considered false positives and qualified, (B). It should be noted that field quality control blanks were not qualified for laboratory method blank contamination.

- The initial calibration contained a Percent Relative Standard Deviation (%RSD) above the 50% quality control for chloroethane. The nondetected results for chloroethane in all of the samples were qualified as estimated, UJ.

- The continuing calibration of 09/30/99 contained a Percent Difference (%D) above the 50% quality control limit for chloroethane. The nondetected results for chloroethane were qualified as estimated, UJ, in the affected samples.

Explosives

- The continuing calibrations of 10/07/99 at 18:42 and 10/08/99 at 02:15 contained %Ds above the 15% quality control limit for nitroglycerin. The nondetected results for nitroglycerin were qualified as estimated, UJ, in the affected samples (all).

NOTES

Positive results reported below the Contract Required Quantitation Limits were qualified as estimated, J.

A continuing calibration for explosives contained a %D above the 15% quality control limit for nitroglycerine and PETN. Because no samples were affected, no action was taken.

Executive Summary

Laboratory Performance: Blank contamination was noted for acetone. Nondetected results for 1,2-dibromo-3-chloropropane were rejected for gross calibration noncompliances. Nondetected results for cholorethane and nitroglycerin were qualified as estimated for calibration noncompliances.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", September 1994 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Sean T. Nixon
Environmental Scientist
Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer
Tetra Tech NUS

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

DATA QUALIFIER TABLE:

U	-	Value is a nondetected result as reported by the laboratory.
UJ	-	Nondetected result is considered estimated as a result of various technical noncompliances.
B	-	Positive result is considered to be an artifact of blank contamination.
J	-	Positive result is considered estimated as a result of various technical noncompliances.
UR	-	Nondetected result is rejected for gross technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT 12-9-042

TO:	**GEORGE LATULIPPE**	**DATE:**	**DECEMBER 15, 1999**
FROM:	**SEAN NIXON**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOAS** **CTO 245 NSWC INDIAN HEAD, MARYLAND** **SDG – IH010**		

SAMPLES: 3/Aqueous
S57DUP010102 S57PW0070102 S57TB0010102

Overview

The Sample Delivery Group (SDG) for CTO 245 NSWC Indian Head, Maryland SDG IH010, consists of three (3) aqueous environmental samples including one (1) trip blank. One field duplicate pair, samples S57PW0070102/S57DUP010102, was included in this SDG.

All of the samples were to be analyzed for selected Target Compound List (TCL) Low Concentration volatiles and ethyl ether. The samples were collected by Tetra Tech NUS on October 28, 1999 and analyzed by Quanterra – Pittsburgh under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The VOAs analyses were conducted according to Contract Laboratory Procedure (CLP) OLM02.1.

Summary

All analytes were successfully analyzed with the exception of those compounds that were rejected. The findings offered in this report were based upon a general review of all available data including data completeness, holding times, calibration data, laboratory and field quality control blank results, GC/MS tuning and performance, Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) analyses, surrogate spike recoveries, internal standard areas, Laboratory Control Sample (LCS) analyses, field duplicate results, compound identification and quantification, and detection limits.

Areas of concern with respect to data quality are listed below.

MAJOR PROBLEMS

Volatiles

- Initial and continuing calibrations contained Relative Response Factors RRFs below the 0.05 quality control limit for acetone, 2-butanone, and 1,2-dibromo-3-chloropropane. The nondetected results for the aforementioned compounds were rejected, UR, in the affected samples (all samples).

NOTES

Positive results reported below the Contract Required Quantitation Limits were qualified as estimated, J.

Initial calibration Percent Relative Standard Deviations (%RSDs) were noted for several compounds above the 30% quality control limit. Because only nondetected results were reported for the affected compounds, no action was taken.

Continuing calibration %Ds were noted above the 25% quality control limit for several compounds. Because only nondetected results were reported for the affected compounds, no action was taken.

Executive Summary

Laboratory Performance:. Nondetected results for acetone, 2-butanone, and 1,2-dibromo-3-chloropropane were rejected for gross calibration noncompliances.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", September 1994 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Sean T. Nixon
Environmental Scientist
Tetra Tech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer
Tetra Tech NUS

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

DATA QUALIFIER TABLE:

U	-	Value is a nondetected result as reported by the laboratory.
J	-	Positive result is considered estimated as a result of various technical noncompliances.
UR	-	Nondetected result is rejected for gross technical noncompliances.

APPENDIX A
Qualified Analytical Results

CTO245 - NSWC INDIAN HEAD
WATER DATA
QUANTERRA
SDG: IH010

SAMPLE NUMBER:	S57DUP010102			S57PW0070102			S57TB0010102			/ /		
SAMPLE DATE:	10/28/99			10/28/99			10/28/99					
LABORATORY ID:	C9J290170002			C9J290170001			C9J290170003					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	0.0 %			0.0 %			0.0 %			100.0 %		
UNITS:	UG/L			UG/L			UG/L					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1	U		1	U		1	U				
1,1,2,2-TETRACHLOROETHANE	1	U		1	U		1	U				
1,1,2-TRICHLOROETHANE	1	U		1	U		1	U				
1,1-DICHLOROETHANE	1	U		1	U		1	U				
1,1-DICHLOROETHENE	1	U		1	U		1	U				
1,2,4-TRICHLOROBENZENE	1	U		1	U		1	U				
1,2-DIBROMO-3-CHLOROPROPANE	1	UR	C	1	UR	C	1	UR	C			
1,2-DIBROMOETHANE	1	U		1	U		1	U				
1,2-DICHLOROBENZENE	1	U		1	U		1	U				
1,2-DICHLOROETHANE	1	U		1	U		1	U				
1,2-DICHLOROPROPANE	1	U		1	U		1	U				
1,3-DICHLOROBENZENE	1	U		1	U		1	U				
1,4-DICHLOROBENZENE	0.13	J	P	1	U		1	U				
2-BUTANONE	5	UR	C	5	UR	C	5	UR	C			
2-HEXANONE	5	U		5	U		5	U				
4-METHYL-2-PENTANONE	5	U		5	U		5	U				
ACETONE	5	UR	C	5	UR	C	5	UR	C			
BENZENE	1	U		1	U		1	U				
BROMOCHLOROMETHANE	1	U		1	U		1	U				
BROMODICHLOROMETHANE	1	U		1	U		1	U				
BROMOFORM	1	U		1	U		1	U				
BROMOMETHANE	1	U		1	U		1	U				
CARBON DISULFIDE	1	U		1	U		1	U				
CARBON TETRACHLORIDE	1	U		1	U		1	U				
CHLOROBENZENE	1	U		1	U		1	U				
CHLOROETHANE	1	U		1	U		1	U				
CHLOROFORM	1	U		1	U		1	U				
CHLOROMETHANE	1	U		1	U		1	U				
CIS-1,2-DICHLOROETHENE	1	U		1	U		1	U				
CIS-1,3-DICHLOROPROPENE	1	U		1	U		1	U				
DIBROMOCHLOROMETHANE	1	U		1	U		1	U				
ETHYL ETHER	1	U		1	U		1	U				
ETHYLBENZENE	1	U		1	U		1	U				

CTO245 - NSWC INDIAN HEAD
WATER DATA
QUANTERRA
SDG: H010

SAMPLE NUMBER:	S57DUP010102			S57FW0070102			S57TB0010102			/ /		
SAMPLE DATE:	10/28/99			10/28/99			10/28/99					
LABORATORY ID:	C9J290170002			C9J290170001			C9J290170003					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	0.0 %			0.0 %			0.0 %			100.0 %		
UNITS:	UG/L			UG/L			UG/L					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
STYRENE	1	U		1	U		1	U				
TETRACHLOROETHENE	1	U		1	U		1	U				
TOLUENE	1	U		1	U		1	U				
TRANS-1,2-DICHLOROETHENE	1	U		1	U		1	U				
TRANS-1,3-DICHLOROPROPENE	1	U		1	U		1	U				
TRICHLOROETHENE	1	U		1	U		1	U				
VINYL CHLORIDE	1	U		1	U		1	U				
XYLENES, TOTAL	1	U		1	U		1	U				

APPENDIX J

Statistical Analysis of Environmental Data

INDIAN HEAD
SURFACE SOIL - UPGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		1	1	8.36	---	---	---	LOGNORMAL	---	---	8.36	8.36
ALUMINUM	mg/kg	1	1	6660	---	---	---	LOGNORMAL	---	---	6660	6660
ANTIMONY	mg/kg	1	1	0.87	---	---	---	LOGNORMAL	---	---	0.87	0.87
ARSENIC	mg/kg	1	1	9.6	---	---	---	LOGNORMAL	---	---	9.6	9.6
BARIUM	mg/kg	1	1	26.8	---	---	---	LOGNORMAL	---	---	26.8	26.8
BERYLLIUM	mg/kg	1	1	0.27	---	---	---	LOGNORMAL	---	---	0.27	0.27
CADMIUM	mg/kg	1	1	0.21	---	---	---	LOGNORMAL	---	---	0.21	0.21
CALCIUM	mg/kg	1	1	1580	---	---	---	LOGNORMAL	---	---	1580	1580
CHROMIUM	mg/kg	1	1	22.7	---	---	---	LOGNORMAL	---	---	22.7	22.7
COBALT	mg/kg	1	1	10.3	---	---	---	LOGNORMAL	---	---	10.3	10.3
COPPER	mg/kg	1	1	15	---	---	---	LOGNORMAL	---	---	15	15
IRON	mg/kg	1	1	13000	---	---	---	LOGNORMAL	---	---	13000	13000
LEAD	mg/kg	1	1	120	---	---	---	LOGNORMAL	---	---	120	120
MAGNESIUM	mg/kg	1	1	9150	---	---	---	LOGNORMAL	---	---	9150	9150
MANGANESE	mg/kg	1	1	124	---	---	---	LOGNORMAL	---	---	124	124
MERCURY	mg/kg	1	1	0.08	---	---	---	LOGNORMAL	---	---	0.08	0.08
NICKEL	mg/kg	1	1	135	---	---	---	LOGNORMAL	---	---	135	135
POTASSIUM	mg/kg	1	1	398	---	---	---	LOGNORMAL	---	---	398	398
SODIUM	mg/kg	1	1	144	---	---	---	LOGNORMAL	---	---	144	144
VANADIUM	mg/kg	1	1	20.7	---	---	---	LOGNORMAL	---	---	20.7	20.7
ZINC	mg/kg	1	1	94.4	---	---	---	LOGNORMAL	---	---	94.4	94.4
BENZO(B)FLUORANTHENE	µg/kg	1	1	63	---	---	---	LOGNORMAL	---	---	63	63
BIS(2-ETHYLHEXYL)PHTHALATE	µg/kg	1	1	120	---	---	---	LOGNORMAL	---	---	120	120
FLUORANTHENE	µg/kg	1	1	55	---	---	---	LOGNORMAL	---	---	55	55
PYRENE	µg/kg	1	1	50	---	---	---	LOGNORMAL	---	---	50	50

INDIAN HEAD
SURFACE SOIL - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		3	3	7.34	0.8498	0.8385	0.767	NORMAL	9.2236	10.4371	8.12	8.12
ALUMINUM	mg/kg	3	3	6313.3333	0.999	0.9945	0.767	NORMAL	10982.4226	47228.0447	9170	9170
ARSENIC	mg/kg	3	3	55.3333	0.7946	0.8323	0.767	LOGNORMAL	125.0254	4690.3845	103	103
BARIUM	mg/kg	3	3	35.9	0.9677	0.9268	0.767	NORMAL	59.4641	219.6929	48.2	48.2
BERYLLIUM	mg/kg	3	3	0.6467	0.8841	0.8387	0.767	NORMAL	1.1756	20.5048	0.88	0.88
CADMIUM	mg/kg	2	3	0.455	0.9986	0.9228	0.767	NORMAL	1.0497	52012.3455	0.8	0.8
CALCIUM	mg/kg	3	3	2001.3333	0.993	0.9252	0.767	NORMAL	4256.4263	2902055.474	3270	3270
CHROMIUM	mg/kg	3	3	13.1333	0.9994	1	0.767	LOGNORMAL	15.0727	15.6245	14.3	14.3
COBALT	mg/kg	3	3	7.7667	0.8546	0.8471	0.767	NORMAL	9.0432	9.4581	8.3	8.3
COPPER	mg/kg	3	3	15.1333	0.9943	0.9996	0.767	LOGNORMAL	23.5023	44.6312	20.3	20.3
IRON	mg/kg	3	3	19233.3333	0.9696	0.9366	0.767	NORMAL	29848.0231	65654.1033	24800	24800
LEAD	mg/kg	3	3	200.5333	0.8514	0.9926	0.767	LOGNORMAL	622.218	2.0287E+11	487	487
MAGNESIUM	mg/kg	3	3	593	0.9116	0.8657	0.767	NORMAL	1030.0158	7708.5736	796	796
MANGANESE	mg/kg	3	3	110.9667	0.8139	0.8237	0.767	LOGNORMAL	144.6967	163.8247	134	134
MERCURY	mg/kg	3	3	0.0733	0.8546	0.8151	0.767	NORMAL	0.1372	4.8433	0.1	0.1
NICKEL	mg/kg	3	3	7.0333	0.9453	0.962	0.767	LOGNORMAL	9.1141	10.3421	8.4	8.4
POTASSIUM	mg/kg	3	3	600	0.8606	0.8177	0.767	NORMAL	1139.7184	59965.4621	828	828
SELENIUM	mg/kg	1	3	0.3033	0.8059	0.8507	0.767	LOGNORMAL	0.6789	22.6671	0.56	0.56
SODIUM	mg/kg	3	3	85.2333	0.9954	0.9939	0.767	NORMAL	154.767	1038.1342	128	128
VANADIUM	mg/kg	3	3	28.7333	0.9281	0.8961	0.767	NORMAL	43.2575	82.8532	35.7	35.7
ZINC	mg/kg	3	3	125.2667	0.8348	0.9229	0.767	LOGNORMAL	324.5369	320830.1302	261	261
TOLUENE	µg/kg	1	9	5.2222	0.619	0.4991	0.829	LOGNORMAL	6.2517	9.3279	1	1
TRICHLOROETHENE	µg/kg	4	9	23.1111	0.6268	0.7263	0.829	LOGNORMAL	43.1582	89.5803	93	89.5803
ACENAPHTHYLENE	µg/kg	1	3	188.3333	0.9967	0.9996	0.767	LOGNORMAL	272.7668	398.011	140	140
ANTHRACENE	µg/kg	2	3	158.6667	0.9449	0.8719	0.767	NORMAL	322.5542	105184.8438	240	240
BENZO(A)ANTHRACENE	µg/kg	3	3	883.3333	0.7674	0.828	0.767	LOGNORMAL	2952.096	1.35105E+12	2300	2300
BENZO(A)PYRENE	µg/kg	3	3	660	0.7595	0.7916	0.767	LOGNORMAL	2178.4936	2.16443E+11	1700	1700
BENZO(B)FLUORANTHENE	µg/kg	3	3	1560	0.765	0.8317	0.767	LOGNORMAL	5414.9899	3.76556E+14	4200	4200
BENZO(G,H,I)PERYLENE	µg/kg	3	3	187.6667	0.7669	0.8051	0.767	LOGNORMAL	570.7485	146435141.6	450	450
BENZO(K)FLUORANTHENE	µg/kg	3	3	527	0.7585	0.7939	0.767	LOGNORMAL	1801.6427	9.66311E+12	1400	1400
BIS(2-ETHYLHEXYL)PHTHALATE	µg/kg	2	3	133.6667	0.986	0.9847	0.767	NORMAL	302.5926	235256.25	120	120
CARBAZOLE	µg/kg	1	3	174.6667	0.9841	0.9464	0.767	NORMAL	294.4737	1222.119	99	99
CHRYSENE	µg/kg	3	3	860	0.7574	0.7815	0.767	LOGNORMAL	2816.4726	1.29213E+11	2200	2200
DIBENZO(A,H)ANTHRACENE	µg/kg	1	3	258.3333	0.9643	0.9889	0.767	LOGNORMAL	399.9692	702.2321	350	350
FLUORANTHENE	µg/kg	3	3	803.3333	0.755	0.7637	0.767	LOGNORMAL	2258.4911	15190944.97	1800	1800
FLUORENE	µg/kg	1	3	154.6667	0.936	0.8549	0.767	NORMAL	329.7882	1439664.549	39	39
INDENO(1,2,3-CD)PYRENE	µg/kg	3	3	376	0.75	0.75	0.767	LOGNORMAL	1243.24	1.3425E+11	970	970
NAPHTHALENE	µg/kg	1	3	154.3333	0.9353	0.8535	0.767	NORMAL	330.3937	1901471.041	38	38
PHENANTHRENE	µg/kg	3	3	326.6667	0.9914	0.9975	0.767	LOGNORMAL	589.1059	3436.91	490	490
PYRENE	µg/kg	3	3	1096.6667	0.8078	0.8988	0.767	LOGNORMAL	3150.5384	95415967.15	2500	2500
GAMMA-CHLORDANE	µg/kg	1	3	2.4833	0.7929	0.8498	0.767	LOGNORMAL	6.6011	8551.3926	5.3	5.3
CIS-1,2-DICHLOROETHENE	µg/kg	2	9	5	0.6461	0.5858	0.829	LOGNORMAL	5.775	6.5677	4	4

INDIAN HEAD
SURFACE SOIL - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
4,4'-DDE	µg/kg	1	3	21.7667	0.7563	0.8002	0.767	LOGNORMAL	79.0489	5.24728E+16	61	61
4,4'-DDT	µg/kg	1	3	51.4333	0.7525	0.79	0.767	LOGNORMAL	195.3413	3.23594E+26	150	150
NITROCELLULOSE	µg/kg	3	3	99.769	0.7502	0.7974	0.767	LOGNORMAL	390.6463	1.42399E+82	299	299
4,4'-DDD	µg/kg	1	3	5.4333	0.787	0.8433	0.767	LOGNORMAL	15.0299	68160.1892	12	12
2-METHYLNAPHTHALENE	µg/kg	1	3	154	0.9346	0.8521	0.767	NORMAL	330.9995	2542166.678	37	37
TOTAL ORGANIC CARBON	mg/kg	2	2	29195	---	---	---	LOGNORMAL	---	---	50600	50600

INDIAN HEAD
SURFACE/SUBSURFACE SOIL - UPGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		3	3	7.5733	0.9579	0.946	0.767	NORMAL	9.115	9.772	8.36	8.36
ALUMINUM	mg/kg	3	3	6616.6667	0.999	0.9931	0.767	NORMAL	8615.4156	10049.4129	7780	7780
ANTIMONY	mg/kg	1	2	0.565	---	---	---	LOGNORMAL	---	---	0.87	0.87
ARSENIC	mg/kg	3	3	5.0333	0.7821	0.8122	0.767	LOGNORMAL	11.7055	684.8557	9.6	9.6
BARIUM	mg/kg	3	3	28.5	0.9156	0.9336	0.767	LOGNORMAL	37.0448	42.0392	34.2	34.2
BERYLLIUM	mg/kg	3	3	0.3367	0.871	0.9162	0.767	LOGNORMAL	0.6076	2.2261	0.52	0.52
CADMIUM	mg/kg	2	3	0.145	0.8811	0.8242	0.767	NORMAL	0.2932	130.5239	0.21	0.21
CALCIUM	mg/kg	3	3	983	0.9062	0.9604	0.767	LOGNORMAL	1874.6589	12006.7427	1580	1580
CHROMIUM	mg/kg	3	3	14.4667	0.8134	0.8433	0.767	LOGNORMAL	26.523	102.216	22.7	22.7
COBALT	mg/kg	3	3	5.9667	0.9979	0.9255	0.767	NORMAL	13.4765	157098.1846	10.3	10.3
COPPER	mg/kg	3	3	9.5667	0.858	0.9025	0.767	LOGNORMAL	17.5747	72.192	15	15
IRON	mg/kg	3	3	10986.6667	0.9672	0.9807	0.767	LOGNORMAL	14106.4391	15891.3429	13000	13000
LEAD	mg/kg	3	3	45.5333	0.7513	0.7567	0.767	LOGNORMAL	154.2548	2.33252E+11	120	120
MAGNESIUM	mg/kg	3	3	3349.6667	0.7669	0.8512	0.767	LOGNORMAL	11819.8145	2.06597E+16	9150	9150
MANGANESE	mg/kg	3	3	64.1	0.8707	0.9548	0.767	LOGNORMAL	152.6267	25626.3792	124	124
MERCURY	mg/kg	3	3	0.0433	0.871	0.9457	0.767	LOGNORMAL	0.0975	5.0535	0.08	0.08
NICKEL	mg/kg	3	3	47.3667	0.7562	0.8111	0.767	LOGNORMAL	175.3147	9.38013E+19	135	135
POTASSIUM	mg/kg	3	3	503.6667	0.8059	0.8275	0.767	LOGNORMAL	853.8895	2013.3042	743	743
SELENIUM	mg/kg	1	3	0.4117	0.8455	0.9282	0.767	LOGNORMAL	1.0121	270.8794	0.82	0.82
SODIUM	mg/kg	3	3	103.3333	0.9643	0.9909	0.767	LOGNORMAL	166.1682	348.4384	144	144
VANADIUM	mg/kg	3	3	21.0667	0.8073	0.8089	0.767	LOGNORMAL	22.2862	22.6012	21.9	21.9
ZINC	mg/kg	3	3	41.1667	0.7639	0.7901	0.767	LOGNORMAL	118.8976	2385210.067	94.4	94.4
ACETONE	µg/kg	1	3	12.5	0.7683	0.7919	0.767	LOGNORMAL	32.2145	15644.7563	26	26
ETHYL ETHER	µg/kg	1	3	21.8333	0.7577	0.7785	0.767	LOGNORMAL	68.7986	147804148.9	54	54
BENZO(B)FLUORANTHENE	µg/kg	1	3	156	0.7764	0.7657	0.767	NORMAL	291.8454	11326.2074	63	63
BIS(2-ETHYLHEXYL)PHTHALATE	µg/kg	2	3	136.3333	0.939	0.9776	0.767	LOGNORMAL	232.8898	657.2659	120	120
DI-N-BUTYL PHTHALATE	µg/kg	1	3	198.3333	0.9643	0.9607	0.767	NORMAL	211.2093	214.8136	200	200
FLUORANTHENE	µg/kg	1	3	153.3333	0.775	0.7641	0.767	NORMAL	296.9619	32183.0827	55	55
PYRENE	µg/kg	1	3	151.6667	0.7742	0.7631	0.767	NORMAL	300.1598	71938.2018	50	50
NITROCELLULOSE	µg/kg	1	1	50.4	---	---	---	LOGNORMAL	---	---	50.4	50.4

INDIAN HEAD
SURFACE/SUBSURFACE SOIL - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		8	8	7.2525	0.8989	0.8861	0.818	NORMAL	7.9881	8.1591	8.34	7.9881
ALUMINUM	mg/kg	8	8	7831.25	0.999	0.932	0.818	NORMAL	9593.9509	10915.771	11500	9593.9509
ARSENIC	mg/kg	8	8	38.125	0.7737	0.9392	0.818	LOGNORMAL	57.3033	71.6836	103	71.6836
BARIUM	mg/kg	8	8	38.6	0.9769	0.9546	0.818	NORMAL	46.9503	51.7331	58.2	46.9503
BERYLLIUM	mg/kg	8	8	0.855	0.7524	0.9459	0.818	LOGNORMAL	1.3325	1.7928	2.5	1.7928
CADMIUM	mg/kg	4	8	0.255	0.7842	0.8967	0.818	LOGNORMAL	0.4294	0.883	0.8	0.8
CALCIUM	mg/kg	8	8	2541.625	0.7493	0.9773	0.818	LOGNORMAL	4369.2999	9796.3372	8840	8840
CHROMIUM	mg/kg	8	8	13.7625	0.8556	0.9098	0.818	LOGNORMAL	16.0235	16.4408	21	16.4408
COBALT	mg/kg	8	8	9.65	0.6067	0.8555	0.818	LOGNORMAL	16.5457	21.5152	34.6	21.5152
COPPER	mg/kg	8	8	13.5125	0.9106	0.9184	0.818	LOGNORMAL	16.2785	17.2241	20.3	17.2241
IRON	mg/kg	8	8	22950	0.8378	0.9484	0.818	LOGNORMAL	30157.7647	32575.1865	46300	32575.1865
LEAD	mg/kg	8	8	102.475	0.605	0.9696	0.818	LOGNORMAL	208.8103	707.7964	487	487
MAGNESIUM	mg/kg	8	8	675.375	0.8939	0.9598	0.818	LOGNORMAL	928.0326	1130.0524	1440	1130.0524
MANGANESE	mg/kg	8	8	112.9875	0.7756	0.909	0.818	LOGNORMAL	154.2448	169.4059	253	169.4059
MERCURY	mg/kg	8	8	0.0863	0.763	0.911	0.818	LOGNORMAL	0.135	0.1943	0.25	0.1943
NICKEL	mg/kg	8	8	6.8875	0.8478	0.9393	0.818	LOGNORMAL	8.7854	9.4022	13	9.4022
POTASSIUM	mg/kg	8	8	711.75	0.9576	0.9691	0.818	LOGNORMAL	966.2112	1303.1304	1330	1303.1304
SELENIUM	mg/kg	4	8	0.4006	0.8089	0.8044	0.818	LOGNORMAL	0.5818	1.0263	0.74	0.74
SODIUM	mg/kg	8	8	96.375	0.8358	0.9284	0.818	LOGNORMAL	140.057	179.9606	231	179.9606
VANADIUM	mg/kg	8	8	32.9875	0.889	0.9507	0.818	LOGNORMAL	42.1846	45.8025	60.8	45.8025
ZINC	mg/kg	8	8	88.225	0.7132	0.8365	0.818	LOGNORMAL	142.1434	191.6663	261	191.6663
1,1,1-TRICHLOROETHANE	µg/kg	1	35	5.9429	0.8282	0.7803	0.934	LOGNORMAL	6.0931	6.286	4	4
2-BUTANONE	µg/kg	1	35	6.6714	0.2495	0.3661	0.934	LOGNORMAL	7.7887	7.0867	29	7.0867
ACETONE	µg/kg	7	35	75.5857	0.1973	0.5128	0.934	LOGNORMAL	181.4658	34.083	2200	34.083
CARBON DISULFIDE	µg/kg	5	35	5.4571	0.6646	0.5402	0.934	LOGNORMAL	5.899	6.6604	4	4
METHYLENE CHLORIDE	µg/kg	35	35	618.7429	0.1756	0.6278	0.934	LOGNORMAL	1632.9041	98.2113	21000	98.2113
TOLUENE	µg/kg	2	35	5.8286	0.6071	0.3942	0.934	LOGNORMAL	6.1123	6.5462	4	4
TRICHLOROETHENE	µg/kg	16	35	6323.5857	0.1739	0.6425	0.934	LOGNORMAL	16955.9436	504.9895	220000	504.9895
ACENAPHTHYLENE	µg/kg	1	8	196.25	0.9045	0.8629	0.818	NORMAL	215.0087	219.6235	140	140
ANTHRACENE	µg/kg	2	8	185.125	0.689	0.5674	0.818	LOGNORMAL	223.0511	302.2309	240	240
BENZO(A)ANTHRACENE	µg/kg	5	8	463.125	0.51	0.7854	0.818	LOGNORMAL	963.0601	1456.0927	2300	1456.0927
BENZO(A)PYRENE	µg/kg	5	8	365.125	0.5314	0.8432	0.818	LOGNORMAL	728.8995	1132.0718	1700	1132.0718
BENZO(B)FLUORANTHENE	µg/kg	5	8	735.625	0.4907	0.7851	0.818	LOGNORMAL	1677.0388	3425.0059	4200	3425.0059
BENZO(G,H,I)PERYLENE	µg/kg	4	8	180.375	0.8262	0.8761	0.818	LOGNORMAL	267.2495	440.5266	450	440.5266
BENZO(K)FLUORANTHENE	µg/kg	4	8	323.875	0.5188	0.7602	0.818	LOGNORMAL	617.1721	823.1485	1400	823.1485
BIS(2-ETHYLHEXYL)PHTHALATE	µg/kg	3	8	162.875	0.8771	0.7998	0.818	NORMAL	209.6156	309.8529	120	120
CARBAZOLE	µg/kg	1	8	191.125	0.7844	0.6919	0.818	LOGNORMAL	218.3644	236.6695	99	99
CHRYSENE	µg/kg	5	8	452	0.5102	0.7812	0.818	LOGNORMAL	927.8026	1417.2344	2200	1417.2344
DIBENZO(A,H)ANTHRACENE	µg/kg	2	8	205.625	0.8749	0.7631	0.818	NORMAL	258.6354	336.5071	350	258.6354
FLUORANTHENE	µg/kg	5	8	442.5	0.5496	0.7942	0.818	LOGNORMAL	813.6181	1000.1757	1800	1000.1757

INDIAN HEAD
SURFACE/SUBSURFACE SOIL - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
FLUORENE	µg/kg	1	8	183.625	0.6717	0.5437	0.818	LOGNORMAL	224.2807	347.9282	39	39
INDENO(1,2,3-CD)PYRENE	µg/kg	5	8	242.625	0.6188	0.9168	0.818	LOGNORMAL	444.2645	788.4561	970	788.4561
NAPHTHALENE	µg/kg	1	8	183.5	0.6703	0.5418	0.818	LOGNORMAL	224.3839	353.1219	38	38
PHENANTHRENE	µg/kg	5	8	226.25	0.8324	0.9234	0.818	LOGNORMAL	309.2529	356.9075	490	356.9075
PYRENE	µg/kg	6	8	534.625	0.5814	0.9445	0.818	LOGNORMAL	1074.3519	2628.7037	2500	2500
GAMMA-CHLORDANE	µg/kg	1	8	1.5563	0.4645	0.5307	0.818	LOGNORMAL	2.5713	2.6239	5.3	2.6239
CIS-1,2-DICHLOROETHENE	µg/kg	8	35	2206.9	0.1729	0.35	0.934	LOGNORMAL	5928.517	80.5926	77000	80.5926
TRANS-1,2-DICHLOROETHENE	µg/kg	2	35	6.3571	0.3471	0.5225	0.934	LOGNORMAL	7.0529	6.7434	20	6.7434
4,4'-DDE	µg/kg	2	8	11.3	0.5469	0.6515	0.818	LOGNORMAL	25.2029	85.9103	61	61
4,4'-DDT	µg/kg	2	8	22.8	0.4851	0.6402	0.818	LOGNORMAL	57.4907	403.5503	150	150
XYLENES, TOTAL	µg/kg	1	35	6.0714	0.8062	0.8316	0.934	LOGNORMAL	6.2232	6.7411	8	6.7411
NITROCELLULOSE	µg/kg	8	8	64.7838	0.6983	0.8025	0.818	LOGNORMAL	136.4076	3112899604	299	299
4,4'-DDD	µg/kg	1	8	3.2938	0.4549	0.5145	0.818	LOGNORMAL	5.653	5.8227	12	5.8227
2-METHYLNAPHTHALENE	µg/kg	1	8	183.375	0.669	0.5399	0.818	LOGNORMAL	224.4872	358.7457	37	37
TOTAL ORGANIC CARBON	mg/kg	6	7	16218.5714	0.7708	0.9643	0.803	LOGNORMAL	28201.3268	73113.134	50600	50600

INDIAN HEAD
GROUNDWATER - UPGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		2	2	5.5	---	---	---	LOGNORMAL	---	---	6.04	6.04
AMMONIUM PERCHLORATE	µg/L	1	2	5.64	---	---	---	LOGNORMAL	---	---	8.78	8.78
BARIUM	µg/L	2	2	65.8	---	---	---	LOGNORMAL	---	---	72.7	72.7
BERYLLIUM	µg/L	1	2	0.22	---	---	---	LOGNORMAL	---	---	0.39	0.39
CADMIUM	µg/L	1	2	0.265	---	---	---	LOGNORMAL	---	---	0.38	0.38
CALCIUM	µg/L	2	2	5310	---	---	---	LOGNORMAL	---	---	8090	8090
COBALT	µg/L	2	2	20.15	---	---	---	LOGNORMAL	---	---	22.8	22.8
IRON	µg/L	2	2	1161	---	---	---	LOGNORMAL	---	---	2220	2220
MAGNESIUM	µg/L	2	2	1690	---	---	---	LOGNORMAL	---	---	1880	1880
MANGANESE	µg/L	2	2	225	---	---	---	LOGNORMAL	---	---	271	271
NICKEL	µg/L	2	2	7.45	---	---	---	LOGNORMAL	---	---	7.9	7.9
POTASSIUM	µg/L	2	2	4715	---	---	---	LOGNORMAL	---	---	6940	6940
SODIUM	µg/L	2	2	23000	---	---	---	LOGNORMAL	---	---	24100	24100
ZINC	µg/L	2	2	43.95	---	---	---	LOGNORMAL	---	---	64.1	64.1
1,1,1-TRICHLOROETHANE	µg/L	1	2	7.55	---	---	---	LOGNORMAL	---	---	14.6	14.6
1,1-DICHLOROETHANE	µg/L	2	2	3	---	---	---	LOGNORMAL	---	---	5.2	5.2
1,1-DICHLOROETHENE	µg/L	2	2	39.65	---	---	---	LOGNORMAL	---	---	77.5	77.5
1,2-DICHLOROETHANE	µg/L	1	2	1.6	---	---	---	LOGNORMAL	---	---	2.7	2.7
ACETONE	µg/L	1	1	12	---	---	---	LOGNORMAL	---	---	12	12
CHLOROFORM	µg/L	1	2	0.9	---	---	---	LOGNORMAL	---	---	1.3	1.3
ETHYL ETHER	µg/L	1	1	3.6	---	---	---	LOGNORMAL	---	---	3.6	3.6
TRICHLOROETHENE	µg/L	2	2	2.25	---	---	---	LOGNORMAL	---	---	2.3	2.3
BIS(2-ETHYLHEXYL)PHTHALATE	µg/L	1	2	2.25	---	---	---	LOGNORMAL	---	---	2	2
TOTAL DISSOLVED SOLIDS	mg/L	2	2	79	---	---	---	LOGNORMAL	---	---	90	90
CIS-1,2-DICHLOROETHENE	µg/L	1	2	1.4	---	---	---	LOGNORMAL	---	---	2.3	2.3
NITROCELLULOSE	mg/L	1	1	0.223	---	---	---	LOGNORMAL	---	---	0.223	0.223
BARIUM, FILTERED	µg/L	2	2	66.45	---	---	---	LOGNORMAL	---	---	73.5	73.5
BERYLLIUM, FILTERED	µg/L	2	2	0.245	---	---	---	LOGNORMAL	---	---	0.37	0.37
CADMIUM, FILTERED	µg/L	1	2	0.26	---	---	---	LOGNORMAL	---	---	0.37	0.37
CALCIUM, FILTERED	µg/L	2	2	5225	---	---	---	LOGNORMAL	---	---	7810	7810
COBALT, FILTERED	µg/L	2	2	24.15	---	---	---	LOGNORMAL	---	---	27.6	27.6
IRON, FILTERED	µg/L	2	2	1195.5	---	---	---	LOGNORMAL	---	---	2260	2260
LEAD, FILTERED	µg/L	1	2	0.75	---	---	---	LOGNORMAL	---	---	1	1
MAGNESIUM, FILTERED	µg/L	2	2	1715	---	---	---	LOGNORMAL	---	---	1920	1920
MANGANESE, FILTERED	µg/L	2	2	243	---	---	---	LOGNORMAL	---	---	281	281
NICKEL, FILTERED	µg/L	2	2	8	---	---	---	LOGNORMAL	---	---	8	8
POTASSIUM, FILTERED	µg/L	2	2	4760	---	---	---	LOGNORMAL	---	---	6950	6950
SODIUM, FILTERED	µg/L	2	2	23350	---	---	---	LOGNORMAL	---	---	24600	24600
ZINC, FILTERED	µg/L	2	2	44.5	---	---	---	LOGNORMAL	---	---	61.9	61.9
TOTAL ORGANIC CARBON	mg/L	1	2	1.88	---	---	---	LOGNORMAL	---	---	3.26	3.26

INDIAN HEAD
GROUNDWATER - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		8	8	5.7463	0.9273	0.9332	0.818	LOGNORMAL	6.0166	6.3399	6.39	6.3399
BARIUM	µg/L	4	4	39.625	0.999	0.9576	0.748	NORMAL	54.4941	71.0043	57.4	54.4941
BERYLLIUM	µg/L	3	4	0.15	0.9512	0.9392	0.748	NORMAL	0.2574	2.6632	0.25	0.25
CALCIUM	µg/L	4	4	5452.5	0.6546	0.7042	0.748	LOGNORMAL	13415.701	1227190.76	15600	15600
COBALT	µg/L	4	4	21.9	0.8382	0.8608	0.748	LOGNORMAL	34.8265	119.2179	31.9	31.9
IRON	µg/L	4	4	1277.5	0.692	0.916	0.748	LOGNORMAL	3677.6308	781640957	4330	4330
LEAD	µg/L	2	4	0.875	0.7843	0.7673	0.748	NORMAL	1.3867	4.1492	1.3	1.3
MAGNESIUM	µg/L	4	4	1617.5	0.6703	0.6836	0.748	LOGNORMAL	2200.4218	2658.656	2360	2360
MANGANESE	µg/L	4	4	216.4	0.8037	0.7125	0.748	NORMAL	356.7947	27863.431	311	311
NICKEL	µg/L	4	4	7.125	0.8983	0.9329	0.748	LOGNORMAL	9.829	12.8711	10.3	10.3
POTASSIUM	µg/L	4	4	3725	0.9186	0.9196	0.748	LOGNORMAL	4776.3505	5651.9664	4760	4760
SODIUM	µg/L	4	4	18340	0.7681	0.8705	0.748	LOGNORMAL	34104.1517	150410.6174	38200	38200
ZINC	µg/L	4	4	37.575	0.7294	0.8	0.748	LOGNORMAL	65.7566	182.3933	73.3	73.3
1,1,1-TRICHLOROETHANE	µg/L	8	14	5.3143	0.6477	0.89	0.874	LOGNORMAL	9.0337	22.2419	29.5	22.2419
1,1-DICHLOROETHANE	µg/L	8	14	2.4643	0.8659	0.8527	0.874	LOGNORMAL	3.3274	5.4863	5.2	5.2
1,1-DICHLOROETHENE	µg/L	7	14	6.3071	0.7477	0.8572	0.874	LOGNORMAL	9.9603	35.4626	29	29
ACETONE	µg/L	1	5	9.38	0.632	0.7924	0.762	LOGNORMAL	20.1005	77.3203	29.4	29.4
CHLOROFORM	µg/L	2	14	1.5286	0.5626	0.6114	0.874	LOGNORMAL	2.4246	2.9807	1.3	1.3
ETHYL ETHER	µg/L	9	12	688.4417	0.6622	0.858	0.859	LOGNORMAL	1303.1384	3610249.548	3950	3950
TETRACHLOROETHENE	µg/L	1	14	2.1071	0.627	0.6141	0.874	LOGNORMAL	3.4561	5.4051	9.5	5.4051
TOLUENE	µg/L	1	14	1.4643	0.516	0.516	0.874	LOGNORMAL	2.3712	2.8123	0.5	0.5
TRICHLOROETHENE	µg/L	11	14	160.8357	0.776	0.9007	0.874	LOGNORMAL	257.2092	18482.6766	611.7	611.7
VINYL CHLORIDE	µg/L	6	14	11.7286	0.5342	0.8056	0.874	LOGNORMAL	23.3387	99.1683	85	85
BIS(2-ETHYLHEXYL)PHTHALATE	µg/L	2	4	2.75	0.6297	0.6297	0.748	LOGNORMAL	3.3383	3.8225	3	3
DI-N-BUTYL PHTHALATE	µg/L	2	4	4.5	0.8648	0.8617	0.748	NORMAL	6.7528	12.1509	7	6.7528
TOTAL DISSOLVED SOLIDS	mg/L	10	11	95.2727	0.9208	0.8978	0.85	NORMAL	129.3925	254.0553	184	129.3925
CIS-1,2-DICHLOROETHENE	µg/L	12	14	79.4857	0.5911	0.9337	0.874	LOGNORMAL	148.4987	4938.773	528	528
TRANS-1,2-DICHLOROETHENE	µg/L	4	14	1.8214	0.6165	0.6598	0.874	LOGNORMAL	2.9894	3.9239	8.3	3.9239
NITROCELLULOSE	mg/L	2	2	0.148	---	---	---	LOGNORMAL	---	---	0.148	0.148
BARIUM, FILTERED	µg/L	4	4	37.575	0.8703	0.9241	0.748	LOGNORMAL	51.8414	66.6415	55	55
BERYLLIUM, FILTERED	µg/L	2	4	0.1175	0.8085	0.863	0.748	LOGNORMAL	0.2341	3.187	0.26	0.26
CALCIUM, FILTERED	µg/L	4	4	6465	0.6483	0.698	0.748	LOGNORMAL	16847.9819	5415725.017	19700	19700
COBALT, FILTERED	µg/L	4	4	22.275	0.889	0.8926	0.748	LOGNORMAL	34.6372	111.9225	31.9	31.9
IRON, FILTERED	µg/L	4	4	1041.5	0.6619	0.9191	0.748	LOGNORMAL	3214.2577	3.90128E+12	3810	3810
LEAD, FILTERED	µg/L	1	4	0.7	0.6297	0.6297	0.748	LOGNORMAL	1.1706	2.4939	1.3	1.3
MAGNESIUM, FILTERED	µg/L	4	4	1587.5	0.7328	0.7669	0.748	LOGNORMAL	2221.0919	2821.919	2390	2390
MANGANESE, FILTERED	µg/L	4	4	210.875	0.8206	0.7274	0.748	NORMAL	341.7368	10938.1203	301	301
NICKEL, FILTERED	µg/L	4	4	7.2	0.8793	0.9283	0.748	LOGNORMAL	9.6622	11.8025	10.2	10.2
POTASSIUM, FILTERED	µg/L	4	4	3892.5	0.8631	0.8889	0.748	LOGNORMAL	5414.4313	7191.4149	5690	5690
SODIUM, FILTERED	µg/L	4	4	19075	0.7394	0.836	0.748	LOGNORMAL	36952.7359	209288.1429	41700	41700
ZINC, FILTERED	µg/L	4	4	41.95	0.878	0.9311	0.748	LOGNORMAL	75.2888	423.783	81.2	81.2
TOTAL ORGANIC CARBON	mg/L	1	4	1.275	0.6297	0.6297	0.748	LOGNORMAL	3.0986	208.3768	3.6	3.6

INDIAN HEAD
SURFACE WATER - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		3	3	7.25	0.9347	0.939	0.767	LOGNORMAL	7.7644	7.8994	7.59	7.59
ALUMINUM	µg/L	2	2	384	---	---	---	LOGNORMAL	---	---	449	449
BARIUM	µg/L	2	2	18.5	---	---	---	LOGNORMAL	---	---	19.7	19.7
BERYLLIUM	µg/L	1	2	0.18	---	---	---	LOGNORMAL	---	---	0.26	0.26
CALCIUM	µg/L	2	2	19825	---	---	---	LOGNORMAL	---	---	30200	30200
CHROMIUM	µg/L	2	2	0.815	---	---	---	LOGNORMAL	---	---	1	1
COBALT	µg/L	2	2	10.985	---	---	---	LOGNORMAL	---	---	21.1	21.1
CYANIDE	µg/L	2	2	8.55	---	---	---	LOGNORMAL	---	---	10.6	10.6
IRON	µg/L	2	2	623	---	---	---	LOGNORMAL	---	---	785	785
LEAD	µg/L	2	2	4.7	---	---	---	LOGNORMAL	---	---	7.9	7.9
MAGNESIUM	µg/L	2	2	8240	---	---	---	LOGNORMAL	---	---	14900	14900
MANGANESE	µg/L	2	2	192.55	---	---	---	LOGNORMAL	---	---	363	363
NICKEL	µg/L	2	2	13.25	---	---	---	LOGNORMAL	---	---	23.4	23.4
POTASSIUM	µg/L	2	2	4000	---	---	---	LOGNORMAL	---	---	6710	6710
SELENIUM	µg/L	1	2	1.875	---	---	---	LOGNORMAL	---	---	2.8	2.8
SODIUM	µg/L	2	2	83830	---	---	---	LOGNORMAL	---	---	160000	160000
VANADIUM	µg/L	2	2	1.4	---	---	---	LOGNORMAL	---	---	1.4	1.4
ZINC	µg/L	2	2	91.05	---	---	---	LOGNORMAL	---	---	119	119
ACETONE	µg/L	1	1	7	---	---	---	LOGNORMAL	---	---	7	0
TRICHLOROETHENE	µg/L	2	5	0.72	0.6872	0.7324	0.762	LOGNORMAL	1.0917	1.3555	1.4	1.3555
1,2,4-TRICHLOROBENZENE	µg/L	1	5	0.54	0.5521	0.5521	0.762	LOGNORMAL	0.6253	0.6343	0.7	0.6343
CHLORIDE	mg/L	3	3	119.0667	0.9957	0.8791	0.767	NORMAL	296.2926	1.46186E+13	220	220
FLUORIDE	mg/L	3	3	0.9547	0.8754	0.9942	0.767	LOGNORMAL	2.7529	3435271.025	2.17	2.17
NITRATE/NITRITE	mg/L	3	3	1.0883	0.7973	0.9399	0.767	LOGNORMAL	3.6645	79240983323	2.85	2.85
SULFATE	mg/L	3	3	244.32	0.9901	0.8473	0.767	NORMAL	621.3271	1.77873E+21	454	454
TOTAL DISSOLVED SOLIDS	mg/L	3	3	550.3333	0.9482	0.8397	0.767	NORMAL	1292.2017	3.06187E+11	921	921
TOTAL SUSPENDED SOLIDS	mg/L	1	3	4	0.75	0.75	0.767	LOGNORMAL	8.38	108.5465	7	7
CIS-1,2-DICHLOROETHENE	µg/L	1	5	0.5	---	---	---	LOGNORMAL	---	---	0.5	0.5
TURBIDITY	NTU	3	3	5.0367	0.9979	0.9894	0.767	NORMAL	6.758	8.305	6.03	6.03
NITROCELLULOSE	mg/L	1	2	0.4705	---	---	---	LOGNORMAL	---	---	0.221	0.221
ALUMINUM, FILTERED	µg/L	2	2	64.75	---	---	---	LOGNORMAL	---	---	69.7	69.7
BARIUM, FILTERED	µg/L	2	2	15.3	---	---	---	LOGNORMAL	---	---	17.3	17.3
CALCIUM, FILTERED	µg/L	2	2	19480	---	---	---	LOGNORMAL	---	---	30400	30400
COBALT, FILTERED	µg/L	2	2	13.3	---	---	---	LOGNORMAL	---	---	22.5	22.5
IRON, FILTERED	µg/L	2	2	106.95	---	---	---	LOGNORMAL	---	---	205	205
MAGNESIUM, FILTERED	µg/L	2	2	8180	---	---	---	LOGNORMAL	---	---	15000	15000
MANGANESE, FILTERED	µg/L	2	2	202.95	---	---	---	LOGNORMAL	---	---	364	364
NICKEL, FILTERED	µg/L	2	2	12.7	---	---	---	LOGNORMAL	---	---	23.2	23.2
POTASSIUM, FILTERED	µg/L	2	2	3965	---	---	---	LOGNORMAL	---	---	6720	6720
SODIUM, FILTERED	µg/L	2	2	85915	---	---	---	LOGNORMAL	---	---	164000	164000
ZINC, FILTERED	µg/L	2	2	53.9	---	---	---	LOGNORMAL	---	---	61.2	61.2
DISSOLVED OXYGEN	mg/L	3	3	10.4	0.9423	0.9352	0.767	NORMAL	11.6157	11.9795	11	11
TOTAL ORGANIC CARBON	mg/L	2	2	2.92	---	---	---	LOGNORMAL	---	---	3.52	3.52

INDIAN HEAD
SURFACE WATER - STORM SEWER
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		1	1	7.35	---	---	---	LOGNORMAL	---	---	7.35	7.35
ALUMINUM	µg/L	5	5	509	0.999	0.9573	0.762	NORMAL	810.3558	2260.4072	924	810.3558
BARIUM	µg/L	5	5	27.58	0.978	0.9895	0.762	LOGNORMAL	31.7094	32.625	34	32.625
CALCIUM	µg/L	5	5	12184	0.9377	0.9199	0.762	NORMAL	13700.0544	14082.6352	13800	13700.0544
CHROMIUM	µg/L	4	5	1.146	0.9819	0.9646	0.762	NORMAL	1.8313	5.4035	2.2	1.8313
COBALT	µg/L	5	5	3.4	0.8412	0.8341	0.762	NORMAL	4.0216	4.2577	4	4
COPPER	µg/L	5	5	18.76	0.8752	0.8827	0.762	LOGNORMAL	23.1307	24.6908	25.2	24.6908
CYANIDE	µg/L	1	5	3.72	0.5521	0.5521	0.762	LOGNORMAL	6.321	8.8418	8.6	8.6
IRON	µg/L	5	5	1250.8	0.8437	0.8257	0.762	NORMAL	1546.0504	1698.7039	1570	1546.0504
LEAD	µg/L	5	5	4.26	0.9526	0.9515	0.762	NORMAL	5.0095	5.2406	5.4	5.0095
MAGNESIUM	µg/L	5	5	2822	0.9416	0.9362	0.762	NORMAL	3388.6229	3607.4703	3680	3388.6229
MANGANESE	µg/L	5	5	92.8	0.8449	0.8548	0.762	LOGNORMAL	114.0663	122.2992	119	119
NICKEL	µg/L	5	5	3.42	0.9412	0.986	0.762	LOGNORMAL	4.4411	4.9462	5.1	4.9462
POTASSIUM	µg/L	5	5	2978	0.8354	0.8391	0.762	LOGNORMAL	3156.9356	3286.9969	3200	3200
SODIUM	µg/L	5	5	55040	0.7871	0.7874	0.762	LOGNORMAL	61440.1205	62357.1404	63700	62357.1404
VANADIUM	µg/L	5	5	4.98	0.8685	0.7487	0.762	NORMAL	6.924	13.7867	7.1	6.924
ZINC	µg/L	5	5	78.96	0.8523	0.814	0.762	NORMAL	90.6869	95.2375	90.4	90.4
1,1,1-TRICHLOROETHANE	µg/L	1	13	0.4692	0.3111	0.3111	0.866	LOGNORMAL	0.5241	0.6362	0.1	0.1
1,1-DICHLOROETHENE	µg/L	3	13	0.4154	0.5559	0.5569	0.866	LOGNORMAL	0.4957	0.6679	0.2	0.2
2-BUTANONE	µg/L	11	11	16.3364	0.8954	0.8568	0.85	NORMAL	17.7835	18.1422	21	17.7835
ACETONE	µg/L	6	6	308.8333	0.9306	0.9395	0.788	LOGNORMAL	520.3132	3918.2254	725.1	725.1
BROMODICHLOROMETHANE	µg/L	1	13	0.4692	0.3111	0.3111	0.866	LOGNORMAL	0.5241	0.6362	0.1	0.1
BROMOFORM	µg/L	6	13	0.5154	0.887	0.8447	0.866	NORMAL	0.5642	0.5774	0.7	0.5642
DIBROMOCHLOROMETHANE	µg/L	6	13	0.4231	0.7072	0.6534	0.866	LOGNORMAL	0.477	0.5151	0.4	0.4
ETHYLBENZENE	µg/L	9	13	0.9308	0.4813	0.6799	0.866	LOGNORMAL	1.3981	1.2886	4	1.2886
ETHYL ETHER	µg/L	13	13	93.1462	0.9749	0.7347	0.866	NORMAL	120.3022	430.2021	197	120.3022
STYRENE	µg/L	9	13	0.9923	0.6848	0.941	0.866	LOGNORMAL	1.4937	1.7381	4	1.7381
TOLUENE	µg/L	4	13	0.3769	0.5919	0.5919	0.866	LOGNORMAL	0.4719	0.7158	0.1	0.1
TRICHLOROETHENE	µg/L	12	13	11.7231	0.9421	0.7143	0.866	NORMAL	15.1895	67.2014	21.3	15.1895
VINYL CHLORIDE	µg/L	8	13	0.5846	0.6515	0.8666	0.866	LOGNORMAL	0.8215	0.8622	2	0.8622
CHLORIDE	µg/L	1	1	43	---	---	---	LOGNORMAL	---	---	43	43
NITRATE/NITRITE	mg/L	1	1	0.452	---	---	---	LOGNORMAL	---	---	0.452	0.452
SULFATE	mg/L	1	1	38	---	---	---	LOGNORMAL	---	---	38	38
TOTAL DISSOLVED SOLIDS	mg/L	1	1	224	---	---	---	LOGNORMAL	---	---	224	224
CIS-1,2-DICHLOROETHENE	µg/L	12	13	7.0231	0.9685	0.7381	0.866	NORMAL	9.0737	28.8244	15	9.0737
TRANS-1,2-DICHLOROETHENE	µg/L	3	13	0.4077	0.5335	0.5335	0.866	LOGNORMAL	0.4944	0.7195	0.1	0.1
TURBIDITY	NTU	1	1	7.71	---	---	---	LOGNORMAL	---	---	7.71	7.71
XYLENES, TOTAL	µg/L	6	13	0.4154	0.7573	0.7131	0.866	LOGNORMAL	0.4931	0.6049	0.6	0.6
NITROCELLULOSE	mg/L	3	3	0.8313	0.8251	0.7827	0.767	NORMAL	1.8391	954537.6901	1.23	1.23
CHROMIUM, FILTERED	µg/L	2	5	0.492	0.7707	0.7548	0.762	NORMAL	0.7534	1.1222	0.89	0.7534
COPPER, FILTERED	µg/L	5	5	9.6	0.9149	0.8633	0.762	NORMAL	12.5503	16.0747	12.5	12.5
LEAD, FILTERED	µg/L	5	5	2.32	0.9425	0.9039	0.762	NORMAL	3.0022	3.6578	3.1	3.0022

INDIAN HEAD
SURFACE WATER - STORM SEWER
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
NICKEL, FILTERED	µg/L	4	5	1.75	0.9153	0.8499	0.762	NORMAL	2.5491	5.4076	2.6	2.5491
ALUMINUM, FILTERED	µg/L	3	5	190.06	0.7502	0.9017	0.762	LOGNORMAL	457.3776	1982900.199	674	674
IRON, FILTERED	µg/L	5	5	545	0.6846	0.6425	0.762	LOGNORMAL	694.7569	904.7637	653	653
MAGNESIUM, FILTERED	µg/L	5	5	2636	0.9406	0.9623	0.762	LOGNORMAL	3343.2844	3675.9888	3750	3675.9888
MANGANESE, FILTERED	µg/L	5	5	90.74	0.87	0.8943	0.762	LOGNORMAL	109.2457	113.8414	121	113.8414
POTASSIUM, FILTERED	µg/L	5	5	2838	0.8685	0.8746	0.762	LOGNORMAL	3000.8435	3124.862	3100	3100
SELENIUM, FILTERED	µg/L	2	5	1.87	0.7654	0.7499	0.762	NORMAL	2.7043	3.5332	3.1	2.7043
SODIUM, FILTERED	µg/L	5	5	53080	0.7591	0.785	0.762	LOGNORMAL	59988.6012	60677.4404	65700	60677.4404
VANADIUM, FILTERED	µg/L	5	5	2.71	0.8623	0.8197	0.762	NORMAL	4.4017	20.5392	4.6	4.4017
ZINC, FILTERED	µg/L	5	5	54.42	0.9821	0.9637	0.762	NORMAL	66.9828	73.4623	72	66.9828
BARIUM, FILTERED	µg/L	5	5	22.42	0.9654	0.9528	0.762	NORMAL	24.6797	25.0892	25.1	24.6797
CALCIUM, FILTERED	µg/L	5	5	11816	0.8976	0.8873	0.762	NORMAL	13921.9218	14676.1374	14100	13921.9218
COBALT, FILTERED	µg/L	5	5	5.84	0.954	0.9609	0.762	LOGNORMAL	6.9694	7.3429	7.6	7.3429
DISSOLVED OXYGEN	mg/L	1	1	9.7	---	---	---	LOGNORMAL	---	---	9.7	9.7
TOTAL ORGANIC CARBON	mg/L	2	2	2.2	---	---	---	LOGNORMAL	---	---	2.32	2.32

INDIAN HEAD
SEDIMENT - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		2	2	7.68	---	---	---	LOGNORMAL	---	---	7.85	7.85
ALUMINUM	mg/kg	2	2	1039.5	---	---	---	LOGNORMAL	---	---	1480	1480
ARSENIC	mg/kg	2	2	3.05	---	---	---	LOGNORMAL	---	---	4.7	4.7
BARIUM	mg/kg	2	2	7.7	---	---	---	LOGNORMAL	---	---	8	8
BERYLLIUM	mg/kg	2	2	0.16	---	---	---	LOGNORMAL	---	---	0.16	0.16
CADMIUM	mg/kg	2	2	0.17	---	---	---	LOGNORMAL	---	---	0.26	0.26
CALCIUM	mg/kg	2	2	402.5	---	---	---	LOGNORMAL	---	---	696	696
CHROMIUM	mg/kg	2	2	6	---	---	---	LOGNORMAL	---	---	10.7	10.7
COBALT	mg/kg	2	2	3.35	---	---	---	LOGNORMAL	---	---	5	5
COPPER	mg/kg	2	2	4.3	---	---	---	LOGNORMAL	---	---	6.9	6.9
CYANIDE	mg/kg	2	2	0.58	---	---	---	LOGNORMAL	---	---	0.61	0.61
IRON	mg/kg	2	2	4635	---	---	---	LOGNORMAL	---	---	7440	7440
LEAD	mg/kg	2	2	10.65	---	---	---	LOGNORMAL	---	---	18.8	18.8
MAGNESIUM	mg/kg	2	2	623.3	---	---	---	LOGNORMAL	---	---	1180	1180
MANGANESE	mg/kg	2	2	56	---	---	---	LOGNORMAL	---	---	96.4	96.4
MERCURY	mg/kg	1	2	0.955	---	---	---	LOGNORMAL	---	---	1.9	1.9
NICKEL	mg/kg	2	2	5.47	---	---	---	LOGNORMAL	---	---	10	10
POTASSIUM	mg/kg	2	2	183	---	---	---	LOGNORMAL	---	---	214	214
SODIUM	mg/kg	2	2	137.9	---	---	---	LOGNORMAL	---	---	208	208
VANADIUM	mg/kg	2	2	7.2	---	---	---	LOGNORMAL	---	---	9	9
ZINC	mg/kg	2	2	67.55	---	---	---	LOGNORMAL	---	---	126	126
ACETONE	µg/kg	1	5	11.2	0.5712	0.5989	0.762	LOGNORMAL	21.7561	42.4813	31	31
CARBON DISULFIDE	µg/kg	1	5	5.7	0.6437	0.6198	0.762	LOGNORMAL	7.1538	8.859	3	3
ANTHRACENE	µg/kg	1	2	139.5	---	---	---	LOGNORMAL	---	---	59	59
BENZO(A)ANTHRACENE	µg/kg	1	2	200	---	---	---	LOGNORMAL	---	---	180	180
BENZO(A)PYRENE	µg/kg	1	2	170	---	---	---	LOGNORMAL	---	---	120	120
BENZO(B)FLUORANTHENE	µg/kg	1	2	255	---	---	---	LOGNORMAL	---	---	290	290
BENZO(G,H,I)PERYLENE	µg/kg	1	2	138.5	---	---	---	LOGNORMAL	---	---	57	57
BENZO(K)FLUORANTHENE	µg/kg	1	2	148.5	---	---	---	LOGNORMAL	---	---	77	77
BIS(2-ETHYLHEXYL)PHTHALATE	µg/kg	1	2	133	---	---	---	LOGNORMAL	---	---	46	46
CHRYSENE	µg/kg	1	2	190	---	---	---	LOGNORMAL	---	---	160	160
DI-N-BUTYL PHTHALATE	µg/kg	1	2	140.5	---	---	---	LOGNORMAL	---	---	61	61
FLUORANTHENE	µg/kg	1	2	300	---	---	---	LOGNORMAL	---	---	380	380
FLUORENE	µg/kg	1	2	132	---	---	---	LOGNORMAL	---	---	44	44
INDENO(1,2,3-CD)PYRENE	µg/kg	1	2	152	---	---	---	LOGNORMAL	---	---	84	84
PHENANTHRENE	µg/kg	1	2	250	---	---	---	LOGNORMAL	---	---	280	280
PYRENE	µg/kg	1	2	275	---	---	---	LOGNORMAL	---	---	330	330
4,4'-DDE	µg/kg	1	2	1.22	---	---	---	LOGNORMAL	---	---	0.34	0.34
4,4'-DDT	µg/kg	1	2	1.53	---	---	---	LOGNORMAL	---	---	0.96	0.96
ACID VOLATILE SULFIDE	mg/kg	1	2	54.925	---	---	---	LOGNORMAL	---	---	81.3	81.3
CADMIUM(SEM)	mg/kg	2	2	0.09	---	---	---	LOGNORMAL	---	---	0.16	0.16
COPPER(SEM)	mg/kg	2	2	1.34	---	---	---	LOGNORMAL	---	---	2.1	2.1

INDIAN HEAD
SEDIMENT - DOWNGRADIENT
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
LEAD(SEM)	mg/kg	2	2	7.9	---	---	---	LOGNORMAL	---	---	12.7	12.7
MERCURY(SEM)	mg/kg	2	2	6.856	---	---	---	LOGNORMAL	---	---	13.7	13.7
NICKEL(SEM)	mg/kg	2	2	1.12	---	---	---	LOGNORMAL	---	---	1.7	1.7
ZINC(SEM)	mg/kg	2	2	26.4	---	---	---	LOGNORMAL	---	---	48	48
4,4'-DDD	µg/kg	1	2	1.75	---	---	---	LOGNORMAL	---	---	1.4	1.4
TOTAL ORGANIC CARBON	mg/kg	2	2	14750	---	---	---	LOGNORMAL	---	---	18800	18800

INDIAN HEAD
SEDIMENT - STORM SEWER
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
PH		1	1	7.21	---	---	---	LOGNORMAL	---	---	7.21	7.21
ALUMINUM	mg/kg	1	1	2260	---	---	---	LOGNORMAL	---	---	2260	2260
ANTIMONY	mg/kg	1	1	3	---	---	---	LOGNORMAL	---	---	3	3
ARSENIC	mg/kg	1	1	8.4	---	---	---	LOGNORMAL	---	---	8.4	8.4
BARIUM	mg/kg	1	1	23.2	---	---	---	LOGNORMAL	---	---	23.2	23.2
BERYLLIUM	mg/kg	1	1	0.27	---	---	---	LOGNORMAL	---	---	0.27	0.27
CADMIUM	mg/kg	1	1	0.76	---	---	---	LOGNORMAL	---	---	0.76	0.76
CALCIUM	mg/kg	1	1	2870	---	---	---	LOGNORMAL	---	---	2870	2870
CHROMIUM	mg/kg	1	1	12.6	---	---	---	LOGNORMAL	---	---	12.6	12.6
COBALT	mg/kg	1	1	7.7	---	---	---	LOGNORMAL	---	---	7.7	7.7
COPPER	mg/kg	1	1	103	---	---	---	LOGNORMAL	---	---	103	103
CYANIDE	mg/kg	1	1	0.76	---	---	---	LOGNORMAL	---	---	0.76	0.76
IRON	mg/kg	1	1	20800	---	---	---	LOGNORMAL	---	---	20800	20800
LEAD	mg/kg	1	1	182	---	---	---	LOGNORMAL	---	---	182	182
MAGNESIUM	mg/kg	1	1	2070	---	---	---	LOGNORMAL	---	---	2070	2070
MANGANESE	mg/kg	1	1	150	---	---	---	LOGNORMAL	---	---	150	150
MERCURY	mg/kg	1	1	0.45	---	---	---	LOGNORMAL	---	---	0.45	0.45
NICKEL	mg/kg	1	1	24.9	---	---	---	LOGNORMAL	---	---	24.9	24.9
POTASSIUM	mg/kg	1	1	187	---	---	---	LOGNORMAL	---	---	187	187
SILVER	mg/kg	1	1	0.15	---	---	---	LOGNORMAL	---	---	0.15	0.15
SODIUM	mg/kg	1	1	118	---	---	---	LOGNORMAL	---	---	118	118
VANADIUM	mg/kg	1	1	118	---	---	---	LOGNORMAL	---	---	118	118
ZINC	mg/kg	1	1	183	---	---	---	LOGNORMAL	---	---	183	183
1,1-DICHLOROETHENE	µg/kg	1	1	9	---	---	---	LOGNORMAL	---	---	9	9
ACETONE	µg/kg	1	1	28	---	---	---	LOGNORMAL	---	---	28	28
ETHYLBENZENE	µg/kg	1	1	2	---	---	---	LOGNORMAL	---	---	2	2
ETHYL ETHER	µg/kg	1	1	14	---	---	---	LOGNORMAL	---	---	14	14
TRICHLOROETHENE	µg/kg	1	1	18	---	---	---	LOGNORMAL	---	---	18	18
VINYL CHLORIDE	µg/kg	1	1	1000	---	---	---	LOGNORMAL	---	---	1000	1000
ACENAPHTHENE	µg/kg	1	1	84	---	---	---	LOGNORMAL	---	---	84	84
ANTHRACENE	µg/kg	1	1	190	---	---	---	LOGNORMAL	---	---	190	190
BENZO(A)ANTHRACENE	µg/kg	1	1	420	---	---	---	LOGNORMAL	---	---	420	420
BENZO(A)PYRENE	µg/kg	1	1	300	---	---	---	LOGNORMAL	---	---	300	300
BENZO(B)FLUORANTHENE	µg/kg	1	1	500	---	---	---	LOGNORMAL	---	---	500	500
BENZO(G,H,I)PERYLENE	µg/kg	1	1	190	---	---	---	LOGNORMAL	---	---	190	190
BENZO(K)FLUORANTHENE	µg/kg	1	1	140	---	---	---	LOGNORMAL	---	---	140	140
BIS(2-ETHYLHEXYL)PHTHALATE	µg/kg	1	1	180	---	---	---	LOGNORMAL	---	---	180	180
CARBAZOLE	µg/kg	1	1	82	---	---	---	LOGNORMAL	---	---	82	82
CHRYSENE	µg/kg	1	1	340	---	---	---	LOGNORMAL	---	---	340	340
DIBENZO(A,H)ANTHRACENE	µg/kg	1	1	50	---	---	---	LOGNORMAL	---	---	50	50
DIBENZOFURAN	µg/kg	1	1	80	---	---	---	LOGNORMAL	---	---	80	80
FLUORANTHENE	µg/kg	1	1	750	---	---	---	LOGNORMAL	---	---	750	750

INDIAN HEAD
SEDIMENT - STORM SEWER
95% UPPER CONFIDENCE LIMITS

PARAMETER	UNITS	DETECTS	COUNT	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
FLUORENE	µg/kg	1	1	130	---	---	---	LOGNORMAL	---	---	130	130
INDENO(1,2,3-CD)PYRENE	µg/kg	1	1	160	---	---	---	LOGNORMAL	---	---	160	160
N-NITROSODIPHENYLAMINE	µg/kg	1	1	50	---	---	---	LOGNORMAL	---	---	50	50
NAPHTHALENE	µg/kg	1	1	180	---	---	---	LOGNORMAL	---	---	180	180
PHENANTHRENE	µg/kg	1	1	810	---	---	---	LOGNORMAL	---	---	810	810
PYRENE	µg/kg	1	1	720	---	---	---	LOGNORMAL	---	---	720	720
GAMMA-CHLORDANE	µg/kg	1	1	2.1	---	---	---	LOGNORMAL	---	---	2.1	2.1
CIS-1,2-DICHLOROETHENE	µg/kg	1	1	6300	---	---	---	LOGNORMAL	---	---	6300	6300
TRANS-1,2-DICHLOROETHENE	µg/kg	1	1	14	---	---	---	LOGNORMAL	---	---	14	14
ACID VOLATILE SULFIDE	mg/kg	1	1	64.4	---	---	---	LOGNORMAL	---	---	64.4	64.4
CADMIUM(SEM)	mg/kg	1	1	0.25	---	---	---	LOGNORMAL	---	---	0.25	0.25
COPPER(SEM)	mg/kg	1	1	62.9	---	---	---	LOGNORMAL	---	---	62.9	62.9
LEAD(SEM)	mg/kg	1	1	140	---	---	---	LOGNORMAL	---	---	140	140
MERCURY(SEM)	mg/kg	1	1	0.006	---	---	---	LOGNORMAL	---	---	0.006	0.006
NICKEL(SEM)	mg/kg	1	1	3.9	---	---	---	LOGNORMAL	---	---	3.9	3.9
ZINC(SEM)	mg/kg	1	1	78	---	---	---	LOGNORMAL	---	---	78	78
2-METHYLNAPHTHALENE	µg/kg	1	1	90	---	---	---	LOGNORMAL	---	---	90	90
TOTAL ORGANIC CARBON	mg/kg	1	1	16000	---	---	---	LOGNORMAL	---	---	16000	16000

APPENDIX K

SUPPORTING INFORMATION FOR HUMAN HEALTH RISK ASSESSMENT

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APPENDIX K.1

TOXICOLOGICAL PROFILES FOR CHEMICALS OF POTENTIAL CONCERN

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K.1.1 1,1-DICHLOROETHENE

Noncancer Toxicity

Chronic oral exposure of laboratory animals to 1,1-dichloroethene induced liver effects (EPA 1998b). In animals, inhalation exposure induced degenerative changes in the liver and kidneys (ATSDR 1992). No health effects were observed in a limited study of 138 exposed workers (ACGIH 1986). The EPA (1998b) presented a verified RfD for chronic oral exposure of 0.009 mg/kg/day, based on an NOAEL for liver effects in a chronic drinking water study in rats and an uncertainty factor of 1000. The EPA (1998) presented the same value a s a provisional subchronic oral RfD. The liver and kidneys are the target organs for exposure to 1,1-dichloroethene.

Carcinogenicity

EPA classified 1,1-dichloroethene as a cancer weight-of-evidence Group C compound (possible human carcinogen), based on an inadequate occupational exposure cancer study, limited data in several animal studies, its mutagenicity and ability to alkylate deoxyribonucleic acid (DNA), and its structural similarity to vinyl chloride (a known human carcinogen) (EPA 1998). The eighteen available animal studies (11 by inhalation exposure, 5 by oral exposure, and 1 each by dermal application and subcutaneous injection) were limited in sensitivity by various deficiencies in design. Credible evidence that 1,1-dichlorethene was a complete carcinogen was provide only by one 12-month inhalation study in mice, in which the incidence of kidney adenocarcinomas was significantly greater in the high-dose males than in the control males. A slope factor of 0.6 per mg/kg/day for oral exposure was based on the increase incidence of adrenal pheochromocytomas in male rats treated by gavage for two years, even though the increase was not statistically significant (EPA, 1998). A unit risk for inhalation exposure of 5.0E-05 per mg/m^3 was based on the incidence of kidney adenocarcinomas in male mice in the inhalation study mentioned above (EPA, 1998). The unit risk is equivalent to 0.175 per mg/kg/day, assuming humans inhale 20 m^3 of air/day and weight 70 kg.

K.1.2 1,2-DICHLOROETHANE

Pharmacokinetics

1,2-Dichloroethane is readily absorbed through the lungs following inhalation exposure. Blood levels, in rats, reach steady state within 2-3 hours after the onset of a 6-hour exposure to 50-250 ppm. The absorption does not appear to be linear. 1,2-Dichloroethane is lipophilic and is distributed throughout the body. Un-metabolized 1,2-dichloroethane is excreted in the urine with some exhaled as CO_2. The half-life of whole body elimination is 6-8 hours after occupational exposure in man (EPA, September 1994).

Noncancer Toxicity

Oral or inhalation exposure of humans or laboratory animals to 1,2-dichloroethane induced liver and kidney effects (ACGIH, 1991). Inhalation exposure also induced pulmonary congestion or edema, and, in humans, CNS depression. The EPA (1998a) presented an oral RfD of 0.03 mg/kg/day. The EPA (September 1994) presented a provisional inhalation RfC of 0.005 mg/m^3 based on a LOAEL for liver and gallbladder disease in workers exposed to 10-15 ppm and an uncertainty factor of 3000. The inhalation RfC value is equivalent to 0.0014 mg/kg/day, assuming an inhalation rate of 20 m^3 of air/day and a body weight of 70 kg for humans. The target organs for 1,2-dichloroethane toxicity are the liver, kidney, lung, gastrointestinal tract, mucous membranes, and CNS.

Studies concluded that 1,2-dichloroethane does not have the potential to produce adverse reproductive or developmental effects at maternally non-toxic levels.

Carcinogenicity

EPA classifies 1,2-dichloroethane as a cancer weight-of-evidence Group B2 compound (probable human carcinogen), based on the induction of several tumor types in rats and mice treated by gavage, and on the induction of benign lung papillomas in mice after dermal application (EPA, July 1998). The EPA (July 1998b) presented a slope factor for oral exposure of 0.091 per mg/kg/day, and a unit risk for inhalation exposure of 2.6E-05 per ug/m^3, based on the incidence of vascular system hemangiosarcomas in male rats in the gavage study. The inhalation unit risk is equivalent to 0.091 per mg/kg/day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg (EPA, July 1998).

K.1.3 1,2-DICHLOROETHENE, TOTAL (1,2-DICHLOROETHYLENE, TOTAL) CIS-1,2-DICHLOROETHENE (CIS-1,2-DICHLOROETHYLENE)

Noncancer Toxicity

Repeated oral exposure of rats to cis-1,2-dichloroethene was associated with signs of anemia (decreased hematocrit and hemoglobin) (EPA 1998). Inhalation exposure to isomeric mixtures of 1,2-dichloroethene induced narcosis, and mixed isomers of 1,2-dichloroethene were used as an anesthetic gas (ACGIH 1991). The EPA (1998) presented a provisional chronic oral RfD of 0.01 mg/kg/day based on an NOAEL for signs of anemia in rats and an uncertainty factor of 3000. A provisional subchronic oral RfD of 0.1 mg/kg/day was derived from the same NOAEL and an uncertainty factor of 300. Target organs appear to be the erythrocyte for oral exposure and the CNS for inhalation exposure.

Carcinogenicity

The EPA (1998) classifies cis-1,2-dichloroethene as a cancer weight-of-evidence Group D compound (not classifiable as to carcinogenicity to humans), based on an absence of human or animal cancer data. Quantitative estimates of cancer risk are not derived for Group D chemicals.

K.1.4 ACETONE

Noncancer Toxicity

Studies of workers exposed to acetone revealed irritation of the ocular and respiratory tract mucosa, and, at high concentrations, central nervous system (CNS) effects (American Conference of Governmental Industrial Hygienists [ACGIH] 1991). Rats exposed by inhalation to high concentrations exhibited narcosis and slight decreases in organ and body weight, compared with controls, but no clinical pathological or histopathological evidence of organ damage. Inhalation reference concentration (RfC) values were not located for acetone. Oral toxicity data are limited to a comprehensive 90-day gavage study in rats, in which 100 mg/kg/day was a no observed effect level (NOEL) and 500 mg/kg/day was the lowest observed adverse effect level (LOAEL) associated with increased liver and kidney weight and tubular nephropathy (EPA 1998). A verified reference dose RfD for chronic oral exposure of 0.1 mg/kg/day was derived by applying an uncertainty factor of 1000 to the NOEL of 100 mg/kg/day. The EPA (1998) presented a provisional subchronic oral RfD of 1 mg/kg/day, based on the same NOEL and an uncertainty factor of 100. The target organs for inhalation exposure to acetone are the CNS and the respiratory and ocular mucosa. Target organs for oral exposure are the liver and kidney.

Carcinogenicity

No data was located on the carcinogenicity of acetone.

K.1.5 CHLOROFORM

Noncancer Toxicty

Oral or inhalation exposure of animals to chloroform was associated with liver and kidney damage (ACGIH 1991; EPA 1998). In humans, acute inhalation exposure to high levels induced narcosis, ventricular fibrillation, and death (ACGIH 1991). Limited occupational data associated chronic exposure to chloroform with CNS depression, digestive disturbances, and enlarged livers. The EPA (1998) presented a verified chronic oral RfD of 0.01 mg/kg/day based on an LOAEL for fatty cyst formation in the livers of dogs treated orally for 7.5 years and an uncertainty factor of 1000. The same value was presented as a provisional subchronic oral RfD (EPA 1998). The EPA (1998) presented an inhalation RfD of 0.086 ug/kg/day. Target organs for the toxicity of chloroform include the liver and kidney for oral and inhalation exposure, and the heart and CNS for inhalation exposure.

Carcinogenicity

Chloroform is classified as a cancer weight-of-evidence group B2 compound (probable human carcinogen), based on increased incidence of several tumor types in rats and liver tumors in mice (EPA 1998). Human carcinogenicity data are inadequate. An oral slope factor of 0.0061 per mg/kg/day was derived from the incidence of kidney tumors in rats treated with chloroform in drinking water for two years. An inhalation unit risk of 2.3E-05 per mg/m^3 was based on the incidence of hepatocellular carcinomas in mice treated by gavage for 78 weeks. The inhalation unit risk is equivalent to 0.081 per mg/kg/day, assuming an inhalation rate of 20 m^3/day and a body weight of 70 kg for humans.

K.1.6 ETHYL ETHER

Noncancer Toxicity

Information regarding oral exposure to ethyl ether is limited to acute oral exposure. An evaluation of a19 week oral toxicity study in rats revealed marked toxicity of ethyl ether at a dose of 3500 mg/kg-day, including mortality, decreased food intake, and body weight loss. Histological evaluation showed no effect on tissue. The oral reference dose is 0.2 mg/kg-day with a modifying factor of 3000 and a modifying factor of 1. No information is available for inhalation of ethyl ether.

Carcinogenicity

No information is available for oral or inhalation cancer slope factors or toxicity.

K.1.7 TETRACHLOROETHENE

Noncancer Toxicity

Occupational (inhalation and dermal) exposure to tetrachloroethene was associated with neuralgic effects, beginning with incoordination and progressing to dizziness, headache, vertigo, and unconsciousness (ACGIH 1986). The EPA (1999) presented a verified chronic oral RfD for tetrachloroethene of 0.01 mg/kg/day based on an NOAEL for liver toxicity in mice in a subchronic gavage study, and on an NOEL for depressed body weight gain in rats in a subchronic drinking water study. An uncertainty factor of 1000 was used. The EPA (1997) presented a provisional subchronic oral RfD of 0.1 mg/kg/day based on the same NOEL and an uncertainty factor of 100. The EPA (1999) presents an inhalation RfD of 0.14 mg/kg/day. The CNS is the principal target organ for inhalation exposure and the liver is the principal target organ for oral exposure to tetrachloroethene.

Carcinogenicity

Inhalation exposure to tetrachloroethene induced mononuclear clell leukemia in rats, and inhalation or oral exposure induced hepatocellular carcinomas in mice (ATSDR 1995a). Occupational exposure data do not suggest a carcinogenic role for tetrachloroethene in humans (ACGIH 1986). Interpretation of the data regarding the carcinogenicity of tetrachloroethene is controversial and the EPA (1999) has not adopted a final position on the cancer weight-of-evidence classification. The EPA has presented an oral slope factor of 0.052 per mg/kg/day and an inhalation slope factor of 0.002 per mg/kg/day (EPA 1998).

K.1.8 TRICHLOROETHENE

Noncancer Toxicity

Little is known about the toxicity of prolonged oral exposure to trichloroethene. Acute inhalation exposure to high levels induced anesthesia, tachypnea, and ventricular arrhythmias (ACGIH 1986). Occupational exposure was associated with headache, dizziness, lassitude, and other CNS effects. Prolonged inhalation exposure of animals affected the liver and kidneys. An oral RfD of 0.006 mg/kg/day was presented by EPA (1998). An inhalation RfC value was not located for trichloroethene in IRIS or HEAST. The principal target organs for trichloroethene are the CNS and heart, and, to a lesser extent, the liver and kidney.

Carcinogenicity

Carcinogenicity studies in laboratory animals showed increased incidence of hepatocellular carcinomas (gavage exposure) and malignant lymphomas (inhalation exposure) in mice and increased incidence of renal adenocarcinomas in male rats (gavage) (ATSDR, 1995). Cancer studies in humans were inadequate. Interpretation of the data regarding the carcinogenicity of trichloroethene is controversial, and the EPA (1998) has not adopted a final position on a cancer weight-of-evidence classification. Currently, EPA believes the weight-of-evidence to be on the C-B2 continuum (possible-probable human carcinogen), and offers slope factor of 0.011 per mg/kg/day for oral exposure and 0.006 per mg/kg/day for inhalation exposure as being useful.

K.1.9 VINYL CHLORIDE

Noncancer Toxicity

Data were not located regarding oral exposure of humans to vinyl chloride (ATSDR 1995b). In rats, lifetime dietary ingestion of vinyl chloride slightly but significantly increased mortality and induced mild histopathologic effects in the liver. Several early occupational studies associated vinyl chloride exposure with a syndrome known as vinyl chloride disease, which includes acroosteolysis (dissolution of the ends of the distal phalanges of the hands), circulatory disturbances in the extremities, Raynaud syndrome (sudden, recurrent bilateral cyanosis of the digits), scleroderma, hematologic effects, effects on the lungs, and imparied liver function and liver damage. Mild neurologic effects were also associated with occupational exposure. Long-term inhalation studies in rats and mice identified elevated relative liver weight as a sensitive indictor of liver effects. Neither inhalation RfC values nor oral RfD values for vinyl chloride were located. The principal target organs for vinyl chloride appear to be the CNS and the liver.

Carcinogenicity

The EPA (1998) lists vinyl chloride as a EPA cancer weight-of-evidence Group A compound (human carcinogen) and presents a verified oral slope factor of 1.9 per mg/kg/day, based on the increased incidence of liver and lung tumors in a lifetime dietary study in rats. An inhalation unit risk of 8.4E-05 per mg/m^3, equivalent to 0.3 per mg/kg/day, assuming humans inhale 20 m^3 of air/day and weight 70 kg, is based on liver tumors in rats intermittently exposed by inhalation for 12 months.

K.1.10 BENZO[A]ANTHRACENE

Noncancer Toxicity

The oral and inhalation RfD and RfC are not available at this time (EPA 1998).

Carcinogenicity

Benzo[a]anthracene has a weight of evidence classification of B2, a probable human carcinogen. The classification was based on sufficient data from animal bioassays. Benzo[a]anthracene produced tumors in mice exposed by gavage; intraperitoneal, subcutaneous or intramuscular injection; and topical application. Benzo[a]anthracene produced mutations in bacteria and in mammalian cells, and transformed mammalian cells in culture.

Although there are no human data that specifically link exposure to benzo[a]anthracene to human cancers, benzo[a]anthracene is a component of mixtures that have been associated with human cancer. These include coal tar, soot, coke oven emissions and cigarette smoke (U.S. EPA, 1984, 1990; IARC, 1984; Lee et al., 1976; Brockhaus and Tomingas, 1976).

Benzo[a]anthracene administration caused an increase in the incidence of tumors by gavage (Klein, 1963); dermal application (IARC, 1973); and both subcutaneous injection (Steiner and Faulk, 1951; Steiner and Edgecomb, 1952) and intraperitoneal injection (Wislocki et al., 1986) assays. A group of male mice was exposed to gavage solutions containing 3% benzo[a]anthracene for 5 weeks. There was an increased incidence of pulmonary adenomas and hepatomas.

Supporting data for carcinogenicity include genetic mutations in five different strains of Salmonella typhimurium. Benzo[a]anthracene produced positive results in an assay for mutations in Drosophila melongaster (Fahmy and Fahmy, 1973).

The currently used Oral Slope Factor (CSF) for Benzo[a]anthracene is 7.3E-01 per (mg/kg)/day which is extrapolated from the CSF for Benzo[a]pyrene (BaP), i.e., 0.1 x 7.3 (BaP) = 7.3E-01 per (mg/kg)/day (USEPA Region III Risk-Based Concentration Table, 4/1/98).

The inhalation CSF is not available.

K.1.11 BENZO(B)FLUORANTHENE

Noncancer Toxicity

Little information is available on benzo(b)fluoranthene. However, based on the similarities of chemical structures, most properties should be similar to benzo(a)pyrene.

Carcinogenicity

A Clement's relative potency factor (RFP) has been developed (Clement International, 1990) for benzo(b)fluoranthene which allows the estimation of CSFs of 9.0E-01 and 7.5E-01 mg/kg/day for the oral and inhalation routes respectively. The EPA (1993) has classified benzo(b)fluoranthene in cancer weight-of-evidence Group B2 (Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans) based on lung tumors in mice. The currently used Oral Slope Factor (CSF) for benzo(b)fluoranthene is 7.3E-01 per (mg/kg)/day which is extrapolated from the CSF for Benzo[a]pyrene (BaP), i.e., 0.1 x 7.3 (BaP) = 7.3E-01 per (mg/kg)/day (USEPA Region III Risk-Based Concentration Table, 4/1/98).

K.1.12 BENZO[A]PYRENE (BAP)

CASRN 50-32-8

Pharmacokinetics

Benzo(a)pyrene was readily absorbed across the GI (Rees et al. 1971) and respiratory epithelia (Kotin et al. 1969; Vainich et al. 1976). Benzo(a)pyrene was distributed widely in the tissues of treated rats and mice, but primarily to tissues high in fat, such as adipose tissue and mammary gland (Kotin et al. 1969; Schlede et al. 1970a).

Studies of the metabolism of benzo(a)pyrene provide information relevant to other PAHs because of the structural similarities of all members of the class. Metabolism involves microsomal mixed function oxidase hydroxylation of one or more of the phenyl rings with the formation of phenols and dihydrodiols, probably via formation of arene oxide intermediates (EPA 1979a). The dihydrodiols may be further oxidized to diol epoxides, which, for certain members of the class, are known to be the ultimate carcinogens (LaVoie et al. 1982). Conjugation with glutathione or glucuronic acid, and reduction to tetrahydrotetrols are important detoxification pathways.

Excretion of benzo(a)pyrene residue was reported to be rapid, although quantitative data were not located (EPA 1979b). Excretion occurred mainly via the feces, probably largely due to biliary secretion (Schlede et al. 1970a, 1970b). The EPA (1980) concluded that accumulation in the body tissues of PAHs from chronic low level exposure would be unlikely.

Noncancer Toxicity

REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Not available at this time.

REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Not available at this time.

K.1.13 DIBENZO[A,H]ANTHRACENE

CASRN 53-70-3 (03/01/97)

Noncancer Toxicity

REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Not available at this time.

REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Not available at this time.

Carcinogenicity

Substance Name -- Dibenzo[a,h]anthracene

EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Based on no human data and sufficient data from animal bioassays. Dibenzo[a,h]anthracene produced carcinomas in mice following oral or dermal exposure and injection site tumors in several species following subcutaneous or intramuscular administration. Dibenzo[a,h]anthracene has induced DNA damage and gene mutations in bacteria as well as gene mutations and transformation in several types of mammalian cell cultures.

HUMAN CARCINOGENICITY DATA

None. Although there are no human data that specifically link exposure to dibenzo[a,h]anthracene with human cancers, dibenzo[a]anthracene is a component of mixtures that have been associated with human cancer. These include coal tar, soot, coke oven emissions and cigarette smoke (U.S. EPA, 1984, 1990; IARC, 1984).

ANIMAL CARCINOGENICITY DATA

Sufficient. Dibenzo[a,h]anthracene has been shown to be carcinogenic when administered to mice by the oral route (Snell and Stewart, 1962, 1963). Instead of drinking water DBA/2 mice (21/sex) were given a water-olive oil emulsion containing 0.2 mg/mL dibenzo[a,h]anthracene ad libitum. Average exposure was estimated to be 0.85 mg/day for males and 0.76 mg/day for females. The control groups (25 male and 10 female) received the water-olive oil emulsion in place of water. The mice did not tolerate the olive oil vehicle well and all 4 groups lost weight after a few weeks exposure and eventually became emaciated and dehydrated. Animals that died spontaneously or that became moribund were examined for tumors. The duration of the experiment was 279 and 237 days for males and females, respectively, in the dosed groups and 351 and 226 days for male and female controls. Mice developed pulmonary adenomas (treated males, 14/14; control males 1/23; treated females, 13/13; control females, 0/6), pulmonary carcinomas (treated males, 14/14; control males, 0/23; treated females, 10/13; control females, 0/6), mammary carcinoma (treated females, 12/13; control females, 0/6) and hemangioendothelioma (treated males, 10/14; control males, 0/23; treated females, 6/13; control females, 0/6). No statistical analyses appear to have been performed.

SUPPORTING DATA FOR CARCINOGENICITY

Dibenzo[a,h]anthracene has produced positive results in bacterial DNA damage and mutagenicity assays and in mammalian cell DNA damage, mutagenicity and cell transformation assays. In bacterial DNA damage assays, positive results were obtained in Escherichia coli and Bacillus subtilis at exposure levels of 12-50 ug/well. Dibenzo[a,h]anthracene tested positive for reverse mutation in Salmonella typhimurium strains TA100 and TA98 (3-5 ug/plate) and positive for forward mutation in strain TM677 (21 ug/mL) (McCann et al., 1975; Andrews et al., 1978; Baker et al., 1980; Hermann, 1981; Kaden et al., 1979). In mammalian cell DNA damage assays, positive results were obtained in human foreskin epithelial cells not activated with mixed-function oxidase (MFO) inducers (1-100 ug/mL) and in HeLa cells (28 ng/mL) activated with 3-methylcholanthrene (Lake et al., 1978; Martin et al., 1978). When Syrian hamster embryo cells and rat hepatocytes not activated with MFO inducers were exposed to 20-30 ug/mL the results were not positive (Casto, 1979; Probst et al., 1981). Dibenzo[a,h]anthracene induced forward mutations in Chinese hamster embryo cells exposed to concentrations of 1 ug/mL or greater (Huberman and Sachs, 1976; Krahn and Heidelberger, 1977; Huberman, 1978). It transformed several types of mammalian cells exposed to concentrations of 10 ug/mL or greater; these cell types included: Syrian hamster embryo cells, mouse C3H10T 1/2 cells and mouse prostate C3H cells (DiPaolo et al., 1969; Chen and Heidelberger, 1969; Pienta et al., 1977; Casto et al., 1977; Casto, 1979; Reznikoff et al., 1973; Lubet et al., 1983).

QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

The currently used Oral Slope Factor (CSF) for Dibenzo[a,h]anthracene is 7.3E+00 per (mg/kg)/day which is extrapolated from the CSF for Benzo[a]pyrene (BaP = 7.3 per (mg/kg)/day) (USEPA Region III Risk-Based Concentration Table, 4/1/98).

QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

K.1.14 INDENO(1,2,3-CD)PYRENE

Noncancer Toxicity

Little information was found on the toxicity of indeno(1,2,3-cd)pyrene. Because of its structural similarity its properties should resemble benzo(a)pyrene.

Carcinogenicity

A Toxicity Equivalency Factor (TEF) has been developed for indeno(1,2,3-cd)pyrene (EPA 1993). This allows the estimation of an oral CSF of 0.73 mg/kg/day. The EPA (1998) has classified indeno(1,2,3-cd)pyrene in cancer weight-of-evidence Group B2 (Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans) based on tumors in mice following lung implants.

K.1.15 ARSENIC

Pharmacokinetics

Several studies confirm that soluble inorganic arsenic compounds and organic arsenic compounds are almost completely (>90 percent) absorbed from the GI tract in both animals and humans (Ishinishi et al. 1986). The absorption efficiency of insoluble inorganic arsenic compounds depends on particle size an stomach pH. Initial distribution of absorbed arsenic is to the liver, kidneys, and lungs, flowed by redistribution to hair, nails, teeth, bone, and skin, which are considered tissues of accumulation. Arsenic has a long half-life in the blood of rats, compared with other animals and humans, because of firm binding to the hemoglobin in erythrocytes.

Metabolism of inorganic arsenic includes reversible oxidation-reduction so that both arsenite (valence of 3) and arsenate (valence of 5) are present in the urine of animals treated with arsenic of either valence (Ishinishi et al. 1986). Arsenite is subsequently oxidized and methylated by a saturable mechanism to form mono- or dimethylarsenate; the latter is the predominant metabolite in the urine of animals or humans. Organic arsenic compounds (arsenilic acid, cacodylic acid) are not readily converted to inorganic arsenic. Excretion of organic or inorganic arsenic is largely via the urine, but considerable species variation exists. Continuously exposed humans appear to excrete 60 to 70 percent of their daily intake of arsenate or arsenite via the urine.

Noncancer Toxicity

A lethal dose of arsenic trioxide in humans is 70 to 180 mg. (approximately 50 to 140 mg arsenic; Ishinishi et al. 1986). Acute oral exposure of humans to high doses of arsenic produce liver swelling, skin lesions, disturbed heart function, and neurological effects. The only noncancer effects in humans clearly attributable to chronic oral exposure to arsenic are dermal hyperpigmentation and keratosis, as revealed by studies of several hundred Chinese exposed to naturally occurring arsenic in well water (Tseng 1977; Tseng et al. 1968; EPA 1999). Similar effects were observed in persons exposed to high levels of arsenic in water in Utah and the northern part of Mexico (Cebrian et al. 1983; Southwick et al. 1983). Occupational (predominantly inhalation) exposure is also associated with neurological deficits, anemia, and cardiovascular effects (Ishinishi et al. 1986), but concomitant exposure to other chemicals cannot be ruled out. The EPA (1999) derived an RfD of 0.3 ug/kg/day for chronic oral exposure, based on an NOAEL of 0.8 ug/kg/day for skin lesions from Chinese data. The principal target organ for arsenic appears to be the skin. The nervous system and cardiovascular systems appear to be less significant target organs. Inorganic arsenic may be an essential nutrient, exerting beneficial effects on growth, health, and feed conversion efficiency (Underwood 1977).

Carcinogenicity

Inorganic arsenic is clearly a carcinogen in humans. Inhalation exposure is associated with increased risk of lung cancer in persons employed as smelter workers, in arsenical pesticide applicators, and in a population residing near a pesticide manufacturing plant (EPA 1999). Oral exposure to high levels in well water is associated with increased risk of skin cancer (Tseng 1977; EPA 1999). Extensive animal testing with various forms of arsenic given by many routes of exposure to several species, however, has not demonstrated the carcinogenicity of arsenic (International Agency for Research on Cancer [IARC 1980). The EPA (1999) classifies inorganic arsenic in cancer weight-of-evidence Group A (human carcinogen), and recommends an oral unit risk of 0.00005 ug/L in drinking water, based on the incidence of skin cancer in the Tseng (1977) study. The EPA presents a chronic oral slope factor of 1.5 per mg/kg/day based on the same information. The EPA (1999) notes that the uncertainties associated with the oral unit risk are considerably less than those for most carcinogens, so that the unit risk might be reduced in order of magnitude. An inhalation unit risk of 0.0043 per mg/m^3 was derived for inorganic arsenic from the incidence of lung cancer in occupationally exposed men (EPA 1999), equivalent to 15.1 per mg/kg/day, was derived from the same data assuming an inhalation rate of 20 m^3/day and a body weight of 70 kg for humans.

K.1.16 IRON

Noncancer Toxicity

Iron is potentially toxic in all forms and by all routes of exposure. Inorganic iron is a poison by the intraperitoneal route. The inhalation of large amounts of iron dust may result in iron pneumoconiosis or arc welders lung. Chronic exposure to excess levels of iron (>50-100 mg Iron/day) can result in pathological deposition of iron in tissues. The target organs are the pancreas and liver (Sax and Lewis, 1989).

Iron compounds are of varying toxicity. Iron oxides are a potential risk in all industrial settings. In general, ferrous compounds are more toxic than ferric compounds. Acute exposure to excessive levels of ferrous compounds can cause liver and kidney damage, altered respiratory rates and convulsions (Sax and Lewis, 1989). An oral RfD of 0.3 mg/kg/day has been published for iron by EPA (1998). No inhalation RfD has been found for iron.

Carcinogenicity

Some iron compounds are suspected human carcinogens. Iron dust is an experimental neoplastigen and an increased incidence of lung cancer has been associated with exposure to iron dust. Iron oxide is an experimental tumorigen and a suspected human carcinogen (Sax and Lewis, 1989). EPA has not published oral or inhalation slope factors for iron.

K.1.17 LEAD

Pharmacokinetics

Studies in humans indicate that an average of 10 percent of ingested lead is absorbed, but estimates as high as 40 percent were obtained in some individuals (Tsuchiya, 1986). Nutritional factors have a profound effect on GI absorption efficiency. Children absorb ingested lead more efficiently than adults; absorption efficiencies up to 53 percent were recorded for children three months to eight years of age. Similar results were obtained for laboratory animals; absorption efficiencies of 5 to 10 percent were obtained for adults and > 50 percent were obtained for young animals. The deposition rate of inhaled lead averages approximately 30 to 50 percent, depending on particle size, with as much as 60 percent deposition of very small particles (0.03 mm) near highways. All lead deposited in the lungs is eventually absorbed.

Approximately 95 percent of the lead in the blood is located in the erythrocytes (EPA, 1998). Lead in the plasma exchanges with several body compartments, including the internal organs, bone, and several excretory pathways. In humans, lead concentrations in bone increase with age (Tsuchiya, 1986). About 90 percent of the body burden of lead is located in the skeleton. Neonatal blood concentrations are about 85 percent of maternal concentrations (EPA, 1998). Excretion of absorbed lead is principally through the urine, although GI secretion, biliary excretion, and loss through hair, nails, and sweat are also significant.

Noncancer Toxicity

The noncancer toxicity of lead to humans has been well characterized through decades of medical observation and scientific research (EPA, 1990). The principal effects of acute oral exposure are colic with diffuse paroxysmal abdominal pain (probably due to vagal irritation), anemia, and, in severe cases, acute encephalopathy, particularly in children (Tsuchiya, 1986). The primary effects of long-term exposure are neurological and hematological. Limited occupational data indicate that long-term exposure to lead may induce kidney damage. The principal target organs of lead toxicity are the erythrocyte and the nervous system. Some of the effects on the blood, particularly changes in levels of certain blood enzymes, and subtle neurobehavioral changes in children, appear to occur at levels so low as to be considered nonthreshold effects.

The USEPA (1990; July 1995) determined that it is inappropriate to derive an RfD for oral exposure to lead for several reasons. First, the use of an RfD assumes that a threshold for toxicity exists, below which adverse effects are not expected to occur; however, the most sensitive effects of lead exposure, impaired neurobehavioral development in children and altered blood enzyme levels associated with anemia, may occur at blood lead concentrations so low as to be considered practically nonthreshold in

nature. Second, RfD values are specific for the route of exposure for which they are derived. Lead, however, is ubiquitous, so that exposure occurs from virtually all media and by all pathways simultaneously, making it practically impossible to quantify the contribution to blood lead from any one route of exposure. Finally, the dose-response relationships common to many toxicants, and upon which derivation of an RfD is based, do not hold true for lead. This is because the fate of lead within the body depends, in part, on the amount and rate of previous exposures, the age of the recipient, and the rate of exposure. There is, however, a reasonably good correlation between blood lead concentration and effect. Therefore, blood lead concentration is the appropriate parameter on which to base the regulation of lead.

USEPA (1997) presented no inhalation RfC for lead, but referred to the National Ambient Air Quality Standard (NAAQS) for lead, which could be used in lieu of an inhalation RfC. The NAAQSs are based solely on human health considerations and are designed to protect the most sensitive subgroup of the human population. The NAAQS for lead is 1.5 mg/m^3, averaged quarterly.

Carcinogenicity

USEPA (February 1998) classifies lead in cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate evidence of cancer in humans and sufficient animal evidence. The human data consist of several epidemiologic occupational studies that yielded confusing results. All of the studies lacked quantitative exposure data and failed to control for smoking and concomitant exposure to other possibly carcinogenic metals. Rat and mouse bioassays showed statistically significant increases in renal tumors following dietary and subcutaneous exposure to several soluble lead salts. Various lead compounds were observed to induce chromosomal alterations in vivo and in vitro, sister chromatic exchange in exposed workers, and cell transformation in Syrian hamster embryo cells; to enhance simian adenovirus induction; and to alter molecular processes that regulate gene expression. USEPA (July 1997) declined to estimate risk for oral exposure to lead because many factors (e.g., age, general health, nutritional status, existing body burden and duration of exposure) influence the bioavailability of ingested lead, introducing a great deal of uncertainty into any estimate of risk.

The USEPA IEUBK lead model is an iterated set of equations that estimate blood lead concentration in children aged 0 to 7 years (USEPA, February 1994). The biokinetic part of the model describes the movement of lead between the plasma and several body compartments and estimates the resultant blood lead concentration. The rate of the movement of lead between the plasma and each compartment is a function of the transition or residence time (i.e., the mean time for lead to leave the plasma and enter a given compartment, or the mean residence time for lead in that compartment). Compartments modeled include the erythrocytes, liver, kidneys, all the other soft tissue of the body, cortical bone, and trabecular bone. Excretory pathways and their rates are also modeled. These include the mean time for excretion

from the plasma to the urine, from the liver to the bile, and from the other soft tissues to the hair, skin, sweat, etc. The model permits the user to adjust the transition and residence times.

USEPA guidance (USEPA, July 1994) recommends using 400 mg/kg as a screening level for lead in soil for residential scenarios at CERCLA sties and at RCRA Corrective Action sites. Residential areas with soil lead below 400 mg/kg generally require no further action. However, in some special situations, further study is warranted below the screening level (e.g., wetlands, agricultural areas).

K.1.18 MANGANESE

Noncancer Toxicity

Manganese is nutritionally required in humans for normal growth and health (EPA, 1998). Humans exposed to approximately 0.8 mg manganese/kg/day in drinking water exhibited lethargy, mental disturbances (1/16 committed suicide), and other neurologic effects. The elderly appeared to be more sensitive than children. Oral treatment of laboratory rodents induced biochemical changes in the brain, but rodents did not exhibit the neurological signs exhibited by humans. Occupational exposure to high concentrations in air induced a generally typical spectrum of neurological effects and an increased incidence of pneumonia (ACGIH, 1986).

EPA presented the oral RfD for manganese of 0.02 mg/kg/day (EPA, 1998) based on drinking water. The EPA (1998) presented a verified chronic inhalation RfC based on a LOAEL for impairment of neurobehaviorial function in occupationally exposed humans. The inhalation RfC is equivalent to 0.0143 ug/kg/day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg. The CNS and respiratory tract are target organs of inhalation exposure to manganese.

Carcinogenicity

The EPA (1998) classifies manganese in cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans). Quantitative cancer risk estimates are not derived from Group D chemicals.

K.1.19 VANADIUM

Noncancer Toxicity

The oral toxicity of vanadium compounds to humans is very low (Lagerkvist et al. 1986), probably because little vanadium is absorbed from the GI tract. Effects in humans exposed by inhalation include upper and lower respiratory tract irritation. A provisional subchronic and chronic oral RfD of 0.007 mg/kg/day was derived from an NOEL of 5 ppm in rats in a lifetime drinking water study with vanadyl sulfate and an uncertainty factor of 100 (EPA 1997). A target organ could not be identified for oral exposure. The respiratory tract is the target organ for inhalation exposure.

Carcinogenicity

No information was located regarding the carcinogenicity of vanadium.

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APPENDIX K.2

SAMPLE CALCULATIONS

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT NSWC Indian Head		JOB NUMBER 7129	
SUBJECT Calculation of Risk via Ingestion of Soil			
BASED ON RAGs		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/4/99

Purpose: To calculate Carcinogenic and Noncarcinogenic risk via soil ingestion for a child resident.

Relevant Equations:

$$\text{Intake (mg/Kg-day)} = \frac{C_s \times IR\text{-}S \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where;

C_s = Chemical Concentration in Soil = Chemical specific (mg/kg)
IR-S = Ingestion Rate = 200 (mg/day)
CF = Conversion Factor = 1.0E-6 (Kg/mg)
FI = Fraction Ingested = 1 (unitless)
EF = Exposure Frequency = 350 (days/year)
ED = Exposure Duration = 7 (years)
BW = Body Weight = 15 (Kg)
AT_N = Averaging Time (Noncarcinogens) = 2555 (days)
AT_C = Averaging Time (carcinogens) = 25,550 (days)

The concentration of Trichloroethene in surface/subsurface soil at Site 57 - Downgradient is 0.504 mg/kg.

$$\text{Noncarcinogenic Intake (mg/Kg-day)} = \frac{0.504(\text{mg/kg}) \times 200\,\text{mg/day} \times 1E\text{-}6\,\text{Kg/mg} \times 1 \times 350\,\text{day/yr} \times 7\,\text{yrs}}{15\,\text{kg} \times 2555\,\text{days}}$$

$$= \boxed{6.4E\text{-}6\ \text{mg/Kg-day}}$$

CLIENT NSWC Indian Head		JOB NUMBER 7129	
SUBJECT Calculation of Risk via Ingestion of Soil			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/4/99

Carcinogenic Intake (mg/kg-day) $= \dfrac{0.564\ mg/kg \times 200\ mg/kg \times 1E\text{-}6\ kg/mg \times 1 \times 350\ days/yr \times 7\ yrs}{15\ kg \times 25{,}550\ days}$

$= \boxed{6.44E\text{-}7\ mg/kg\text{-}day}$

These intakes are then used to calculate carcinogenic (Incremental Cancer risk) and noncarcinogenic (Hazard Index) risks where:

Incremental Cancer Risk (ICR) unitless = Cancer Slope Factor (CSF) kg/mg-day × carcinogenic Intake (mg/kg-day)

Hazard Index HI (unitless) = Noncarcinogenic Intake mg/kg-day / Reference dose (RfD) mg/kg-day

Where the CSF for Trichloroethene = 1.1E-2 and the RfD for Trichloroethene = 6.0E-3

ICR = (1.1E-2 kg/mg-day) × (6.44E-7 mg/kg-day) = $\boxed{7.08E\text{-}9}$

HI = 6.4E-6 mg/kg-day / 6.0E-3 mg/kg-day = $\boxed{1.1E\text{-}3}$

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT NSWC Indian Head		JOB NUMBER 7129	
SUBJECT Calculation of Risk via Dermal Contact			
BASED ON RAGs		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

Purpose: To calculate carcinogenic and noncarcinogenic risk via direct dermal contact with soil for a child resident.

Relevant Equations:

$$\text{Dermally Absorbed Dose (mg/kg-day)} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

Cs =	Chemical Concentration in Soil	=	Chemical specific (mg/kg)
CF =	Conversion Factor	=	1E-6 kg/mg
SA =	Surface Area	=	1743 cm^2
AF =	Soil to Skin Adherence Factor	=	0.2 mg/cm^2/event
ABS =	Dermal Absorption Factor	=	Chemical specific (unitless)
EF =	Exposure Frequency	=	350 days/year
ED =	Exposure Duration	=	7 years
BW =	Body Weight	=	15 kg
AT-C =	Averaging Time Carcinogen	=	25,5550 days
AT-N =	Averaging Time noncarcinogen	=	2555 days

The concentration of Tricheloroethene in surface/subsurface soil at Site 57 - Downgradient is 0.504 mg/kg.

$$\text{Noncarcinogenic Intake mg/kg/day} = \frac{0.504\,mg/kg \times 1E\text{-}6\,kg/mg \times 1743\,cm^2 \times 0.2\,mg/cm^2 \times 0.03 \times 350\,days/yr}{15\,kg \times 2555\,days}$$

$$= \boxed{3.37E\text{-}7\ mg/kg\text{-}day}$$

CLIENT NSWC Indian Head		JOB NUMBER 7129	
SUBJECT Calculation of Risk Via Dermal Contact			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

$$\text{Carcinogenic Intake mg/Kg-day} = \frac{0.504\,\frac{mg}{Kg} \times 1E\text{-}6\,\frac{Kg}{mg} \times 1743\,cm^2 \times 0.2\,\frac{mg}{cm^2} \times 0.03 \times 350\,\frac{days}{yr} \times 7\,yrs}{15\,Kg \times 25550\,days}$$

$$= \boxed{3.37E\text{-}8\ mg/Kg\text{-}day}$$

These intakes are then used to calculate carcinogenic (Incremental Cancer Risk) and noncarcinogenic (Hazard Index) risk where:

Incremental Cancer Risk (ICR unitless) = Cancer Slope factor (CSF Kg/mg-day) × Carcinogenic Intake (mg/Kg-day)

Hazard Index (HI unitless) = $\frac{\text{Noncarcinogenic Intake mg/Kg-day}}{\text{Reference Dose mg/Kg-day}}$

Where the CSF for Trichloroethene = 1.1E-2 and the RFD for Trichloroethene = 6.0E-3

$$ICR = 1.1E\text{-}2\ Kg/mg\text{-}day \times 3.37E\text{-}8\ mg/Kg\text{-}day = \boxed{3.7E\text{-}10}$$

$$HI = \frac{3.37E\text{-}7\ mg/Kg\text{-}day}{6.0E\text{-}3\ mg/Kg\text{-}day} = \boxed{5.6E\text{-}5}$$

CLIENT NSWC Indian Head	JOB NUMBER 7617
SUBJECT Calculation of Risk via Inhalation of volatiles in soil	
BASED ON RAGs + SSL Guidance	DRAWING NUMBER
BY KAC / CHECKED BY RJJ	APPROVED BY / DATE 6/7/99

Noncarcinogenic Intake mg/Kg-day $= \dfrac{2.9E\text{-}4\ mg/m^3 \times 3.3\ m^3/hour \times 8\ hrs/day \times 250\ days/year \times 1\ year}{70\ Kg \times 365\ days}$

$= \boxed{7.49E\text{-}5\ mg/Kg\text{-}day}$

Carcinogenic Intake mg/Kg-day $= \dfrac{2.9E\text{-}4\ mg/m^3 \times 3.3\ m^3/hour \times 8\ hrs/day \times 250\ days/year \times 1\ year}{70\ Kg \times 25550\ days}$

$= \boxed{1.07E\text{-}6\ mg/Kg\text{-}day}$

Carcinogenic and noncarcinogenic are then calculated:

Incremental Cancer Risk (ICR unitless) = Cancer Slope Factor (CSF Kg/mg-day) × Carcinogenic Intake (mg/Kg-day)

Hazard Index (HI unitless) = $\dfrac{\text{Noncarcinogenic Intake mg/Kg-day}}{\text{Reference Dose (RfD) mg/Kg-day}}$

Where the CSF for TCE = 6E-3 Kg/mg-day and an inhalation RfD for TCE is not available hence noncarcinogenic risk (Hazard Index) cannot be calculated.

ICR = 1.07E-6 mg/Kg-day × 6E-3 Kg/mg-day = $\boxed{6.6E\text{-}9}$

CLIENT NSWC Indian Head	JOB NUMBER 7617
SUBJECT Calculation of Risk via Inhalation of volatiles in Soil	
BASED ON RAGs and Soil Screening Guidance	DRAWING NUMBER
BY KAC / CHECKED BY RJJ	APPROVED BY / DATE 6/7/99

Purpose: To calculate carcinogenic and noncarcinogenic risk via inhalation of volatiles in soil for the construction worker.

Relevant Equations:

From the Federal Soil Screening Guidance the Chemical Specific soil Saturation Concentration

$$C_{sat} = \frac{S}{pb} \times (Kd \times pb \times \theta w + H' \times \theta a)$$

and if C_{sat} < the C_s then C_{sat} should be substituted for the chemical concentration in soil (C_s).

$$C_{air} = C_s \times \left(\frac{1}{PEF} + \frac{1}{VF}\right)$$

Where:

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4} (m^2/cm^2)}{2 \times pb \times DA}$$

where:

$$DA = \frac{\left[(\theta a^{10/3} \times Di \times H' + \theta w^{10/3} \times DW)/\theta_T^2\right]}{pb \times Kd + \theta w + \theta a \times H'}$$

The example calculation will be completed for Trichloroethene (TCE) in soil from Site 57- Downgradient where the soil concentration of trichloroethene = 0.504 mg/kg

CLIENT NSWC Indian Head	JOB NUMBER 7617
SUBJECT Calculation of Risk via Inhalation of Volatiles in Soil	
BASED ON RAGS and Soil Screening Guidance	DRAWING NUMBER
BY KAC / CHECKED BY RJJ	APPROVED BY / DATE 6/7/99

Csat = Chemical specific soil saturation concentration = Calc mg/kg
Q/C = Inverse of mean conc. at center of source = 79.14 g/m² per kg/m³
T = Exposure Interval = 3.2E+7 seconds
ρb = Dry soil bulk Density = 1.65 g/cm³
ρs = Soil particle density = 2.65 g/cm³
θT = Total soil porosity = 0.377 Lpore/Lsoil
θw = water filled soil porosity = 0.19 Lpore/Lsoil
θa = Air filled soil porosity = 0.187 Lair/Lsoil
Di = Diffusivity in air = 7.9E-2 cm²/sec TCE
H' = Dimensionless Henry's Law Constant = 4.22E-1 TCE
Dw = Diffusivity in air = 9.1E-6 cm²/sec TCE
DA = Apparent Diffusivity = Calc cm²/sec
Kd = Soil-water partition coefficient = 2.66 cm³/g TCE
Koc = Soil Organic carbon partition coefficient = 1.66E+2 cm³/g TCE
foc = Fraction Organic Carbon in soil = 0.016 g/g
PEF = Particulate Emission Factor = 1.32E+9 m³/kg
S = Solubility = 1.1E+3 mg/L TCE
VF = Volatilization Factor = calc m³/kg

$$C_{sat}\ \text{TCE mg/kg} = \frac{1.1E{+}3\ \frac{mg}{L}}{1.65\ g/cm^3} \times \left(2.66\ \frac{cm^3}{g} \times 1.65\ g/cm^3 + 0.19\ \frac{L_{pore}}{L_{soil}} + 4.22E{-}1 \times 0.187\ \frac{L_{air}}{L_{soil}}\right)$$

Csat for TCE (mg/kg) = 3.1E+3 mg/kg

And the Concentration of TCE in soil is 0.504 mg/kg which is less than Csat hence the concentration of ~~TCE~~ 0.504 mg/kg TCE in soil will be used in the calculation of TCE in air.

$$DA\ \text{cm}^2/\text{sec} = \frac{\left[\left(0.187\ \frac{L_{air}}{L_{soil}}^{10/3} \times 7.9E{-}2\ \frac{cm^2}{sec} \times 4.22E{-}1 + 0.19\ \frac{L_{pore}}{L_{soil}}^{10/3} \times 9.1E{-}6\ \frac{cm^2}{sec}\right) / 0.377^2\ \frac{L_{pore}}{L_{soil}}\right]}{1.65\ \frac{g}{cm^3} \times 2.66\ \frac{cm^3}{g} + 0.19\ \frac{L_{pore}}{L_{soil}} + 0.187\ \frac{L_{air}}{L_{soil}} \times 4.22E{-}1}$$

$$DA\ \frac{cm^2}{sec} = \boxed{1.89E{-}4}$$

CLIENT NSWC Indian Head	JOB NUMBER 7617
SUBJECT Calculation of Risk Via Inhalation of Volatiles in Soil	
BASED ON RAGS and Soil Screening Guidance	DRAWING NUMBER
BY KAC / CHECKED BY RJJ	APPROVED BY / DATE 6/7/99

$$VF_{m^3/kg} = \frac{79.14\ g/m^2\ per\ kg/m^3 \times \left(3.14 \times 1.89E{-4}\ \frac{cm^2}{sec} \times 3.2E{+7}\ sec\right)^{1/2} \times 10^{-4}\ (m^2/cm^2)}{2 \times 1.65\ g/cm^3 \times 1.89E{-4}\ cm^2/sec}$$

$$VF\ m^3/kg = \boxed{1.74\ E{+3}}$$

$$C_{air} = C_S \times \left(\frac{1}{PEF} + \frac{1}{VF}\right)$$

Chemical concentration in air mg/m³

$$= 0.504\ mg/kg \times \left(\frac{1}{1.32E{+9}} + \frac{1}{1.74E{+3}}\right)$$

$$C_{air} = \boxed{2.9E{-4}\ mg/m^3}$$

Intake can then be calculated

$$Intake_{mg/kg\text{-}day} = \frac{C_{air} \times IR \times ET \times EF \times ED}{BW \times AT}$$

Where:

C_{air} = Concentration of TCE in air = 2.9E-4 mg/m³
IR = Inhalation Rate = 3.3 m³/hour
ET = Exposure Time = 8 hrs/day
EF = Exposure Frequency = 250 days/year
ED = Exposure Duration = 1 year
BW = Body Weight = 70 kg
AT_N = Averaging Time noncarcinogen = 365 days
AT_C = Averaging Time carcinogens = 25550 days

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT NSWC Indian Head		JOB NUMBER 7617	
SUBJECT Calculation of Risk via Ingestion of Groundwater			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

Purpose: To calculate carcinogenic and noncarcinogenic risk via ingestion of groundwater for the adult resident.

Relevant Equations:

$$\text{Intake (mg/Kg-day)} = \frac{C_W \times IR \times EF \times ED}{BW \times AT}$$

where:

C_W = Chemical Concentration in water = Chemical specific (mg/L)
IR = Ingestion Rate = 2 L/day
EF = Exposure Frequency = 350 days/year
ED = Exposure Duration = 24 years
BW = Body Weight = 70 Kg
AT_N = Averaging Time (noncarcinogens) = 8760 days
AT_C = Averaging Time (carcinogens) = 25,550 days

The concentration of chloroform in groundwater at site 57 Downgradient is 1.3 ug/L.

$$\text{Noncarcinogenic Intake (mg/Kg-day)} = \frac{0.0013\ \text{mg/L} \times 2\ \text{L/day} \times 350\ \text{days/yr} \times 24\ \text{yrs}}{70\ \text{Kg} \times 8760\ \text{days}}$$

$$= \boxed{3.56\text{E-}5\ \text{mg/Kg-day}}$$

$$\text{Carcinogenic Intake (mg/Kg-day)} = \frac{0.0013\ \text{mg/L} \times 2\ \text{L/day} \times 350\ \text{days/yr} \times 24\ \text{years}}{70\ \text{Kg} \times 25550\ \text{days}}$$

$$= \boxed{1.22\text{E-}5\ \text{mg/Kg-day}}$$

CLIENT NSWC Indian Head		JOB NUMBER 7617	
SUBJECT Calculation of Risk via Ingestion of Groundwater			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

These intakes are then used to calculate carcinogenic (Incremental Cancer Risk) and Noncarcinogenic (Hazard Index) risks where:

Incremental Cancer Risk = Cancer Slope Factor x Carcinogenic Intake
(ICR unitless) (CSF Kg/mg-day) mg/Kg-day

Hazard Index = $\frac{\text{Noncarcinogenic Intake (mg/Kg-day)}}{\text{Reference Dose (RfD) (mg/Kg-day)}}$
(HI unitless)

Where the CSF for Chloroform = 6.1E-3 and the RfD = 1.0E-2

ICR = 6.1E-3 Kg/mg-day x 1.22E-5 mg/Kg-day = **7.4E-8**

HI = $\frac{3.6E-5 \text{ mg/Kg-day}}{1.0E-2 \text{ mg/Kg-day}}$ = **3.6E-3**

CLIENT NSWC Indian Head	JOB NUMBER 7617
SUBJECT Calculation of Risk via Dermal Exposure to Groundwater	
BASED ON RAGs	DRAWING NUMBER
BY KAC / CHECKED BY RJJ	APPROVED BY / DATE 6/7/99

Purpose: To calculate carcinogenic and noncarcinogenic risk via dermal contact with groundwater for the adult resident.

Relevant Equation:

DAevent For Organics

If tevent < t*, then $DA_{event} = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times t_{event}}{\pi}}$

If tevent > t*, then $DA_{event} = Kp \times Cw \times CF \times \left[\frac{t_{event}}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

Dermally absorbed Dose (DAD mg/Kg-day) $= \frac{DA_{event} \times EV \times EF \times ED \times SA}{BW \times AT}$

where:

CF = Volumetric Conversion Factor for water = 1L/1E+3 cm3
DAevent = Chemical specific absorbed Dose per event = chemical specific (mg/cm²-event)
Cw = Concentration of Chemical in water = Chemical specific (mg/L)
tevent = duration of event = 0.25 (hr/event)
tau = Chemical Specific lag time = Chemical specific (hr)
t* = Chemical specific time it takes to reach steady state = Chemical specific (hr)
B = Chemical specific dimensionless constant = Chemical specific (unitless)
EV = Event Frequency = 1 event/day
EF = Exposure Frequency = 350 days/year
ED = Exposure Duration = 24 years
SA = Skin Surface Area = 20,000 cm²
BW = Body Weight = 70 Kg
ATN = Averaging Time Noncarcinogens = 8760 days
ATc = Averaging Time carcinogens = 25550 days

CLIENT NSWC Indian Head	JOB NUMBER 7617
SUBJECT Calculation of Risk via Dermal Exposure to Groundwater	
BASED ON RAGS	DRAWING NUMBER
BY KAC / CHECKED BY RJJ	APPROVED BY / DATE 6/7/99

t* for Chloroform = 1.1 which is greater than tevent = 0.25 and the following values are also for chloroform

Cw = 0.0013 mg/L
Kp = 8.90 E-3 cm/hr
Tau = 4.70E-1 hr
B = 9.3 E-3

$$DAevent = 2 \times 8.90E\text{-}3 \frac{cm}{hr} \times 0.0013 \frac{mg}{L} \times 1E\text{-}3 \, L/cm^3 \sqrt{\frac{6 \times 4.7E\text{-}1 \times 0.25}{\pi}}$$

mg/cm²-event

DAevent = **1.1 E-8 mg/cm²-event**

$$\text{Dermally absorbed Dose} = \frac{1.1E\text{-}8 \frac{mg}{cm^2} \times 1 \frac{event}{day} \times 350 \frac{day}{year} \times 24 \text{ years} \times 20000 \, cm^2}{70 \, Kg \times 8760 \text{ days}}$$

mg/kg-day
Noncarcinogenic

= **3.0 E-6 mg/kg-day**

$$\text{Dermally Absorbed Dose} = \frac{1.1E\text{-}8 \frac{mg}{cm^2} \times 1 \frac{event}{day} \times 350 \frac{day}{year} \times 24 \text{ years} \times 20000 \, cm^2}{70 \, Kg \times 25550 \text{ days}}$$

Carcinogens
mg/kg-day

= **1.0 E-6 mg/kg-day**

These Dermally absorbed Doses (DAD) are then used to calculate Carcinogenic risk (Incremental Cancer Risk) and noncarcinogenic risk (Hazard Index) where:

Incremental Cancer Risk (ICR) unitless = Cancer Slope factor (CSF kg/mg-day) × carcinogenic DAD mg/kg-day

Hazard Index (HI) unitless = DAD noncarcinogenic mg/kg-day / Reference Dose (RfD) mg/kg-day

CLIENT NSWC Indian Head		JOB NUMBER 7617	
SUBJECT Calculation of Risk via Dermal Exposure to Groundwater			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

where the CSF for Chloroform = 6.1E-3 and the RfD for Chloroform = 1.0E-2

ICR = 1.0E-6 mg/kg-day X 6.1E-3 kg/mg-day = $\boxed{6.1E-9}$

$$HI = \frac{3.0E-6 \text{ mg/kg-day}}{1.0E-2 \text{ mg/kg-day}} = \boxed{3.0E-4}$$

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT NSWC Indian Head		JOB NUMBER 4617	
SUBJECT Calculation of Risk via ingestion of Surface Water			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

Purpose: To calculate carcinogenic and noncarcinogenic risk via exposure to surface water for a construction worker

Relevant Equations:

$$\text{Intake (mg/Kg-day)} = \frac{Cw \times CR \times CF \times ET \times EF \times ED}{BW \times AT}$$

Where:

Cw =	Chemical Concentration in water	=	Chemical Specific ug/L
CR =	Contact Rate	=	0.01 L/hour
CF =	Conversion Factor	=	0.001 ug/mg
ET =	Exposure Time	=	8 hrs/event
EF =	Exposure Frequency	=	60 events/year
ED =	Exposure Duration	=	1 year
BW =	Body Weight	=	70 Kg
AT-C =	Averaging Time carcinogens	=	25550 days
AT-N =	Averaging Time noncarcinogens	=	365 days

And the Cw of trichloroethene in surface water = 15.2 ug/L

$$\text{Noncarcinogenic Intake (mg/Kg-day)} = \frac{15.2\,\frac{ug}{L} \times 0.01\,\frac{L}{hr} \times 0.001\,\frac{ug}{mg} \times 8\,\frac{hrs}{event} \times 60\,\frac{events}{yr} \times 1\,year}{70\,Kg \times 365\,days}$$

$$= \boxed{2.8\,E\text{-}6\ mg/Kg\text{-}day}$$

$$\text{Carcinogenic Intake (mg/Kg-day)} = \frac{15.2\,ug/L \times 0.01\,L/hr \times 0.001\,ug/mg \times 8\,hrs/event \times 60\,events/yr \times 1\,year}{70\,Kg \times 25550\,days}$$

$$= \boxed{4.08\,E\text{-}8\ mg/Kg\text{-}day}$$

CLIENT NSWC Indian Head		JOB NUMBER 7617	
SUBJECT Calculation of Risk via ingestion of Surface water			
BASED ON RAGS		DRAWING NUMBER	
BY KAC	CHECKED BY RJJ	APPROVED BY	DATE 6/7/99

These intakes are then used to calculate carcinogenic risk (Incremental Cancer Risk) and Noncarcinogenic risk (Hazard Index) where:

Incremental Cancer Risk = Cancer Slope Factor x Carcinogenic Intake
(ICR unitless) (CSF Kg/mg-day) (mg/Kg-day)

Hazard Index = Noncarcinogenic Intake mg/Kg-day / Reference dose mg/Kg-day
(HI unitless)

Where the CSF for trichloroethene = 1.1E-2 and the RfD = 6.0E-3

ICR = 4.08E-8 mg/Kg-day x 1.1E-2 Kg/mg-day = $\boxed{4.5E-10}$

$$HI = \frac{2.8E-6 \text{ mg/Kg-day}}{6.0E-3 \text{ mg/Kg-day}} = \boxed{4.7E-4}$$

CLIENT NSWC Indian Head	JOB NUMBER 7129
SUBJECT Calculation of Risk via Inhalation while Showering	
BASED ON Foster & Chrostowski	DRAWING NUMBER
BY RJJ / CHECKED BY	APPROVED BY [illegible] / DATE 6/9/99

Purpose: To calculate carcinogenic and Noncarcinogenic risk via inhalation while showering for an adult resident.

Relevant Equations.

$$Intake = \frac{S \times IRsh \times K \times EF \times ED}{BW \times AT \times Ra \times CF}$$

$$K = Ds + \frac{\exp(-Ra \times Dt)}{Ra} - \frac{\exp[Ra \times (Ds - Dt)]}{Ra}$$

$$S = Cwd \times \frac{FR}{SV} \qquad Cwd = Cwc\left(1 - \exp\left[\frac{-KaL \times ts}{60 \times d}\right]\right)$$

$$KaL = KL\left(\frac{T_1 \times vs}{Ts \times v_1}\right)^{-0.5} \qquad KL = \left(\frac{1}{K_1} + \frac{RT}{HKg}\right)^{-1}$$

$$K_1 = (20\ cm/hr)\left(\frac{44}{MW}\right)^{0.5} \qquad Kg = (3000\ cm/hr)\left(\frac{18}{MW}\right)^{0.5}$$

where
- K = Mass transfer coefficient (min)
- S = Volatile chemical generation rate (mg/m³-min-shower)
- Ra = air exchange rate = 0.0166 min⁻¹
- Ds = Shower duration = 15 min
- Dt = total time in bathroom = 20 min
- FR = Shower flow rate = 20 L/min
- SV = Shower room air volume = 6 m³
- ts = Shower droplet drop time = 2 sec
- d = Shower droplet diameter = 1 mm
- T1 = calibration water temperature = 293 °K
- Ts = shower water temperature = 318 °K
- IRsh = inhalation rate = 10 L/min
- EF = Exposure frequency = 350 showers/year
- ED = Exposure duration = 24 years

CLIENT	JOB NUMBER		
NSWC Indian Head	7129		
SUBJECT: Calculation of risk via inhalation while showering			
BASED ON: Foster & Chrostowski	DRAWING NUMBER		
BY: RJJ	CHECKED BY	APPROVED BY	DATE: 6/9/99

BW = Body weight = 70 Kg
ATc = Averaging time for carcinogenic exposure = 25,550 days
ATn = Averaging time for noncarcinogenic exposures = 8,760 days
Mw = Molecular weight = 131 g/mole for TCE
H = Henry's Law Constant = 1.03×10^{-2} atm-m³/mol for TCE
Cwi = Chemical concentration = 612 ug/L for TCE

$$K_l = \left(20 \frac{cm}{hr}\right)\left(\frac{44}{131}\right)^{0.5} = 11.6 \text{ cm/hr}$$

$$K_g = \left(3000 \frac{cm}{hr}\right)\left(\frac{18}{131}\right)^{0.5} = 1{,}112 \text{ cm/hr}$$

$$K_L = \left(\frac{1}{11.6 \text{ cm/hr}} + \frac{\left(8.2\times10^{-5} \frac{atm\text{-}m^3}{mole\text{-}K}\right)(293K)}{\left(1.03\times10^{-2} \frac{atm\text{-}m^3}{mole}\right)\left(1112 \text{ cm/hr}\right)}\right)^{-1} = 11.3 \text{ cm/hr}$$

$$K_{oL} = \left(11.3 \frac{cm}{hr}\right)\left[\frac{(293°K)(0.616 \text{ cp})}{(318)(0.982)}\right]^{-0.5} = 14.9 \text{ cm/hr}$$

$$C_{wd} = (612 \text{ ug/L})\left[1 - \exp\left(-\frac{14.9 \text{ cm/hr} \cdot 2 \text{ sec}}{60 \cdot 1}\right)\right] = 239 \text{ ug/L}$$

$$S = \frac{(239 \text{ ug/L})(20 \text{ L/min})}{(6 \text{ m}^3)} = 798 \frac{\text{ug}}{\text{min-m}^3\text{-shower}}$$

$$K = 15 \text{ min} + \frac{\exp[(-0.0166 \text{ 1/min})(20 \text{ min})]}{0.0166 \text{ 1/min}} - \frac{\exp[(0.0166 \text{ 1/min}) \times (15 \text{ min} - 20 \text{ min})]}{0.0166 \text{ 1/min}}$$

$$K = 2.78 \text{ min}$$

CLIENT		JOB NUMBER	
NSWC Indian Head		7129	
SUBJECT			
Calculation of Risk via Inhalation while Showering			
BASED ON		DRAWING NUMBER	
Foster & Chrostowski			
BY	CHECKED BY	APPROVED BY	DATE
RJJ			6/9/97

Carcinogenic intake

$$= \frac{(798\ \frac{ug}{min\text{-}m^3\text{-}shower})(10\ L/min)(2.78\ min)(350\ \frac{showers}{yr})(24\ yr)}{(70\ Kg)(25{,}550\ days)(0.0166\ hr^{-1})(10^6\ ug\text{-}L/mg\text{-}m^3)}$$

$$= 6.28 \times 10^{-3}\ mg/kg\text{-}day$$

Noncarcinogenic intake

$$= \frac{(798\ \frac{ug}{min\text{-}m^3\text{-}shower})(10\ L/min)(2.78\ min)(350\ \frac{showers}{yr})(24\ yr)}{(70\ Kg)(8760\ days)(0.0166\ hr^{-1})(10^6\ ug\text{-}L/mg\text{-}m^3)}$$

$$= 1.83 \times 10^{-2}\ \frac{mg}{kg\text{-}day}$$

Cancer risk = CSF × Intake, for TCE $CSF = 6.0 \times 10^{-3} \left(\frac{mg}{kg\text{-}day}\right)^{-1}$

$$= 6.0 \times 10^{-3} \left(\frac{mg}{kg\text{-}day}\right)^{-1} \times 6.28 \times 10^{-3}\ \frac{mg}{kg\text{-}day}$$

$$= 3.8 \times 10^{-5}$$

Hazard Index = $\frac{\text{Intake}}{\text{RFD}}$, no RFD available for TCE

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE 1 OF 2

CLIENT: NSWC Indian Head	JOB NUMBER: 7129
SUBJECT: Calculation of air concentration resulting from volatilization from GW	
BASED ON: ASTM RBCA Guidance	DRAWING NUMBER:
BY: RJJ / CHECKED BY:	APPROVED BY: MAC / DATE: 6/10/99

Purpose: To calculate outdoor air concentration resulting from volatilization from groundwater.

Relevant Equations:

$$C_{air} = C_{gw} \cdot VF_{gw,amb}$$

$$VF_{gw,amb} = \frac{H}{1+\left[\frac{U_{air} \cdot \delta_{air} \cdot L_{GW}}{W \cdot D_{eff,ws}}\right]} \cdot 10^3 \frac{L}{m^3}$$

$$D_{eff,ws} = \frac{L_{gw}}{(h_v / D_{eff,vad}) + (h_{cap} / D_{eff,cap})}$$

$$D_{eff,cap} = D_{air} \cdot \frac{\theta_{acap}^{3.33}}{\theta_T^2} + D_{wat} \cdot \left(\frac{\theta_{wcap}^{3.33}}{H_{eff} \cdot \theta_T^2}\right) \qquad D_{effvad} = D_{air} \cdot \frac{\theta_{avad}^{3.33}}{\theta_T^2} + D_{wat} \cdot \left(\frac{\theta_{wvad}^{3.33}}{H_{eff} \cdot \theta_T^2}\right)$$

Parameter	Value	Definition
Cgw	Chemical specific	Concentration in groundwater (mg/L)
VFgw,amb	Chemical specific	volatilization factor (L/m3)
H	Chemical specific	Henry's Law Constant, (cm^3-H_2O)/(cm^3-air)
Uair	420	Wind speed above ground in mixing zone (cm/sec)
dair	200	ambient air mixing zone height, (cm)
W	4500	width of source parallel to groundwater flow direction, (cm)
hcap	0.1	thickness of capillary fringe, (cm)
hv	0	thickness of vadose zone, (cm)
Lgw	0.1	depth to groundwater (cm)
Dws	Chemical specific	effective diffusion coefficient between groundwater and soil (cm^2/sec)
Dcap	Chemical specific	effective diffusion through capillary fringe, (cm^2/sec)
Ds	Chemical specific	effective diffusion coefficient in soil based on vapor concentration, (cm^2/sec)
Dair	Chemical specific	diffusion coefficient in air, (cm^2/sec)
Dwater	Chemical specific	diffusion coefficient in water, (cm^2/sec)
theta_as	0.12	volumetric air content in vadose zone soils, (cm^3-air/cm^3-soil)
theta_ws	0.12	volumetric water content in vadose zone soils, (cm^3-H_2O/cm^3-soil)
theta_T	0.38	total soil porosity, (cm^3/cm^3-soil)
theta_acap	0.038	volumetric air content in capillary fringe soils, (cm^3-air/cm^3-soil)
theta_wcap	0.342	volumetric water content in capillary fringe soils, (cm^3-H_2O/cm^3-soil)

For Vinyl Chloride

$H = 1.11$ cm^3-H_2O/cm^3-air

$D_{water} = 1.23 \times 10^{-6}$ cm^2/sec

$D_{air} = 1.06 \times 10^{-1}$ cm^2/sec

$C_{gw} = 0.085$ mg/L

CLIENT	JOB NUMBER
NSWC Indian Head	7129

SUBJECT: Calculation of Air Concentration Resulting From Volatilization From Groundwater

BASED ON	DRAWING NUMBER
ASTM RBCA Guidance	

BY	CHECKED BY	APPROVED BY	DATE
RJJ			

$$D_{eff,cap} = (1.06\times10^{-1}\ cm^2/sec)\frac{(0.038\ cm^3/cm^3)^{3.33}}{(0.38\ cm^3/cm^3)^2} + (1.23\times10^{-6}\ cm^2/sec)\left[\frac{(0.342\ cm^3/cm^3)^{3.33}}{(1.11\ cm^3/cm^3)(0.38\ cm^3/cm^3)^2}\right]$$

$$D_{eff,cap} = 1.39\times10^{-5}\ cm^2/sec$$

$$D_{eff,ws} = \frac{0.1\ cm}{\left(\frac{0}{D_{eff,w.1}}\right) + \frac{0.1\ cm}{1.39\times10^{-5}\ cm^2/sec}} = 1.39\times10^{-5}\ cm^2/sec$$

$$VF_{gw,amb} = \frac{\left(1.11\ \frac{cm^3\text{-}H_2O}{cm^3\text{-}air}\right)}{1+\left[\frac{(420\ cm/sec)(200\ cm)(0.1\ cm)}{(4500\ cm)(1.39\times10^{-5}\ cm^2/sec)}\right]}\cdot10^3\ \frac{L}{m^3}$$

$$VF_{gw,amb} = 8.27\times10^{-3}\ L/m^3$$

$$C_{air} = \left(0.085\ \frac{mg}{L}\right)\left(8.27\times10^{-3}\ \frac{L}{m^3}\right)$$

$$C_{air} = 7.03\times10^{-4}\ \mu g/m^3$$

APPENDIX K.3

SUPPORTING CALCULATIONS

Da_{event} for Dermal Exposure to Groundwater and Surface Water
Volatilization from Showering
Volatilization from Soil
Volatilization from Groundwater to Outdoor Air

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CONSTRUCTION WORKERS - RME & CTE SCENARIOS
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = : Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = : Concentration of chemical in water (mg/L)
tevent = : 8 duration of event (hr/event)
tau = : Chemical specific lag time (hr)
t* = : Chemical specific time it takes to reach steady state (hr)
B = : Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	29	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	3.99E-06
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.03E-07
Ethyl Ether	3950	O	2.90E-03	2.50E-01	5.90E-01	7.80E-04	9.73E-05
Tetrachloroethene	5.41	O	4.80E-02	9.00E-01	4.30E+00	2.50E-01	2.32E-06
Trichloroethene	612	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	8.77E-05
Vinyl Chloride	85	O	7.30E-03	2.10E-01	5.10E-01	2.30E-03	5.21E-06
cis-1,2-Dichloroethene	528	O	1.00E-02	3.40E-01	8.20E-01	7.20E-03	4.56E-05

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - UPGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.25	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	77.5	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	9.99E-07
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	1.17E-08
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.10E-08
Trichloroethene	2.3	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	3.77E-08

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - UPGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.167	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	77.5	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	8.17E-07
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	9.56E-09
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	8.96E-09
Trichloroethene	2.3	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	3.08E-08

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.25	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	29	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	3.74E-07
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.10E-08
Ethyl Ether	3950	O	2.90E-03	2.50E-01	5.90E-01	7.80E-04	7.92E-06
Tetrachloroethene	5.41	O	4.80E-02	9.00E-01	4.30E+00	2.50E-01	3.40E-07
Trichloroethene	612	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	1.00E-05
Vinyl Chloride	85	O	7.30E-03	2.10E-01	5.10E-01	2.30E-03	3.93E-07
cis-1,2-Dichloroethene	528	O	1.00E-02	3.40E-01	8.20E-01	7.20E-03	4.25E-06

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.167	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	29	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	3.06E-07
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	8.96E-09
Ethyl Ether	3950	O	2.90E-03	2.50E-01	5.90E-01	7.80E-04	6.47E-06
Tetrachloroethene	5.41	O	4.80E-02	9.00E-01	4.30E+00	2.50E-01	2.78E-07
Trichloroethene	612	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	8.20E-06
Vinyl Chloride	85	O	7.30E-03	2.10E-01	5.10E-01	2.30E-03	3.21E-07
cis-1,2-Dichloroethene	528	O	1.00E-02	3.40E-01	8.20E-01	7.20E-03	3.48E-06

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.167	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Trichloroethene	7.2	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	9.65E-08
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	9.56E-09
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	8.96E-09
Trichloroethene	7	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	9.38E-08

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.25	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Trichloroethene	7.2	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	1.18E-07
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	1.17E-08
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.10E-08
Trichloroethene	7	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	1.15E-07

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - UPGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.25	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	77.5	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	9.99E-07
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	1.17E-08
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.10E-08
Trichloroethene	2.3	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	3.77E-08

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - UPGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.167	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	77.5	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	8.17E-07
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	9.56E-09
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	8.96E-09
Trichloroethene	2.3	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	3.08E-08

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.25	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	29	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	3.74E-07
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.10E-08
Ethyl Ether	3950	O	2.90E-03	2.50E-01	5.90E-01	7.80E-04	7.92E-06
Tetrachloroethene	5.41	O	4.80E-02	9.00E-01	4.30E+00	2.50E-01	3.40E-07
Trichloroethene	612	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	1.00E-05
Vinyl Chloride	85	O	7.30E-03	2.10E-01	5.10E-01	2.30E-03	3.93E-07
cis-1,2-Dichloroethene	528	O	1.00E-02	3.40E-01	8.20E-01	7.20E-03	4.25E-06

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.167	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	29	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	3.06E-07
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	8.96E-09
Ethyl Ether	3950	O	2.90E-03	2.50E-01	5.90E-01	7.80E-04	6.47E-06
Tetrachloroethene	5.41	O	4.80E-02	9.00E-01	4.30E+00	2.50E-01	2.78E-07
Trichloroethene	612	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	8.20E-06
Vinyl Chloride	85	O	7.30E-03	2.10E-01	5.10E-01	2.30E-03	3.21E-07
cis-1,2-Dichloroethene	528	O	1.00E-02	3.40E-01	8.20E-01	7.20E-03	3.48E-06

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.25	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Trichloroethene	7.2	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	1.18E-07
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	1.17E-08
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	1.10E-08
Trichloroethene	7	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	1.15E-07

CALCULATION OF Dvevent FOR EXPOSURES TO GROUNDWATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	0.167	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Trichloroethene	7.2	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	9.65E-08
1,2-Dichloroethane	2.7	O	5.30E-03	3.50E-01	8.40E-01	3.00E-03	9.56E-09
Chloroform	1.3	O	8.90E-03	4.70E-01	1.10E+00	9.30E-03	8.96E-09
Trichloroethene	7	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	9.38E-08

CALCULATION OF Dvevent FOR EXPOSURES TO SURFACE WATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CONSTRUCTION WORKERS - RME & CTE SCENARIOS
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	8	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Iron	785	I	1.00E-03	NA	NA	NA	6.28E-06
Manganese	363	I	1.00E-03	NA	NA	NA	2.90E-06

CALCULATION OF Dvevent FOR EXPOSURES TO SURFACE WATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CONSTRUCTION WORKERS - RME & CTE SCENARIOS
EXPOSURE POINT - SITE 57 - STORM SEWERS
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent ⟨ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent ⟩ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

.DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	8	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
1,1-Dichloroethene	0.2	O	1.60E-02	3.40E-01	8.20E-01	1.30E-02	2.75E-08
Acetone	725	O	1.24E-03	1.98E-01	4.75E-01	5.75E-05	7.55E-06
Ethyl Ether	120	O	2.90E-03	2.50E-01	5.90E-01	7.80E-04	2.96E-06
Trichloroethene	15.2	O	1.60E-02	5.50E-01	1.30E+00	2.60E-02	2.18E-06
cis-1,2-Dichloroethene	9.1	O	1.00E-02	3.40E-01	8.20E-01	7.20E-03	7.86E-07
Iron	1546	I	1.00E-03	NA	NA	NA	1.24E-05
Manganese	119	I	1.00E-03	NA	NA	NA	9.52E-07

CALCULATION OF Dvevent FOR EXPOSURES TO SURFACE WATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	4	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Iron	785	I	1.00E-03	NA	NA	NA	3.14E-06
Manganese	363	I	1.00E-03	NA	NA	NA	1.45E-06

CALCULATION OF Dvevent FOR EXPOSURES TO SURFACE WATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = : Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = : Concentration of chemical in water (mg/L)
tevent = : 2 duration of event (hr/event)
tau = : Chemical specific lag time (hr)
t* = : Chemical specific time it takes to reach steady state (hr)
B = : Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Iron	785	I	1.00E-03	NA	NA	NA	1.57E-06
Manganese	363	I	1.00E-03	NA	NA	NA	7.26E-07

CALCULATION OF Dvevent FOR EXPOSURES TO SURFACE WATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = :		Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = :		Concentration of chemical in water (mg/L)
tevent = :	4	duration of event (hr/event)
tau = :		Chemical specific lag time (hr)
t* = :		Chemical specific time it takes to reach steady state (hr)
B = :		Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Iron	785	I	1.00E-03	NA	NA	NA	3.14E-06
Manganese	363	I	1.00E-03	NA	NA	NA	1.45E-06

CALCULATION OF Dvevent FOR EXPOSURES TO SURFACE WATER
SOURCE: DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA 1992.
SITE NAME: IHDIV-NSWC
RECEPTOR: CHILD RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\langle$ t*, then $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $\rangle$ t*, then $Daevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3 \times B}{1+B}\right)\right]$

DAevent = : Chemical specific absorbed dose per event (mg/cm^2-event)
Cw = : Concentration of chemical in water (mg/L)
tevent = : 2 duration of event (hr/event)
tau = : Chemical specific lag time (hr)
t* = : Chemical specific time it takes to reach steady state (hr)
B = : Chemical specific dimensionless constant

CHEMICAL	Cw (ug/L)	Organic or Inorganic	Estimated Kp (cm/hr)	Tau (hr)	t* (hr)	B	DAevent (mg/cm^2 - event)
Iron	785	I	1.00E-03	NA	NA	NA	1.57E-06
Manganese	363	I	1.00E-03	NA	NA	NA	7.26E-07

VOLATILIZATION FROM SHOWERING (PAGE 1 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATION: $$\text{Intake} = \frac{S \times IR_{SW} \times K \times EF \times ED}{BW \times AT \times R_a \times CF}$$

Parameter	Value	Definition
Ra	0.0166	air exchange rate, (min^{-1})
Ds	15	shower duration, (min)
Dt	20	total time in bathroom, (min)
Fr	20	shower water flow rate, (L/min)
Sv	6	shower room air volume, (m^3)
ts	2	shower dropler drop time, (sec)
d	1	shower droplet diameter, (mm)
T1	293	calibration water temperature, (K)
Ts	318	shower water temperature, (K)
m1	0.982	water viscosity at T1, (cp)
ms	0.616	water viscosity at Ts, (cp)
K	2.78	mass transfer coefficient, (min)
IR_{sh} = :	10	Inhalation rate (L/min)
S = :		Volatile chemical generation rate (mg/m^3-min-shower)
EF = :	350	Exposure Frequency (days/year)
ED = :	24	Exposure Duration (years)
BW = :	70	Body Weight (kg)
ATc = :	25,550	Averaging time for carcinogenic exposures (days)
Atn = :	8,760	Averaging time for noncarcinogenic exposures (days)
CF = :	1.0E+06	Convesrion Factor (L/m^3)

VOLATILIZATION FROM SHOWERING (PAGE 1 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

Chemical	Cw (ug/L)	MW (g/mole)	H (atm-m^3/mol	Kl (cm/hr)	Kg (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd ug/L	S	carc intake	noncarc intake
1,1-Dichloroethene	29	9.70E+01	2.61E-02	1.35E+01	1.29E+03	1.33E+01	1.75E+01	1.28E+01	4.28E+01	3.37E-04	9.82E-04
Chloroform	1.3	1.19E+02	3.66E-03	1.22E+01	1.17E+03	1.14E+01	1.50E+01	5.11E-01	1.70E+00	1.34E-05	3.90E-05
Ethyl Ether	3950	7.40E+01	6.80E-04	1.54E+01	1.48E+03	1.13E+01	1.48E+01	1.54E+03	5.13E+03	4.04E-02	1.18E-01
Tetrachloroethene	5.41	1.66E+02	1.84E-02	1.03E+01	9.88E+02	1.02E+01	1.34E+01	1.94E+00	6.48E+00	5.10E-05	1.49E-04
Trichloroethene	612	1.31E+02	1.03E-02	1.16E+01	1.11E+03	1.13E+01	1.49E+01	2.39E+02	7.98E+02	6.27E-03	1.83E-02
Vinyl Chloride	85	6.30E+01	2.71E-02	1.67E+01	1.60E+03	1.66E+01	2.18E+01	4.39E+01	1.46E+02	1.15E-03	3.35E-03
cis-1,2-Dichloroethene	528	9.70E+01	4.07E-03	1.35E+01	1.29E+03	1.27E+01	1.67E+01	2.25E+02	7.51E+02	5.91E-03	1.72E-02

VOLATILIZATION FROM SHOWERING (PAGE 1 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATION: $$\text{Intake} = \frac{S \times IR_{SW} \times K \times EF \times ED}{BW \times AT \times R_a \times CF}$$

Parameter	Value	Definition
Ra	0.0166	air exchange rate, (min^{-1})
Ds	10	shower duration, (min)
Dt	15	total time in bathroom, (min)
Fr	20	shower water flow rate, (L/min)
Sv	6	shower room air volume, (m^3)
ts	2	shower dropler drop time, (sec)
d	1	shower droplet diameter, (mm)
T1	293	calibration water temperature, (K)
Ts	318	shower water temperature, (K)
m1	0.982	water viscosity at T1, (cp)
ms	0.616	water viscosity at Ts, (cp)
K	1.52	mass transfer coefficient, (min)
IR_{sh} = :	10	Inhalation rate (L/min)
S = :		Volatile chemical generation rate (mg/m^3-min-shower)
EF = :	234	Exposure Frequency (days/year)
ED = :	7	Exposure Duration (years)
BW = :	70	Body Weight (kg)
ATc = :	25,550	Averaging time for carcinogenic exposures (days)
Atn = :	2,555	Averaging time for noncarcinogenic exposures (days)
CF = :	1.0E+06	Convesrion Factor (L/m^3)

VOLATILIZATION FROM SHOWERING (PAGE 2 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - SITE 57 - DOWNGRADIENT
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

Chemical	Cw (ug/L)	MW (g/mole)	H (atm-m^3/mol	Kl (cm/hr)	Kg (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd ug/L	S	carc intake	noncarc intake
1,1-Dichloroethene	29	9.70E+01	2.61E-02	1.35E+01	1.29E+03	1.33E+01	1.75E+01	1.28E+01	4.28E+01	3.59E-05	3.59E-04
Chloroform	1.3	1.19E+02	3.66E-03	1.22E+01	1.17E+03	1.14E+01	1.50E+01	5.11E-01	1.70E+00	1.43E-06	1.43E-05
Ethyl Ether	3950	7.40E+01	6.80E-04	1.54E+01	1.48E+03	1.13E+01	1.48E+01	1.54E+03	5.13E+03	4.30E-03	4.30E-02
Tetrachloroethene	5.41	1.66E+02	1.84E-02	1.03E+01	9.88E+02	1.02E+01	1.34E+01	1.94E+00	6.48E+00	5.44E-06	5.44E-05
Trichloroethene	612	131	1.03E-02	1.16E+01	1.11E+03	1.13E+01	1.49E+01	2.39E+02	7.98E+02	6.69E-04	6.69E-03
Vinyl Chloride	85	63	2.71E-02	1.67E+01	1.60E+03	1.66E+01	2.18E+01	4.39E+01	1.46E+02	1.23E-04	1.23E-03
cis-1,2-Dichloroethene	528	97	4.07E-03	1.35E+01	1.29E+03	1.27E+01	1.67E+01	2.25E+02	7.51E+02	6.30E-04	6.30E-03

VOLATILIZATION FROM SHOWERING (PAGE 1 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATION: $\text{Intake} = \dfrac{S \times IR_{SW} \times K \times EF \times ED}{BW \times AT \times R_a \times CF}$

Parameter	Value	Definition
Ra	0.0166	air exchange rate, (min^{-1})
Ds	15	shower duration, (min)
Dt	20	total time in bathroom, (min)
Fr	20	shower water flow rate, (L/min)
Sv	6	shower room air volume, (m^3)
ts	2	shower dropler drop time, (sec)
d	1	shower droplet diameter, (mm)
T1	293	calibration water temperature, (K)
Ts	318	shower water temperature, (K)
m1	0.982	water viscosity at T1, (cp)
ms	0.616	water viscosity at Ts, (cp)
K	2.78	mass transfer coefficient, (min)
IR_{sh} = :	10	Inhalation rate (L/min)
S = :		Volatile chemical generation rate (mg/m^3-min-shower)
EF = :	350	Exposure Frequency (days/year)
ED = :	24	Exposure Duration (years)
BW = :	70	Body Weight (kg)
ATc = :	25,550	Averaging time for carcinogenic exposures (days)
Atn = :	8,760	Averaging time for noncarcinogenic exposures (days)
CF = :	1.00E+03	Convesrion Factor (L/m^3)

VOLATILIZATION FROM SHOWERING (PAGE 2 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - REASONABLE MAXIMUM EXPOSURES
EXPOSURE POINT - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

Chemical	Cw (ug/L)	MW (g/mole)	H (atm-m^3/mol)	Kl (cm/hr)	Kg (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd ug/L	S	carc intake	noncarc intake
Trichloroethene	7.2	1.31E+02	1.03E-02	1.16E+01	1.11E+03	1.13E+01	1.49E+01	2.82E+00	9.39E+00	7.38E-05	2.15E-04
1,2-Dichloroethane	2.7	9.90E+01	5.61E-03	1.33E+01	1.28E+03	1.28E+01	1.68E+01	1.16E+00	3.86E+00	3.03E-05	8.85E-05
Chloroform	1.3	1.19E+02	3.66E-03	1.22E+01	1.17E+03	1.14E+01	1.50E+01	5.11E-01	1.70E+00	1.34E-05	3.90E-05
Trichloroethene	7.2	1.31E+02	1.03E-02	1.16E+01	1.11E+03	1.13E+01	1.49E+01	2.82E+00	9.39E+00	7.38E-05	2.15E-04

VOLATILIZATION FROM SHOWERING (PAGE 1 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

RELEVANT EQUATION: $$\text{Intake} = \frac{S \times IR_{SW} \times K \times EF \times ED}{BW \times AT \times R_a \times CF}$$

Parameter	Value	Definition
Ra	0.0166	air exchange rate, (min^{-1})
Ds	10	shower duration, (min)
Dt	15	total time in bathroom, (min)
Fr	20	shower water flow rate, (L/min)
Sv	6	shower room air volume, (m^3)
ts	2	shower dropler drop time, (sec)
d	1	shower droplet diameter, (mm)
T1	293	calibration water temperature, (K)
Ts	318	shower water temperature, (K)
m1	0.982	water viscosity at T1, (cp)
ms	0.616	water viscosity at Ts, (cp)
K	1.52	mass transfer coefficient, (min)
IR_{sh} = :	10	Inhalation rate (L/min)
S = :		Volatile chemical generation rate (mg/m^3-min-shower)
EF = :	234	Exposure Frequency (days/year)
ED = :	7	Exposure Duration (years)
BW = :	70	Body Weight (kg)
ATc = :	25,550	Averaging time for carcinogenic exposures (days)
Atn = :	2,555	Averaging time for noncarcinogenic exposures (days)
CF = :	1.0E+03	Convesrion Factor (L/m^3)

VOLATILIZATION FROM SHOWERING (PAGE 2 OF 2)
SOURCE: FOSTER & CHROSTOWSKI, 1987
SITE NAME: IHDIV-NSWC
RECEPTOR: ADULT RESIDENT - CENTRAL TENDENCY EXPOSURES
EXPOSURE POINT - POTABLE WELL
LOCATION: INDIAN HEAD, MARYLAND
DATE: JUNE 12, 1999

Chemical	Cw (ug/L)	MW (g/mole)	H (atm-m^3/mol)	Kl (cm/hr)	Kg (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd ug/L	S	carc intake	noncarc intake
Trichloroethene	7.2	9.70E+01	2.61E-02	1.35E+01	1.29E+03	1.33E+01	1.75E+01	3.19E+00	1.06E+01	8.91E-06	8.91E-05
1,2-Dichloroethane	2.7	9.90E+01	5.61E-03	1.33E+01	1.28E+03	1.28E+01	1.68E+01	1.16E+00	3.86E+00	3.23E-06	3.23E-05
Chloroform	1.3	1.19E+02	3.66E-03	1.22E+01	1.17E+03	1.14E+01	1.50E+01	5.11E-01	1.70E+00	1.43E-06	1.43E-05
Trichloroethene	7.2	1.31E+02	1.03E-02	1.16E+01	1.11E+03	1.13E+01	1.49E+01	2.82E+00	9.39E+00	7.87E-06	7.87E-05

DERIVATION OF VOLATILIZATION FACTOR (PAGE 1 OF2)
SOURCE: SOIL SCREENING GUIDANCE
SITE NAME: NSWC
RECEPTOR: CONSTRUCTION WORKER
LOCATION: INDIAN HEAD
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

$$Cair = Cs \times \left(\frac{1}{PEF} + \frac{1}{VF} \right)$$

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4} \left(m^2/cm^2\right)}{(2 \times pb \times DA)}$$

where :

$$DA = \frac{\left[\left(\theta a^{10/3} \times Di \times H' + \theta w^{10/3} \times Dw\right)/\theta_T^2\right]}{pb \times Kd + \theta w + \theta a \times H'}$$

$$Csat = \frac{S}{pb} \times (Kd \times pb + \theta w + H' \times \theta a)$$

Parameter	Value	Definition
Cs = :	Chemical specific	Chemical concentrationin soil (mg/kg).
VF = :	Chemical specific	volalization factor (kg/m3)
Q/C = :	79.14	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
T = :	3.2E+07	Exposure interval (seconds).
pb = :	1.65	Dry soil bulk density (g/cm^3).
ps = :	2.65	soil particle density (g/cm^3).
θ_T = :	0.377	Total soil porosity (L_{pore}/L_{soil}).
θw = :	0.19	Water-filled soil porosity (L_{pore}/L_{soil}).
θa = :	0.187	Air-filled soil porosity (L_{air}/L_{soil}).
Di = :	Chemical specific	Diffusivity in air (cm^2/sec).
H' = :	Chemical specific	Dimensionless Henry's Law Constant.
Dw = :	Chemical specific	Diffusivity in water (cm^2/sec).
DA = :	Chemical specific	Apparent diffusivity (cm^2/sec).
Kd = :	Chemical specific	Soil-water partition coefficient (cm^3/g).
Koc = :	Chemical specific	Soil organic carbon partition coefficient (cm^3/g).
foc = :	0.016	Fraction organic carbon in soil (g/g).
PEF = :	1.32E+09	Particulate emission factor (m^3/kg)

DERIVATION OF VOLATILIZATION FACTOR (PAGE 2 OF 2)
SOURCE: SOIL SCREENING GUIDANCE
SITE NAME: NSWC
RECEPTOR: CONSTRUCTION WORKER
LOCATION: INDIAN HEAD
DATE: JUNE 12, 1999

Chemical	Cs (mg/kg)	Chemical Properties					Intermediate Calculations				Results		
		Koc (cm^3/g)	Dl (cm^2/sec)	Dw (cm^2/sec)	S (mg/L)	H'	Kd (cm^3/g)	Da (cm^2/sec)	VF (m^3/kg)	Csat (mg/kg)	CaV (mg/m^3)	CaP (mg/m^3)	CaTot (mg/m^3)
All Soil													
RME													
Trichloroethene	0.504	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	2.66E+00	1.89E-04	1.73E+03	3.10E+03	2.91E-04	3.82E-10	2.91E-04
CTE													
Trichloroethene	0.504	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	2.66E+00	1.89E-04	1.73E+03	3.10E+03	2.91E-04	3.82E-10	2.91E-04

DERIVATION OF VOLATILIZATION FACTOR (PAGE 1 OF 2)
SOURCE: SOIL SCREENING GUIDANCE
SITE NAME: NSWC
RECEPTOR: CHILD RESIDENT
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

$$Cair = Cs \times \left(\frac{1}{PEF} + \frac{1}{VF} \right)$$

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4} \left(m^2/cm^2\right)}{(2 \times pb \times DA)}$$

where :

$$DA = \frac{\left[\left(\theta a^{10/3} \times Di \times H' + \theta w^{10/3} \times Dw\right)/\theta_T^2\right]}{pb \times Kd + \theta w + \theta a \times H'}$$

$$Csat = \frac{S}{pb} \times (Kd \times pb + \theta w + H' \times \theta a)$$

Parameter	Value	Definition
Cs = :	Chemical specific	Chemical concentrationin soil (mg/kg).
VF = :	Chemical specific	volalization factor (kg/m3)
Q/C = :	79.14	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
T = :	2.2E+08	Exposure interval (seconds).
pb = :	1.65	Dry soil bulk density (g/cm^3).
ps = :	2.65	soil particle density (g/cm^3).
θ_T = :	0.377	Total soil porosity (L_{pore}/L_{soil}).
θw = :	0.19	Water-filled soil porosity (L_{pore}/L_{soil}).
θa = :	0.187	Air-filled soil porosity (L_{air}/L_{soil}).
Di = :	Chemical specific	Diffusivity in air (cm^2/sec).
H' = :	Chemical specific	Dimensionless Henry's Law Constant.
Dw = :	Chemical specific	Diffusivity in water (cm^2/sec).
DA = :	Chemical specific	Apparent diffusivity (cm^2/sec).
Kd = :	Chemical specific	Soil-water partition coefficient (cm^3/g).
Koc = :	Chemical specific	Soil organic carbon partition coefficient (cm^3/g).
foc = :	0.016	Fraction organic carbon in soil (g/g).
PEF = :	1.32E+09	Particulate emission factor (m^3/kg)

DERIVATION OF VOLATILIZATION FACTOR (PAGE 2 OF 2)
SOURCE: SOIL SCREENING GUIDANCE
SITE NAME: NSWC
RECEPTOR: CHILD RESIDENT
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

Chemical	Cs	Chemical Properties					Intermediate Calculations				Results		
	(mg/kg)	Koc (cm^3/g)	Dl (cm^2/sec)	Dw (cm^2/sec)	S (mg/L)	H'	Kd (cm^3/g)	Da (cm^2/sec)	VF (m^3/kg)	Csat (mg/kg)	CaV (mg/m^3)	CaP (mg/m^3)	CaTot (mg/m^3)
All Soil													
RME													
Trichloroethene	0.504	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	2.66E+00	1.89E-04	4.59E+03	3.10E+03	1.10E-04	3.82E-10	1.10E-04
CTE													
Trichloroethene	0.504	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	2.66E+00	1.89E-04	4.59E+03	3.10E+03	1.10E-04	3.82E-10	2.06E-04

DERIVATION OF VOLATILIZATION FACTOR (PAGE 1 OF 2)
SOURCE: SOIL SCREENING GUIDANCE
SITE NAME: NSWC
RECEPTOR: ADULT RESIDENT
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

$$Cair = Cs \times \left(\frac{1}{PEF} + \frac{1}{VF} \right)$$

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4} (m^2/cm^2)}{(2 \times pb \times DA)}$$

where :

$$DA = \frac{\left[\left(\theta a^{10/3} \times Di \times H' + \theta w^{10/3} \times Dw \right) / \theta_T^2 \right]}{pb \times Kd + \theta w + \theta a \times H'}$$

$$Csat = \frac{S}{pb} \times (Kd \times pb + \theta w + H' \times \theta a)$$

Parameter	Value	Definition
Cs = :	Chemical specific	Chemical concentrationin soil (mg/kg).
VF = :	Chemical specific	volalization factor (kg/m3)
Q/C = :	79.14	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
T = :	7.6E+08	Exposure interval (seconds).
pb = :	1.65	Dry soil bulk density (g/cm^3).
ps = :	2.65	soil particle density (g/cm^3).
θ_T = :	0.377	Total soil porosity (L_{pore}/L_{soil}).
θw = :	0.19	Water-filled soil porosity (L_{pore}/L_{soil}).
θa = :	0.187	Air-filled soil porosity (L_{air}/L_{soil}).
Di = :	Chemical specific	Diffusivity in air (cm^2/sec).
H' = :	Chemical specific	Dimensionless Henry's Law Constant.
Dw = :	Chemical specific	Diffusivity in water (cm^2/sec).
DA = :	Chemical specific	Apparent diffusivity (cm^2/sec).
Kd = :	Chemical specific	Soil-water partition coefficient (cm^3/g).
Koc = :	Chemical specific	Soil organic carbon partition coefficient (cm^3/g).
foc = :	0.016	Fraction organic carbon in soil (g/g).
PEF = :	1.32E+09	Particulate emission factor (m^3/kg)

DERIVATION OF VOLATILIZATION FACTOR (PAGE 2 OF 2)
SOURCE: SOIL SCREENING GUIDANCE
SITE NAME: NSWC
RECEPTOR: ADULT RESIDENT
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

Chemical	Cs	Chemical Properties					Intermediate Calculations				Results		
		Koc	Di	Dw	S	H'	Kd	Da	VF	Csat	CaV	CaP	CaTot
	(mg/kg)	(cm^3/g)	(cm^2/sec)	(cm^2/sec)	(mg/L)		(cm^3/g)	(cm^2/sec)	(m^3/kg)	(mg/kg)	(mg/m^3)	(mg/m^3)	(mg/m^3)
All Soil													
RME													
Trichloroethene	0.504	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	2.66E+00	1.89E-04	8.49E+03	3.10E+03	5.93E-05	3.82E-10	5.93E-05
CTE													
Trichloroethene	0.504	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	2.66E+00	1.89E-04	8.49E+03	3.10E+03	5.93E-05	3.82E-10	1.10E-04

VOLATILZATION FROM GROUNDWATER TO OUTDOOR AIR (PAGE 1 OF 2)
SOURCE: ASTM E1739-95
SITE NAME: NSWC
RECEPTOR: CONSTRUCTION WORKER
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

$$C_{air} = C_{gw} \cdot VF_{gw,amb}$$

$$VF_{gw,amb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{GW}}{W \cdot D_{eff,ws}}\right]} \cdot 10^3 \frac{L}{m^3}$$

$$D_{eff,ws} = \frac{L_{gw}}{(h_v / D_{eff,vad}) + (h_{cap} / D_{eff,cap})}$$

$$D_{eff,cap} = D_{air} \cdot \frac{\theta_{acap}^{3.33}}{\theta_T^2} + D_{wat} \cdot \left(\frac{\theta_{wcap}^{3.33}}{H_{eff} \cdot \theta_T^2}\right)$$

$$D_{effvad} = D_{air} \cdot \frac{\theta_{avad}^{3.33}}{\theta_T^2} + D_{wat} \cdot \left(\frac{\theta_{wvad}^{3.33}}{H_{eff} \cdot \theta_T^2}\right)$$

Parameter	Value	Definition
Cgw	Chemical specific	Concentration in groundwater (mg/L)
VFgw,amb	Chemical specific	volatilization factor (L/m3)
H	Chemical specific	Henry's Law Constant, (cm^3-H_2O)/(cm^3-air)
Uair	420	Wind speed above ground in mixing zone (cm/sec)
dair	200	ambient air mixing zone height, (cm)
W	4500	width of source parallel to groundwater flow direction, (cm)
hcap	0.1	thickness of capillary fringe, (cm)
hv	0	thickness of vadose zone, (cm)
Lgw	0.1	depth to groundwater (cm)
Dws	Chemical specific	effective diffusion coefficient between groundwater and soil (cm^2/sec)
Dcap	Chemical specific	effective diffusion through capillary fringe, (cm^2/sec)
Ds	Chemical specific	effective diffusion coefficient in soil based on vapor concentration, (cm^2/sec)
Dair	Chemical specific	diffusion coefficient in air, (cm^2/sec)
Dwater	Chemical specific	diffusion coefficient in water, (cm^2/sec)
theta_as	0.12	volumetric air content in vadose zone soils, (cm^3-air/cm^3-soil)
theta_ws	0.12	volumetric water content in vadose zone soils, (cm^3-H_2O/cm^3-soil)
theta_T	0.38	total soil porosity, (cm^3/cm^3-soil)
theta_acap	0.038	volumetric air content in capillary fringe soils, (cm^3-air/cm^3-soil)
theta_wcap	0.342	volumetric water content in capillary fringe soils, (cm^3-H_2O/cm^3-soil)

VOLATILZATION FROM GROUNDWATER TO OUTDOOR AIR (PAGE 2 OF 2)
SOURCE: ASTM E50.04
SITE NAME: NSWC
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

Chemical	Cgw (mg/L)	Dair (cm^2/sec)	Dwater (cm^2/sec)	H'	Ds (cm^2/sec)	Dcap (cm^2/sec)	Dws (cm^2/sec)	VF g/m^3)/(mg/L	Cair (mg/m^3)
Upgradient									
1,1-Dichloroethene	0.0775	9.00E-02	1.04E-05	1.07E+00	5.35E-04	1.35E-05	1.35E-05	7.75E-03	6.00E-04
1,2-Dichloroethane	0.0027	1.04E-01	9.90E-06	4.01E-02	6.20E-04	6.14E-05	6.14E-05	1.32E-03	3.56E-06
Chloroform	0.0013	1.04E-01	1.00E-05	1.50E-01	6.19E-04	2.64E-05	2.64E-05	2.12E-03	2.76E-06
Trichloroethene	0.0023	7.90E-02	9.10E-06	4.22E-01	4.70E-04	1.44E-05	1.44E-05	3.25E-03	7.49E-06
Downgradient									
1,1-Dichloroethene	0.029	9.00E-02	1.04E-05	1.07E+00	5.35E-04	1.35E-05	1.35E-05	7.75E-03	2.25E-04
Chloroform	0.0013	1.04E-01	1.00E-05	1.50E-01	6.19E-04	2.64E-05	2.64E-05	2.12E-03	2.76E-06
Ethyl Ether	3.95	7.40E-02	9.30E-06	2.79E-02	4.42E-04	7.44E-05	7.44E-05	1.11E-03	4.39E-03
Tetrachloroethene	0.00541	7.20E-02	8.20E-06	7.54E-01	4.28E-04	1.14E-05	1.14E-05	4.61E-03	2.49E-05
Trichloroethene	0.612	7.90E-02	9.10E-06	4.22E-01	4.70E-04	1.44E-05	1.44E-05	3.25E-03	1.99E-03
Vinyl Chloride	0.085	1.06E-01	1.23E-06	1.11E+00	6.30E-04	1.39E-05	1.39E-05	8.27E-03	7.03E-04
cis-1,2-Dichloroethene	0.528	7.36E-02	1.13E-05	1.67E-01	4.38E-04	2.27E-05	2.27E-05	2.03E-03	1.07E-03

VOLATILZATION FROM GROUNDWATER TO OUTDOOR AIR (PAGE 1 OF 2)
SOURCE: ASTM E1739-95
SITE NAME: NSWC
RECEPTOR: CONSTRUCTION WORKER
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

RELEVANT EQUATIONS:

$$C_{air} = C_{gw} \cdot VF_{gw,amb}$$

$$VF_{gw,amb} = \frac{H}{1 + \left[\frac{U_{air} \cdot \delta_{air} \cdot L_{GW}}{W \cdot D_{eff,ws}}\right]} \cdot 10^3 \frac{L}{m^3}$$

$$D_{eff,ws} = \frac{L_{gw}}{(h_v / D_{eff,vad}) + (h_{cap} / D_{eff,cap})}$$

$$D_{eff,cap} = D_{air} \cdot \frac{\theta_{acap}^{3.33}}{\theta_T^2} + D_{wat} \cdot \left(\frac{\theta_{wcap}^{3.33}}{H_{eff} \cdot \theta_T^2}\right)$$

$$D_{effvad} = D_{air} \cdot \frac{\theta_{avad}^{3.33}}{\theta_T^2} + D_{wat} \cdot \left(\frac{\theta_{wvad}^{3.33}}{H_{eff} \cdot \theta_T^2}\right)$$

Parameter	Value	Definition
Cgw	Chemical specific	Concentration in groundwater (mg/L)
VFgw,amb	Chemical specific	volatilization factor (L/m3)
H	Chemical specific	Henry's Law Constant, (cm^3-H_2O)/(cm^3-air)
Uair	420	Wind speed above ground in mixing zone (cm/sec)
dair	200	ambient air mixing zone height, (cm)
W	4500	width of source parallel to groundwater flow direction, (cm)
hcap	0.1	thickness of capillary fringe, (cm)
hv	0	thickness of vadose zone, (cm)
Lgw	0.1	depth to groundwater (cm)
Dws	Chemical specific	effective diffusion coefficient between groundwater and soil (cm^2/sec)
Dcap	Chemical specific	effective diffusion through capillary fringe, (cm^2/sec)
Ds	Chemical specific	effective diffusion coefficient in soil based on vapor concentration, (cm^2/sec)
Dair	Chemical specific	diffusion coefficient in air, (cm^2/sec)
Dwater	Chemical specific	diffusion coefficient in water, (cm^2/sec)
theta_as	0.12	volumetric air content in vadose zone soils, (cm^3-air/cm^3-soil)
theta_ws	0.12	volumetric water content in vadose zone soils, (cm^3-H_2O/cm^3-soil)
theta_T	0.38	total soil porosity, (cm^3/cm^3-soil)
theta_acap	0.038	volumetric air content in capillary fringe soils, (cm^3-air/cm^3-soil)
theta_wcap	0.342	volumetric water content in capillary fringe soils, (cm^3-H_2O/cm^3-soil)

VOLATILZATION FROM GROUNDWATER TO OUTDOOR AIR (PAGE 2 OF 2)
SOURCE: ASTM E50.04
SITE NAME: NSWC
LOCATION: INDIANAPOLIS, INDIANA
DATE: JUNE 12, 1999

Chemical	Cgw (mg/L)	Dair (cm^2/sec)	Dwater (cm^2/sec)	H'	Ds (cm^2/sec)	Dcap (cm^2/sec)	Dws (cm^2/sec)	VF (mg/m^3)/(mg/L)	Cair (mg/m^3)
Upgradient									
1,1-Dichloroethene	0.0775	9.00E-02	1.04E-05	1.07E+00	5.35E-04	1.35E-05	1.35E-05	7.75E-03	6.00E-04
1,2-Dichloroethane	0.0027	1.04E-01	9.90E-06	4.01E-02	6.20E-04	6.14E-05	6.14E-05	1.32E-03	3.56E-06
Chloroform	0.0013	1.04E-01	1.00E-05	1.50E-01	6.19E-04	2.64E-05	2.64E-05	2.12E-03	2.76E-06
Trichloroethene	0.0023	7.90E-02	9.10E-06	4.22E-01	4.70E-04	1.44E-05	1.44E-05	3.25E-03	7.49E-06
Downgradient									
1,1-Dichloroethene	0.029	9.00E-02	1.04E-05	1.07E+00	5.35E-04	1.35E-05	1.35E-05	7.75E-03	2.25E-04
Chloroform	0.0013	1.04E-01	1.00E-05	1.50E-01	6.19E-04	2.64E-05	2.64E-05	2.12E-03	2.76E-06
Ethyl Ether	3.95	7.40E-02	9.30E-06	2.79E-02	4.42E-04	7.44E-05	7.44E-05	1.11E-03	4.39E-03
Tetrachloroethene	0.00541	7.20E-02	8.20E-06	7.54E-01	4.28E-04	1.14E-05	1.14E-05	4.61E-03	2.49E-05
Trichloroethene	0.612	7.90E-02	9.10E-06	4.22E-01	4.70E-04	1.44E-05	1.44E-05	3.25E-03	1.99E-03
Vinyl Chloride	0.085	1.06E-01	1.23E-06	1.11E+00	6.30E-04	1.39E-05	1.39E-05	8.27E-03	7.03E-04
cis-1,2-Dichloroethene	0.528	7.36E-02	1.13E-05	1.67E-01	4.38E-04	2.27E-05	2.27E-05	2.03E-03	1.07E-03

APPENDIX K.4

RAGS PART D TABLES

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ On-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	Upgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Full-Time employees may be exposed to COPCs in soil during normal work activities.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
		Air	Upgradient	Full-Time Employee	Adult	Inhalation	On-site	None	No COPCs identified for this pathway.
				Trespassers	Adolescents	Inhalation	On-site	None	Access to site is restricted.
		Surface Soil	Downgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Full-Time employees may be exposed to COPCs in soil during normal work activities.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
		Air	Downgradient	Full-Time Employee	Adult	Inhalation	On-site	None	No COPCs identified for this pathway.
				Trespassers	Adolescents	Inhalation	On-site	None	Access to site is restricted.
	Groundwater	Groundwater	Upgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	None None	Full-time employee is not exposed to groundwater.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
			Downgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	None None	Full-time employee is not exposed to groundwater.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
	Sediment	Sediment	Upgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
			Downgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	None None	Full-time employee is not exposed to sediment.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
	Surface Water	Surface Water	Upgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.
			Downgradient	Full-Time Employee	Adult	Ingestion Dermal	On-Site On-Site	None None	Full-time employee is not exposed to surface water.
				Trespassers	Adolescents	Ingestion Dermal	On-Site On-Site	None None	Access to site is restricted.

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ On-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface/ Subsurface Soil	Surface/ Subsurface Soil	Upgradient	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Construction worker my be exposed to COPCs in soil during excavation activities.
				Residents	Child	Ingestion Dermal	On-Site On-Site	Quant Quant	Residents may be exposed to COPCs in soil.
					Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Residents may be exposed to COPCs in soil.
		Air	Upgradient	Construction Worker	Adult	Inhalation	On-site	None	No COPCs identified for this pathway.
				Residents	Child	Inhalation	On-Site	None	No COPCs identified for this pathway.
					Adult	Inhalation	On-Site	None	No COPCs identified for this pathway.
		Surface/ Subsurface Soil	Downgradient	Construction Worker	Adult	Ingestion Dermal	On-site On-site	Quant Quant	Construction worker my be exposed to COPCs in soil during excavation activities.
				Residents	Child	Ingestion Dermal	On-site On-site	Quant Quant	Residents may be exposed to COPCs in soil.
					Adult	Ingestion Dermal	On-site On-site	Quant Quant	Residents may be exposed to COPCs in soil.
		Air	Downgradient	Construction Worker	Adult	Inhalation	On-site	Quant	Concentrations of TCE exceeded EPA SSLs for soil to air in subsurface soil.
				Residents	Child	Inhalation	On-site	Quant	Concentrations of TCE exceeded EPA SSLs for soil to air in subsurface soil.
					Adult	Inhalation	On-site	Quant	Concentrations of TCE exceeded EPA SSLs for soil to air in subsurface soil.
	Groundwater	Groundwater	Upgradient	Construction Worker	Adult	Dermal	On-site	Quant	Construction workers may be exposed to COPCs in groundwater during excavation activities.
				Residents	Child	Ingestion Dermal	On-site On-site	Quant Quant	Residents may be exposed to COPCs in groundwater if groundwater is used as a potable water supply.
					Adult	Ingestion Dermal	On-site On-site	Quant Quant	Residents may be exposed to COPCs in groundwater if groundwater is used as a potable water supply.
		Air	Upgradient	Construction Worker	Adult	Inhalation	On-Site	Quant	Construction workers may be exposed to COPCs in groundwater during excavation activities.
				Residents	Adult	Inhalation	On-Site	Quant	Adults may be exposed to COPCS while showering.
					Child	Inhalation	On-Site	None	Child is not assumed to shower.
		Groundwater	Downgradient	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Construction workers may be exposed to COPCs in groundwater during excavation activities.
				Residents	Child	Ingestion Dermal	On-site On-site	Quant Quant	Residents may be exposed to COPCs in groundwater if groundwater is used as a potable water supply.

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ On-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
		Groundwater	Downgradient	Residents	Adult	Ingestion Dermal	On-site On-site	Quant Quant	Residents may be exposed to COPCs in groundwater if groundwater is used as a potable water supply.
		Air	Downgradient	Construction Worker	Adult	Inhalation	On-Site	Quant	Construction workers may be exposed to COPCs in groundwater during excavation activities.
				Residents	Adult	Inhalation	On-Site	Quant	Adults may be exposed to COPCS while showering.
					Child	Inhalation	On-Site	None	Child is not assumed to shower.
	Sediment	Sediment	Upgradient	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
				Residents	Child	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
					Adult	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
			Downgradient	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Construction worker may be exposed to COPCs in sediment during construction activities.
				Residents	Child	Ingestion Dermal	On-Site On-Site	Quant Quant	Residents may be exposed to COPCs in sediment during recreational activities.
					Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Residents may be exposed to COPCs in sediment during recreational activities.
			Sewer	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Construction worker may be exposed to COPCs in sediment during construction activities.
	Surface Water	Surface Water	Upgradient	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
				Residents	Child	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
					Adult	Ingestion Dermal	On-Site On-Site	None None	No COPCs identified for this pathway.
			Downgradient	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Construction worker may be exposed to COPCs in surface water during construction activities.
				Residents	Child	Ingestion Dermal	On-Site On-Site	Quant Quant	Residents may be exposed to COPCs in surface water during recreational activities.
					Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Residents may be exposed to COPCs in surface water during recreational activities.
			Sewer	Construction Worker	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Construction worker may be exposed to COPCs in surface water during construction activities.

TABLE 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Semivolatile Organic Compounds																	
205-99-2	Benzo(b)fluoranthene	63	J	63	J	ug/kg	S57SS0130101	1/1	NA	63	63	NA	870	C	NA	NA	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	120	J	120	J	ug/kg	S57SS0130101	1/1	NA	120	120	NA	46000	C	NA	NA	No	BSL
206-44-0	Fluoranthene	55	J	55	J	ug/kg	S57SS0130101	1/1	NA	55	55	NA	310000	N	NA	NA	No	BSL
129-00-0	Pyrene	50	J	50	J	ug/kg	S57SS0130101	1/1	NA	50	50	NA	230000	N	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	6660		6660		mg/kg	S57SS0130101	1/1	NA	6660	6660	18329	7800	N	NA	NA	No	BSL, BKG
7440-36-0	Antimony	0.87	L	0.87	L	mg/kg	S57SS0130101	1/1	NA	0.87	0.87	ND	3.1	N	NA	NA	No	BSL
7440-38-2	Arsenic	9.6		9.6		mg/kg	S57SS0130101	1/1	NA	9.6	9.6	4.25	0.43	C	NA	NA	Yes	ASL
7440-39-3	Barium	26.8		26.8		mg/kg	S57SS0130101	1/1	NA	26.8	26.8	144	550	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.27		0.27		mg/kg	S57SS0130101	1/1	NA	0.27	0.27	0.905	16	N	NA	NA	No	BSL, BKG
7440-43-9	Cadmium	0.21		0.21		mg/kg	S57SS0130101	1/1	NA	0.21	0.21	0.26	3.9	N	NA	NA	No	BSL, BKG
7440-70-2	Calcium	1580		1580		mg/kg	S57SS0130101	1/1	NA	1580	1580	409	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	22.7		22.7		mg/kg	S57SS0130101	1/1	NA	22.7	22.7	24.2	23 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	10.3		10.3		mg/kg	S57SS0130101	1/1	NA	10.3	10.3	39.7	470	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	15		15		mg/kg	S57SS0130101	1/1	NA	15	15	18.7	310	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	13000		13000		mg/kg	S57SS0130101	1/1	NA	13000	13000	43170	2300	N	NA	NA	No	BSL
7439-92-1	Lead	120		120		mg/kg	S57SS0130101	1/1	NA	120	120	149	400 (6)	N	NA	NA	No	BSL, BKG
7439-95-4	Magnesium	9150	J	9150	J	mg/kg	S57SS0130101	1/1	NA	9150	9150	1382	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	124	L	124	L	mg/kg	S57SS0130101	1/1	NA	124	124	2248	160	N	NA	NA	No	BSL, BKG
7439-97-6	Mercury	0.08		0.08		mg/kg	S57SS0130101	1/1	NA	0.08	0.08	0.087	2.3 (7)	N	NA	NA	No	BSL, BKG
7440-02-0	Nickel	135	J	135	J	mg/kg	S57SS0130101	1/1	NA	135	135	18.2	160	N	NA	NA	No	BSL
7440-09-7	Potassium	398		398		mg/kg	S57SS0130101	1/1	NA	398	398	1874	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	144		144		mg/kg	S57SS0130101	1/1	NA	144	144	51.9	NA		NA	NA	No	NUT
7440-62-2	Vanadium	20.7		20.7		mg/kg	S57SS0130101	1/1	NA	20.7	20.7	53.5	55	N	NA	NA	No	BSL, BKG
7440-66-6	Zinc	94.4		94.4		mg/kg	S57SS0130101	1/1	NA	94.4	94.4	36.1	2300	N	NA	NA	No	BSL
	Miscellaneous																	
	pH	8.36		8.36			S57SS0130101	1/1	NA	8.36	8.36	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SS0130101

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Residential, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

(6) Value is based on OSWER Soil Screening Level for residential land use (USEPA, July 1994).

(7) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Semivolatile Organic Compounds																	
205-99-2	Benzo(b)fluoranthene	63	J	63	J	ug/kg	S57SS0130101	1/1	NA	63	63	NA	7800	C	NA	NA	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	120	J	120	J	ug/kg	S57SS0130101	1/1	NA	120	120	NA	410000	C	NA	NA	No	BSL
206-44-0	Fluoranthene	55	J	55	J	ug/kg	S57SS0130101	1/1	NA	55	55	NA	8200000	N	NA	NA	No	BSL
129-00-0	Pyrene	50	J	50	J	ug/kg	S57SS0130101	1/1	NA	50	50	NA	6100000	N	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	6660		6660		mg/kg	S57SS0130101	1/1	NA	6660	6660	18329	200000	N	NA	NA	No	BSL, BKG
7440-36-0	Antimony	0.87	L	0.87	L	mg/kg	S57SS0130101	1/1	NA	0.87	0.87	ND	82	N	NA	NA	No	BSL
7440-38-2	Arsenic	9.6		9.6		mg/kg	S57SS0130101	1/1	NA	9.6	9.6	4.25	3.8	C	NA	NA	Yes	ASL
7440-39-3	Barium	26.8		26.8		mg/kg	S57SS0130101	1/1	NA	26.8	26.8	144	14000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.27		0.27		mg/kg	S57SS0130101	1/1	NA	0.27	0.27	0.905	410	N	NA	NA	No	BSL, BKG
7440-43-9	Cadmium	0.21		0.21		mg/kg	S57SS0130101	1/1	NA	0.21	0.21	0.26	10	N	NA	NA	No	BSL, BKG
7440-70-2	Calcium	1580		1580		mg/kg	S57SS0130101	1/1	NA	1580	1580	409	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	22.7		22.7		mg/kg	S57SS0130101	1/1	NA	22.7	22.7	24.2	610 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	10.3		10.3		mg/kg	S57SS0130101	1/1	NA	10.3	10.3	39.7	12000	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	15		15		mg/kg	S57SS0130101	1/1	NA	15	15	18.7	8200	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	13000		13000		mg/kg	S57SS0130101	1/1	NA	13000	13000	43170	61000	N	NA	NA	No	BSL
7439-92-1	Lead	120		120		mg/kg	S57SS0130101	1/1	NA	120	120	149	1000 (6)	N	NA	NA	No	BSL, BKG
7439-95-4	Magnesium	9150	J	9150	J	mg/kg	S57SS0130101	1/1	NA	9150	9150	1382	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	124	L	124	L	mg/kg	S57SS0130101	1/1	NA	124	124	2248	4100	N	NA	NA	No	BSL, BKG
7439-97-6	Mercury	0.08		0.08		mg/kg	S57SS0130101	1/1	NA	0.08	0.08	0.087	61 (7)	N	NA	NA	No	BSL, BKG
7440-02-0	Nickel	135	J	135	J	mg/kg	S57SS0130101	1/1	NA	135	135	18.2	4100	N	NA	NA	No	BSL
7440-09-7	Potassium	398		398		mg/kg	S57SS0130101	1/1	NA	398	398	1874	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	144		144		mg/kg	S57SS0130101	1/1	NA	144	144	51.9	NA		NA	NA	No	NUT
7440-62-2	Vanadium	20.7		20.7		mg/kg	S57SS0130101	1/1	NA	20.7	20.7	53.5	1400	N	NA	NA	No	BSL, BKG
7440-66-6	Zinc	94.4		94.4		mg/kg	S57SS0130101	1/1	NA	94.4	94.4	38.1	61000	N	NA	NA	No	BSL
	Miscellaneous																	
	pH	8.36		8.36			S57SS0130101	1/1	NA	8.36	8.36	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SS0130101

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Industrial, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

(6) EPA Region III.

(7) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Semivolatile Organic Compounds																	
205-99-2	Benzo(b)fluoranthene	63	J	63	J	ug/kg	S57SS0130101	1/1	NA	63	63	NA	NA	C	NA	NA	No	NTX
117-81-7	Bis(2-Ethylhexyl)phthalate	120	J	120	J	ug/kg	S57SS0130101	1/1	NA	120	120	NA	31000000	C	NA	NA	No	BSL
206-44-0	Fluoranthene	55	J	55	J	ug/kg	S57SS0130101	1/1	NA	55	55	NA	NA	N	NA	NA	No	NTX
129-00-0	Pyrene	50	J	50	J	ug/kg	S57SS0130101	1/1	NA	50	50	NA	NA	N	NA	NA	No	NTX
	Inorganics																	
7429-90-5	Aluminum	6660		6660		mg/kg	S57SS0130101	1/1	NA	6660	6660	18329	NA	N	NA	NA	No	BKG
7440-36-0	Antimony	0.87	L	0.87	L	mg/kg	S57SS0130101	1/1	NA	0.87	0.87	ND	NA	N	NA	NA	No	NTX
7440-38-2	Arsenic	9.6		9.6		mg/kg	S57SS0130101	1/1	NA	9.6	9.6	4.25	750	C	NA	NA	No	BSL
7440-39-3	Barium	26.8		26.8		mg/kg	S57SS0130101	1/1	NA	26.8	26.8	144	690000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.27		0.27		mg/kg	S57SS0130101	1/1	NA	0.27	0.27	0.905	1300	N	NA	NA	No	BSL, BKG
7440-43-9	Cadmium	0.21		0.21		mg/kg	S57SS0130101	1/1	NA	0.21	0.21	0.26	1800	N	NA	NA	No	BSL, BKG
7440-70-2	Calcium	1580		1580		mg/kg	S57SS0130101	1/1	NA	1580	1580	409	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	22.7		22.7		mg/kg	S57SS0130101	1/1	NA	22.7	22.7	24.2	270 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	10.3		10.3		mg/kg	S57SS0130101	1/1	NA	10.3	10.3	39.7	NA	N	NA	NA	No	BKG
7440-50-8	Copper	15		15		mg/kg	S57SS0130101	1/1	NA	15	15	18.7	NA	N	NA	NA	No	BKG
7439-89-6	Iron	13000		13000		mg/kg	S57SS0130101	1/1	NA	13000	13000	43170	NA	N	NA	NA	No	NTX
7439-92-1	Lead	120		120		mg/kg	S57SS0130101	1/1	NA	120	120	149	NA	N	NA	NA	No	BKG
7439-95-4	Magnesium	9150	J	9150	J	mg/kg	S57SS0130101	1/1	NA	9150	9150	1382	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	124	L	124	L	mg/kg	S57SS0130101	1/1	NA	124	124	2248	NA	N	NA	NA	No	BKG
7439-97-6	Mercury	0.08		0.08		mg/kg	S57SS0130101	1/1	NA	0.08	0.08	0.087	10	N	NA	NA	No	BSL, BKG
7440-02-0	Nickel	135	J	135	J	mg/kg	S57SS0130101	1/1	NA	135	135	16.2	13000	N	NA	NA	No	BSL
7440-09-7	Potassium	398		398		mg/kg	S57SS0130101	1/1	NA	398	398	1874	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	144		144		mg/kg	S57SS0130101	1/1	NA	144	144	51.9	NA		NA	NA	No	NUT
7440-62-2	Vanadium	20.7		20.7		mg/kg	S57SS0130101	1/1	NA	20.7	20.7	53.5	NA	N	NA	NA	No	BKG
7440-66-6	Zinc	94.4		94.4		mg/kg	S57SS0130101	1/1	NA	94.4	94.4	38.1	NA	N	NA	NA	No	NTX
	Miscellaneous																	
	pH	8.36		8.36			S57SS0130101	1/1	NA	8.36	8.36	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SS0130101

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Soil Screening Level Guidance: Technical Background Document, May 1996.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
67-64-1	Acetone	26		26		ug/kg	S57SB0130101	1/2	12	16	26	NA	780000	N	NA	NA	No	BSL
60-29-7	Ethyl Ether	54		54		ug/kg	S57SB0130201	1/2	12	30	54	NA	1600000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
117-81-7	Bis(2-Ethylhexyl)phthalate	89	J	89	J	ug/kg	S57SB0130201	1/2	400	145	89	NA	46000	C	NA	NA	No	BSL
84-74-2	Di-n-butyl phthalate	200	J	200	J	ug/kg	S57SB0130101	1/2	410	203	200	NA	780000	N	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	5410	J	7780		mg/kg	S57SB0130101	2/2	NA	6595	7780	34406	7800	N	NA	NA	No	BSL, BKG
7440-38-2	Arsenic	2.6	L	2.9		mg/kg	S57SB0130101	2/2	NA	2.75	2.9	24.4	0.43	C	NA	NA	No	BKG
7440-39-3	Barium	24.5		34.2		mg/kg	S57SB0130201	2/2	NA	29.4	34.2	191	550	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.22		0.52		mg/kg	S57SB0130201	2/2	NA	0.37	0.52	2.46	16	N	NA	NA	No	BSL, BKG
7440-70-2	Calcium	573		796		mg/kg	S57SB0130201	2/2	NA	685	796	196	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	9.8		10.9	J	mg/kg	S57SB0130201	2/2	NA	10.4	10.9	101	23 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	1.4		6.2		mg/kg	S57SB0130201	2/2	NA	3.8	6.2	133	470	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	6.2		7.5		mg/kg	S57SB0130101	2/2	NA	6.85	7.5	56.5	310	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	9360		10600		mg/kg	S57SB0130201	2/2	NA	9980	10600	151453	2300	N	NA	NA	No	BKG
7439-92-1	Lead	8.2	J	8.4		mg/kg	S57SB0130101	2/2	NA	8.3	8.4	37.5	400 (6)	N	NA	NA	No	BSL, BKG
7439-95-4	Magnesium	350		549	J	mg/kg	S57SB0130101	2/2	NA	450	549	4307	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	26	L	42.3	K	mg/kg	S57SB0130201	2/2	NA	34.2	42.3	1270	160	N	NA	NA	No	BSL, BKG
7439-97-6	Mercury	0.02		0.03		mg/kg	S57SB0130201	2/2	NA	0.025	0.03	0.13	2.3 (7)	N	NA	NA	No	BSL, BKG
7440-02-0	Nickel	3		4.1	J	mg/kg	S57SB0130101	2/2	NA	3.55	4.1	22.1	160	N	NA	NA	No	BSL, BKG
7440-09-7	Potassium	370		743		mg/kg	S57SB0130101	2/2	NA	557	743	5998	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.82	K	0.82	K	mg/kg	S57SB0130101	1/2	0.5	0.535	0.82	8.93	39	N	NA	NA	No	BSL, BKG
7440-23-5	Sodium	70.8		95.2		mg/kg	S57SB0130101	2/2	NA	83	95.2	826	NA		NA	NA	No	NUT, BKG
7440-62-2	Vanadium	20.6		21.9		mg/kg	S57SB0130101	2/2	NA	21.3	21.9	133	55	N	NA	NA	No	BSL, BKG
7440-66-6	Zinc	13.8		15.3		mg/kg	S57SB0130101	2/2	NA	14.6	15.3	79.5	2300	N	NA	NA	No	BSL, BKG
	Miscellaneous																	
9004-70-0	Nitrocellulose	50.4	L	50.4	L	mg/kg	S57SB0130201	1/1	NA	50.4	299	NA	NA		NA	NA	No	NTX
	pH	6.57		7.79			S57SB0130101	2/2	NA	7.18	NA	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SB0130101, S57SB0130201

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Residential, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

(6) Value is based on OSWER Soil Screening Level for residential land use (USEPA, July 1994).

(7) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
67-64-1	Acetone	26		26		ug/kg	S57SB0130101	1/2	12	16	26	NA	20000000	N	NA	NA	No	BSL
60-29-7	Ethyl Ether	54		54		ug/kg	S57SB0130201	1/2	12	30	54	NA	41000000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
117-81-7	Bis(2-Ethylhexyl)phthalate	89	J	89	J	ug/kg	S57SB0130201	1/2	400	145	89	NA	410000	C	NA	NA	No	BSL
84-74-2	Di-n-butyl phthalate	200	J	200	J	ug/kg	S57SB0130101	1/2	410	203	200	NA	20000000	N	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	5410	J	7780		mg/kg	S57SB0130101	2/2	NA	6595	7780	34406	200000	N	NA	NA	No	BSL, BKG
7440-38-2	Arsenic	2.6	L	2.9		mg/kg	S57SB0130101	2/2	NA	2.75	2.9	24.4	3.8	C	NA	NA	No	BKG
7440-39-3	Barium	24.5		34.2		mg/kg	S57SB0130201	2/2	NA	29.4	34.2	191	14000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.22		0.52		mg/kg	S57SB0130201	2/2	NA	0.37	0.52	2.46	410	N	NA	NA	No	BSL, BKG
7440-70-2	Calcium	573		796		mg/kg	S57SB0130201	2/2	NA	685	796	196	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	9.8		10.9	J	mg/kg	S57SB0130201	2/2	NA	10.4	10.9	101	610 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	1.4		6.2		mg/kg	S57SB0130201	2/2	NA	3.8	6.2	133	12000	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	6.2		7.5		mg/kg	S57SB0130101	2/2	NA	6.85	7.5	56.5	8200	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	9360		10600		mg/kg	S57SB0130201	2/2	NA	9980	10600	151453	61000	N	NA	NA	No	BKG
7439-92-1	Lead	8.2	J	8.4		mg/kg	S57SB0130101	2/2	NA	8.3	8.4	37.5	1000 (6)	N	NA	NA	No	BSL, BKG
7439-95-4	Magnesium	350		549	J	mg/kg	S57SB0130101	2/2	NA	450	549	4307	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	26	L	42.3	K	mg/kg	S57SB0130201	2/2	NA	34.2	42.3	1270	4100	N	NA	NA	No	BSL, BKG
7439-97-6	Mercury	0.02		0.03		mg/kg	S57SB0130201	2/2	NA	0.025	0.03	0.13	61 (7)	N	NA	NA	No	BSL, BKG
7440-02-0	Nickel	3		4.1	J	mg/kg	S57SB0130101	2/2	NA	3.55	4.1	22.1	4100	N	NA	NA	No	BSL, BKG
7440-09-7	Potassium	370		743		mg/kg	S57SB0130101	2/2	NA	557	743	5998	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.82	K	0.82	K	mg/kg	S57SB0130101	1/2	0.5	0.535	0.82	8.93	1000	N	NA	NA	No	BSL, BKG
7440-23-5	Sodium	70.8		95.2		mg/kg	S57SB0130101	2/2	NA	83	95.2	826	NA		NA	NA	No	NUT, BKG
7440-62-2	Vanadium	20.6		21.9		mg/kg	S57SB0130101	2/2	NA	21.3	21.9	133	1400	N	NA	NA	No	BSL, BKG
7440-66-6	Zinc	13.8		15.3		mg/kg	S57SB0130101	2/2	NA	14.6	15.3	79.5	61000	N	NA	NA	No	BSL, BKG
	Miscellaneous																	
9004-70-0	Nitrocellulose	50.4	L	50.4	L	mg/kg	S57SB0130201	1/1	NA	50.4	299	NA	NA		NA	NA	No	NTX
	pH	6.57		7.79			S57SB0130101	2/2	NA	7.18	NA	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SB0130101, S57SB0130201

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Industrial, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

(6) EPA Region III.

(7) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
67-64-1	Acetone	26		26		ug/kg	S57SB0130101	1/2	12	16	26	NA	100000000	N	NA	NA	No	BSL
60-29-7	Ethyl Ether	54		54		ug/kg	S57SB0130201	1/2	12	30	54	NA	NA	N	NA	NA	No	NTX
	Semivolatile Organic Compounds																	
117-81-7	Bis(2-Ethylhexyl)phthalate	89	J	89	J	ug/kg	S57SB0130201	1/2	400	145	89	NA	31000000	C	NA	NA	No	BSL
84-74-2	Di-n-butyl phthalate	200	J	200	J	ug/kg	S57SB0130101	1/2	410	203	200	NA	2300000	N	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	5410	J	7780		mg/kg	S57SB0130101	2/2	NA	6595	7780	34406	NA	N	NA	NA	No	BKG
7440-38-2	Arsenic	2.6	L	2.9		mg/kg	S57SB0130101	2/2	NA	2.75	2.9	24.4	750	C	NA	NA	No	BSL, BKG
7440-39-3	Barium	24.5		34.2		mg/kg	S57SB0130201	2/2	NA	29.4	34.2	191	690000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.22		0.52		mg/kg	S57SB0130201	2/2	NA	0.37	0.52	2.46	1300	N	NA	NA	No	BSL, BKG
7440-70-2	Calcium	573		796		mg/kg	S57SB0130201	2/2	NA	685	796	196	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	9.8		10.9	J	mg/kg	S57SB0130201	2/2	NA	10.4	10.9	101	270 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	1.4		6.2		mg/kg	S57SB0130201	2/2	NA	3.8	6.2	133	NA	N	NA	NA	No	BKG
7440-50-8	Copper	6.2		7.5		mg/kg	S57SB0130101	2/2	NA	6.85	7.5	56.5	NA	N	NA	NA	No	BKG
7439-89-6	Iron	9360		10600		mg/kg	S57SB0130201	2/2	NA	9980	10600	151453	NA	N	NA	NA	No	BKG
7439-92-1	Lead	8.2	J	8.4		mg/kg	S57SB0130101	2/2	NA	8.3	8.4	37.5	NA	N	NA	NA	No	BKG
7439-95-4	Magnesium	350		549	J	mg/kg	S57SB0130101	2/2	NA	450	549	4307	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	26	L	42.3	K	mg/kg	S57SB0130201	2/2	NA	34.2	42.3	1270	NA	N	NA	NA	No	BKG
7439-97-6	Mercury	0.02		0.03		mg/kg	S57SB0130201	2/2	NA	0.025	0.03	0.13	10	N	NA	NA	No	BSL, BKG
7440-02-0	Nickel	3		4.1	J	mg/kg	S57SB0130101	2/2	NA	3.55	4.1	22.1	13000	N	NA	NA	No	BSL, BKG
7440-09-7	Potassium	370		743		mg/kg	S57SB0130101	2/2	NA	557	743	5998	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.82	K	0.82	K	mg/kg	S57SB0130101	1/2	0.5	0.535	0.82	8.93	NA	N	NA	NA	No	BKG
7440-23-5	Sodium	70.8		95.2		mg/kg	S57SB0130101	2/2	NA	83	95.2	826	NA		NA	NA	No	NUT, BKG
7440-62-2	Vanadium	20.6		21.9		mg/kg	S57SB0130101	2/2	NA	21.3	21.9	133	NA	N	NA	NA	No	BKG
7440-66-6	Zinc	13.8		15.3		mg/kg	S57SB0130101	2/2	NA	14.6	15.3	79.5	NA	N	NA	NA	No	BKG
	Miscellaneous																	
9004-70-0	Nitrocellulose	50.4	L	50.4	L	mg/kg	S57SB0130201	1/1	NA	50.4	299	NA	NA		NA	NA	No	NTX
	pH	6.57		7.79			S57SB0130101	2/2	NA	7.18	NA	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SB0130101, S57SB0130201

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Soil Screening Level Guidance: Technical Background Document, May 1996.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)

No Toxicity Information (NTX)

Essential Nutrient (NUT)

Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

Definitions: N/A = Not Applicable

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

J = Estimated Value

C = Carcinogenic

N = Non-Carcinogenic

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
108-88-3	Toluene	1	J	1	J	ug/kg	S57SS0040101	1/9	11 - 14	5.22	1	NA	1600000	N	NA	NA	No	BSL
79-01-6	Trichloroethene	10	J	93		ug/kg	S57SS0070101	4/9	11 - 12	23.1	10	NA	58000	C	NA	NA	No	BSL
156-59-2	cis-1,2-dichloroethene	2	J	4	J	ug/kg	S57SS0070101	2/9	11 - 12	5	2	NA	78000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
91-57-6	2-Methylnaphthalene	37	J	37	J	ug/kg	S57SS0050101	1/3	370 - 480	154	37	NA	160000	N	NA	NA	No	BSL
208-96-8	Acenaphthylene	140	J	140	J	ug/kg	S57SS0050101	1/3	370 - 480	188	140	NA	160000 (5)	N	NA	NA	No	BSL
120-12-7	Anthracene	51	J	240	J	ug/kg	S57SS0050101	2/3	370	159	240	NA	2300000	N	NA	NA	No	BSL
56-55-3	Benzo(a)anthracene	150		2300		ug/kg	S57SS0050101	3/3	NA	883	2300	NA	870	C	NA	NA	Yes	ASL
50-32-8	Benzo(a)pyrene	130	J	1700		ug/kg	S57SS0050101	3/3	NA	660	1700	NA	87	C	NA	NA	Yes	ASL
205-99-2	Benzo(b)fluoranthene	200	J	4200		ug/kg	S57SS0050101	3/3	NA	1560	4200	NA	870	C	NA	NA	Yes	ASL
191-24-2	Benzo(g,h,i)perylene	52		450		ug/kg	S57SS0050101	3/3	NA	188	450	NA	160000 (5)	N	NA	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	83	J	1400		ug/kg	S57SS0050101	3/3	NA	527	1400	NA	8700	N	NA	NA	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	41		120	J	ug/kg	S57SS0050101	2/3	480	134	120	NA	46000	C	NA	NA	No	BSL
86-74-8	Carbazole	99	J	99	J	ug/kg	S57SS0050101	1/3	370 - 480	175	99	NA	32000	C	NA	NA	No	BSL
218-01-9	Chrysene	180		2200		ug/kg	S57SS0050101	3/3	NA	860	2200	NA	87000	C	NA	NA	No	BSL
53-70-3	Dibenzo(a,h)anthracene	350	J	350	J	ug/kg	S57SS0050101	1/3	370 - 480	258	350	NA	87	C	NA	NA	Yes	ASL
206-44-0	Fluoranthene	300		1800		ug/kg	S57SS0050101	3/3	NA	803	1800	NA	310000	N	NA	NA	No	BSL
86-73-7	Fluorene	39	J	39	J	ug/kg	S57SS0050101	1/3	370 - 480	155	39	NA	310000	N	NA	NA	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	79		970		ug/kg	S57SS0050101	3/3	NA	376	970	NA	870	N	NA	NA	Yes	ASL
91-20-3	Naphthalene	38	J	38	J	ug/kg	S57SS0050101	1/3	370 - 480	154	38	NA	160000	C	NA	NA	No	BSL
85-01-8	Phenanthrene	180		490		ug/kg	S57SS0050101	3/3	NA	327	490	NA	160000 (5)	N	NA	NA	No	BSL
129-00-0	Pyrene	310		2500		ug/kg	S57SS0050101	3/3	NA	1097	2500	NA	230000	N	NA	NA	No	BSL
	Pesticides																	
72-54-8	4,4'-DDD	12		12		ug/kg	S57SS0050101	1/3	3.8 - 4.8	5.43	12	NA	2700	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	61		61		ug/kg	S57SS0050101	1/3	3.8 - 4.8	21.8	61	NA	1900	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	150	J	150	J	ug/kg	S57SS0050101	1/3	3.8 - 4.8	51.4	150	NA	1900	C	NA	NA	No	BSL
5103-74-2	Gamma-Chlordane	5.3	J	5.3	J	ug/kg	S57SS0050101	1/3	1.9 - 2.4	2.48	5.3	NA	1800	C	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	3640	J	9170		mg/kg	S57SS0070101	3/3	NA	6313	9170	18329	7800	N	NA	NA	No	BKG
7440-38-2	Arsenic	29.3		103		mg/kg	S57SS0070101	3/3	NA	55.3	103	4.25	0.43	C	NA	NA	Yes	ASL
7440-39-3	Barium	20.7		48.2		mg/kg	S57SS0070101	3/3	NA	35.9	48.2	144	550	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.29		0.88		mg/kg	S57SS0080101-MAX	3/3	NA	0.647	0.88	0.905	16	N	NA	NA	No	BSL, BKG
7440-43-9	Cadmium	0.47		0.8		mg/kg	S57SS0080101-MAX	2/3	0.19	0.455	0.8	0.26	3.9	N	NA	NA	No	BSL
7440-70-2	Calcium	604		3270		mg/kg	S57SS0070101	3/3	NA	2001	3270	409	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	12		14.3		mg/kg	S57SS0070101	3/3	NA	13.1	14.3	24.2	23 (6)	N	NA	NA	No	BSL, BKG

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-48-4	Cobalt	6.9		8.3	K	mg/kg	S57SS0070101	3/3	NA	7.77	8.3	39.7	470	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	10.4		20.3		mg/kg	S57SS0080101-MAX	3/3	NA	15.1	20.3	18.7	310	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	12400		24800		mg/kg	S57SS0070101	3/3	NA	19233	24800	43170	2300	N	NA	NA	No	BKG
7439-92-1	Lead	25.4	K	487	J	mg/kg	S57SS0050101	3/3	NA	201	487	149	400 (7)	N	NA	NA	Yes	ASL
7439-95-4	Magnesium	301		796		mg/kg	S57SS0070101	3/3	NA	593	796	1382	NA	N	NA	NA	No	NUT, BKG
7439-96-5	Manganese	97.9		134	K	mg/kg	S57SS0050101	3/3	NA	111	134	2248	160	N	NA	NA	No	BSL, BKG
7439-97-6	Mercury	0.03		0.1		mg/kg	S57SS0080101-MAX	3/3	NA	0.073	0.1	0.087	2.3 (9)	N	NA	NA	No	BSL
7440-02-0	Nickel	6		8.4		mg/kg	S57SS0080101-MAX	3/3	NA	7.03	8.4	18.2	160	N	NA	NA	No	BSL, BKG
7440-09-7	Potassium	234		828		mg/kg	S57SS0070101	3/3	NA	600	828	1874	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.56	L	0.56	L	mg/kg	S57SS0050101	1/3	0.32 - 0.38	0.303	0.56	1.09	39	N	NA	NA	No	BSL, BKG
7440-23-5	Sodium	45.7		82		mg/kg	S57SS0080101-MAX	2/3	128	63.9	82	51.9	NA		NA	NA	No	NUT
7440-62-2	Vanadium	19.1		35.7		mg/kg	S57SS0070101	3/3	NA	28.7	35.7	53.5	55	N	NA	NA	No	BSL, BKG
7440-66-6	Zinc	45		261		mg/kg	S57SS0080101-MAX	3/3	NA	125	261	38.1	2300	N	NA	NA	No	BSL
	Miscellaneous																	
9004-70-0	Nitrocellulose	116		299	L	mg/kg	S57SS0050101	3/3	NA	202	299	NA	NA		NA	NA	No	NTX
	pH	6.06		8.12			S57SS0070101	3/3	NA	7.34	8.12	NA	NA		NA	NA	NA	NTX
	Total Organic Carbon	7790	L	50600		mg/kg	S57SS0090101-MAX	2/2	NA	29195	50600	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SS0010101, S57SS0020101, S57SS0040101, S57SS0050101, S57SS0070101, S57SS0080101-MAX, S57SS0090101-MAX, S57SS0110101, S57SS0150101.

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Residential, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for naphthalene.

(6) Value is for hexavalent chromium.

(7) Value is based on OSWER Soil Screening Level for residential land use (USEPA, July 1994).

(8) EPA Region III.

(9) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
108-88-3	Toluene	1	J	1	J	ug/kg	S57SS0040101	1/9	11 - 14	5.22	1	NA	41000000	N	NA	NA	No	BSL
79-01-6	Trichloroethene	10	J	93		ug/kg	S57SS0070101	4/9	11 - 12	23.1	10	NA	520000	C	NA	NA	No	BSL
156-59-2	cis-1,2-dichloroethene	2	J	4	J	ug/kg	S57SS0070101	2/9	11 - 12	5	2	NA	200000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
91-57-6	2-Methylnaphthalene	37	J	37	J	ug/kg	S57SS0050101	1/3	370 - 480	154	37	NA	4100000	N	NA	NA	No	BSL
208-96-8	Acenaphthylene	140	J	140	J	ug/kg	S57SS0050101	1/3	370 - 480	188	140	NA	4100000 (5)	N	NA	NA	No	BSL
120-12-7	Anthracene	51	J	240	J	ug/kg	S57SS0050101	2/3	370	159	240	NA	61000000	N	NA	NA	No	BSL
56-55-3	Benzo(a)anthracene	150		2300		ug/kg	S57SS0050101	3/3	NA	883	2300	NA	7800	C	NA	NA	No	BSL
50-32-8	Benzo(a)pyrene	130	J	1700		ug/kg	S57SS0050101	3/3	NA	660	1700	NA	780	C	NA	NA	Yes	ASL
205-99-2	Benzo(b)fluoranthene	200	J	4200		ug/kg	S57SS0050101	3/3	NA	1560	4200	NA	7800	C	NA	NA	No	BSL
191-24-2	Benzo(g,h,i)perylene	52		450		ug/kg	S57SS0050101	3/3	NA	188	450	NA	4100000 (5)	N	NA	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	83	J	1400		ug/kg	S57SS0050101	3/3	NA	527	1400	NA	78000	N	NA	NA	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	41		120	J	ug/kg	S57SS0050101	2/3	480	134	120	NA	410000	C	NA	NA	No	BSL
86-74-8	Carbazole	99	J	99	J	ug/kg	S57SS0050101	1/3	370 - 480	175	99	NA	290000	C	NA	NA	No	BSL
218-01-9	Chrysene	180		2200		ug/kg	S57SS0050101	3/3	NA	860	2200	NA	780000	C	NA	NA	No	BSL
53-70-3	Dibenzo(a,h)anthracene	350	J	350	J	ug/kg	S57SS0050101	1/3	370 - 480	258	350	NA	780	C	NA	NA	No	BSL
206-44-0	Fluoranthene	300		1800		ug/kg	S57SS0050101	3/3	NA	803	1800	NA	8200000	N	NA	NA	No	BSL
86-73-7	Fluorene	39	J	39	J	ug/kg	S57SS0050101	1/3	370 - 480	155	39	NA	8200000	N	NA	NA	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	79		970		ug/kg	S57SS0050101	3/3	NA	376	970	NA	7800	N	NA	NA	No	BSL
91-20-3	Naphthalene	38	J	38	J	ug/kg	S57SS0050101	1/3	370 - 480	154	38	NA	41000000	C	NA	NA	No	BSL
85-01-8	Phenanthrene	180		490		ug/kg	S57SS0050101	3/3	NA	327	490	NA	4100000 (5)	N	NA	NA	No	BSL
129-00-0	Pyrene	310		2500		ug/kg	S57SS0050101	3/3	NA	1097	2500	NA	6100000	N	NA	NA	No	BSL
	Pesticides																	
72-54-8	4,4'-DDD	12		12		ug/kg	S57SS0050101	1/3	3.8 - 4.8	5.43	12	NA	24000	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	61		61		ug/kg	S57SS0050101	1/3	3.8 - 4.8	21.8	61	NA	17000	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	150	J	150	J	ug/kg	S57SS0050101	1/3	3.8 - 4.8	51.4	150	NA	17000	C	NA	NA	No	BSL
5103-74-2	Gamma-Chlordane	5.3	J	5.3	J	ug/kg	S57SS0050101	1/3	1.9 - 2.4	2.48	5.3	NA	16000	C	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	3640	J	9170		mg/kg	S57SS0070101	3/3	NA	6313	9170	18329	200000	N	NA	NA	No	BKG
7440-38-2	Arsenic	29.3		103		mg/kg	S57SS0070101	3/3	NA	55.3	103	4.25	3.8	C	NA	NA	Yes	ASL
7440-39-3	Barium	20.7		48.2		mg/kg	S57SS0070101	3/3	NA	35.9	48.2	144	14000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.29		0.88		mg/kg	S57SS0080101-MAX	3/3	NA	0.647	0.88	0.905	410	N	NA	NA	No	BSL, BKG
7440-43-9	Cadmium	0.47		0.8		mg/kg	S57SS0080101-MAX	2/3	0.19	0.455	0.8	0.26	10	N	NA	NA	No	BSL
7440-70-2	Calcium	604		3270		mg/kg	S57SS0070101	3/3	NA	2001	3270	409	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	12		14.3		mg/kg	S57SS0070101	3/3	NA	13.1	14.3	24.2	610 (6)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	6.9		8.3	K	mg/kg	S57SS0070101	3/3	NA	7.77	8.3	39.7	12000	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	10.4		20.3		mg/kg	S57SS0080101-MAX	3/3	NA	15.1	20.3	18.7	6200	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	12400		24800		mg/kg	S57SS0070101	3/3	NA	19233	24800	43170	61000	N	NA	NA	No	BKG
7439-92-1	Lead	25.4	K	487	J	mg/kg	S57SS0050101	3/3	NA	201	487	149	1000 (7)	N	NA	NA	No	BSL
7439-95-4	Magnesium	301		796		mg/kg	S57SS0070101	3/3	NA	593	796	1382	NA	N	NA	NA	No	NUT, BKG
7439-96-5	[illegible]anese	97.9		134	K	mg/kg	S57SS0050101	3/[illegible]	NA	111	134	2248	4100	N	NA	NA	No	BSL, BKG

TABLE 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7439-97-6	Mercury	0.03		0.1		mg/kg	S57SS0080101-MAX	3/3	NA	0.073	0.1	0.087	51 (8)	N	NA	NA	No	BSL
7440-02-0	Nickel	6		8.4		mg/kg	S57SS0080101-MAX	3/3	NA	7.03	8.4	18.2	4100	N	NA	NA	No	BSL, BKG
7440-09-7	Potassium	234		828		mg/kg	S57SS0070101	3/3	NA	600	828	1874	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.56	L	0.56	L	mg/kg	S57SS0050101	1/3	0.32 - 0.38	0.303	0.56	1.09	1000	N	NA	NA	No	BSL, BKG
7440-23-5	Sodium	45.7		82		mg/kg	S57SS0080101-MAX	2/3	128	63.9	82	51.9	NA		NA	NA	No	NUT
7440-62-2	Vanadium	19.1		35.7		mg/kg	S57SS0070101	3/3	NA	28.7	35.7	53.5	1400	N	NA	NA	No	BSL, BKG
7440-66-6	Zinc	45		261		mg/kg	S57SS0080101-MAX	3/3	NA	125	261	38.1	61000	N	NA	NA	No	BSL
	Miscellaneous																	
9004-70-0	Nitrocellulose	116		299	L	mg/kg	S57SS0050101	3/3	NA	202	299	NA	NA		NA	NA	No	NTX
	pH	6.06		8.12			S57SS0070101	3/3	NA	7.34	8.12	NA	NA		NA	NA	NA	NTX
	Total Organic Carbon	7790	L	50600		mg/kg	S57SS0090101-MAX	2/2	NA	29195	50600	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SS0010101, S57SS0020101, S57SS0040101, S57SS0050101, S57SS0070101, S57SS0080101-MAX, S57SS0090101-MAX, S57SS0110101, S57SS0150101.

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Industrial, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for naphthalene.

(6) Value is for hexavalent chromium.

(7) EPA Region III.

(8) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
108-88-3	Toluene	1	J	1	J	ug/kg	S57SS0040101	1/9	11 - 14	5.22	1	NA	650000	N	NA	NA	No	BSL
79-01-6	Trichloroethene	10	J	93		ug/kg	S57SS0070101	4/9	11 - 12	23.1	10	NA	5000	C	NA	NA	No	BSL
156-59-2	cis-1,2-dichloroethene	2	J	4	J	ug/kg	S57SS0070101	2/9	11 - 12	5	2	NA	1200000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
91-57-6	2-Methylnaphthalene	37	J	37	J	ug/kg	S57SS0050101	1/3	370 - 480	154	37	NA	NA	N	NA	NA	No	NTX
208-96-8	Acenaphthylene	140	J	140	J	ug/kg	S57SS0050101	1/3	370 - 480	188	140	NA	NA	N	NA	NA	No	BSL
120-12-7	Anthracene	51	J	240	J	ug/kg	S57SS0050101	2/3	370	159	240	NA	NA	N	NA	NA	No	NTX
56-55-3	Benzo(a)anthracene	150		2300		ug/kg	S57SS0050101	3/3	NA	883	2300	NA	NA	C	NA	NA	No	NTX
50-32-8	Benzo(a)pyrene	130	J	1700		ug/kg	S57SS0050101	3/3	NA	660	1700	NA	NA	C	NA	NA	No	NTX
205-99-2	Benzo(b)fluoranthene	200	J	4200		ug/kg	S57SS0050101	3/3	NA	1560	4200	NA	NA	C	NA	NA	No	NTX
191-24-2	Benzo(g,h,i)perylene	52		450		ug/kg	S57SS0050101	3/3	NA	188	450	NA	NA	N	NA	NA	No	NTX
207-08-9	Benzo(k)fluoranthene	83	J	1400		ug/kg	S57SS0050101	3/3	NA	527	1400	NA	NA	N	NA	NA	No	NTX
117-81-7	Bis(2-Ethylhexyl)phthalate	41		120	J	ug/kg	S57SS0050101	2/3	480	134	120	NA	31000000	C	NA	NA	No	BSL
86-74-8	Carbazole	99	J	99	J	ug/kg	S57SS0050101	1/3	370 - 480	175	99	NA	NA	C	NA	NA	No	NTX
218-01-9	Chrysene	180		2200		ug/kg	S57SS0050101	3/3	NA	860	2200	NA	NA	C	NA	NA	No	NTX
53-70-3	Dibenzo(a,h)anthracene	350	J	350	J	ug/kg	S57SS0050101	1/3	370 - 480	258	350	NA	NA	C	NA	NA	No	NTX
206-44-0	Fluoranthene	300		1800		ug/kg	S57SS0050101	3/3	NA	803	1800	NA	NA	N	NA	NA	No	NTX
86-73-7	Fluorene	39	J	39	J	ug/kg	S57SS0050101	1/3	370 - 480	155	39	NA	NA	N	NA	NA	No	NTX
193-39-5	Indeno(1,2,3-cd)pyrene	79		970		ug/kg	S57SS0050101	3/3	NA	376	970	NA	NA	N	NA	NA	No	NTX
91-20-3	Naphthalene	38	J	38	J	ug/kg	S57SS0050101	1/3	370 - 480	154	38	NA	NA	C	NA	NA	No	NTX
85-01-8	Phenanthrene	180		490		ug/kg	S57SS0050101	3/3	NA	327	490	NA	NA	N	NA	NA	No	NTX
129-00-0	Pyrene	310		2500		ug/kg	S57SS0050101	3/3	NA	1097	2500	NA	NA	N	NA	NA	No	NTX
	Pesticides																	
72-54-8	4,4'-DDD	12		12		ug/kg	S57SS0050101	1/3	3.8 - 4.8	5.43	12	NA	NA	C	NA	NA	No	NTX
72-55-9	4,4'-DDE	61		61		ug/kg	S57SS0050101	1/3	3.8 - 4.8	21.8	61	NA	NA	C	NA	NA	No	NTX
50-29-3	4,4'-DDT	150	J	150	J	ug/kg	S57SS0050101	1/3	3.8 - 4.8	51.4	150	NA	NA	C	NA	NA	No	NTX
5103-74-2	Gamma-Chlordane	5.3	J	5.3	J	ug/kg	S57SS0050101	1/3	1.9 - 2.4	2.48	5.3	NA	NA	C	NA	NA	No	NTX
	Inorganics																	
7429-90-5	Aluminum	3640	J	9170		mg/kg	S57SS0070101	3/3	NA	6313	9170	18329	NA	N	NA	NA	No	BKG
7440-38-2	Arsenic	29.3		103		mg/kg	S57SS0070101	3/3	NA	55.3	103	4.25	750	C	NA	NA	No	BSL
7440-39-3	Barium	20.7		48.2		mg/kg	S57SS0070101	3/3	NA	35.9	48.2	144	690000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.29		0.88		mg/kg	S57SS0080101-MAX	3/3	NA	0.647	0.88	0.905	1300	N	NA	NA	No	BSL, BKG
7440-43-9	Cadmium	0.47		0.8		mg/kg	S57SS0080101-MAX	2/3	0.19	0.455	0.8	0.26	1800	N	NA	NA	No	BSL
7440-70-2	Calcium	604		3270		mg/kg	S57SS0070101	3/3	NA	2001	3270	409	NA	N	NA	NA	No	NUT
7440-47-3	Chromium	12		14.3		mg/kg	S57SS0070101	3/3	NA	13.1	14.3	24.2	270 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	6.9		8.3	K	mg/kg	S57SS0070101	3/3	NA	7.77	8.3	39.7	NA	N	NA	NA	No	BKG
7440-50-8	Copper	10.4		20.3		mg/kg	S57SS0080101-MAX	3/3	NA	15.1	20.3	18.7	NA	N	NA	NA	No	BKG
7439-89-6	Iron	12400		24800		mg/kg	S57SS0070101	3/3	NA	19233	24800	43170	NA	N	NA	NA	No	BKG
7439-92-1	Lead	25.4	K	487	J	mg/kg	S57SS0050101	3/3	NA	201	487	149	NA	N	NA	NA	No	NTX
7439-95-4	Magnesium	301		796		mg/kg	S57SS0070101	3/3	NA	593	796	1382	NA	N	NA	NA	No	NUT, BKG
7439-96-5	[illegible]anese	97.9		134	K	mg/kg	S57SS0050101	3/[illegible]	NA	111	134	2248	NA	N	NA	NA	No	BKG

TABLE 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7439-97-6	Mercury	0.03		0.1		mg/kg	S57SS0080101-MAX	3/3	NA	0.073	0.1	0.087	10	N	NA	NA	No	BSL
7440-02-0	Nickel	6		8.4		mg/kg	S57SS0080101-MAX	3/3	NA	7.03	8.4	18.2	13000	N	NA	NA	No	BSL, BKG
7440-09-7	Potassium	234		828		mg/kg	S57SS0070101	3/3	NA	600	828	1874	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.56	L	0.56	L	mg/kg	S57SS0050101	1/3	0.32 - 0.38	0.303	0.56	1.09	NA	N	NA	NA	No	BKG
7440-23-5	Sodium	45.7		82		mg/kg	S57SS0080101-MAX	2/3	128	63.9	82	51.9	NA		NA	NA	No	NUT
7440-62-2	Vanadium	19.1		35.7		mg/kg	S57SS0070101	3/3	NA	28.7	35.7	53.5	NA	N	NA	NA	No	BKG
7440-66-6	Zinc	45		261		mg/kg	S57SS0080101-MAX	3/3	NA	125	261	38.1	NA	N	NA	NA	No	NTX
	Miscellaneous																	
9004-70-0	Nitrocellulose	116		299	L	mg/kg	S57SS0050101	3/3	NA	202	299	NA	NA		NA	NA	No	NTX
	pH	6.06		8.12			S57SS0070101	3/3	NA	7.34	8.12	NA	NA		NA	NA	NA	NTX
	Total Organic Carbon	7790	L	50600		mg/kg	S57SS0090101-MAX	2/2	NA	29195	50600	NA	NA		NA	NA	NA	NTX

Notes:

Samples included in table include: S57SS0010101, S57SS0020101, S57SS0040101, S57SS0050101, S57SS0070101, S57SS0080101-MAX, S57SS0090101-MAX, S57SS0110101, S57SS0150101.

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Soil Screening Level Guidance: Technical Background Document, May 1996.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.10

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
71-55-6	1,1,1-Trichloroethane	4	J	4	J	ug/kg	S57SB0120201	1/26	11 - 14	6.02	4	NA	160000	N	NA	NA	No	BSL
78-93-3	2-Butanone	29	J	29	J	ug/kg	S57SB0090201	1/26	11 - 14	7.00	29	NA	4700000	N	NA	NA	No	BSL
67-64-1	Acetone	14	J	2200		ug/kg	S57SB0050201-MAX	7/26	11 - 14	99.8	2200	NA	780000	N	NA	NA	No	BSL
75-15-0	Carbon Disulfide	1	J	4	J	ug/kg	S57SB0040101	5/26	11 - 14	5.37	4	NA	780000	N	NA	NA	No	BSL
75-09-2	Methylene Chloride	110	J	21000		ug/kg	S57SB0060101	2/26	5 - 44	820	21000	NA	85000	C	NA	NA	No	BSL
108-88-3	Toluene	4	J	4	J	ug/kg	S57SB0060101	1/26	11 - 14	6.04	4	NA	1600000	N	NA	NA	No	BSL
156-60-5	Trans-1,2-dichloroethene	4	J	20		ug/kg	S57SB0080201	2/26	11 - 14	6.58	20	NA	160000	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1	J	220000		ug/kg	S57SB0060101	12/26	11 - 13	8505	220000	NA	58000	C	NA	NA	Yes	ASL
1330-20-7	Xylenes, Total	8	J	8	J	ug/kg	S57SB0060101	1/26	11 - 14	6.19	8	NA	16000000	N	NA	NA	No	BSL
156-59-2	cis-1,2-dichloroethene	3	J	77000		ug/kg	S57SB0060101	6/26	11 - 13	2969	77000	NA	78000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
56-55-3	Benzo(a)anthracene	85		360	J	ug/kg	S57SB0050101	2/5	390 - 420	211	360	NA	870	C	NA	NA	No	BSL
50-32-8	Benzo(a)pyrene	61		270	J	ug/kg	S57SB0050101	2/5	390 - 420	188	270	NA	87	C	NA	NA	Yes	ASL
205-99-2	Benzo(b)fluoranthene	85		510		ug/kg	S57SB0050101	2/5	390 - 420	241	510	NA	870	C	NA	NA	No	BSL
191-24-2	Benzo(g,h,i)perylene	70	J	70	J	ug/kg	S57SB0050101	1/5	390 - 420	176	70	NA	160000 (5)	N	NA	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	200	J	200	J	ug/kg	S57SB0050101	1/5	390 - 420	202	200	NA	8700	N	NA	NA	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	92	J	92	J	ug/kg	S57SB0050101	1/5	390 - 420	180	92	NA	46000	C	NA	NA	No	BSL
218-01-9	Chrysene	76		350	J	ug/kg	S57SB0050101	2/5	390 - 420	207.2	350	NA	87000	C	NA	NA	No	BSL
53-70-3	Dibenzo(a,h)anthracene	60	J	60	J	ug/kg	S57SB0050101	1/5	390 - 420	174	60	NA	87	C	NA	NA	No	BSL
206-44-0	Fluoranthene	140		380	J	ug/kg	S57SB0050101	2/5	390 - 420	226	380	NA	310000	N	NA	NA	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	43		160	J	ug/kg	S57SB0050101	2/5	390 - 420	163	160	NA	870	N	NA	NA	No	BSL
85-01-8	Phenanthrene	110		110	J	ug/kg	050101, S57SB005020	2/5	390 - 420	166	110	NA	160000 (5)	N	NA	NA	No	BSL
129-00-0	Pyrene	52		380	J	ug/kg	S57SB0050101	3/5	410 - 420	197	380	NA	230000	N	NA	NA	No	BSL
	Pesticides																	
72-55-9	4,4'-DDE	17		17		ug/kg	S57SB0050101	1/5	3.9 - 4.2	5.02	17	NA	1900	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	20		20		ug/kg	S57SB0050101	1/5	3.9 - 4.2	5.62	20	NA	1900	C	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	5300		11500		mg/kg	S57SB0070101	5/5	NA	8742	13200	34406	7800	N	NA	NA	No	BKG
7440-38-2	Arsenic	15.3		50		mg/kg	S57SB0050201-MAX	5/5	NA	27.8	50	24.4	0.43	C	NA	NA	Yes	ASL
7440-39-3	Barium	24.7		58.2		mg/kg	S57SB0070101	5/5	NA	40.2	58.2	191	550	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.32		2.5		mg/kg	S57SB0070101	5/5	NA	0.98	2.5	2.46	16	N	NA	NA	No	BSL
7440-70-2	Calcium	415		8840		mg/kg	S57SB0080101-MAX	5/5	NA	2866	8840	196	NA		NA	NA	No	NUT
7440-47-3	Chromium	9.1		21		mg/kg	S57SB0070101	5/5	NA	14.1	21	101	23 (6)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	3.1		34.6	K	mg/kg	S57SB0070101	5/5	NA	10.8	34.6	133	470	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	9.1		17.5		mg/kg	S57SB0070101	5/5	NA	12.5	17.5	56.5	310	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	16000		46300		mg/kg	S57SB0070101	5/5	NA	25180	46300	151453	2300	N	NA	NA	No	BKG
7439-92-1	Lead	8.6	K	100		mg/kg	S57SB0050201-MAX	5/5	NA	43.6	100	37.5	400 (7)	N	NA	NA	No	BSL, BKG
7439-95-4	Magnesium	314		1440		mg/kg	S57SB0070101	5/5	NA	725	1440	4307	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	59.8		253	J	mg/kg	S57SB0070101	5/5	NA	114	253	1270	160	N	NA	NA	No	BKG
7439-97-6	Mercury	0.03		0.25		mg/kg	S57SB0050101	5/5	NA	0.094	0.25	0.13	2.3 (9)	N	NA	NA	No	BSL
7440-02-0	Nickel	3.9		13	K	mg/kg	S57SB0070101	5/5	NA	6.80	13	22.1	160	N	NA	NA	No	BSL, BKG

TABLE 2.10

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-09-7	Potassium	334		1330		mg/kg	S57SB0070101	5/5	NA	779	1330	5998	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.59	L	0.74	L	mg/kg	S57SB0070101	3/5	0.26 - 0.27	0.459	0.74	8.93	39	N	NA	NA	No	BSL, BKG
7440-23-5	Sodium	39.4		56.8		mg/kg	S57SB0080101-MAX	3/5	133 - 231	66.7	56.8	826	NA		NA	NA	No	NUT
7440-62-2	Vanadium	21.8		60.8		mg/kg	S57SB0070101	5/5	NA	35.54	60.8	133	55	N	NA	NA	No	BKG
7440-66-6	Zinc	35.1		158		mg/kg	S57SB0080101-MAX	5/5	NA	66.0	158	79.5	2300	N	NA	NA	No	BSL
	Miscellaneous																	
9004-70-0	Nitrocellulose	0.066		123		mg/kg	S57SB0050201-MAX	5/5	NA	43.8	123	NA	NA		NA	NA	No	NTX
	pH	5.4		8.34			S57SB0080201	5/5	NA	7.2	8.34	NA	NA		NA	NA	No	NTX
	Total Organic Carbon	8120	L	22000		mg/kg	S57SB0050101	4/5	4440	11028	22000	NA	NA		NA	NA	No	NTX

Notes:

Samples included in table include: S57SB0010101, S57SB0010201, S57SB0020101, S57SB0020201, S57SB0020401, S57SB0020501, S57SB0030101-MAX, S57SB0030201-MAX, S57SB0040101, S57SB0040201, S57SB0050101, S57SB0050201-MAX, S57SB0050401, S57SB0060101, S57SB0060201, S57SB0070101, S57SB0080101-MAX, S57SB0080201, S57SB0090101, S57SB0090201, S57SB0100101, S57SB0100201, S57SB0110101, S57SB0110201, S57SB0120101, S57SB0120201, S57SB0140101, S57SB0140201, S57SB0150101.

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, Residential, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for naphthalene.

(6) Value is for hexavalent chromium.

(7) Value is based on OSWER Soil Screening Level for residential land use (USEPA, July 1994).

(8) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.11

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
71-55-6	1,1,1-Trichloroethane	4	J	4	J	ug/kg	S57SB0120201	1/26	11 - 14	6.02	4	NA	4100000	N	NA	NA	No	BSL
78-93-3	2-Butanone	29	J	29	J	ug/kg	S57SB0090201	1/26	11 - 14	7.00	29	NA	120000000	N	NA	NA	No	BSL
67-64-1	Acetone	14	J	2200		ug/kg	S57SB0050201-MAX	7/26	11 - 14	99.8	2200	NA	20000000	N	NA	NA	No	BSL
75-15-0	Carbon Disulfide	1	J	4	J	ug/kg	S57SB0040101	5/26	11 - 14	5.37	4	NA	20000000	N	NA	NA	No	BSL
75-09-2	Methylene Chloride	110	J	21000		ug/kg	S57SB0060101	2/26	5 - 44	820	21000	NA	760000	C	NA	NA	No	BSL
108-88-3	Toluene	4	J	4	J	ug/kg	S57SB0060101	1/26	11 - 14	6.04	4	NA	41000000	N	NA	NA	No	BSL
156-60-5	Trans-1,2-dichloroethene	4	J	20		ug/kg	S57SB0060201	2/26	11 - 14	6.58	20	NA	4100000	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1	J	220000		ug/kg	S57SB0060101	12/26	11 - 13	8505	220000	NA	520000	C	NA	NA	No	ASL
1330-20-7	Xylenes, Total	8	J	8	J	ug/kg	S57SB0060101	1/26	11 - 14	6.19	8	NA	410000000	N	NA	NA	No	BSL
156-59-2	cis-1,2-dichloroethene	3	J	77000		ug/kg	S57SB0060101	6/26	11 - 13	2969	77000	NA	2000000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
56-55-3	Benzo(a)anthracene	85		360	J	ug/kg	S57SB0050101	2/5	390 - 420	211	360	NA	7800	C	NA	NA	No	BSL
50-32-8	Benzo(a)pyrene	61		270	J	ug/kg	S57SB0050101	2/5	390 - 420	188	270	NA	780	C	NA	NA	No	ASL
205-99-2	Benzo(b)fluoranthene	85		510		ug/kg	S57SB0050101	2/5	390 - 420	241	510	NA	7800	C	NA	NA	No	BSL
191-24-2	Benzo(g,h,i)perylene	70	J	70	J	ug/kg	S57SB0050101	1/5	390 - 420	176	70	NA	4100000 (5)	N	NA	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	200	J	200	J	ug/kg	S57SB0050101	1/5	390 - 420	202	200	NA	78000	N	NA	NA	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	92	J	92	J	ug/kg	S57SB0050101	1/5	390 - 420	180	92	NA	410000	C	NA	NA	No	BSL
218-01-9	Chrysene	76		350	J	ug/kg	S57SB0050101	2/5	390 - 420	207.2	350	NA	780000	C	NA	NA	No	BSL
53-70-3	Dibenzo(a,h)anthracene	60	J	60	J	ug/kg	S57SB0050101	1/5	390 - 420	174	60	NA	780	C	NA	NA	No	BSL
206-44-0	Fluoranthene	140		380	J	ug/kg	S57SB0050101	2/5	390 - 420	226	380	NA	8200000	N	NA	NA	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	43		160	J	ug/kg	S57SB0050101	2/5	390 - 420	163	160	NA	7800	N	NA	NA	No	BSL
85-01-8	Phenanthrene	110		110	J	ug/kg	050101, S57SB005020	2/5	390 - 420	166	110	NA	4100000 (5)	N	NA	NA	No	BSL
129-00-0	Pyrene	52		380	J	ug/kg	S57SB0050101	3/5	410 - 420	197	380	NA	6100000	N	NA	NA	No	BSL
	Pesticides																	
72-55-9	4,4'-DDE	17		17		ug/kg	S57SB0050101	1/5	3.9 - 4.2	5.02	17	NA	17000	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	20		20		ug/kg	S57SB0050101	1/5	3.9 - 4.2	5.62	20	NA	17000	C	NA	NA	No	BSL
	Inorganics																	
7429-90-5	Aluminum	5300		11500		mg/kg	S57SB0070101	5/5	NA	8742	13200	34406	200000	N	NA	NA	No	BKG
7440-38-2	Arsenic	15.3		50		mg/kg	S57SB0050201-MAX	5/5	NA	27.8	50	24.4	3.8	C	NA	NA	Yes	ASL
7440-39-3	Barium	24.7		58.2		mg/kg	S57SB0070101	5/5	NA	40.2	58.2	191	14000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.32		2.5		mg/kg	S57SB0070101	5/5	NA	0.98	2.5	2.46	410	N	NA	NA	No	BSL
7440-70-2	Calcium	415		8840		mg/kg	S57SB0060101-MAX	5/5	NA	2866	8840	196	NA		NA	NA	No	NUT
7440-47-3	Chromium	9.1		21		mg/kg	S57SB0070101	5/5	NA	14.1	21	101	610 (6)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	3.1		34.6	K	mg/kg	S57SB0070101	5/5	NA	10.8	34.6	133	12000	N	NA	NA	No	BSL, BKG
7440-50-8	Copper	9.1		17.5		mg/kg	S57SB0070101	5/5	NA	12.5	17.5	56.5	8200	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	16000		46300		mg/kg	S57SB0070101	5/5	NA	25180	46300	151453	61000	N	NA	NA	No	BKG
7439-92-1	Lead	8.6	K	100		mg/kg	S57SB0050201-MAX	5/5	NA	43.6	100	37.5	1000 (7)	N	NA	NA	No	BSL, BKG
7439-95-4	Magnesium	314		1440		mg/kg	S57SB0070101	5/5	NA	725	1440	4307	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	59.8		253	J	mg/kg	S57SB0070101	5/5	NA	114	253	1270	4100	N	NA	NA	No	BKG
7439-97-6	Mercury	0.03		0.25		mg/kg	S57SB0050101	5/5	NA	0.094	0.25	0.13	61 (8)	N	NA	NA	No	BSL
7440-02-0	[illegible]	3.9		13	K	mg/kg	S57SB0070101	5/5	NA	6.80	13	22.1	4100	N	NA	NA	No	BSL, BKG

TABLE 2.11

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-09-7	Potassium	334		1330		mg/kg	S57SB0070101	5/5	NA	779	1330	5998	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.59	L	0.74	L	mg/kg	S57SB0070101	3/5	0.26 - 0.27	0.459	0.74	8.93	1000	N	NA	NA	No	BSL, BKG
7440-23-5	Sodium	39.4		56.8		mg/kg	S57SB0080101-MAX	3/5	133 - 231	66.7	56.8	826	NA		NA	NA	No	NUT
7440-62-2	Vanadium	21.8		60.8		mg/kg	S57SB0070101	5/5	NA	35.54	60.8	133	1400	N	NA	NA	No	BKG
7440-66-6	Zinc	35.1		158		mg/kg	S57SB0080101-MAX	5/5	NA	66.0	158	79.5	61000	N	NA	NA	No	BSL
	Miscellaneous																	
9004-70-0	Nitrocellulose	0.066		123		mg/kg	S57SB0050201-MAX	5/5	NA	43.8	123	NA	NA		NA	NA	No	NTX
	pH	5.4		8.34			S57SB0080201	5/5	NA	7.2	8.34	NA	NA		NA	NA	No	NTX
	Total Organic Carbon	8120	L	22000		mg/kg	S57SB0050101	4/5	4440	11028	22000	NA	NA		NA	NA	No	NTX

Notes:

Samples included in table include: S57SB0010101, S57SB0010201, S57SB0020101, S57SB0020201, S57SB0020401, S57SB0020501, S57SB0030101-MAX, S57SB0030201-MAX, S57SB0040101, S57SB0040201, S57SB0050101, S57SB0050201-MAX, S57SB0050401, S57SB0060101, S57SB0060201, S57SB0070101, S57SB0080101-MAX, S57SB0080201, S57SB0090101, S57SB0090201, S57SB0100101, S57SB0100201, S57SB0110101, S57SB0110201, S57SB0120101, S57SB0120201, S57SB0140101, S57SB0140201, S57SB0150101.

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for naphthalene.

(6) Value is for hexavalent chromium.

(7) EPA Region III.

(8) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.12

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
71-55-6	1,1,1-Trichloroethane	4	J	4	J	ug/kg	S57SB0120201	1/26	11 - 14	6.02	4	NA	120000	N	NA	NA	No	BSL
78-93-3	2-Butanone	29	J	29	J	ug/kg	S57SB0090201	1/26	11 - 14	7.00	29	NA	NA	N	NA	NA	No	NTX
67-64-1	Acetone	14	J	2200		ug/kg	S57SB0050201-MAX	7/26	11 - 14	99.8	2200	NA	100000000	N	NA	NA	No	BSL
75-15-0	Carbon Disulfide	1	J	4	J	ug/kg	S57SB0040101	5/26	11 - 14	5.37	4	NA	720000	N	NA	NA	No	BSL
75-09-2	Methylene Chloride	110	J	21000		ug/kg	S57SB0060101	2/26	5 - 44	820	21000	NA	13000	C	NA	NA	No	BSL
108-88-3	Toluene	4	J	4	J	ug/kg	S57SB0060101	1/26	11 - 14	6.04	4	NA	650000	N	NA	NA	No	BSL
156-60-5	Trans-1,2-dichloroethene	4	J	20		ug/kg	S57SB0080201	2/26	11 - 14	6.58	20	NA	3100000	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1	J	220000		ug/kg	S57SB0060101	12/26	11 - 13	8505	220000	NA	5000	C	NA	NA	Yes	ASL
1330-20-7	Xylenes, Total	8	J	8	J	ug/kg	S57SB0060101	1/26	11 - 14	6.19	8	NA	410000	N	NA	NA	No	BSL
156-59-2	cis-1,2-dichloroethene	3	J	77000		ug/kg	S57SB0060101	8/26	11 - 13	2969	77000	NA	1200000	N	NA	NA	No	BSL
	Semivolatile Organic Compounds																	
56-55-3	Benzo(a)anthracene	85		360	J	ug/kg	S57SB0050101	2/5	390 - 420	211	360	NA	NA	C	NA	NA	No	NTX
50-32-8	Benzo(a)pyrene	61		270	J	ug/kg	S57SB0050101	2/5	390 - 420	188	270	NA	NA	C	NA	NA	No	NTX
205-99-2	Benzo(b)fluoranthene	85		510		ug/kg	S57SB0050101	2/5	390 - 420	241	510	NA	NA	C	NA	NA	No	NTX
191-24-2	Benzo(g,h,i)perylene	70	J	70	J	ug/kg	S57SB0050101	1/5	390 - 420	176	70	NA	NA	N	NA	NA	No	NTX
207-08-9	Benzo(k)fluoranthene	200	J	200	J	ug/kg	S57SB0050101	1/5	390 - 420	202	200	NA	NA	N	NA	NA	No	NTX
117-81-7	Bis(2-Ethylhexyl)phthalate	92	J	92	J	ug/kg	S57SB0050101	1/5	390 - 420	180	92	NA	31000000	C	NA	NA	No	BSL
218-01-9	Chrysene	76		350	J	ug/kg	S57SB0050101	2/5	390 - 420	207.2	350	NA	NA	C	NA	NA	No	NTX
53-70-3	Dibenzo(a,h)anthracene	60	J	60	J	ug/kg	S57SB0050101	1/5	390 - 420	174	60	NA	NA	C	NA	NA	No	NTX
206-44-0	Fluoranthene	140		380	J	ug/kg	S57SB0050101	2/5	390 - 420	226	380	NA	NA	N	NA	NA	No	NTX
193-39-5	Indeno(1,2,3-cd)pyrene	43		160	J	ug/kg	S57SB0050101	2/5	390 - 420	163	160	NA	NA	N	NA	NA	No	NTX
85-01-8	Phenanthrene	110		110	J	ug/kg	050101, S57SB005020	2/5	390 - 420	166	110	NA	NA	N	NA	NA	No	NTX
129-00-0	Pyrene	52		380	J	ug/kg	S57SB0050101	3/5	410 - 420	197	380	NA	NA	N	NA	NA	No	NTX
	Pesticides																	
72-55-9	4,4'-DDE	17		17		ug/kg	S57SB0050101	1/5	3.9 - 4.2	5.02	17	NA	NA	C	NA	NA	No	NTX
50-29-3	4,4'-DDT	20		20		ug/kg	S57SB0050101	1/5	3.9 - 4.2	5.62	20	NA	NA	C	NA	NA	No	NTX
	Inorganics																	
7429-90-5	Aluminum	5300		11500		mg/kg	S57SB0070101	5/5	NA	8742	13200	34406	NA	N	NA	NA	No	BKG
7440-38-2	Arsenic	15.3		50		mg/kg	S57SB0050201-MAX	5/5	NA	27.8	50	24.4	750	C	NA	NA	No	BSL
7440-39-3	Barium	24.7		58.2		mg/kg	S57SB0070101	5/5	NA	40.2	58.2	191	690000	N	NA	NA	No	BSL, BKG
7440-41-7	Beryllium	0.32		2.5		mg/kg	S57SB0070101	5/5	NA	0.98	2.5	2.46	1300	N	NA	NA	No	BSL
7440-70-2	Calcium	415		8840		mg/kg	S57SB0080101-MAX	5/5	NA	2866	8840	196	NA		NA	NA	No	NUT
7440-47-3	Chromium	9.1		21		mg/kg	S57SB0070101	5/5	NA	14.1	21	101	270 (5)	N	NA	NA	No	BSL, BKG
7440-48-4	Cobalt	3.1		34.6	K	mg/kg	S57SB0070101	5/5	NA	10.8	34.6	133	NA	N	NA	NA	No	BKG
7440-50-8	Copper	9.1		17.5		mg/kg	S57SB0070101	5/5	NA	12.5	17.5	56.5	NA	N	NA	NA	No	BKG
7439-89-6	Iron	16000		46300		mg/kg	S57SB0070101	5/5	NA	25180	46300	151453	NA	N	NA	NA	No	BKG
7439-92-1	Lead	8.6	K	100		mg/kg	S57SB0050201-MAX	5/5	NA	43.6	100	37.5	NA	N	NA	NA	No	BKG
7439-95-4	Magnesium	314		1440		mg/kg	S57SB0070101	5/5	NA	725	1440	4307	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	59.8		253	J	mg/kg	S57SB0070101	5/5	NA	114	253	1270	NA	N	NA	NA	No	BKG
7439-97-6	Mercury	0.03		0.25		mg/kg	S57SB0050101	5/5	NA	0.094	0.25	0.13	10	N	NA	NA	No	BSL
7440-02-0	[illegible]	3.9		13	K	mg/kg	S57SB0070101	5/5	NA	6.80	13	22.1	13000	N	NA	NA	No	BSL, BKG

TABLE 2.12

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-09-7	Potassium	334		1330		mg/kg	S57SB0070101	5/5	NA	779	1330	5998	NA		NA	NA	No	NUT, BKG
7782-49-2	Selenium	0.59	L	0.74	L	mg/kg	S57SB0070101	3/5	0.26 - 0.27	0.459	0.74	8.93	NA	N	NA	NA	No	BKG
7440-23-5	Sodium	39.4		56.8		mg/kg	S57SB0080101-MAX	3/5	133 - 231	66.7	56.8	826	NA		NA	NA	No	NUT
7440-62-2	Vanadium	21.8		60.8		mg/kg	S57SB0070101	5/5	NA	35.54	60.8	133	NA	N	NA	NA	No	BKG
7440-66-6	Zinc	35.1		158		mg/kg	S57SB0080101-MAX	5/5	NA	66.0	158	79.5	NA	N	NA	NA	No	NTX
	Miscellaneous																	
9004-70-0	Nitrocellulose	0.066		123		mg/kg	S57SB0050201-MAX	5/5	NA	43.8	123	NA	NA		NA	NA	No	NTX
	pH	5.4		8.34			S57SB0080201	5/5	NA	7.2	8.34	NA	NA		NA	NA	No	NTX
	Total Organic Carbon	8120	L	22000		mg/kg	S57SB0050101	4/5	4440	11028	22000	NA	NA		NA	NA	No	NTX

Notes:

Samples included in table include: S57SB0010101, S57SB0010201, S57SB0020101, S57SB0020201, S57SB0020401, S57SB0020501, S57SB0030101-MAX, S57SB0030201-MAX, S57SB0040101, S57SB0040201, S57SB0050101, S57SB0050201-MAX, S57SB0050401, S57SB0060101, S57SB0060201, S57SB0070101, S57SB0080101-MAX, S57SB0080201, S57SB0090101, S57SB0090201, S57SB0100101, S57SB0100201, S57SB0110101, S57SB0110201, S57SB0120101, S57SB0120201, S57SB0140101, S57SB0140201, S57SB0150101.

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Soil Screening Level Guidance: Technical Background Document, May 1996.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for hexavalent chromium.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.13

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient Shallow

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
71-55-6	1,1,1-Trichloroethane	14.6		14.6		ug/L	S57MW0130101	1/1	NA	14.6	14.6	NA	54	N	200	MCL	No	BSL
75-34-3	1,1-Dichloroethane	0.8	J	0.8	J	ug/L	S57MW0130101	1/1	NA	0.8	0.8	NA	80	N	NA	NA	No	BSL
75-35-4	1,1-Dichloroethene	77.5	J	77.5	J	ug/L	S57MW0130101	1/1	NA	77.5	77.5	NA	0.044	C	7	MCL	Yes	ASL
107-06-2	1,2-Dichloroethane	2.7		2.7		ug/L	S57MW0130101	1/1	NA	2.7	2.7	NA	0.12	C	NA	NA	Yes	ASL
67-66-3	Chloroform	1.3		1.3		ug/L	S57MW0130101	1/1	NA	1.3	1.3	NA	0.15	C	80	MCL	Yes	ASL
79-01-6	Trichloroethene	2.2		2.2		ug/L	S57MW0130101	1/1	NA	2.2	2.2	NA	1.6	C	5	MCL	Yes	ASL
	Inorganics - Unfiltered																	
7440-39-3	Barium	72.7		72.7		ug/L	S57MW0130101	1/1	NA	72.7	72.7	254	260	N	2000	MCL	No	BSL, BKG
7440-41-7	Beryllium	0.39		0.39		ug/L	S57MW0130101	1/1	NA	0.39	0.39	ND	7.3	N	4	MCL	No	BSL
7440-70-2	Calcium	2530		2530		ug/L	S57MW0130101	1/1	NA	2530	2530	599450	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	22.8		22.8		ug/L	S57MW0130101	1/1	NA	22.8	22.8	39.6	220	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	102	J	102	J	ug/L	S57MW0130101	1/1	NA	102	102	57199	1100	N	300	SMCL	No	BSL, BKG
7439-95-4	Magnesium	1500		1500		ug/L	S57MW0130101	1/1	NA	1500	1500	31254	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	179	J	179	J	ug/L	S57MW0130101	1/1	NA	179	179	28160	73	N	50	SMCL	No	BKG
7440-02-0	Nickel	7		7		ug/L	S57MW0130101	1/1	NA	7	7	39	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	2490		2490		ug/L	S57MW0130101	1/1	NA	2490	2490	83058	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	21900	J	21900	J	ug/L	S57MW0130101	1/1	NA	21900	21900	79585	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	23.8		23.8		ug/L	S57MW0130101	1/1	NA	23.8	23.8	45.2	1100	N	5000	SMCL	No	BSL, BKG
	Inorganics - Filtered																	
7440-39-3	Barium	73.5		73.5		ug/L	S57MW0130101-F	1/1	NA	73.5	73.5	114	260	N	2000	MCL	No	BSL, BKG
7440-41-7	Beryllium	0.37		0.37		ug/L	S57MW0130101-F	1/1	NA	0.37	0.37	ND	7.3	N	4	MCL	No	BSL
7440-70-2	Calcium	2640		2640		ug/L	S57MW0130101-F	1/1	NA	2640	2640	102113	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	27.6		27.6		ug/L	S57MW0130101-F	1/1	NA	27.6	27.6	13	220	N	NA	NA	No	BSL
7439-89-6	Iron	131		131		ug/L	S57MW0130101-F	1/1	NA	131	131	4171372	1100	N	300	SMCL	No	BSL, BKG
7439-95-4	Magnesium	1510		1510		ug/L	S57MW0130101-F	1/1	NA	1510	1510	13988	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	205		205		ug/L	S57MW0130101-F	1/1	NA	205	205	2257	73	N	50	SMCL	No	BKG
7440-02-0	Nickel	8		8		ug/L	S57MW0130101-F	1/1	NA	8	8	41.4	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	2570		2570		ug/L	S57MW0130101-F	1/1	NA	2570	2570	32631	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	22100	J	22100	J	ug/L	S57MW0130101-F	1/1	NA	22100	22100	135991	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	27.1		27.1		ug/L	S57MW0130101-F	1/1	NA	27.1	27.1	10.3	1100	N	5000	SMCL	No	BSL
	Miscellaneous																	
7790-98-9	Ammonium Perchlorate	8.78		8.78		ug/L	S57MW0130101	1/1	NA	8.78	8.78	NA	NA		NA	NA	No	NTX
	Hardness As Caco3	11.9		11.9		ug/L	S57MW0130101	1/1	NA	11.9	11.9	NA	NA		NA	NA	No	NTX
	pH	4.96		4.96			S57MW0130101	1/1	NA	4.96	4.96	NA	NA		NA	NA	No	NTX
	Total Dissolved Solids	68		68		ug/L	S57MW0130101	1/1	NA	68	68	NA	NA		NA	NA	No	NTX

TABLE 2.13

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient Shallow

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)

Notes:

Samples included in table include: S57MW0130101, S57MW0130101-F

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.14

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient Deep

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
75-34-3	1,1-Dichloroethane	5.2		5.2		ug/L	S57MW0120101-MAX	1/1	NA	5.2	5.2	NA	60	N	NA	NA	No	BSL
75-35-4	1,1-Dichloroethene	1.8		1.8		ug/L	S57MW0120101-MAX	1/1	NA	1.8	1.8	NA	0.044	C	7	MCL	Yes	ASL
67-64-1	Acetone	12		12		ug/L	S57MW0120101-MAX	1/1	NA	12	12	NA	370	N	NA	NA	No	BSL
60-29-7	Ethyl Ether	3.6		3.6		ug/L	S57MW0120101-MAX	1/1	NA	3.6	3.6	NA	120	N	NA	NA	No	BSL
79-01-6	Trichloroethene	2.3		2.3		ug/L	S57MW0120101-MAX	1/1	NA	2.3	2.3	NA	1.6	C	5	MCL	Yes	ASL
156-59-2	cis-1,2-dichloroethene	2.3		2.3		ug/L	S57MW0120101-MAX	1/1	NA	2.3	2.3	NA	6.1	N	70	MCL	No	BSL
	Semivolatile Organic Compounds																	
117-81-7	Bis(2-Ethylhexyl)phthalate	2		2		ug/L	S57MW0120101-MAX	1/1	NA	2	2	NA	4.8	C	6	MCL	No	BSL
	Inorganics - Unfiltered																	
7440-39-3	Barium	58.9		58.9		ug/L	S57MW0120101-MAX	1/1	NA	58.9	58.9	254	260	N	2000	MCL	No	BSL, BKG
7440-43-9	Cadmium	0.38		0.38		ug/L	S57MW0120101-MAX	1/1	NA	0.38	0.38	2.6	1.8	N	5	MCL	No	BSL,BKG
7440-70-2	Calcium	8090		8090		ug/L	S57MW0120101-MAX	1/1	NA	8090	8090	599450	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	17.5		17.5		ug/L	S57MW0120101-MAX	1/1	NA	17.5	17.5	39.6	220	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	2220		2220		ug/L	S57MW0120101-MAX	1/1	NA	2220	2220	57199	1100	N	300	SMCL	No	BKG
7439-95-4	Magnesium	1880		1880		ug/L	S57MW0120101-MAX	1/1	NA	1880	1880	31254	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	271		271		ug/L	S57MW0120101-MAX	1/1	NA	271	271	28160	73	N	50	SMCL	No	BKG
7440-02-0	Nickel	7.9		7.9		ug/L	S57MW0120101-MAX	1/1	NA	7.9	7.9	39	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	6940		6940		ug/L	S57MW0120101-MAX	1/1	NA	6940	6940	83058	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	24100		24100		ug/L	S57MW0120101-MAX	1/1	NA	24100	24100	79585	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	64.1		64.1		ug/L	S57MW0120101-MAX	1/1	NA	64.1	64.1	45.2	1100	N	5000	SMCL	No	BSL
	Inorganics - Filtered																	
7440-39-3	Barium	59.4		59.4		ug/L	S57MW0120101-F-MAX	1/1	NA	59.4	59.4	114	260	N	2000	MCL	No	BSL, BKG
7440-41-7	Beryllium	0.12		0.12		ug/L	S57MW0120101-F-MAX	1/1	NA	0.12	0.12	ND	7.3	N	4	MCL	No	BSL
7440-43-9	Cadmium	0.37		0.37		ug/L	S57MW0120101-F-MAX	1/1	NA	0.37	0.37	2.9	1.8	N	5	MCL	No	BSL, BKG
7440-70-2	Calcium	7810		7810		ug/L	S57MW0120101-F-MAX	1/1	NA	7810	7810	102113	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	20.7		20.7		ug/L	S57MW0120101-F-MAX	1/1	NA	20.7	20.7	13	220	N	NA	NA	No	BSL
7439-89-6	Iron	2260		2260		ug/L	S57MW0120101-F-MAX	1/1	NA	2260	2260	417372	1100	N	300	SMCL	No	BKG
7439-92-1	Lead	1		1		ug/L	S57MW0120101-F-MAX	1/1	NA	1	1	1.4	15 (5)		NA	NA	No	BSL, BKG
7439-95-4	Magnesium	1920		1920		ug/L	S57MW0120101-F-MAX	1/1	NA	1920	1920	13968	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	281		281		ug/L	S57MW0120101-F-MAX	1/1	NA	281	281	2257	73	N	50	SMCL	No	BKG
7440-02-0	Nickel	8		8		ug/L	S57MW0120101-F-MAX	1/1	NA	8	8	41.4	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	6950		6950		ug/L	S57MW0120101-F-MAX	1/1	NA	6950	6950	83058	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	24600		24600		ug/L	S57MW0120101-F-MAX	1/1	NA	24600	24600	79585	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	61.9		61.9		ug/L	S57MW0120101-F-MAX	1/1	NA	61.9	61.9	10.3	1100	N	5000	SMCL	No	BSL
	Miscellaneous																	
9004-70-0	Nitrocellulose	0.223		0.223		ug/L	S57MW0120101-MAX	1/1	NA	0.223	0.223	NA	NA		NA	NA	No	NTX
	pH	6.04		6.04			S57MW0120101-MAX	1/1	NA	6.04	6.04	NA	NA		NA	NA	No	NTX
	Hardness As Caco3	35.7		35.7		ug/L	S57MW0120101-MAX	1/1	NA	35.7	35.7	NA	NA		NA	NA	No	NTX
	Total Dissolved Solids	90		90		ug/L	S57MW0120101-MAX	1/1	NA	90	90	NA	NA		NA	NA	No	NTX
	Total Organic Carbon	3.26		3.26		ug/L	S57MW0120101-MAX	1/1	NA	3.26	3.26	NA	NA		NA	NA	No	NTX

TABLE 2.14

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient Deep

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)

Notes:

Samples included in table include: S57MW0120101-MAX, S57MW0120101-F-MAX

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Action level.

Definitions:

N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.15

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient Shallow

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
71-55-6	1,1,1-Trichloroethane	1	J	29.5	J	ug/L	S57MW0040101	5/9	1 - 10	5.9	29.5	NA	54	N	200	MCL	No	BSL
75-34-3	1,1-Dichloroethane	2		4.4		ug/L	S57MW0020101	5/9	1 - 10	2.83	4.4	NA	80	N	NA	NA	No	BSL
75-35-4	1,1-Dichloroethene	4	J	11	J	ug/L	S57MW0060101	4/9	1 - 10	4.82	11	NA	0.044	C	7	MCL	Yes	ASL
67-64-1	Acetone	29.4	J	29.4	J	ug/L	S57MW0100101	1/4	10	11.1	29.4	NA	370	N	NA	NA	No	BSL
67-66-3	Chloroform	0.6	J	0.6	J	ug/L	S57MW0100101	1/9	1 - 10	2.01	0.6	NA	0.15	C	80	MCL	Yes	ASL
60-29-7	Ethyl Ether	1	J	3950		ug/L	S57MW0110101-MAX	4/7	10	765	3950	NA	120	N	NA	NA	Yes	ASL
127-18-4	Tetrachloroethene	9.5		9.5		ug/L	S57MW0040101	1/9	1 - 10	3	9.5	NA	1.1	C	5	MCL	Yes	ASL
108-88-3	Toluene	0.5	J	0.5	J	ug/L	S57MW0040101	1/9	1 - 10	2	0.5	NA	75	N	1	MCL	No	BSL
156-60-5	Trans-1,2-dichloroethene	2	J	8.3		ug/L	S57MW0040101	2/9	1 - 10	2.53	8.3	NA	12	N	100	MCL	No	BSL
79-01-6	Trichloroethene	51		611.7	J	ug/L	S57MW0040101	6/9	1 - 10	132	611.7	NA	1.6	C	5	MCL	Yes	ASL
75-01-4	Vinyl Chloride	2.9		85		ug/L	S57TW0030101	5/9	1 - 10	17.7	85	NA	0.019	C	2	MCL	Yes	ASL
156-59-2	cis-1,2-dichloroethene	0.7	J	528	J	ug/L	S57MW0040101	8/9	10	106	528	NA	6.1	N	70	MCL	Yes	ASL
	Semivolatile Organic Compounds																	
117-81-7	Bis(2-Ethylhexyl)phthalate	2	J	2	J	ug/L	S57MW0040101	1/2	6	2.5	2	NA	4.8	C	6	MCL	No	BCL
84-74-2	Di-n-butyl phthalate	5	J	5	J	ug/L	S57MW0100101	1/2	6	4	5	NA	370	N	NA	NA	No	BSL
	Inorganics - Unfiltered																	
7440-39-3	Barium	35.3		57.4		ug/L	S57MW0100101	2/2	NA	46.4	57.4	254	260	N	2000	MCL	No	BSL, BKG
7440-41-7	Beryllium	0.1		0.1		ug/L	S57MW0040101	1/2	0.1	0.075	0.1	ND	7.3	N	4	MCL	No	BSL
7440-70-2	Calcium	2380		15600		ug/L	S57MW0100101	2/2	NA	8990	15600	599450	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	10.5		30.7		ug/L	S57MW0040101	2/2	NA	20.6	30.7	39.6	220	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	215	J	4330		ug/L	S57MW0100101	2/2	NA	2273	4330	57199	1100	N	300	SMCL	No	BKG
7439-92-1	Lead	1.2		1.3		ug/L	S57MW0040101	2/2	NA	1.25	1.3	ND	15 (5)		NA	NA	No	BSL
7439-95-4	Magnesium	1380		2360		ug/L	S57MW0100101	2/2	NA	1870	2360	31254	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	256	J	311		ug/L	S57MW0100101	2/2	NA	284	311	28160	73	N	50	SMCL	No	BKG
7440-02-0	Nickel	5.7		10.3		ug/L	S57MW0040101	2/2	NA	8	10.3	39	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	3110		4760		ug/L	S57MW0100101	2/2	NA	3935	4760	83058	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	14300	J	38200		ug/L	S57MW0100101	2/2	NA	26250	38200	79585	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	28.5		73.3		ug/L	S57MW0100101	2/2	NA	50.9	73.3	45.2	1100	N	5000	SMCL	No	BSL
	Inorganics - Filtered																	
7440-39-3	Barium	33.1		55		ug/L	S57MW0100101-F	2/2	NA	44.1	55	114	260	N	2000	MCL	No	BSL, BKG
7440-70-2	Calcium	2310		19700		ug/L	S57MW0100101-F	2/2	NA	11005	19700	102113	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	10.2		30.2		ug/L	S57MW0040101-F	2/2	NA	20.2	30.2	13	220	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	154		3810		ug/L	S57MW0100101-F	2/2	NA	1982	3810	4171372	1100	N	300	SMCL	No	BKG
7439-92-1	Lead	1.3		1.3		ug/L	S57MW0100101-F	1/2	1	0.9	1.3	ND	15 (5)		NA	NA	No	BSL
7439-95-4	Magnesium	1310		2390		ug/L	S57MW0100101-F	2/2	NA	1850	2390	13988	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	244		301		ug/L	S57MW0100101-F	2/2	NA	273	301	2257	73	N	50	SMCL	No	BKG
7440-02-0	Nickel	6.9		10.2		ug/L	S57MW0040101-F	2/2	NA	8.55	10.2	41.4	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	3000		5690		ug/L	S57MW0100101-F	2/2	NA	4345	5690	32631	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	13900	J	41700		ug/L	S57MW0100101-F	2/2	NA	27800	41700	135991	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	44.1		81.2		ug/L	S57MW0100101-F	2/2	NA	62.65	81.2	10.3	1100	N	5000	SMCL	No	BSL

TABLE 2.15

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient Shallow

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Miscellaneous																
	Hardness As Caco3	13.9		51.5		ug/L	S57MW0100101	2/2	NA	32.7	51.5	NA	NA	NA	NA	No	NTX
	Nitrocellulose	0.148	L	0.148	L	ug/L	S57MW0100101	1/1	NA	0.148	0.148	NA	NA	NA	NA	No	NTX
	pH	5.62		6.39			S57MW0100101	4/4	NA	6.01	6.39	NA	NA	NA	NA	No	NTX
	Total Dissolved Solids	44		184		ug/L	S57MW0080101	6/6	NA	121	184	NA	NA	NA	NA	No	NTX
	Total Organic Carbon	3.6		3.6		ug/L	S57MW0100101	1/2	1	2.05	3.6	NA	NA	NA	NA	No	NTX

Notes:

Samples included in table include: S57MW0020101, S57MW0040101, S57MW0040101-F, S57MW0060101, S57MW0080101, S57MW0100101, S57MW0110101-MAX, S57MW0100101-F, S57TW0010101, S57TW0020101, S57TW0030101

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Action Level.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.16

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient Deep

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds																	
71-55-6	1,1,1-Trichloroethane	0.6	J	13.7		ug/L	S57MW0090101	3/5	1	4.26	13.7	NA	54	N	200	MCL	No	BSL
75-34-3	1,1-Dichloroethane	1		5.2		ug/L	S57MW0090101	3/5	1	1.8	5.2	NA	80	N	NA	NA	No	BSL
75-35-4	1,1-Dichloroethene	2.9		29	J	ug/L	S57MW0090101	3/5	1	8.98	29	NA	0.044	C	7	MCL	Yes	ASL
67-66-3	Chloroform	1.3		1.3		ug/L	S57MW0090101	1/5	1	0.66	1.3	NA	0.15	C	80	MCL	Yes	ASL
60-29-7	Ethyl Ether	2.8	J	1930.6	J	ug/L	S57MW0070101	5/5	NA	582	1930.6	NA	120	N	80	MCL	Yes	ASL
156-60-5	Trans-1,2-dichloroethene	0.6	J	0.6	J	ug/L	7MW0030101, S57MW009010	2/5	1	0.54	0.6	NA	12	N	100	MCL	No	BSL
79-01-6	Trichloroethene	2.2		566		ug/L	S57MW0090101	5/5	NA	213	566	NA	1.6	C	5	MCL	Yes	ASL
75-01-4	Vinyl Chloride	3.1		3.1		ug/L	S57MW0030101	1/5	1	1.02	3.1		0.019	C	2	MCL	Yes	ASL
156-59-2	cis-1,2-dichloroethene	0.5	J	79		ug/L	S57MW0090101	4/5	1	31.4	79	NA	6.1	N	70	MCL	Yes	ASL
	Semivolatile Organic Compounds																	
117-81-7	Bis(2-Ethylhexyl)phthalate	3	J	3	J	ug/L	S57MW0090101	1/2	6	3	3	NA	4.8	C	6	MCL	No	BSL
	Inorganics - Unfiltered																	
7440-39-3	Barium	27.7		38.1		ug/L	S57MW0030101	2/2	NA	32.9	38.1	254	260	N	2000	MCL	No	BSL, BKG
7440-41-7	Beryllium	0.2		0.25		ug/L	S57MW0090101	2/2	NA	0.225	0.25	ND	7.3	N	4	MCL	No	BSL
7440-70-2	Calcium	1910		1920		ug/L	S57MW0090101	2/2	NA	1915	1920	599450	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	14.5		31.9		ug/L	S57MW0030101	2/2	NA	23.2	31.9	39.6	220	N	NA	NA	No	BSL, BKG
7439-89-6	Iron	111		454	J	ug/L	S57MW0030101	2/2	NA	283	454	57199	1100	N	300	SMCL	No	BSL, BKG
7439-95-4	Magnesium	1340		1390		ug/L	S57MW0090101	2/2	NA	1365	1390	31254	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	41.6		257	J	ug/L	S57MW0030101	2/2	NA	149	257	28160	73	N	50	SMCL	No	BSL, BKG
7440-02-0	Nickel	5.2		7.3		ug/L	S57MW0030101	2/2	NA	6.25	7.3	39	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	2860		4170		ug/L	S57MW0030101	2/2	NA	3515	4170	83058	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	9260	L	11600	J	ug/L	S57MW0030101	2/2	NA	10430	11600	79585	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	22.3		26.2		ug/L	S57MW0090101	2/2	NA	24.3	26.2	45.2	1100	N	5000	SMCL	No	BSL, BKG
	Inorganics - Filtered																	
7440-39-3	Barium	27		35.2		ug/L	S57MW0030101-F	2/2	NA	31.1	35.2	114	260	N	2000	MCL	No	BSL, BKG
7440-41-7	Beryllium	0.11		0.26		ug/L	S57MW0090101-F	2/2	NA	0.185	0.26	ND	7.3	N	4	MCL	No	BSL
7440-70-2	Calcium	1870		1980		ug/L	S57MW0090101-F	2/2	NA	1925	1980	102113	NA		NA	NA	No	NUT, BKG
7440-48-4	Cobalt	16.8		31.9		ug/L	S57MW0030101-F	2/2	NA	24.4	31.9	13	220	N	NA	NA	No	BSL
7439-89-6	Iron	174		174		ug/L	S57MW0030101-F	1/2	28	94	174	417372	1100	N	300	SMCL	No	BSL, BKG
7439-95-4	Magnesium	1250		1400		ug/L	S57MW0090101-F	2/2	NA	1325	1400	13988	NA		NA	NA	No	NUT, BKG
7439-96-5	Manganese	48.5		250		ug/L	S57MW0030101-F	2/2	NA	149	250	2257	73	N	50	SMCL	No	BSL, BKG
7440-02-0	Nickel	5.4		6.3		ug/L	S57MW0030101-F	2/2	NA	5.85	6.3	41.4	73	N	100	MCL	No	BSL, BKG
7440-09-7	Potassium	2900		3980		ug/L	S57MW0030101-F	2/2	NA	3440	3980	32631	NA		NA	NA	No	NUT, BKG
7440-23-5	Sodium	9400	L	11300	J	ug/L	S57MW0030101-F	2/2	NA	10350	11300	135991	NA		NA	NA	No	NUT, BKG
7440-66-6	Zinc	19.4		23.1		ug/L	S57MW0090101-F	2/2	NA	21.3	23.1	10.3	1100	N	5000	SMCL	No	BSL
	Miscellaneous																	
	Nitrocellulose	0.148	L	0.148	L	ug/L	S57MW0030101	1/1	NA	0.148	0.148	NA	NA		NA	NA	No	NTX
	Hardness As Caco3	9.91		11.9		ug/L	S57MW0030101	2/2	NA	10.9	11.9	NA	NA		NA	NA	No	NTX
	pH	5.29		5.87			S57MW0070101	4/4	NA	5.49	5.87	NA	NA		NA	NA	No	NTX
	Total Dissolved Solids	24		170		ug/L	S57MW0070101	4/5	20	64.8	170	NA	NA		NA	NA	No	NTX

TABLE 2.16

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient Deep

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)

Notes:

Samples included in table include: S57MW0010101, S57MW0030101, S57MW0030101-F, S57MW0050101, S57MW0070101, S57MW0090101, S57MW0090101-F

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:

N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.17

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Miscellaneous														
	Dissolved Oxygen	10600		10600		ug/L	S57SW0130101	1/1	NA	10600	10600	N/A	N/A	No	NTX
	Hardness As Caco3	17800		17800		ug/L	S57SW0130101	1/1	NA	17800	17800	N/A	N/A	No	NTX
14797-55-8	Nitrate/nitrite	686		686		ug/L	S57SW0130101	1/1	NA	686	686	N/A	N/A	No	NTX
	pH	5.54		5.54			S57SW0130101	1/1	NA	5.54	5.54	N/A	N/A	No	NTX
	Total Dissolved Solids	178000		178000		ug/L	S57SW0130101	1/1	NA	178000	178000	N/A	N/A	No	NTX
	Total Organic Carbon	3280		3280		ug/L	S57SW0130101	1/1	NA	3280	3280	N/A	N/A	No	NTX
	Total Suspended Solids	30000		30000		ug/L	S57SW0130101	1/1	NA	30000	30000	N/A	N/A	No	NTX
	Turbidity	25.7		25.7		ug/L	S57SW0130101	1/1	NA	25.7	25.7	N/A	N/A	No	NTX

Notes:

Samples included in table include: S57SW0130101

(1) Minimum/maximum detected concentration.

(2) Background values presented for inorganics is two times the mean concentration.

(3) Criteria as published in FR 63:68354-68364 unless otherwise noted.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:

N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic

TABLE 2.18

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds														
120-82-1	1,2,4-Trichlorobenzene	0.7	J	0.7	J	ug/L	S57SW0150101	1/5	1	0.54	0.7	N/A	260	No	BSL
67-64-1	Acetone	7	J	7	J	ug/L	S57SW0140101	1/1	NA	7	7	N/A	61 (5) N	No	BSL
79-01-6	Trichloroethene	0.7	J	1.4		ug/L	S57SW0150101	2/5	1	0.72	1.4	N/A	2.7	No	BSL
156-59-2	cis-1,2-dichloroethene	0.5	J	0.5	J	ug/L	S57SW0120101	1/5	1	0.5	0.5	N/A	6.1 (5) N	No	BSL
	Inorganics - unfiltered														
7429-90-5	Aluminum	319		449		ug/L	S57SW0160101-MAX	2/2	NA	384	449	N/A	3700 (5) N	No	BSL
7440-39-3	Barium	17.3		19.7		ug/L	S57SW0160101-MAX	2/2	NA	18.5	19.7	N/A	1000	No	BSL
7440-41-7	Beryllium	0.26		0.26		ug/L	S57SW0160101-MAX	1/2	0.2	0.18	0.26	N/A	7.3 (5) N	No	BSL
7440-70-2	Calcium	9450		30200		ug/L	S57SW0160101-MAX	2/2	NA	19825	30200	N/A	NA	No	NUT
7440-47-3	Chromium	0.63		1		ug/L	S57SW0140101	2/2	NA	0.815	1	N/A	11 (5,6) N	No	BSL
7440-48-4	Cobalt	21.1		21.1		ug/L	S57SW0160101-MAX	1/2	0.87	10.8	21.1	N/A	220 (5) N	No	BSL
57-12-5	Cyanide	6.5		10.6		ug/L	S57SW0160101-MAX	2/2	NA	8.55	10.6	N/A	73 (5) N	No	BSL
7439-89-6	Iron	461		785		ug/L	S57SW0140101	2/2	NA	623	785	N/A	300	Yes	ASL
7439-92-1	Lead	1.5		7.9		ug/L	S57SW0140101	2/2	NA	4.7	7.9	N/A	15 (7)	No	BSL
7439-95-4	Magnesium	1580		14900		ug/L	S57SW0160101-MAX	2/2	NA	8240	14900	N/A	NA	No	NUT
7439-96-5	Manganese	22.1		363		ug/L	S57SW0160101-MAX	2/2	NA	193	363	N/A	50	Yes	ASL
7440-02-0	Nickel	3.1		23.4		ug/L	S57SW0160101-MAX	2/2	NA	13.3	23.4	N/A	610	No	BSL
7440-09-7	Potassium	1290		6710		ug/L	S57SW0160101-MAX	2/2	NA	4000	6710	N/A	NA	No	Nut
7782-49-2	Selenium	2.8		2.8		ug/L	S57SW0160101-MAX	1/2	1.9	1.88	2.8	N/A	170	No	BSL
7440-23-5	Sodium	7660	K	160000		ug/L	S57SW0160101-MAX	2/2	NA	83830	160000	N/A	NA	No	NUT
7440-62-2	Vanadium	1.4		1.4		ug/L	S57SW0140101	1/2	1.4	1.05	1.4	N/A	26 (5) N	No	BSL
7440-66-6	Zinc	63.1		119		ug/L	S57SW0140101	2/2	NA	91.05	119	N/A	9100	No	BSL
	Inorganics - Filtered														
7429-90-5	Aluminum	59.8		59.8		ug/L	S57SW0140101-F	1/2	69.7	47.3	59.8	N/A	3700 (5) N	No	BSL
7440-39-3	Barium	13.3		17.3		ug/L	S57SW0160101-F-MAX	2/2	NA	15.3	17.3	N/A	1000	No	BSL
7440-70-2	Calcium	8560		30400		ug/L	S57SW0160101-F-MAX	2/2	NA	19480	30400	N/A	NA	No	NUT
7440-48-4	Cobalt	22.5		22.5		ug/L	S57SW0160101-F-MAX	1/2	4.1	12.3	22.5	N/A	220 (5) N	No	BSL
7439-89-6	Iron	205		205		ug/L	S57SW0140101-F	1/2	8.9	105	205	N/A	300	No	BSL
7439-95-4	Magnesium	1360		15000		ug/L	S57SW0160101-F-MAX	2/2	NA	8180	15000	N/A	NA	No	NUT
7439-96-5	Manganese	41.9		364		ug/L	S57SW0160101-F-MAX	2/2	NA	203	364	N/A	50	Yes	ASL
7440-02-0	Nickel	2.2		23.2		ug/L	S57SW0160101-F-MAX	2/2	NA	12.7	23.2	N/A	610	No	BSL
7440-09-7	Potassium	1210		6720		ug/L	S57SW0160101-F-MAX	2/2	NA	3965	6720	N/A	NA	No	NUT
7440-23-5	Sodium	7830	K	164000		ug/L	S57SW0160101-F-MAX	2/2	NA	85915	164000	N/A	NA	No	NUT
7440-66-6	Zinc	46.8		61.2		ug/L	S57SW0140101-F	2/2	NA	53.9	61.2	N/A	9100	No	BSL

TABLE 2.18

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Miscellaneous														
16887-00-6	Chloride	10.2		220		ug/L	S57SW0160101-MAX	3/3	NA	119	220	N/A	N/A	No	NTX
	Dissolved Oxygen	9.6		11		ug/L	S57SW0140101	3/3	NA	10.4	11	N/A	N/A	No	NTX
	Fluoride	0.174	K	2.17	K	ug/L	S57SW0150101	3/3	NA	0.955	2.17	N/A	N/A	No	NTX
	Hardness As Caco3	27.3		143		ug/L	S57SW0160101-MAX	2/2	NA	85.2	143	N/A	N/A	No	NTX
14797-55-8	Nitrate/nitrite	0.121		2.85		ug/L	S57SW0160101-MAX	3/3	NA	1.09	2.85	N/A	N/A	No	NTX
9004-70-0	Nitrocellulose	0.221		0.221		ug/L	S57SW0160101-MAX	1/2	1.44	0.471	0.221	N/A	N/A	No	NTX
	pH	7		7.59			S57SW0160101-MAX	3/3	NA	7.25	7.59	N/A	N/A	No	NTX
14808-79-8	Sulfate	8.96		454	J	ug/L	S57SW0150101	3/3	NA	244	454	N/A	N/A	No	NTX
	Total Dissolved Solids	64		921		ug/L	S57SW0150101	3/3	NA	550	921	N/A	N/A	No	NTX
	Total Organic Carbon	2.32		3.52		ug/L	S57SW0160101-MAX	2/2	NA	2.92	3.52	N/A	N/A	No	NTX
	Total Suspended Solids	7		7		ug/L	S57SW0140101	1/3	5	4	7	N/A	N/A	No	NTX
	Turbidity	3.99		6.03		ug/L	S57SW0150101	3/3	NA	5.04	6.03	N/A	N/A	No	NTX

Notes:

Samples included in table include: S57SW0110101, S57SW0120101, S57SW0140101, S57SW0140101-F, S57SW0150101, S57SW0160101-MAX, S57SW0160101-F-MAX

(1) Minimum/maximum detected concentration.

(2) Background values presented for inorganics is two times the mean concentration.

(3) Criteria as published in FR 63:68354-68364 unless otherwise noted.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Water quality criteria not available EPA Region III RBC for tap water ingestion used (Cancer benchmark value = 1E-6, HI = 0.1).

(6) Value is for hexavalent chromium..

Definitions:

N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.19

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Storm Sewer

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Volatile Organic Compounds														
71-55-6	1,1,1-Trichloroethane	0.1		0.1		ug/L	S57SW0060101-MAX	1/13	1	0.469	0.1	NA	54 (5) N	No	BSL
75-35-4	1,1-Dichloroethene	0.1	J	0.2		ug/L	S57SW0060101-MAX	3/13	1	0.415	0.2	NA	0.057	Yes	ASL
78-93-3	2-Butanone	10.7	J	21	L	ug/L	S57SW0020101	11/11	NA	16.4	21	NA	190 (5) N	No	BSL
67641	Acetone	255.3	J	741.1		ug/L	S57SW0060101-MAX	4/6	37.1 - 64.4	301	741.1	NA	61 (5) N	Yes	ASL
75-27-4	Bromodichloromethane	0.1		0.1		ug/L	S57SW0060101-MAX	1/13	1	0.469	0.1	NA	0.17 (5) N	No	BSL
75-25-2	Bromoform	0.3	J	0.7	J	ug/L	S57SW0070201	6/13	1	0.515	0.7	NA	4.3	No	BSL
124-48-1	Dibromochloromethane	0.2	J	0.4		ug/L	57SW0080101, S57SW00	6/13	1	0.423	0.4	NA	0.56	No	BSL
60-29-7	Ethyl Ether	1.9		197	L	ug/L	S57SW0020101	13/13	NA	93.3	197	NA	120 N	Yes	BSL
60-29-7	Ethylbenzene	0.5	J	4	J	ug/L	S57SW0020101	9/13	1	0.938	4	NA	3100	No	BSL
100-42-5	Styrene	0.2	J	4	J	ug/L	S57SW0020101	9/13	1	0.992	4	NA	160 (5) N	No	BSL
108-88-3	Toluene	0.1		0.1		ug/L	57SW0070201, S57SW00	4/13	1	0.377	0.1	NA	6800	No	BSL
156-60-5	Trans-1,2-dichloroethene	0.1	J	0.1	J	ug/L	101, S57SW0070201, S57	3/13	1	0.408	0.1	NA	700	No	BSL
79-01-6	Trichloroethene	0.4	J	21.3		ug/L	S57SW0070201	12/13	1	11.7	21.3	NA	2.7	Yes	ASL
75-01-4	Vinyl Chloride	0.2	J	2	J	ug/L	S57SW0020101	8/13	1	0.585	2	NA	2	No	BSL
1330-20-7	Xylenes, Total	0.1	J	0.6	J	ug/L	S57SW0070101	6/13	1	0.415	0.6	NA	1200 (5) N	No	BSL
156-59-2	cis-1,2-dichloroethene	0.3	J	15	J	ug/L	S57SW0020101	12/13	1	7.02	15	NA	6.1 (5) N	Yes	ASL
	Inorganics - unfiltered														
7429-90-5	Aluminum	277		924	J	ug/L	S57SW0040101	4/5	148	494	924	NA	3700 (5) N	No	BSL
7440-39-3	Barium	22.2	K	34		ug/L	S57SW0090101	5/5	NA	27.6	34	NA	1000	No	BSL
7440-70-2	Calcium	9820	K	13800		ug/L	S57SW0090101	5/5	NA	12184	13800	NA	NA	No	NUT
7440-47-3	Chromium	0.73		2.2		ug/L	S57SW0040101	4/5	0.6	1.15	2.2	NA	11 (5,6) N	No	BSL
7440-48-4	Cobalt	2.6		4		ug/L	S57SW0090101	5/5	NA	3.4	4	NA	220 (5) N	No	BSL
7440-50-8	Copper	14.9		25.2		ug/L	S57SW0040101	4/5	14.8	17.3	25.2	NA	1300	No	BSL
57-12-5	Cyanide	8.6		8.6		ug/L	S57SW0090101	1/5	5	3.72	8.6	NA	73 (5) N	No	BSL
7439-89-6	Iron	925	K	1570		ug/L	S57SW0090101	5/5	NA	1251	1570	NA	300	Yes	ASL
7439-92-1	Lead	3.2	L	5.4	L	ug/L	S57SW0040101	4/5	4.4	3.82	5.4	NA	15 (7)	No	BSL
7439-95-4	Magnesium	2010		3680		ug/L	S57SW0090101	5/5	NA	2822	3680	NA	NA	No	NUT
7439-96-5	Manganese	71.9		119		ug/L	S57SW0090101	5/5	NA	92.8	119	NA	50	Yes	ASL
7440-02-0	Nickel	2.3		5.1		ug/L	S57SW0040101	5/5	NA	3.42	5.1	NA	610	No	BSL
7440-09-7	Potassium	2800		3200		ug/L	S57SW0070101	5/5	NA	2978	3200	NA	NA	No	NUT
7440-23-5	Sodium	49700		63700	J	ug/L	S57SW0090101	5/5	NA	55040	63700	NA	NA	No	NUT
7440-62-2	Vanadium	1.6	K	7.1		ug/L	S57SW0040101	2/5	5.1 - 5.7	3.36	7.1		26 (5) N	No	BSL
7440-66-6	Zinc	58.3		90.4		ug/L	S57SW0040101	5/5	NA	79.0	90.4	NA	9100	No	BSL
	Inorganics - Filtered														
7429-90-5	Aluminum	674	J	674	J	ug/L	S57SW0040101-F	1/5	17.4 - 189	164	674	NA	3700 (5) N	No	BSL

TABLE 2.19

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Storm Sewer

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
7440-39-3	Barium	19		25.1		ug/L	S57SW0030101-F	5/5	NA	22.4	25.1	NA	1000	No	BSL
7440-70-2	Calcium	9070	K	14100		ug/L	S57SW0090101-F	5/5	NA	11816	14100	NA	NA	No	NUT
7440-47-3	Chromium	0.67		0.89		ug/L	S57SW0040101-F	2/5	0.6	0.492	0.89	NA	11 (5,6) N	No	BSL
7440-48-4	Cobalt	4.3	K	7.6		ug/L	S57SW0090101-F	5/5	NA	5.84	7.6	NA	220 (5) N	No	BSL
7440-50-8	Copper	12.2		12.5		ug/L	S57SW0030101-F	2/5	4.9 - 9.8	7.27	12.5	NA	1300	No	BSL
7439-89-6	Iron	267		653		ug/L	S57SW0040101-F	5/5	NA	545	653	NA	300	Yes	BSL
7439-92-1	Lead	1.3	L	3.1	L	ug/L	S57SW0030101-F	3/5	1.9 - 2.6	1.87	3.1	NA	15 (6)	No	BSL
7439-95-4	Magnesium	1850		3750		ug/L	S57SW0090101-F	5/5	NA	2636	3750	NA	NA	No	NUT
7439-96-5	Manganese	73.6		121		ug/L	S57SW0090101-F	5/5	NA	90.7	121	NA	50	Yes	ASL
7440-02-0	Nickel	1.5		2.6		ug/L	S57SW0090101-F	4/5	1.1	1.75	2.6	NA	610	No	BSL
7440-09-7	Potassium	2690		3100		ug/L	S57SW0090101-F	5/5	NA	2838	3100	NA	NA	No	NUT
7782-49-2	Selenium	2.5	K	3.1	K	ug/L	S57SW0030101-F	2/5	2.5	1.87	3.1	NA	170	No	BSL
7440-23-5	Sodium	47900		65700	J	ug/L	S57SW0090101-F	5/5	NA	53080	65700	NA	NA	No	NUT
7440-62-2	Vanadium	0.72	K	0.93	K	ug/L	S57SW0020101-F	2/5	3.4 - 4.6	1.52	0.93	NA	26 (5) N	No	BSL
7440-66-6	Zinc	36.3	K	72	K	ug/L	S57SW0020101-F	5/5	NA	54.4	72	NA	9100	No	BSL
	Miscellaneous														
16887-00-6	Chloride	43000	L	43000	L	ug/L	S57SW0090101	1/1	NA	43000	43000	NA	NA	No	NTX
	Dissolved Oxygen	9700		9700		ug/L	S57SW0090101	1/1	NA	9700	9700	NA	NA	No	NTX
	Hardness As Caco3	35700		59500		ug/L	S57SW0090101	2/2	NA	47600	59500	NA	NA	No	NTX
14797-55-8	Nitrate/nitrite	452	L	452	L	ug/L	S57SW0090101	1/1	NA	452	452	NA	NA	No	NTX
9004700	Nitrocellulose	144	L	1230	L	ug/L	S57SW0040101	3/3	NA	831	1230	NA	NA	No	NTX
	pH	7.35		7.35			S57SW0090101	1/1	NA	7.35	7.35	NA	NA	No	NTX
14808-79-8	Sulfate	38000	L	38000	L	ug/L	S57SW0090101	1/1	NA	38000	38000	NA	NA	No	NTX
	Total Dissolved Solids	224000	L	224000	L	ug/L	S57SW0090101	1/1	NA	224000	224000	NA	NA	No	NTX
	Total Organic Carbon	2080		2320		ug/L	S57SW0020101	2/2	NA	2200	2320	NA	NA	No	NTX
	Turbidity	7.71	L	7.71	L	ug/L	S57SW0090101	1/1	NA	7.71	7.71	NA	NA	No	NTX

TABLE 2.19

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Storm Sewer

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background Value (2)	Screening Toxicity Value (3)	COPC Flag	Rationale for Contaminant Deletion or Selection (4)

Notes:

Samples included in table include: S57SW0010101, S57SW0020101, S57SW0020101-F, S57SW0030101-F, S57SW0030101-MAX, S57SW0030201, S57SW0040101, S57SW0040101-F, S57SW0060101-MAX, S57SW0060201, S57SW0070101, S57SW0070101-F, S57SW0070201, S57SW0080101, S57SW0080201, S57SW0080301, S57SW0090101, S57SW0090101-F.

(1) Minimum/maximum detected concentration.

(2) Background values presented for inorganics is two times the mean concentration.

(3) Criteria as published in FR 63:68354-68364 unless otherwise noted.

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Water quality criteria not available EPA Region III RBC for tap water ingestion used (Cancer benchmark value = 1E-6, HI = 0.1).

(6) Value is for hexavalent chromium..

(7) Action level.

Definitions:

N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.20

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Upgradient

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background (2) Value	Risk Based COPC Screening Level (3)			COPC Flag	Rationale for (4) Contaminant Deletion or Selection
													Residential	Industrial	Basis		
	Volatile Organic Compounds																
75-09-2	Methylene Chloride	8		8		ug/kg	S57SD0090101	1/1	NA	8	8	NA	85000	760000	C	No	BSL
	Inorganics																
7440-43-9	Cadmium	0.1		0.1		mg/kg	S57SD0090101	1/1	NA	0.1	0.1	0.26	3.9	100000	N	No	BSL, BKG
7440-50-8	Copper	2.9		2.9		mg/kg	S57SD0090101	1/1	NA	2.9	2.9	18.7	310	820	N	No	BSL, BKG
7439-92-1	Lead	21.7		21.7		mg/kg	S57SD0090101	1/1	NA	21.7	21.7	149	400 (5)	1000 (6)		No	BSL, BKG
7440-02-0	Nickel	0.74		0.74		mg/kg	S57SD0090101	1/1	NA	0.74	0.74	18.2	160	4100	N	No	BSL, BKG
7440-66-6	Zinc	13.5		13.5		mg/kg	S57SD0090101	1/1	NA	13.5	13.5	38.1	2300	61000	N	No	BSL, BKG
	Miscellaneous																
	Acid Volatile Sulfide	80.1	K	80.1	K	mg/kg	S57SD0090101	1/1	NA	80.1	80.1	NA	NA	NA		No	NTX
	Total Organic Carbon	16900	J	16900	J	mg/kg	S57SD0090101	1/1	NA	16900	16900	NA	NA	NA		No	NTX

Notes:

Samples included in table include: S57SD0090101

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Investigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, October 1, 1998. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is based on OSWER Soil Screening Level for residential land use (USEPA, July 1994).

(6) EPA Region III

Definitions:

N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.21

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background (2) Value	Risk Based COPC Screening Level (3)			COPC Flag	Rationale for (4) Contaminant Deletion or Selection
													Residential	Industrial	Basis		
	Volatile Organic Compounds																
67-64-1	Acetone	31		31		ug/kg	S57SD0120101-MAX	1/5	12 - 13	11.2	31	NA	780000	20000000	N	No	BSL
75-15-0	Carbon Disulfide	3	J	3	J	ug/kg	S57SD0080101	1/5	12 - 13	5.7	3	NA	780000	20000000	N	No	BSL
	Semivolatile Organic Compounds																
120-12-7	Anthracene	59	J	59	J	ug/kg	S57SD0100101	1/2	440	140	59	NA	2300000	61000000	N	No	BSL
56-55-3	Benzo(a)anthracene	180	J	180	J	ug/kg	S57SD0100101	1/2	440	200	180	NA	870	7800	C	No	BSL
50-32-8	Benzo(a)pyrene	120	J	120	J	ug/kg	S57SD0100101	1/2	440	170	120	NA	87	780	C	Yes	ASL
205-99-2	Benzo(b)fluoranthene	290	J	290	J	ug/kg	S57SD0100101	1/2	440	255	290	NA	870	7800	C	No	BSL
191-24-2	Benzo(g,h,i)perylene	57	J	57	J	ug/kg	S57SD0100101	1/2	440	139	57	NA	160000 (5)	4100000 (5)	N	No	BSL
207-08-9	Benzo(k)fluoranthene	77	J	77	J	ug/kg	S57SD0100101	1/2	440	149	77	NA	8700	78000	C	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	46	J	46	J	ug/kg	S57SD0100101	1/2	440	133	46	NA	46000	410000	C	No	BSL
218-01-9	Chrysene	160	J	160	J	ug/kg	S57SD0100101	1/2	440	190	160	NA	87000	780000	C	No	BSL
84-74-2	Di-n-butyl phthalate	61	J	61	J	ug/kg	S57SD0100101	1/2	440	141	61	NA	78000	20000000	N	No	BSL
206-44-0	Fluoranthene	380	J	380	J	ug/kg	S57SD0100101	1/2	440	300	380	NA	310000	8200000	N	No	BSL
86-73-7	Fluorene	44	J	44	J	ug/kg	S57SD0100101	1/2	440	132	44	NA	310000	8200000	N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	84	J	84	J	ug/kg	S57SD0100101	1/2	440	152	84	NA	870	7800	C	No	BSL
85-01-8	Phenanthrene	280	J	280	J	ug/kg	S57SD0100101	1/2	440	250	280	NA	160000 (5)	4100000 (5)	N	No	BSL
129-00-0	Pyrene	330	J	330	J	ug/kg	S57SD0100101	1/2	440	275	330	NA	230000	6100000	N	No	BSL
	Pesticides																
72-54-8	4,4'-DDD	1.4		1.4		ug/kg	S57SD0120101-MAX	1/2	4.2	1.75	0.0014	NA	2700	24000	C	No	BSL
72-55-9	4,4'-DDE	0.34		0.34		ug/kg	S57SD0120101-MAX	1/2	4.2	1.22	0.00034	NA	1900	17000	C	No	BSL
50-29-3	4,4'-DDT	0.96		0.96		ug/kg	S57SD0120101-MAX	1/2	4.2	1.53	0.00096	NA	1900	17000	C	No	BSL
	Inorganics																
7429-90-5	Aluminum	599		1480		mg/kg	S57SD0100101	2/2	NA	1040	1480	18329	7800	200000	N	No	BSL, BKG
7440-38-2	Arsenic	4.7		4.7		mg/kg	S57SD0100101	1/2	1.4	2.7	4.7	4.25	0.43	3.8	C	Yes	ASL
7440-39-3	Barium	7.4		8		mg/kg	120101-MAX, S57SD0	2/2	NA	7.7	8	144	550	14000	N	No	BSL, BKG
7440-41-7	Beryllium	0.16		0.16		mg/kg	S57SD0100101	2/2	NA	0.16	0.16	0.905	16	410	N	No	BSL, BKG
7440-43-9	Cadmium	0.26		0.26		mg/kg	S57SD0100101	1/2	0.08	0.15	0.26	0.26	3.9	10	N	No	BSL, BKG
7440-70-2	Calcium	696		696		mg/kg	S57SD0100101	1/2	109	375	696	409	NA	NA		No	NUT, BKG
7440-47-3	Chromium	1.3		10.7		mg/kg	S57SD0100101	2/2	NA	6	10.7	24.2	23 (6)	610 (6)	N	No	BSL, BKG
7440-48-4	Cobalt	1.7		5		mg/kg	S57SD0100101	2/2	NA	3.35	5	39.7	470	12000	N	No	BSL, BKG
7440-50-8	Copper	6.9		6.9		mg/kg	S57SD0100101	1/2	1.7	3.875	6.9	18.7	310	8200	N	No	BSL, BKG
57-12-5	Cyanide	0.55		0.61		mg/kg	S57SD0120101-MAX	2/2	NA	0.58	0.61	ND	160	4100	N	No	BSL
7439-89-6	Iron	1830		7440		mg/kg	S57SD0100101	2/2	NA	4635	7440	43170	2300	61000	N	No	BKG
7439-92-1	Lead	18.8	J	18.8	J	mg/kg	S57SD0100101	1/2	2.5	10.025	18.8	149	400 (7)	1000 (8)		No	BSL, BKG
7439-95-4	Magnesium	66.6		1180		mg/kg	S57SD0100101	2/2	NA	623	1180	1382	NA	NA		No	NUT, BKG
7439-96-5	Manganese	15.6		96.4	J	mg/kg	S57SD0100101	2/2	NA	56	96.4	2246	160	4100	N	No	BSL, BKG
7439-97-6	Mercury	1.9	L	1.9	L	mg/kg	S57SD0100101	1/2	0.02	0.955	1.9	0.087	2.3 (9)	61 (9)	N	No	BSL
7440-02-0	Nickel	0.94		10		mg/kg	S57SD0100101	2/2	NA	5.47	10	18.2	160	4100	N	No	BSL, BKG
7440-09-7	Potassium	152		214		mg/kg	S57SD0120101-MAX	2/2	NA	183	214	1874	NA	NA		No	NUT, BKG

TABLE 2.21

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background (2) Value	Risk Based COPC Screening Level (3)			COPC Flag	Rationale for (4) Contaminant Deletion or Selection
													Residential	Industrial	Basis		
7440-23-5	Sodium	67.8		208		mg/kg	S57SD0120101-MAX	2/2	NA	138	208	51.9	NA	NA		No	NUT
7440-62-2	Vanadium	5.4		9		mg/kg	S57SD0100101	2/2	NA	7.2	9	53.5	55	1400	N	No	BSL, BKG
7440-66-6	Zinc	9.1		126		mg/kg	S57SD0100101	2/2	NA	67.6	126	38.1	2300	61000	N	No	BSL
	Miscellaneous																
	Acid Volatile Sulfide	81.3		81.3		mg/kg	S57SD0120101-MAX	1/2	57.1	54.9	81.3	NA	NA	NA		No	NTX
	Cadmium (Avs/sem)	0.16		0.16		mg/kg	S57SD0100101	1/2	0.02	0.085	0.16	NA	NA	NA		No	NTX
	Copper (Avs/sem)	2.1		2.1		mg/kg	S57SD0100101	1/2	0.58	1.20	2.1	NA	NA	NA		No	NTX
	Lead (Avs/sem)	3.1		12.7		mg/kg	S57SD0100101	2/2	NA	7.9	12.7	NA	NA	NA		No	NTX
	Mercury (Avs/sem)	0.012		0.012		mg/kg	S57SD0120101-MAX	1/2	0.0137	0.009	0.012	NA	NA	NA		No	NTX
	Nickel (Avs/sem)	0.54		1.7		mg/kg	S57SD0100101	2/2	NA	1.12	1.7	NA	NA	NA		No	NTX
	pH	7.51		7.85			S57SD0120101-MAX	2/2	NA	7.68	7.85	NA	NA	NA		No	NTX
	Total Organic Carbon	10700		18800	L	mg/kg	S57SD0100101	2/2	NA	14750	18800	NA	NA	NA		No	NTX
	Zinc (Avs/sem)	4.8		48		mg/kg	S57SD0100101	2/2	NA	26.4	48	NA	NA	NA		No	NTX

Notes:

Samples included in table include: S57SD0070101, S57SD0080101, S57SD0100101, S57SD0110101, S57SD0120101-MAX

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, April 12, 1999. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)

Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for naphthalene.

(6) Value is for hexavalent chromium.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.22

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Storm Sewer

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background (2) Value	Risk Based COPC Screening Level (3)			COPC Flag	Rationale for (4) Contaminant Deletion or Selection
													Residential	Industrial	Basis		
	Volatile Organic Compounds																
75-35-4	1,1-Dichloroethene	9	J	9	J	ug/kg	S57SD0050101	1/1	NA	9	9	NA	1100	9500	C	No	BSL
67-64-1	Acetone	28	J	28	J	ug/kg	S57SD0050101	1/1	NA	28	28	NA	780000	20000000	N	No	BSL
60-29-7	Ethyl Ether	14	J	14	J	ug/kg	S57SD0050101	1/1	NA	14	14	NA	1600000	41000000	N	No	BSL
100-41-4	Ethylbenzene	2	J	2	J	ug/kg	S57SD0050101	1/1	NA	2	2	NA	780000	20000000	N	No	BSL
156-60-5	Trans-1,2-dichloroethene	14	J	14	J	ug/kg	S57SD0050101	1/1	NA	14	14	NA	160000	4100000	N	No	BSL
79-01-6	Trichloroethene	18	J	18	J	ug/kg	S57SD0050101	1/1	NA	18	18	NA	58000	520000	C	No	BSL
75-01-4	Vinyl Chloride	1000	J	1000	J	ug/kg	S57SD0050101	1/1	NA	1000	1000	NA	340	3000	C	Yes	ASL
156-59-2	cis-1,2-dichloroethene	6300		6300		ug/kg	S57SD0050101	1/1	NA	6300	6300	NA	78000	200000	N	No	BSL
	Semivolatile Organic Compounds																
91-57-6	2-Methylnaphthalene	90	J	90	J	ug/kg	S57SD0050101	1/1	NA	90	90	NA	160000	4100000	N	No	BSL
83-32-9	Acenaphthene	84	J	84	J	ug/kg	S57SD0050101	1/1	NA	84	84	NA	470000	12000000	N	No	BSL
120-12-7	Anthracene	190	J	190	J	ug/kg	S57SD0050101	1/1	NA	190	190	NA	2300000	61000000	N	No	BSL
56-55-3	Benzo(a)anthracene	420	J	420	J	ug/kg	S57SD0050101	1/1	NA	420	420	NA	870	7800	C	No	BSL
50-32-8	Benzo(a)pyrene	300	J	300	J	ug/kg	S57SD0050101	1/1	NA	300	300	NA	87	780	C	Yes	ASL
205-99-2	Benzo(b)fluoranthene	500		500		ug/kg	S57SD0050101	1/1	NA	500	500	NA	870	7800	C	No	BSL
191-24-2	Benzo(g,h,i)perylene	190	J	190	J	ug/kg	S57SD0050101	1/1	NA	190	190	NA	160000 (5)	4100000 (5)	N	No	BSL
207-08-9	Benzo(k)fluoranthene	140	J	140	J	ug/kg	S57SD0050101	1/1	NA	140	140	NA	8700	78000	N	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	180	J	180	J	ug/kg	S57SD0050101	1/1	NA	180	180	NA	46000	410000	C	No	BSL
86-74-8	Carbazole	82	J	82	J	ug/kg	S57SD0050101	1/1	NA	82	82	NA	32000	290000	C	No	BSL
218-01-9	Chrysene	340	J	340	J	ug/kg	S57SD0050101	1/1	NA	340	340	NA	87000	780000	C	No	BSL
53-70-3	Dibenzo(a,h)anthracene	50	J	50	J	ug/kg	S57SD0050101	1/1	NA	50	50	NA	87	780	C	No	BSL
132-64-9	Dibenzofuran	80	J	80	J	ug/kg	S57SD0050101	1/1	NA	80	80	NA	31000	820000	N	No	BSL
206-44-0	Fluoranthene	750		750		ug/kg	S57SD0050101	1/1	NA	750	750	NA	310000	8200000	N	No	BSL
86-73-7	Fluorene	130	J	130	J	ug/kg	S57SD0050101	1/1	NA	130	130	NA	310000	8200000	N	No	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	160	J	160	J	ug/kg	S57SD0050101	1/1	NA	160	160	NA	870	7800	N	No	BSL
86-30-6	N-Nitrosodiphenylamine	50	J	50	J	ug/kg	S57SD0050101	1/1	NA	50	50	NA	310000	8200000	N	No	BSL
91-20-3	Naphthalene	180	J	180	J	ug/kg	S57SD0050101	1/1	NA	180	180	NA	160000	41000000	C	No	BSL
85-01-8	Phenanthrene	810		810		ug/kg	S57SD0050101	1/1	NA	810	810	NA	160000 (5)	4100000 (5)	N	No	BSL
129-00-0	Pyrene	720		720		ug/kg	S57SD0050101	1/1	NA	720	720	NA	230000	6100000	N	No	BSL
	Pesticides																
5103-74-2	Gamma-Chlordane	2.1	J	2.1	J	ug/kg	S57SD0050101	1/1	NA	2.1	2.1	NA	1800	16000	C	No	BSL
	Inorganics																
7429-90-5	Aluminum	2260		2260		mg/kg	S57SD0050101	1/1	NA	2260	2260	18329	7800	200000	N	No	BSL, BKG
7440-36-0	Antimony	3	K	3	K	mg/kg	S57SD0050101	1/1	NA	3	3	ND	3.1	82	N	No	BSL
7440-38-2	Arsenic	8.4		8.4		mg/kg	S57SD0050101	1/1	NA	8.4	8.4	4.25	0.43	3.8	C	Yes	ASL
7440-39-3	Barium	23.2		23.2		mg/kg	S57SD0050101	1/1	NA	23.2	23.2	144	550	14000	N	No	BSL, BKG
7440-41-7	Beryllium	0.27	L	0.27	L	mg/kg	S57SD0050101	1/1	NA	0.27	0.27	0.905	16	410	N	No	BSL, BKG
7440-43-9	Cadmium	0.76	K	0.76	K	mg/kg	S57SD0050101	1/1	NA	0.76	0.76	0.26	3.9	10	N	No	BSL
7440-70-2	Calcium	2870	J	2870	J	mg/kg	S57SD0050101	1/1	NA	2870	2870	409	NA	NA	N	No	NUT

TABLE 2.22

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Storm Sewer

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	Concentration Used for Screening	Background (2) Value	Risk Based COPC Screening Level (3)			COPC Flag	Rationale for (4) Contaminant Deletion or Selection
													Residential	Industrial	Basis		
7440-47-3	Chromium	12.6		12.6		mg/kg	S57SD0050101	1/1	NA	12.6	12.6	24.2	23 (6)	610 (6)	N	No	BSL, BKG
7440-48-4	Cobalt	7.7		7.7		mg/kg	S57SD0050101	1/1	NA	7.7	7.7	39.7	470	12000	N	No	BSL, BKG
7440-50-8	Copper	103		103		mg/kg	S57SD0050101	1/1	NA	103	103	18.7	310	8200	N	No	BSL
57-12-5	Cyanide	0.76		0.76		mg/kg	S57SD0050101	1/1	NA	0.76	0.76	ND	160	4100	N	No	BSL
7439-89-6	Iron	20800		20800		mg/kg	S57SD0050101	1/1	NA	20800	20800	43170	2300	61000	N	No	BKG
7439-92-1	Lead	182	K	182	K	mg/kg	S57SD0050101	1/1	NA	182	182	149	400 (7)	1000 (8)	N	No	BSL
7439-95-4	Magnesium	2070		2070		mg/kg	S57SD0050101	1/1	NA	2070	2070	1382	NA	NA	N	No	NUT
7439-96-5	Manganese	150		150		mg/kg	S57SD0050101	1/1	NA	150	150	2248	160	4100	N	No	BSL, BKG
7439-97-6	Mercury	0.45		0.45		mg/kg	S57SD0050101	1/1	NA	0.45	0.45	0.087	2.3 (9)	61 (9)	N	No	BSL
7440-02-0	Nickel	24.9		24.9		mg/kg	S57SD0050101	1/1	NA	24.9	24.9	18.2	160	4100	N	No	BSL
7440-09-7	Potassium	187		187		mg/kg	S57SD0050101	1/1	NA	187	187	1874	NA	NA		No	BSL, BKG
7440-22-4	Silver	0.15	K	0.15	K	mg/kg	S57SD0050101	1/1	NA	0.15	0.15	ND	39	1000	N	No	BSL
7440-23-5	Sodium	118	L	118	L	mg/kg	S57SD0050101	1/1	NA	118	118	51.9	NA	NA		No	NUT
7440-62-2	Vanadium	118		118		mg/kg	S57SD0050101	1/1	NA	118	118	53.5	55	1400	N	Yes	ASL
7440-66-6	Zinc	183		183		mg/kg	S57SD0050101	1/1	NA	183	183	38.1	2300	61000	N	No	BSL
	Miscellaneous																
	Acid Volatile Sulfide	64.4		64.4		mg/kg	S57SD0050101	1/1	NA	64.4	64.4	NA	NA	NA		No	NTX
	Cadmium (sem)	0.25		0.25		mg/kg	S57SD0050101	1/1	NA	0.25	0.25	NA	NA	NA		No	NTX
	Copper (sem)	62.9		62.9		mg/kg	S57SD0050101	1/1	NA	62.9	62.9	NA	NA	NA		No	NTX
	Lead (sem)	140	J	140	J	mg/kg	S57SD0050101	1/1	NA	140	140	NA	NA	NA		No	NTX
	Mercury (sem)	0.006	L	0.006	L	mg/kg	S57SD0050101	1/1	NA	0.006	0.006	NA	NA	NA		No	NTX
	Nickel (sem)	3.9		3.9		mg/kg	S57SD0050101	1/1	NA	3.9	3.9	NA	NA	NA		No	NTX
	Zinc (sem)	78		78		mg/kg	S57SD0050101	1/1	NA	78	78	NA	NA	NA		No	NTX
	pH	7.21		7.21			S57SD0050101	1/1	NA	7.21	7.21	NA	NA	NA		No	NTX

Notes:

Samples included in table include: S57SD0050101

(1) Minimum/maximum detected concentration.

(2) Background concentrations from Background Invetsigation Report for Indian Head and Stump Neck Annex, Brown & Root Environmental, December 1997.

(3) USEPA Region III Risk-Based Concentration Table, October 1, 1998. (Cancer benchmark value = 1E-06, HI = 0.1)

(4) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(5) Value is for naphthalene.

(6) Value is for hexavalent chromium.

(7) Value is based on OSWER Soil Screening Level for resdiential land use (USEPA, July 1994).

(8) EPA Region III.

(9) Value is for mercuric chloride.

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	mg/kg	9.6	NA	9.6		mg/kg	9.6	Max	(1)	9.6	Max	(1)

Notes:

(1) - Not enough samples to calculate an UCL or to perform the Shapiro-Wilk W Test.

TABLE 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	mg/kg	0.883	2.95	2.3		mg/kg	2.3	Max	W-Test (1)	2.3	Max	W-Test (1)
Benzo(a)pyrene	mg/kg	0.66	2.18	1.7		mg/kg	1.7	Max	W-Test (1)	1.7	Max	W-Test (1)
Benzo(b)fluoranthene	mg/kg	1.56	5.41	4.2		mg/kg	4.2	Max	W-Test (1)	4.2	Max	W-Test (1)
Dibenzo(a,h)anthracene	mg/kg	0.258	0.4	0.35		mg/kg	0.35	Max	W-Test (1)	0.35	Max	W-Test (1)
Indeno(1,2,3-cd)pyrene	mg/kg	0.376	1.24	0.97		mg/kg	0.97	Max	W-Test (1)	0.97	Max	W-Test (1)
Arsenic	mg/kg	55	125	103		mg/kg	103	Max	W-Test (1)	103	Max	W-Test (1)

Notes:

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) - Data is lognormally distributed but UCL is greater than maximum detected concentration.

TABLE 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	mg/kg	9.6	NA	9.6		mg/kg	9.6	Max	(1)	9.6	Max	(1)

Notes:

(1) - Not enough samples to calculate an UCL or to perform the Shapiro-Wilk W Test.

TABLE 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Trichloroethene	mg/kg	6.32	16.96	220		mg/kg	0.504	95% UCL-L	W-Test (1)	0.504	95% UCL-L	W-Test (1)
Benzo(a)pyrene	mg/kg	0.365	0.729	1.7		mg/kg	1.13	95% UCL-L	W-Test (1)	1.13	95% UCL-L	W-Test (1)
Benzo(a)anthracene	mg/kg	0.463	0.963	2.3		mg/kg	1.46	95% UCL-L	W-Test (1)	1.46	95% UCL-L	W-Test (1)
Benzo(b)fluoranthene	mg/kg	0.736	1.68	4.2		mg/kg	3.43	95% UCL-L	W-Test (1)	3.43	95% UCL-L	W-Test (1)
Dibenzo(a,h)anthracene	mg/kg	0.205	0.259	0.35		mg/kg	0.259	95% UCL-N	W-Test (2)	0.259	95% UCL-N	W-Test (2)
Indeno(1,2,3-cd)pyrene	mg/kg	0.243	0.444	0.97		mg/kg	0.788	95% UCL-L	W-Test (1)	0.788	95% UCL-L	W-Test (1)
Arsenic	mg/kg	38.1	57.3	103		mg/kg	71.7	95% UCL-L	W-Test (1)	71.7	95% UCL-L	W-Test (1)
Lead	mg/kg	102	209	487		mg/kg	102	Mean	(3)	200	Mean	(3)

Notes:

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) - Shapiro-Wilk W Test indicates that data is lognormally distributed.

(2) - Shapiro-Wilk W Test indicates that data is normally distributed.

TABLE 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater - Upgradient
Exposure Point: Site 57

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1-Dichloroethene	ug/L	39.7	(1)	77.5		ug/L	77.5	Max	(1)	77.5	Max	(1)
1,2-Dichloroethane	ug/L	1.6	(1)	2.7		ug/L	2.7	Max	(1)	2.7	Max	(1)
Chloroform	ug/L	0.9	(1)	1.3		ug/L	1.3	Max	(1)	1.3	Max	(1)
Trichloroethene	ug/L	2.25	(1)	2.3		ug/L	2.3	Max	(1)	2.3	Max	(1)

Notes:

(1) - Not enough samples to calculate an UCL or to perform the Shapiro-Wilk W Test.

TABLE 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater - Downgradient
Exposure Point: Site 57

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1-Dichloroethene	ug/L	6.31	9.96	29		ug/L	29	Max	W-Test (1)	29	Max	W-Test (1)
Chloroform	ug/L	1.53	2.42	1.3		ug/L	1.3	Max	W-Test (1)	1.3	Max	W-Test (1)
Ethyl Ether	ug/L	688	1303	3950		ug/L	3950	Max	W-Test (1)	3950	Max	W-Test (1)
Tetrachloroethene	ug/L	2.11	3.46	9.5		ug/L	5.41	95% UCL-L	W-Test (2)	5.41	95% UCL-L	W-Test (2)
Trichloroethene	ug/L	161	257	612		ug/L	612	Max	W-Test (1)	612	Max	W-Test (1)
Vinyl Chloride	ug/L	11.7	23.3	85		ug/L	85	Max	W-Test (1)	85	Max	W-Test (1)
cis-1,2-Dichloroethene	ug/L	79.5	148	528		ug/L	528	Max	W-Test (1)	528	Max	W-Test (1)

Notes:

(1) - Data is lognormally distributed but UCL is greater than maximum detected concentration.

(2) - Shapiro-Wilk W Test indicates that data is lognormally distributed.

TABLE 3.7

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment - Downgradient
Exposure Point: Site 57

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)pyrene	mg/kg	0.17	(1)	0.12		mg/kg	0.12	Max	(1)	0.12	Max	(1)
Arsenic	mg/kg	3.05	(1)	4.7		mg/kg	4.7	Max	(1)	4.7	Max	(1)

Notes:

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

(1) - Not enough samples to calculate an UCL or to perform the Shapiro-Wilk W Test.

TABLE 3.8

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment - Sewer
Exposure Point: Site 57

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Vinyl Chloride	mg/kg	1	(1)	1		mg/kg	1	Max	(1)	1	Max	(1)
Benzo(a)pyrene	mg/kg	0.3	(1)	0.3		mg/kg	0.3	Max	(1)	0.3	Max	(1)
Arsenic	mg/kg	8.4	(1)	8.4		mg/kg	8.4	Max	(1)	8.4	Max	(1)
Vanadium	mg/kg	118	(1)	118		mg/kg	118	Max	(1)	118	Max	(1)

Notes:

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

(1) - Not enough samples to calculate an UCL or to perform the Shapiro-Wilk W Test.

TABLE 3.9

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water - Downgradient
Exposure Point: Site 57

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Iron	ug/L	623	(1)	785		ug/L	785	Max	(1)	785	Max	(1)
Manganese	ug/L	193	(1)	363		ug/L	363	Max	(1)	363	Max	(1)

Notes:

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

(1) - Not enough samples to calculate an UCL or to perform the Shapiro-Wilk W Test.

TABLE 3.10

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water - Sewer
Exposure Point: Site 57

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1-Dichloroethene	ug/L	0.415	0.496	0.2		ug/L	0.2	Max	(1)	9	Max	(1)
Acetone	ug/L	309	520	725		ug/L	725	Max	(1)	28	Max	(1)
Ethyl Ether	ug/L	93	120	197		ug/L	120	95% UCL-L	W-Test (2)	14	Max	(1)
Trichloroethene	ug/L	11.7	15.2	21.3		ug/L	15.2	95% UCL-N	W-Test (3)	18	Max	(1)
cis-1,2-dichloroethene	ug/L	7.02	9.1	15		ug/L	9.1	95% UCL-N	W-Test (3)	6300	Max	(1)
Iron	ug/L	1251	1546	1570		ug/L	1546	95% UCL-N	W-Test (3)	20800	Max	(1)
Manganese	ug/L	92.8	114	119		ug/L	119	Max	(1)	150	Max	(1)

Notes:

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

(1) - Data is lognormally distributed but UCL is greater than maximum detected concentration.

(2) - Shapiro-Wilk W Test indicates that data is lognormally distributed.

(3) - Shapiro-Wilk W Test indicates that data is normally distributed.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	50	EPA, 1999	25	(3)	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1993	5	USDL, 1992	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	1825	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	4300	(1)	4300	(1)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.02	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1993	5	USDL, 1992	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	1825	EPA, 1989	

Notes:

(1) - Mean value for head, arms, and hands

(2) - Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	50	EPA, 1999	25	(2)	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1993	5	USDL, 1992	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	1825	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	4300	(1)	4300	(1)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.02	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1993	5	USDL, 1992	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	1825	EPA, 1989	

Notes:

(1) - Mean value for head, arms, and hands

(2) - Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	480	EPA, 1993	240	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	5300	(2)	5300	(2)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.02	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	(2)	See Text	(2)	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

(2) - Refer to supporting text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	4050	(1)	4050	(1)	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	(2)	1	(2)	
	ET	Exposure Time	hours/event	8	(2)	8	(2)	
	EF	Exposure Frequency	days/year	40	(2)	20	(2)	
	ED	Exposure Duration	years	1	(2)	1	(2)	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Assumes hands, forearms, and lower legs are exposed.

(2) - Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m3	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Inhalation Rate	m3/hour	3.3	EPA, 1989	3.3	EPA, 1989	$\frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$
	ET	Exposure Time	hours/day	8	(2)	8	(2)	
	EF	Exposure Frequency	days/year	40	(2)	20	(2)	
	ED	Exposure Duration	years	1	(2)	1	(2)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement, see text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	480	EPA, 1993	240	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	5300	(2)	5300	(2)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.02	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	(2)	See Text	(2)	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

(2) - Refer to supporting text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m3	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Inhalation Rate	m3/hour	3.3	EPA, 1989	3.3	EPA, 1989	$\frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$
	ET	Exposure Time	hours/day	8	(1)	8	(1)	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	4050	(1)	4050	(1)	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	(2)	1	(2)	
	ET	Exposure Time	hours/event	8	(2)	8	(2)	
	EF	Exposure Frequency	days/year	40	(2)	20	(2)	
	ED	Exposure Duration	years	1	(2)	1	(2)	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Assumes hands, forearms, and lower legs are exposed.

(2) - Professional judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m3	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Inhalation Rate	m3/hour	3.3	EPA, 1989	3.3	EPA, 1989	$\frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$
	ET	Exposure Time	hours/day	8	(2)	8	(2)	
	EF	Exposure Frequency	days/year	40	(2)	20	(2)	
	ED	Exposure Duration	years	1	(2)	1	(2)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement, see text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	240	(1)	120	(1)	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	4300	(2)	4300	(2)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.02	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

(2) - Mean value for head, arms, and hands

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Medium: Surface/Subsurface Soil
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	ug/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	CR	Contact Rate	L/hour	0.01	EPA, 1995	0.01	EPA, 1995	$\frac{CW \times CR \times CF \times ET \times EF \times ED}{BW \times AT}$
	CF	Conversion factor	ug/mg	0.001	- -	0.001	- -	
	ET	Exposure Time	hours/event	8	(1)	8	(1)	
	EF	Exposure Frequency	events/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	4300	(2)	4300	(2)	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	(1)	1	(1)	
	ET	Exposure Time	hours/event	8	EPA, 1989	8	EPA, 1989	
	EF	Exposure Frequency	days/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

(2) - Assumes hand., forearms, and lower legs are exposed.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	240	(1)	120	(1)	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	4300	(2)	4300	(2)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.02	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

(2) - Mean value for head, arms, and hands

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Medium: Surface Water
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	ug/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	CR	Contact Rate	L/hour	0.01	EPA, 1995	0.01	EPA, 1995	$\frac{CW \times CR \times CF \times ET \times EF \times ED}{BW \times AT}$
	CF	Conversion factor	ug/mg	0.001	- -	0.001	- -	
	ET	Exposure Time	hours/event	8	(1)	8	(1)	
	EF	Exposure Frequency	events/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	4300	(2)	4300	(2)	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	(1)	1	(1)	
	ET	Exposure Time	hours/event	8	EPA, 1989	8	EPA, 1989	
	EF	Exposure Frequency	days/year	60	(1)	30	(1)	
	ED	Exposure Duration	years	1	(1)	1	(1)	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes:

(1) - Professional judgement.

(2) - Refer to supporting text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	200	EPA, 1993	100	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2555	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	1743	(1)	1743	(1)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.06	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	(2)	See Text	(2)	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2555	EPA, 1989	730	EPA, 1989	

Notes:

(1) - Assume 25 percent of total body surface area available for contact.

(2) - See text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Ingestion Rate	L/day	1	EPA, 1993	1	EPA, 1993	$\frac{CW \times IR \times EF \times ED}{BW \times AT}$
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	7	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2555	EPA, 1989	730	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	6970	EPA, 1992	6970	EPA, 1992	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	EPA, 1992	1	EPA, 1992	
	ET	Exposure Time	hours/event	0.25	EPA, 1992	0.167	EPA, 1992	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	7	EPA, 1993	2	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,555	EPA, 1989	730	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.16

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	200	EPA, 1993	100	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	1743	(1)	1743	(1)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.06	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	(2)	See Text	(2)	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes:

(1) - Assume 25 percent of total body surface area available for contact.

(2) - See text.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.17

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m3	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Inhalation Rate	m3/hour	0.5	EPA III, 1999	0.5	EPA III, 1999	$\frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$
	ET	Exposure Time	hours/day	24	EPA, 1993	24	EPA, 1993	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes:

Sources:

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

EPA III, 1999: U.S. EPA Region III Risk Based Concentration Table, April 12, 1999.

TABLE 4.18

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Ingestion Rate	L/day	1	EPA, 1993	1	EPA, 1993	$\frac{CW \times IR \times EF \times ED}{BW \times AT}$
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	7	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2555	EPA, 1989	730	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	6970	EPA, 1992	6970	EPA, 1992	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	EPA, 1992	1	EPA, 1992	
	ET	Exposure Time	hours/event	0.25	EPA, 1992	0.167	EPA, 1992	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	7	EPA, 1993	2	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,555	EPA, 1989	730	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.19

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	200	EPA, 1993	100	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	1743	(2)	1743	(2)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.2	EPA, 1997	0.06	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	(3)	See Text	(3)	
	EF	Exposure Frequency	days/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes:

(1) - Assumes 1 day a week for summer months (May through August). CTE is 50 percent of RME.

(2) - Assume 25 percent of total body surface area available for contact.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.20

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	ug/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	CR	Contact Rate	L/hour	0.05	EPA, 1988	0.05	EPA, 1988	$\frac{CW \times CR \times CF \times ET \times EF \times ED}{BW \times AT}$
	CF	Conversion factor	ug/mg	0.001	- -	0.001	- -	
	ET	Exposure Time	hours/event	4	(1)	2	(1)	
	EF	Exposure Frequency	events/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	(2)	See Text	(2)	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	1743	(3)	1743	(3)	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	(1)	1	(1)	
	ET	Exposure Time	hours/event	4	(1)	2	(1)	
	EF	Exposure Frequency	days/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	6	EPA, 1993	2	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes:

(1) - Professional judgement. Assumes 1 day a week for summer months (May through August). CTE is 50 percent of RME.

(2) - Refer to supporting text.

(3) - Assume 25 percent of total body surface area available for contact.

Sources:

EPA, 1988: Superfund Exposure Assessment Manual.

TABLE 4.21

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	100	EPA, 1993	50	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	5000	(1)	5000	(1)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.07	EPA, 1997	0.01	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes:

(1) - Assume 25 percent of total body surface area available for contact.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.22

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Ingestion Rate	L/day	2	EPA, 1993	1.4	EPA, 1993	$\frac{CW \times IR \times EF \times ED}{BW \times AT}$
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	20000	EPA, 1992	20000	EPA, 1992	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	EPA, 1992	1	EPA, 1992	
	ET	Exposure Time	hours/event	0.25	EPA, 1992	0.167	EPA, 1992	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	2,555	EPA, 1989	

Notes:

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.23

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Foster & Chrostowski Inhalation Model
	Ra	Air Exchange Rate	min-1	1.7E-02	default value	1.7E-02	default value	
	Ds	Shower Duration	min	1.5E+01	default value	1.0E+01	default value	
	Dt	Total Time in Bathroom	min	2.0E+01	default value	1.5E+01	default value	
	Fr	Shower Water Flow Rate	L/min	2.0E+01	default value	2.0E+01	default value	
	Sv	Shower Room Air Volume	m3	6.0E+00	default value	6.0E+00	default value	
	Ts	Shower Droplet Drop Time	sec	2.0E+00	default value	2.0E+00	default value	
	d	Shower Droplet Diameter	mm	1.0E+00	default value	1.0E+00	default value	
	T1	Calibration Water Temperature	K	2.9E+02	default value	2.9E+02	default value	
	Ts	Shower Water Temperature	K	3.2E+02	default value	3.2E+02	default value	
	m1	Water Viscosity at T1	cp	9.8E-01	default value	9.8E-01	default value	
	ms	Water Viscosity at Ts	cp	0.616	default value	0.616	default value	
	K	Mass Transfer Coefficient	min	2.78	default value	2.78	default value	
	IRsh	Inhalation Rate	L/min	10	default value	10	default value	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	2,555	EPA, 1989	

TABLE 4.24

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	100	EPA, 1993	50	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	5000	(1)	5000	(1)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.07	EPA, 1997	0.01	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes:

(1) - Assume 25 percent of total body surface area available for contact.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.25

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m3	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Inhalation Rate	m3/hour	0.83	EPA, 1993	0.83	EPA, 1993	$\frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$
	ET	Exposure Time	hours/day	24	EPA, 1993	24	EPA, 1993	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes:

Sources:

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.26

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Ingestion Rate	L/day	2	EPA, 1993	1.4	EPA, 1993	$\frac{CW \times IR \times EF \times ED}{BW \times AT}$
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	20000	EPA, 1992	20000	EPA, 1992	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	EPA, 1992	1	EPA, 1992	
	ET	Exposure Time	hours/event	0.25	EPA, 1992	0.167	EPA, 1992	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	2,555	EPA, 1989	

Notes:

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.27

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Foster & Chrostowski Inhalation Model
	Ra	Air Exchange Rate	min^{-1}	0.0166	default value	0.0166	default value	
	Ds	Shower Duration	min	15	default value	10	default value	
	Dt	Total Time in Bathroom	min	20	default value	15	default value	
	Fr	Shower Water Flow Rate	L/min	20	default value	20	default value	
	Sv	Shower Room Air Volume	m3	6	default value	6	default value	
	Ts	Shower Droplet Drop Time	sec	2	default value	2	default value	
	d	Shower Droplet Diameter	mm	1	default value	1	default value	
	T1	Calibration Water Temperature	K	293	default value	293	default value	
	Ts	Shower Water Temperature	K	318	default value	318	default value	
	m1	Water Viscosity at T1	cp	0.982	default value	0.982	default value	
	ms	Water Viscosity at Ts	cp	0.616	default value	0.616	default value	
	K	Mass Transfer Coefficient	min	2.78	default value	2.78	default value	
	IRsh	Inhalation Rate	L/min	10	default value	10	default value	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	2,555	EPA, 1989	

TABLE 4.28

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR-S	Ingestion Rate	mg/day	100	EPA, 1993	50	EPA, 1993	$\frac{Cs \times IRS \times CF3 \times FI \times EF \times ED}{BW \times AT}$
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	
	FI	Fraction Ingested	unitless	1	EPA, 1993	1	EPA, 1993	
	EF	Exposure Frequency	days/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day) =
	CF3	Conversion Factor 3	kg/mg	1.0E-06	- -	1.0E-06	- -	$\frac{Cs \times CF3 \times SA \times SSAF \times DABS \times EF \times ED}{BW \times AT}$
	SA	Skin Surface Available for Contact	cm2	5000	(2)	5000	(2)	
	SSAF	Soil to Skin Adherence Factor	mg/cm2/event	0.07	EPA, 1997	0.01	EPA, 1997	
	DABS	Absorption Factor	unitless	See Text	See Text	See Text	See Text	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes:

(1) - Assumes 1 day a week for summer months (May through August). CTE is 50 percent of RME.

(2) - Assume 25 percent of total body surface area available for contact.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

TABLE 4.29

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	ug/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	CR	Contact Rate	L/hour	0.05	EPA, 1988	0.05	EPA, 1988	$\frac{CW \times CR \times CF \times ET \times EF \times ED}{BW \times AT}$
	CF	Conversion factor	ug/mg	0.001	- -	0.001	- -	
	ET	Exposure Time	hours/event	4	(1)	2	(1)	
	EF	Exposure Frequency	events/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	5000	(2)	5000	(2)	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	(1)	1	N/A	
	ET	Exposure Time	hours/event	4	(1)	2	(1)	
	EF	Exposure Frequency	days/year	16	(1)	8	(1)	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes:

(1) - Professional judgement. Assumes 1 day a week for summer months (May through August). CTE is 50 percent of RME.

(2) - Assume 25 percent of total body surface area available for contact.

Sources:

EPA, 1988: Superfund Exposure Assessment Manual.

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.30

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Ingestion Rate	L/day	1	EPA, 1993	1	EPA, 1993	$\frac{CW \times IR \times EF \times ED}{BW \times AT}$
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	7	EPA, 1993	2	EPA, 1993	
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2555	EPA, 1989	730	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	6970	EPA, 1992	6970	EPA, 1992	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	EPA, 1992	1	EPA, 1992	
	ET	Exposure Time	hours/event	0.25	EPA, 1992	0.167	EPA, 1992	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	7	EPA, 1993	2	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	15	EPA, 1993	15	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,555	EPA, 1989	730	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.31

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Intake (mg/kg/day) =
	IR	Ingestion Rate	L/day	2	EPA, 1993	1.4	EPA, 1993	$\frac{CW \times IR \times EF \times ED}{BW \times AT}$
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	DAevent	Absorbed dose per event	mg/cm2-event	See Text	See Text	See Text	See Text	Dermally Absorbed Dose (mg/kg/day)
	SA	Skin Surface Available for Contact	cm2	20000	EPA, 1992	20000	EPA, 1992	$= \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$
	EV	Event Frequency	events/day	1	EPA, 1992	1	EPA, 1992	
	ET	Exposure Time	hours/event	0.25	EPA, 1992	0.167	EPA, 1992	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	See text for calculation of DAevent.
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	2,555	EPA, 1989	

Notes:

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1992: Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B.

EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure..

TABLE 4.32

VALUES USED FOR DAILY INTAKE CALCULATIONS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CW	Chemical Concentration in Water	mg/L	See Text	See Text	See Text	See Text	Foster & Chrostowski Inhalation Model
	Ra	Air Exchange Rate	min-1	1.7E-02	default value	1.7E-02	default value	
	Ds	Shower Duration	min	1.5E+01	default value	1.0E+01	default value	
	Dt	Total Time in Bathroom	min	2.0E+01	default value	1.5E+01	default value	
	Fr	Shower Water Flow Rate	L/min	2.0E+01	default value	2.0E+01	default value	
	Sv	Shower Room Air Volume	m3	6.0E+00	default value	6.0E+00	default value	
	Ts	Shower Droplet Drop Time	sec	2.0E+00	default value	2.0E+00	default value	
	d	Shower Droplet Diameter	mm	1.0E+00	default value	1.0E+00	default value	
	T1	Calibration Water Temperature	K	2.9E+02	default value	2.9E+02	default value	
	Ts	Shower Water Temperature	K	3.2E+02	default value	3.2E+02	default value	
	m1	Water Viscosity at T1	cp	9.8E-01	default value	9.8E-01	default value	
	ms	Water Viscosity at Ts	cp	0.616	default value	0.616	default value	
	K	Mass Transfer Coefficient	min	2.78	default value	2.78	default value	
	IRsh	Inhalation Rate	L/min	10	default value	10	default value	
	EF	Exposure Frequency	days/year	350	EPA, 1993	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1993	7	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1993	70	EPA, 1993	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	2,555	EPA, 1989	

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
VOCs										
1,1-Dichloroethene	Chronic	9.0E-03	mg/kg/day	100%	9.0E-03	mg/kg/day	Liver	1000/1	IRIS	06/01/99
1,2-Dichloroethane	Chronic	3.0E-02	mg/kg/day	100%	3.0E-02	mg/kg/day	N/A	N/A	EPAIII	04/12/99
cis-1,2-Dichloroethene	Chronic	1.0E-02	mg/kg/day	100%	1.0E-02	mg/kg/day	Blood	3000	HEAST	7/97
Acetone	Chronic	1.0E-01	mg/kg/day	100%	1.0E-01	mg/kg/day	Liver	1000/1	IRIS	06/01/99
Chloroform	Chronic	1.0E-02	mg/kg/day	100%	1.0E-02	mg/kg/day	Liver	1000/1	IRIS	06/01/99
Ethyl Ether	Chronic	2.0E-01	mg/kg/day	100%	2.0E-01	mg/kg/day	N/A	3000/1	IRIS	06/01/99
Tetrachloroethene	Chronic	1.0E-02	mg/kg/day	100%	1.0E-02	mg/kg/day	Liver	1000/1	IRIS	06/01/99
Trichloroethene	Chronic	6.0E-03	mg/kg/day	100%	6.0E-03	mg/kg/day	N/A	N/A	EPAIII	04/12/99
Vinyl Chloride	Chronic	N/A	mg/kg/day	100%	N/A	mg/kg/day	N/A	N/A	N/A	06/01/99
SVOCs										
Benzo(a)anthracene	Chronic	N/A	mg/kg/day	100%	N/A	mg/kg/day	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	Chronic	N/A	mg/kg/day	100%	N/A	mg/kg/day	N/A	N/A	N/A	N/A
Benzo(a)pyrene	Chronic	N/A	mg/kg/day	100%	N/A	mg/kg/day	N/A	N/A	N/A	N/A
Dibenzo(a,h)anthracene	Chronic	N/A	mg/kg/day	100%	N/A	mg/kg/day	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	Chronic	N/A	mg/kg/day	100%	N/A	mg/kg/day	N/A	N/A	N/A	N/A
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg/day	100%	3.0E-04	mg/kg/day	Skin	3/1	IRIS	06/01/99
Iron	Chronic	3.0E-01	mg/kg/day	100%	3.0E-01	mg/kg/day	Liver	N/A	EPAIII	N/A
Lead	Chronic	N/A	mg/kg/day	N/A	N/A	mg/kg/day	Blood, CNS	N/A	N/A	N/A
Manganese	Chronic	2.0E-02	mg/kg/day	6%	1.2E-03	mg/kg/day	CNS	1/1	IRIS	06/01/99
Vanadium	Chronic	7.0E-03	mg/kg/day	6%	4.2E-04	mg/kg/day	N/A	100	HEAST	7/97

Notes;

(1) - USEPA Region III

(2) - RfDdermal = RfDoral x Oral to Dermal Adjustment Factor

(3) For IRIS values date that IRIS was searched.
For HEAST values, provide the date of HEAST.
FOR EPAIII, date of RBC Table.

N/A = Not Applicable

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

EPAIII = USEPA Region III Risk-Based Concentration Table, April 12, 1999.

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)
VOCs									
1,1-Dichloroethene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
1,2-Dichloroethane	Chronic	N/A	N/A	1.4E-03	(mg/kg/day)	N/A	N/A	EPAIII	4/12/99
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Acetone	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Chloroform	Chronic	N/A	N/A	8.6E-05	(mg/kg/day)	N/A	N/A	EPAIII	4/12/99
Ethyl Ether	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Tetrachloroethene	Chronic	N/A	N/A	1.4E-01	(mg/kg/day)	N/A	N/A	EPAIII	4/12/99
Trichloroethene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Vinyl Chloride	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
SVOCs									
Benzo(a)anthracene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Dibenzo(a,h)anthracene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Inorganics									
Arsenic	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A
Manganese	Chronic	5E-05	(mg/m^3)	1.4E-05	(mg/kg/day)	CNS	1000/1	IRIS	06/01/99
Vanadium	N/A	N/A	N/A	N/A	(mg/kg/day)	N/A	N/A	N/A	N/A

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (3) (MM/DD/YY)
VOCs							
1,1-Dichloroethene	6.0E-01	100%	6.0E-01	$(mg/kg/day)^{-1}$	C	IRIS	06/01/99
1,2-Dichloroethane	9.1E-02	100%	9.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	06/01/99
cis-1,2-Dichloroethene	N/A	100%	N/A	$(mg/kg/day)^{-1}$	D	IRIS	06/01/99
Acetone	N/A	100%	N/A	$(mg/kg/day)^{-1}$	D	IRIS	06/01/99
Chloroform	6.1E-03	100%	6.1E-03	$(mg/kg/day)^{-1}$	B2	IRIS	06/01/99
Ethyl Ether	N/A	100%	N/A	$(mg/kg/day)^{-1}$	N/A	IRIS	06/01/99
Tetrachloroethene	5.2E-02	100%	5.2E-02	$(mg/kg/day)^{-1}$	N/A	EPAIII	4/12/99
Trichloroethene	1.1E-02	100%	1.1E-02	$(mg/kg/day)^{-1}$	N/A	EPAIII	4/12/99
Vinyl Chloride	1.9E+00	100%	1.9E+00	$(mg/kg/day)^{-1}$	N/A	HEAST	7/97
SVOCs							
Benzo(a)anthracene	7.3E-01	100%	7.3E-01	$(mg/kg/day)^{-1}$	B2	N/A	N/A
Benzo(b)fluoranthene	7.3E-01	100%	7.3E-01	$(mg/kg/day)^{-1}$	B2	N/A	N/A
Benzo(a)pyrene	7.3E+00	100%	7.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	06/01/99
Dibenzo(a,h)anthracene	7.3E+00	100%	7.3E+00	$(mg/kg/day)^{-1}$	B2	N/A	N/A
Indeno(1,2,3-cd)pyrene	7.3E-01	100%	7.3E-01	$(mg/kg/day)^{-1}$	B2	N/A	N/A
Inorganics							
Arsenic	1.5E+00	100%	1.5E+00	$(mg/kg/day)^{-1}$	A	IRIS	06/01/99
Iron	N/A	100%	N/A	$(mg/kg/day)^{-1}$	N/A	N/A	N/A
Lead	N/A	N/A	N/A	$(mg/kg/day)^{-1}$	B2	IRIS	06/01/99
Manganese	N/A	6%	N/A	$(mg/kg/day)^{-1}$	D	N/A	N/A
Vanadium	N/A	100%	N/A	$(mg/kg/day)^{-1}$	N/A	N/A	N/A

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (3) (MM/DD/YY)

Notes:

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

(1) - USEPA Region III

(2) - CSFdermal = CSForal/Oral to Dermal Adjustment Factor.

(3) - For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

TABLE 6.2

CANCER TOXICITY DATA – INHALATION

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Unit Risk	Units	Adjustment	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (1) (MM/DD/YY)
VOCs								
1,1-Dichloroethene	5.0E-05	$(ug/m^3)^{-1}$	3,500	1.8E-01	$(mg/kg/day)^{-1}$	C	IRIS	06/01/99
1,2-Dichloroethane	2.6E-05	$(ug/m^3)^{-1}$	3,500	9.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	06/01/99
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	D	N/A	N/A
Acetone	N/A	N/A	N/A	N/A	N/A	D	N/A	N/A
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	3,500	8.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	06/01/99
Ethyl Ether	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	$(ug/m^3)^{-1}$	3,500	2.0E-03	$(mg/kg/day)^{-1}$	N/A	EPAIII	4/12'99
Trichloroethene	N/A	N/A	N/A	6.0E-03	$(mg/kg/day)^{-1}$	N/A	EPAIII	4/12'99
Vinyl Chloride	8.4E-05	$(ug/m^3)^{-1}$	3,500	3.0E-01	$(mg/kg/day)^{-1}$	N/A	HEAST	7/97
SVOCs								
Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	N/A	N/A	3.1E+00	$(mg/kg/day)^{-1}$	B2	EPAIII	4/12'99
Dibenzo(a,h)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inorganics								
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	3,500	1.5E+01	$(mg/kg/day)^{-1}$	A	IRIS	06/01/99
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	B2	N/A	N/A	N/A
Manganese	N/A	N/A	N/A	N/A	D	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

SITE 57 - FORMER DRUM STORAGE AREA

INDIAN HEAD DIVISION NSWC

INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Unit Risk	Units	Adjustment	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (1) (MM/DD/YY)

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

(1) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 7.1
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.7E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.6E-02
	(Total)												1.6E-02
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	2.4E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	8.1E-03
	(Total)												8.1E-03
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.2
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	2.1E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	6.9E-03
	(Total)												6.9E-03
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	2.1E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	7.1E-04
	(Total)												7.1E-04
												Total Hazard Index Across All Exposure Routes/Pathways	7.6E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.3
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	8.3E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	2.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	1.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	1.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	4.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	103	mg/kg	103	mg/kg	M	5.0E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.7E-01
	(Total)												1.7E-01
Dermal	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	1.9E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	4.6E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	2.5E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	3.8E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	1.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	103	mg/kg	103	mg/kg	M	2.6E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	8.7E-02
	(Total)												8.7E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.4
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	3.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	9.0E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	4.9E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	7.5E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	2.1E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	103	mg/kg	103	mg/kg	M	2.2E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	7.4E-02
	(Total)												7.4E-02
Dermal	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	1.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	4.0E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	2.2E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	3.4E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	9.3E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	103	mg/kg	103	mg/kg	M	2.3E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	7.6E-03
	(Total)												7.6E-03
												Total Hazard Index Across All Exposure Routes/Pathways	8.1E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.5
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.5E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.5E-01
	(Total)												1.5E-01
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	3.0E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.0E-02
	(Total)												1.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.6E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.6
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	2.0E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	6.6E-02
	(Total)												6.6E-02
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	2.6E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	8.7E-04
	(Total)												8.7E-04
												Total Hazard Index Across All Exposure Routes/Pathways	6.7E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.7
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	6.8E-05	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	7.5E-03
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	7.9E-07	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	2.6E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	6.5E-07	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	6.5E-05
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	2.1E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	3.5E-04
	(Total)												7.9E-03
												Total Hazard Index Across All Exposure Routes/Pathways	7.9E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.8
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	77.5	ug/L	6.0E-04	mg/m3	R	2.5E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	1,2-Dichloroethane	2.7	ug/L	3.6E-06	mg/m3	R	1.5E-07	mg/kg/day	1.4E-03	mg/kg/day	N/A	N/A	1.1E-04
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	1.1E-07	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	1.3E-03
	Trichloroethene	2.3	ug/L	7.5E-06	mg/m3	R	3.1E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												1.4E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.9
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	3.4E-05	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	3.8E-03
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	3.9E-07	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	1.3E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	3.3E-07	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.3E-05
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.0E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.7E-04
	(Total)												4.0E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.0E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.10
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	77.5	ug/L	6.0E-04	mg/m3	R	1.2E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	1,2-Dichloroethane	2.7	ug/L	3.6E-06	mg/m3	R	7.4E-08	mg/kg/day	1.4E-03	mg/kg/day	N/A	N/A	5.3E-05
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	5.7E-08	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	6.6E-04
	Trichloroethene	2.3	ug/L	7.5E-06	mg/m3	R	1.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												7.2E-04
												Total Hazard Index Across All Exposure Routes/Pathways	7.2E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.11
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.4E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	3.9E-04
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	6.9E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	5.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.6E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.2E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	3.7E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.4E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.1E+00
	(Total)												1.1E+00
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	1.6E-07	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.6E-05
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	2.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.5E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.6E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	3.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	2.2E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	7.4E-02
	(Total)												7.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.12
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene	0.504	mg/kg	2.91E-04	mg/m3	R	7.5E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.13
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	1.0E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.7E-04
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	3.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	2.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	7.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	5.3E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.6E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	1.5E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.9E-01
	(Total)												4.9E-01
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	1.4E-08	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.3E-06
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	1.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.3E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.1E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	3.1E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	9.3E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	2.0E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	6.5E-03
	(Total)												6.5E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.0E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.14
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene	0.504	mg/kg	2.91E-04	mg/m3	R	6.6E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.15
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	2.5E-05	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	2.8E-03
	Chloroform	1.3	ug/L	1.3	ug/L	M	6.5E-07	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	6.5E-05
	Ethyl Ether	3950	ug/L	3950	ug/L	M	6.2E-04	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	3.1E-03
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	1.5E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.5E-03
	Trichloroethene	612	ug/L	612	ug/L	M	5.6E-04	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	9.3E-02
	Vinyl Chloride	85	ug/L	85	ug/L	M	3.3E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	2.9E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	2.9E-02
	(Total)												1.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.16
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	29	ug/L	2.2E-04	mg/m3	R	9.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	1.1E-07	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	1.3E-03
	Ethyl Ether	3950	ug/L	4.4E-03	mg/m3	R	1.8E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Tetrachloroethene	5.41	ug/L	2.5E-05	mg/m3	R	1.0E-06	mg/kg/day	1.4E-01	mg/kg/day	N/A	N/A	7.4E-06
	Trichloroethene	612	ug/L	2.0E-03	mg/m3	R	8.2E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Vinyl Chloride	85	ug/L	7.0E-04	mg/m3	R	2.9E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	cis-1,2-Dichloroethene	528	ug/L	1.1E-03	mg/m3	R	4.4E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												1.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.17
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.3E-05	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.4E-03
	Chloroform	1.3	ug/L	1.3	ug/L	M	3.3E-07	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.3E-05
	Ethyl Ether	3950	ug/L	3950	ug/L	M	3.1E-04	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	1.5E-03
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	7.3E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	7.3E-04
	Trichloroethene	612	ug/L	612	ug/L	M	2.8E-04	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.6E-02
	Vinyl Chloride	85	ug/L	85	ug/L	M	1.7E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	1.4E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.4E-02
	(Total)												6.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.18
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	29	ug/L	2.2E-04	mg/m3	R	4.6E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	5.7E-08	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	6.6E-04
	Ethyl Ether	3950	ug/L	4.4E-03	mg/m3	R	9.1E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Tetrachloroethene	5.41	ug/L	2.5E-05	mg/m3	R	5.2E-07	mg/kg/day	1.4E-01	mg/kg/day	N/A	N/A	3.7E-06
	Trichloroethene	612	ug/L	2.0E-03	mg/m3	R	4.1E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Vinyl Chloride	85	ug/L	7.0E-04	mg/m3	R	1.5E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	cis-1,2-Dichloroethene	528	ug/L	1.1E-03	mg/m3	R	2.2E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												6.7E-04
												Total Hazard Index Across All Exposure Routes/Pathways	6.7E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.19
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	6.8E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.6E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	8.8E-03
	(Total)												8.8E-03
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	3.2E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.8E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	9.5E-04
	(Total)												9.5E-04
												Total Hazard Index Across All Exposure Routes/Pathways	9.8E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.20
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.7E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	6.6E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.2E-03
	(Total)												2.2E-03
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.6E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	1.4E-08	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.7E-05
	(Total)												4.7E-05
												Total Hazard Index Across All Exposure Routes/Pathways	2.3E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.21
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	785	ug/L	785	ug/L	M	1.5E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	4.9E-04
	Manganese	363	ug/L	363	ug/L	M	6.8E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	3.4E-03
	(Total)												3.9E-03
Dermal	Iron	785	ug/L	785	ug/L	M	6.3E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.1E-04
	Manganese	363	ug/L	363	ug/L	M	2.9E-05	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	2.4E-02
	(Total)												2.5E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.9E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.22
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	785	ug/L	785	ug/L	M	7.4E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.5E-04
	Manganese	363	ug/L	363	ug/L	M	3.4E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	1.7E-03
	(Total)												2.0E-03
Dermal	Iron	785	ug/L	785	ug/L	M	3.2E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.1E-04
	Manganese	363	ug/L	363	ug/L	M	1.5E-05	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	1.2E-02
	(Total)												1.2E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.23
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Vinyl Chloride	1	mg/kg	1	mg/kg	M	5.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	1.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	4.7E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.6E-02
	Vanadium	118	mg/kg	118	mg/kg	M	6.7E-05	mg/kg/day	7.0E-03	mg/kg/day	N/A	N/A	9.5E-03
	(Total)												2.5E-02
Dermal	Vinyl Chloride	1	mg/kg	1	mg/kg	M	6.1E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	7.9E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	5.1E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.7E-03
	Vanadium	118	mg/kg	118	mg/kg	M	2.4E-06	mg/kg/day	4.2E-04	mg/kg/day	N/A	N/A	5.7E-03
	(Total)												7.4E-03
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.24
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Vinyl Chloride	1	mg/kg	1	mg/kg	M	1.4E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	4.2E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.9E-03
	Vanadium	118	mg/kg	118	mg/kg	M	1.7E-05	mg/kg/day	7.0E-03	mg/kg/day	N/A	N/A	2.4E-03
	(Total)												6.3E-03
Dermal	Vinyl Chloride	1	mg/kg	1	mg/kg	M	3.0E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	3.9E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	2.5E-08	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	8.5E-05
	Vanadium	118	mg/kg	118	mg/kg	M	1.2E-07	mg/kg/day	4.2E-04	mg/kg/day	N/A	N/A	2.8E-04
	(Total)												3.7E-04
												Total Hazard Index Across All Exposure Routes/Pathways	6.7E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.25
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	0.2	ug/L	0.2	ug/L	M	3.8E-08	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	4.2E-06
	Acetone	725	ug/L	725	ug/L	M	1.4E-04	mg/kg/day	1.0E-01	mg/kg/day	N/A	N/A	1.4E-03
	Ethyl Ether	120	ug/L	120	ug/L	M	2.3E-05	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	1.1E-04
	Trichloroethene	15.2	ug/L	15.2	ug/L	M	2.9E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.8E-04
	cis-1,2-Dichloroethene	9.1	ug/L	9.1	ug/L	M	1.7E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.7E-04
	Iron	1546	ug/L	1546	ug/L	M	2.9E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	9.7E-04
	Manganese	119	ug/L	119	ug/L	M	2.2E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	1.1E-03
	(Total)												4.2E-03
Dermal	1,1-Dichloroethene	0.2	ug/L	0.2	ug/L	M	2.8E-07	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	3.1E-05
	Acetone	725	ug/L	725	ug/L	M	7.6E-05	mg/kg/day	1.0E-01	mg/kg/day	N/A	N/A	7.6E-04
	Ethyl Ether	120	ug/L	120	ug/L	M	3.0E-05	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	1.5E-04
	Trichloroethene	15.2	ug/L	15.2	ug/L	M	2.2E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	3.7E-03
	cis-1,2-Dichloroethene	9.1	ug/L	9.1	ug/L	M	7.9E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	7.9E-04
	Iron	1546	ug/L	1546	ug/L	M	1.2E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	4.2E-04
	Manganese	119	ug/L	119	ug/L	M	9.6E-06	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	8.0E-03
	(Total)												1.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.8E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.26
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	9	ug/L	9	ug/L	M	8.5E-07	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	9.4E-05
	Acetone	28	ug/L	28	ug/L	M	2.6E-06	mg/kg/day	1.0E-01	mg/kg/day	N/A	N/A	2.6E-05
	Ethyl Ether	14	ug/L	14	ug/L	M	1.3E-06	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	6.6E-06
	Trichloroethene	18	ug/L	18	ug/L	M	1.7E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.8E-04
	cis-1,2-Dichloroethene	6300	ug/L	6300	ug/L	M	5.9E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	5.9E-02
	Iron	20800	ug/L	20800	ug/L	M	2.0E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	6.5E-03
	Manganese	150	ug/L	150	ug/L	M	1.4E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	7.0E-04
	(Total)												6.7E-02
Dermal	1,1-Dichloroethene	9	ug/L	9	ug/L	M	1.4E-07	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.5E-05
	Acetone	28	ug/L	28	ug/L	M	3.8E-05	mg/kg/day	1.0E-01	mg/kg/day	N/A	N/A	3.8E-04
	Ethyl Ether	14	ug/L	14	ug/L	M	1.5E-05	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	7.5E-05
	Trichloroethene	18	ug/L	18	ug/L	M	1.1E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.8E-03
	cis-1,2-Dichloroethene	6300	ug/L	6300	ug/L	M	4.0E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	4.0E-04
	Iron	20800	ug/L	20800	ug/L	M	6.2E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.1E-04
	Manganese	150	ug/L	150	ug/L	M	4.8E-06	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	4.0E-03
	(Total)												6.9E-03
												Total Hazard Index Across All Exposure Routes/Pathways	7.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.27
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.1E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.5E-01
	(Total)												3.5E-01
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	5.5E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.8E-02
	(Total)												1.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.28
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.1E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.4E-01
	(Total)												1.4E-01
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.3E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.3E-03
	(Total)												4.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.29
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	5.0E-03	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	5.5E-01
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.7E-04	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	5.8E-03
	Chloroform	1.3	ug/L	1.3	ug/L	M	8.3E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	8.3E-03
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.5E-04	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.5E-02
	(Total)												
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	4.5E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	4.9E-02
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	5.2E-06	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	1.7E-04
	Chloroform	1.3	ug/L	1.3	ug/L	M	4.9E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	4.9E-04
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.7E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.8E-03
	(Total)												5.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.30
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	3.3E-03	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	3.7E-01
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.2E-04	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	3.8E-03
	Chloroform	1.3	ug/L	1.3	ug/L	M	5.6E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	5.6E-03
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	9.8E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.6E-02
	(Total)												3.9E-01
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	2.4E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	2.7E-02
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	2.8E-06	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	9.5E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	2.7E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	2.7E-04
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	9.2E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.5E-03
	(Total)												2.9E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.9E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.31
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	6.4E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.1E-03
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.4E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.4E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.4E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	3.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.0E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	9.2E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.1E+00
	(Total)												3.1E+00
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	3.4E-07	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	5.6E-05
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	3.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	9.9E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	9.9E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	7.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	2.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	4.8E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.6E-01
	(Total)												1.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	3.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.32
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene	0.504	mg/kg	1.10E-04	mg/m3	R	8.4E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.33
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.2E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	3.6E-04
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	4.8E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.5E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.5E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	3.4E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.1E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.0E+00
	(Total)												1.0E+00
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	6.8E-08	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.1E-05
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	6.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	2.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	2.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	4.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	9.6E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.2E-02
	(Total)												3.2E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.34
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene	0.504	mg/kg	2.06E-04	mg/m3	R	1.1E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.35
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.9E-03	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	2.1E-01
	Chloroform	1.3	ug/L	1.3	ug/L	M	8.3E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	8.3E-03
	Ethyl Ether	3950	ug/L	3950	ug/L	M	2.5E-01	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	1.3E+00
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	3.5E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.5E-02
	Trichloroethene	612	ug/L	612	ug/L	M	3.9E-02	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	6.5E+00
	Vinyl Chloride	85	ug/L	85	ug/L	M	5.4E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	3.4E-02	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.4E+00
	(Total)												
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.7E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.9E-02
	Chloroform	1.3	ug/L	1.3	ug/L	M	4.9E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	4.9E-04
	Ethyl Ether	3950	ug/L	3950	ug/L	M	3.5E-03	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	1.8E-02
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	1.5E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.5E-02
	Trichloroethene	612	ug/L	612	ug/L	M	4.5E-03	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	7.5E-01
	Vinyl Chloride	85	ug/L	85	ug/L	M	1.8E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	1.9E-03	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.9E-01
	(Total)												9.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	9.9E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.36
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.2E-03	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.4E-01
	Chloroform	1.3	ug/L	1.3	ug/L	M	5.6E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	5.6E-03
	Ethyl Ether	3950	ug/L	3950	ug/L	M	1.7E-01	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	8.4E-01
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	2.3E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	2.3E-02
	Trichloroethene	612	ug/L	612	ug/L	M	2.6E-02	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.4E+00
	Vinyl Chloride	85	ug/L	85	ug/L	M	3.6E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	2.3E-02	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	2.3E+00
	(Total)												7.6E+00
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	9.1E-05	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.0E-02
	Chloroform	1.3	ug/L	1.3	ug/L	M	2.7E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	2.7E-04
	Ethyl Ether	3950	ug/L	3950	ug/L	M	1.9E-03	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	9.6E-03
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	8.3E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	8.3E-03
	Trichloroethene	612	ug/L	612	ug/L	M	2.4E-03	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.1E-01
	Vinyl Chloride	85	ug/L	85	ug/L	M	9.6E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	1.0E-03	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.0E-01
	(Total)												5.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.4E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.37
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	7.0E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.7E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	9.2E-03
	(Total)												9.2E-03
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.6E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	1.4E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.6E-04
	(Total)												4.8E-04
												Total Hazard Index Across All Exposure Routes/Pathways	9.6E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.38
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.8E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	6.9E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.3E-03
	(Total)												2.3E-03
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	2.4E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.2E-08	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	7.2E-05
	(Total)												7.2E-05
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.39
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	785	ug/L	785	ug/L	M	4.6E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.5E-03
	Manganese	363	ug/L	363	ug/L	M	2.1E-04	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	1.1E-02
	(Total)												1.2E-02
Dermal	Iron	785	ug/L	785	ug/L	M	1.6E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	5.3E-05
	Manganese	363	ug/L	363	ug/L	M	7.4E-06	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	6.2E-03
	(Total)												6.2E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.6E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.40
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cencer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	785	ug/L	785	ug/L	M	1.1E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	3.8E-04
	Manganese	363	ug/L	363	ug/L	M	5.3E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	2.7E-03
	(Total)												3.0E-03
Dermal	Iron	785	ug/L	785	ug/L	M	4.0E-06	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.3E-05
	Manganese	363	ug/L	363	ug/L	M	1.8E-06	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	1.5E-03
	(Total)												1.6E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.6E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.41
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.3E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.4E-02
	(Total)												4.4E-02
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.6E-03
	(Total)												4.6E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.8E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.42
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.4E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.5E-02
	(Total)												1.5E-02
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.3E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.4E-04
	(Total)												4.4E-04
												Total Hazard Index Across All Exposure Routes/Pathways	1.5E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.43
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	2.1E-03	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	2.4E-01
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	7.4E-05	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	2.5E-03
	Chloroform	1.3	ug/L	1.3	ug/L	M	3.6E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.6E-03
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	6.3E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.1E-02
	(Total)												2.5E-01
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	2.7E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	3.0E-02
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	3.2E-06	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	1.1E-04
	Chloroform	1.3	ug/L	1.3	ug/L	M	3.0E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.0E-04
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.0E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.7E-03
	(Total)												3.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.44
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	77.5	ug/L	3.4E+01	ug/L	R	2.6E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	1,2-Dichloroethane	2.7	ug/L	1.2E+00	ug/L	R	8.8E-05	mg/kg/day	1.4E-03	mg/kg/day	N/A	N/A	6.3E-02
	Chloroform	1.3	ug/L	5.1E-01	ug/L	R	3.9E-05	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	4.5E-01
	Trichloroethene	2.3	ug/L	9.0E-01	ug/L	R	6.9E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	(Total)												5.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.2E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.45
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	9.9E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.1E-01
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	3.5E-05	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	1.2E-03
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.7E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.7E-03
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	2.9E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.9E-03
	(Total)												1.2E-01
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	1.5E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.7E-02
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.8E-06	mg/kg/day	3.0E-02	mg/kg/day	N/A	N/A	5.8E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.6E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.6E-04
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	5.6E-06	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	9.4E-04
	(Total)												1.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.8E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.46
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	77.5	ug/L	3.43E+01	ug/L	R	9.6E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	1,2-Dichloroethane	2.7	ug/L	1.16E+00	ug/L	R	3.2E-05	mg/kg/day	1.4E-03	mg/kg/day	N/A	N/A	2.3E-02
	Chloroform	1.3	ug/L	5.11E-01	ug/L	R	1.4E-05	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	1.7E-01
	Trichloroethene	2.3	ug/L	9.00E-01	ug/L	R	2.5E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												1.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.9E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.47
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	6.9E-07	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.2E-04
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.5E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.7E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	2.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	3.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	9.8E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.3E-01
	(Total)												3.3E-01
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	7.2E-08	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.2E-05
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	7.0E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	2.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	9.1E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	4.9E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	1.0E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.4E-02
	(Total)												3.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.6E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.48
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	5.9E-05	mg/m3	R	1.6E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.49
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.3E-07	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	3.8E-05
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	5.2E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.6E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	6.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.2E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	3.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.3E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.1E-01
	(Total)												1.1E-01
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	6.9E-09	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.2E-06
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	6.7E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	2.0E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	8.7E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.5E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	4.7E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	9.8E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.3E-03
	(Total)												3.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.50
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	0.504	mg/kg	1.1E-04	mg/m3	R	2.0E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.51
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	7.9E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	8.8E-02
	Chloroform	1.3	ug/L	1.3	ug/L	M	3.6E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.6E-03
	Ethyl Ether	3950	ug/L	3950	ug/L	M	1.1E-01	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	5.4E-01
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	1.5E-04	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.5E-02
	Trichloroethene	612	ug/L	612	ug/L	M	1.7E-02	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.8E+00
	Vinyl Chloride	85	ug/L	85	ug/L	M	2.3E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	1.4E-02	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.4E+00
	(Total)												
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.0E-04	mg/kg/day	9.0E-03	mg/kg/day	N/A	N/A	1.1E-02
	Chloroform	1.3	ug/L	1.3	ug/L	M	3.0E-06	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	3.0E-04
	Ethyl Ether	3950	ug/L	3950	ug/L	M	2.2E-03	mg/kg/day	2.0E-01	mg/kg/day	N/A	N/A	1.1E-02
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	9.3E-05	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	9.3E-03
	Trichloroethene	612	ug/L	612	ug/L	M	2.7E-03	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.6E-01
	Vinyl Chloride	85	ug/L	85	ug/L	M	1.1E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	1.2E-03	mg/kg/day	1.0E-02	mg/kg/day	N/A	N/A	1.2E-01
	(Total)												6.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.52
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	29	ug/L	1.26E+01	ug/L	R	9.6E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Chloroform	1.3	ug/L	5.11E-01	ug/L	R	3.9E-05	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	4.5E-01
	Ethyl Ether	3950	ug/L	1.54E+03	ug/L	R	1.2E-01	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Tetrachloroethene	5.41	ug/L	1.94E+00	ug/L	R	1.5E-04	mg/kg/day	1.4E-01	mg/kg/day	N/A	N/A	1.1E-03
	Trichloroethene	612	ug/L	2.39E+02	ug/L	R	1.8E-02	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Vinyl Chloride	85	ug/L	4.39E+01	ug/L	R	3.4E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	cis-1,2-Dichloroethene	528	ug/L	2.25E+02	ug/L	R	1.7E-02	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	(Total)												4.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.6E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE 7.54
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1-Dichloroethene	29	ug/L	1.28E+01	ug/L	R	3.6E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Chloroform	1.3	ug/L	5.11E-01	ug/L	R	1.4E-05	mg/kg/day	8.6E-05	mg/kg/day	N/A	N/A	1.7E-01
	Ethyl Ether	3950	ug/L	1.54E+03	ug/L	R	4.3E-02	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Tetrachloroethene	5.41	ug/L	1.94E+00	ug/L	R	5.4E-05	mg/kg/day	1.4E-01	mg/kg/day	N/A	N/A	3.9E-04
	Trichloroethene	612	ug/L	2.39E+02	ug/L	R	6.7E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Vinyl Chloride	85	ug/L	4.39E+01	ug/L	R	1.2E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	cis-1,2-Dichloroethene	528	ug/L	2.25E+02	ug/L	R	6.3E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	(Total)												1.7E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.55
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	7.5E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.9E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	9.8E-04
	(Total)												9.8E-04
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	7.5E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	- -
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	6.8E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.3E-03
	(Total)												2.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	3.2E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.56
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.9E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	7.4E-08	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.5E-04
	(Total)												2.5E-04
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	7.1E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	6.5E-08	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.2E-04
	(Total)												2.2E-04
												Total Hazard Index Across All Exposure Routes/Pathways	4.6E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.57
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	785	ug/L	785	ug/L	M	9.8E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	3.3E-04
	Manganese	363	ug/L	363	ug/L	M	4.5E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	2.3E-03
	(Total)												2.6E-03
Dermal	Iron	785	ug/L	785	ug/L	M	9.8E-06	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	3.3E-05
	Manganese	363	ug/L	363	ug/L	M	4.5E-06	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	3.8E-03
	(Total)												3.8E-03
												Total Hazard Index Across All Exposure Routes/Pathways	6.4E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.58
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	785	ug/L	785	ug/L	M	2.5E-05	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	8.2E-05
	Manganese	363	ug/L	363	ug/L	M	1.1E-05	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	5.7E-04
	(Total)												6.5E-04
Dermal	Iron	785	ug/L	785	ug/L	M	2.5E-06	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	8.2E-06
	Manganese	363	ug/L	363	ug/L	M	1.1E-06	mg/kg/day	1.2E-03	mg/kg/day	N/A	N/A	9.5E-04
	(Total)												9.6E-04
												Total Hazard Index Across All Exposure Routes/Pathways	1.6E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.59
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene (Total)	7.2	ug/L	7.2	ug/L	M	4.6E-04	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	7.7E-02
Dermal	Trichloroethene (Total)	7.2	ug/L	7.2	ug/L	M	5.3E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	8.8E-03
													8.8E-03
												Total Hazard Index Across All Exposure Routes/Pathways	8.8E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.60
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	3.1E-04	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	5.1E-02
	(Total)												5.1E-02
Dermal	Trichloroethene	7.2	ug/L	7.2	ug/L	M	2.9E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	4.8E-03
	(Total)												4.8E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.8E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.61
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	2.0E-04	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	3.3E-02
	(Total)												3.3E-02
Dermal	Trichloroethene	7.2	ug/L	7.2	ug/L	M	3.2E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	5.4E-03
	(Total)												5.4E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.4E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.62
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene	7.2	ug/L	2.8E+00	ug/L	R	2.2E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
	(Total)												--
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.63
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	9.2E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	1.5E-02
	(Total)												1.5E-02
Dermal	Trichloroethene	7.2	ug/L	7.2	ug/L	M	1.8E-05	mg/kg/day	6.0E-03	mg/kg/day	N/A	N/A	2.9E-03
	(Total)												2.9E-03
												Total Hazard Index Across All Exposure Routes/Pathways	2.9E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.64
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene (Total)	7.2	ug/L	3.19E+00	ug/L	R	8.9E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	--
													--
												Total Hazard Index Across All Exposure Routes/Pathways	--

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 8.59
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	4.6E-05	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	5.1E-07
											5.1E-07
Dermal	Trichloroethene (Total)	7.2	ug/L	7.2	ug/L	M	5.3E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	5.8E-08
											5.8E-08
										Total Risk Across All Exposure Routes/Pathways	5.8E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.60
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	8.8E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	9.7E-08
	(Total)										9.7E-08
Dermal	Trichloroethene	7.2	ug/L	7.2	ug/L	M	8.2E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	9.0E-09
	(Total)										9.0E-09
										Total Risk Across All Exposure Routes/Pathways	9.0E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.61
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	6.8E-05	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	7.4E-07
	(Total)										7.4E-07
Dermal	Trichloroethene	7.2	ug/L	7.2	ug/L	M	1.1E-05	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.2E-07
	(Total)										1.2E-07
										Total Risk Across All Exposure Routes/Pathways	1.2E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.62
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Trichloroethene	7.2	ug/L	2.8E+00	ug/L	R	7.4E-05	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	4.4E-07
	(Total)										4.4E-07
										Total Risk Across All Exposure Routes/Pathways	4.4E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.63
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	7.2	ug/L	7.2	ug/L	M	9.2E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.0E-07
	(Total)										1.0E-07
Dermal	Trichloroethene	7.2	ug/L	7.2	ug/L	M	1.8E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.9E-08
	(Total)										1.9E-08
										Total Risk Across All Exposure Routes/Pathways	1.9E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.64
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Potable Well
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Trichloroethene	7.2	ug/L	3.19E+00	ug/L	R	8.9E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	5.3E-08
	(Total)										5.3E-08
										Total Risk Across All Exposure Routes/Pathways	5.3E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.1
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.7E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.5E-06
	(Total)										2.5E-06
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	8.7E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.3E-06
	(Total)										1.3E-06
										Total Risk Across All Exposure Routes/Pathways	3.8E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.2
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic (Total)	9.6	mg/kg	9.6	mg/kg	M	1.5E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-07
											2.2E-07
Dermal	Arsenic (Total)	9.6	mg/kg	9.6	mg/kg	M	1.5E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	2.3E-08
											2.3E-08
										Total Risk Across All Exposure Routes/Pathways	2.4E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.3
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	3.0E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	2.2E-06
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	7.3E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	5.4E-07
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	4.0E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.9E-07
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	6.1E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.5E-07
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	1.7E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.2E-07
	Arsenic	103	mg/kg	103	mg/kg	M	1.8E-05	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.7E-05
	(Total)										3.1E-05
Dermal	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	6.6E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.8E-06
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	1.6E-06	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.2E-06
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	9.0E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	6.6E-07
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	1.4E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.0E-06
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	3.8E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.8E-07
	Arsenic	103	mg/kg	103	mg/kg	M	9.3E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.4E-05
	(Total)										2.2E-05
										Total Risk Across All Exposure Routes/Pathways	5.2E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.4
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Full-Time Employees
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	2.6E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.9E-07
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	6.4E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.7E-08
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	3.5E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.6E-08
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	5.4E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.9E-08
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	1.5E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.1E-08
	Arsenic	103	mg/kg	103	mg/kg	M	1.6E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.4E-06
	(Total)										2.7E-06
Dermal	Benzo(a)pyrene	1.7	mg/kg	1.7	mg/kg	M	1.2E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	8.5E-08
	Benzo(b)fluoranthene	4.2	mg/kg	4.2	mg/kg	M	2.9E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.1E-08
	Benzo(a)anthracene	2.3	mg/kg	2.3	mg/kg	M	1.6E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.1E-08
	Dibenzo(a,h)anthracene	0.35	mg/kg	0.35	mg/kg	M	2.4E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.7E-08
	Indeno(1,2,3-cd)pyrene	0.97	mg/kg	0.97	mg/kg	M	6.6E-09	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.8E-09
	Arsenic	103	mg/kg	103	mg/kg	M	1.6E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.4E-07
	(Total)										3.8E-07
										Total Risk Across All Exposure Routes/Pathways	3.1E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.5
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	6.4E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	9.7E-07
	(Total)										9.7E-07
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.3E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	6.4E-08
	(Total)										6.4E-08
										Total Risk Across All Exposure Routes/Pathways	1.0E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.6
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	2.8E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	4.2E-07
	(Total)										4.2E-07
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	3.7E-09	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	5.6E-09
	(Total)										5.6E-09
										Total Risk Across All Exposure Routes/Pathways	4.3E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.7
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	9.7E-07	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	5.8E-07
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.1E-08	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	1.0E-09
	Chloroform	1.3	ug/L	1.3	ug/L	M	9.3E-09	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	5.7E-11
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	3.0E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.3E-10
	(Total)										5.8E-07
										Total Risk Across All Exposure Routes/Pathways	5.8E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.8
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1-Dichloroethene	77.5	ug/L	6.0E-04	mg/m3	R	3.5E-07	mg/kg/day	1.8E-01	(mg/kg/day) $^{-1}$	6.2E-08
	1,2-Dichloroethane	2.7	ug/L	3.6E-06	mg/m3	R	2.1E-09	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	1.9E-10
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	1.6E-09	mg/kg/day	8.1E-02	(mg/kg/day) $^{-1}$	1.3E-10
	Trichloroethene	2.3	ug/L	7.5E-06	mg/m3	R	4.4E-09	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	2.7E-11
	(Total)										6.2E-08
										Total Risk Across All Exposure Routes/Pathways	6.2E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.9
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	4.8E-07	mg/kg/day	6.0E-01	$(mg/kg/day)^{-1}$	2.9E-07
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	5.6E-09	mg/kg/day	9.1E-02	$(mg/kg/day)^{-1}$	5.1E-10
	Chloroform	1.3	ug/L	1.3	ug/L	M	4.7E-09	mg/kg/day	6.1E-03	$(mg/kg/day)^{-1}$	2.8E-11
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.5E-08	mg/kg/day	1.1E-02	$(mg/kg/day)^{-1}$	1.6E-10
	(Total)										2.9E-07
										Total Risk Across All Exposure Routes/Pathways	2.9E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.10
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1-Dichloroethene	77.5	ug/L	6.0E-04	mg/m3	R	1.8E-07	mg/kg/day	1.8E-01	$(mg/kg/day)^{-1}$	3.1E-08
	1,2-Dichloroethane	2.7	ug/L	3.6E-06	mg/m3	R	1.1E-09	mg/kg/day	9.1E-02	$(mg/kg/day)^{-1}$	9.6E-11
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	8.1E-10	mg/kg/day	8.1E-02	$(mg/kg/day)^{-1}$	6.6E-11
	Trichloroethene	2.3	ug/L	7.5E-06	mg/m3	R	2.2E-09	mg/kg/day	6.0E-03	$(mg/kg/day)^{-1}$	1.3E-11
	(Total)										3.1E-08
										Total Risk Across All Exposure Routes/Pathways	3.1E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.11
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	3.4E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.7E-10
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	9.8E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	7.2E-08
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	7.6E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	5.5E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	2.3E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.7E-07
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.7E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.3E-07
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	5.3E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	3.9E-08
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	4.8E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	7.2E-06
	(Total)										8.2E-06
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.2E-09	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.5E-11
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	2.8E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.1E-08
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	2.2E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.6E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	6.6E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.8E-08
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	5.0E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.6E-08
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.5E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.1E-08
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.2E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	4.8E-07
	(Total)										7.5E-07
										Total Risk Across All Exposure Routes/Pathways	8.9E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.12
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Trichloroethene	0.504	mg/kg	2.91E-04	mg/m3	R	1.1E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	6.4E-09
	(Total)										6.4E-09
										Total Risk Across All Exposure Routes/Pathways	6.4E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.13
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	1.5E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.6E-10
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	4.3E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	3.1E-08
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	3.3E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	2.4E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.0E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	7.4E-08
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	7.6E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	5.6E-08
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	2.3E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.7E-08
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	2.1E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	3.2E-06
	(Total)										3.6E-06
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.0E-10	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.2E-12
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	2.5E-09	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.8E-09
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.9E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.4E-08
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	5.8E-09	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.2E-09
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	4.4E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.2E-09
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.3E-09	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	9.7E-10
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	2.8E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	4.2E-08
	(Total)										6.6E-08
										Total Risk Across All Exposure Routes/Pathways	3.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.14
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Trichloroethene	0.504	mg/kg	2.91E-04	mg/m3	R	9.4E-07	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	5.6E-09
	(Total)										5.6E-09
										Total Risk Across All Exposure Routes/Pathways	5.6E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.15
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	3.6E-07	mg/kg/day	6.0E-01	$(mg/kg/day)^{-1}$	2.2E-07
	Chloroform	1.3	ug/L	1.3	ug/L	M	9.3E-09	mg/kg/day	6.1E-03	$(mg/kg/day)^{-1}$	5.7E-11
	Ethyl Ether	3950	ug/L	3950	ug/L	M	8.8E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	2.1E-07	mg/kg/day	5.2E-02	$(mg/kg/day)^{-1}$	1.1E-08
	Trichloroethene	612	ug/L	612	ug/L	M	7.9E-06	mg/kg/day	1.1E-02	$(mg/kg/day)^{-1}$	8.7E-08
	Vinyl Chloride	85	ug/L	85	ug/L	M	4.7E-07	mg/kg/day	1.9E+00	$(mg/kg/day)^{-1}$	9.0E-07
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	4.1E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										1.2E-06
										Total Risk Across All Exposure Routes/Pathways	1.2E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.16
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1-Dichloroethene	29	ug/L	2.2E-04	mg/m3	R	1.3E-07	mg/kg/day	1.8E-01	$(mg/kg/day)^{-1}$	2.3E-08
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	1.6E-09	mg/kg/day	8.1E-02	$(mg/kg/day)^{-1}$	1.3E-10
	Ethyl Ether	3950	ug/L	4.4E-03	mg/m3	R	2.6E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	2.5E-05	mg/m3	R	1.5E-08	mg/kg/day	2.0E-03	$(mg/kg/day)^{-1}$	2.9E-11
	Trichloroethene	612	ug/L	2.0E-03	mg/m3	R	1.2E-06	mg/kg/day	6.0E-03	$(mg/kg/day)^{-1}$	7.1E-09
	Vinyl Chloride	85	ug/L	7.0E-04	mg/m3	R	4.1E-07	mg/kg/day	3.0E-01	$(mg/kg/day)^{-1}$	1.2E-07
	cis-1,2-Dichloroethene	528	ug/L	1.1E-03	mg/m3	R	6.3E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										2.3E-08
										Total Risk Across All Exposure Routes/Pathways	2.3E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.17
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.8E-07	mg/kg/day	6.0E-01	$(mg/kg/day)^{-1}$	1.1E-07
	Chloroform	1.3	ug/L	1.3	ug/L	M	4.7E-09	mg/kg/day	6.1E-03	$(mg/kg/day)^{-1}$	2.8E-11
	Ethyl Ether	3950	ug/L	3950	ug/L	M	4.4E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	1.0E-07	mg/kg/day	5.2E-02	$(mg/kg/day)^{-1}$	5.5E-09
	Trichloroethene	612	ug/L	612	ug/L	M	4.0E-06	mg/kg/day	1.1E-02	$(mg/kg/day)^{-1}$	4.4E-08
	Vinyl Chloride	85	ug/L	85	ug/L	M	2.4E-07	mg/kg/day	1.9E+00	$(mg/kg/day)^{-1}$	4.5E-07
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	2.1E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										6.1E-07
										Total Risk Across All Exposure Routes/Pathways	6.1E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.18
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1-Dichloroethene	29	ug/L	2.2E-04	mg/m3	R	6.6E-08	mg/kg/day	1.8E-01	$(mg/kg/day)^{-1}$	1.2E-08
	Chloroform	1.3	ug/L	2.8E-06	mg/m3	R	8.1E-10	mg/kg/day	8.1E-02	$(mg/kg/day)^{-1}$	6.6E-11
	Ethyl Ether	3950	ug/L	4.4E-03	mg/m3	R	1.3E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	2.5E-05	mg/m3	R	7.4E-09	mg/kg/day	2.0E-03	$(mg/kg/day)^{-1}$	1.5E-11
	Trichloroethene	612	ug/L	2.0E-03	mg/m3	R	5.9E-07	mg/kg/day	6.0E-03	$(mg/kg/day)^{-1}$	3.5E-09
	Vinyl Chloride	85	ug/L	7.0E-04	mg/m3	R	2.1E-07	mg/kg/day	3.0E-01	$(mg/kg/day)^{-1}$	6.2E-08
	cis-1,2-Dichloroethene	528	ug/L	1.1E-03	mg/m3	R	3.2E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										1.2E-08
										Total Risk Across All Exposure Routes/Pathways	1.2E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.19
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	9.7E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	7.1E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	3.8E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	5.7E-08
	(Total)										6.4E-08
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	4.5E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.3E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	4.1E-09	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	6.1E-09
	(Total)										9.4E-09
										Total Risk Across All Exposure Routes/Pathways	7.3E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.20
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	2.4E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.8E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	9.5E-09	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.4E-08
	(Total)										1.6E-08
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	2.3E-11	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.6E-10
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.0E-10	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	3.1E-10
	(Total)										4.7E-10
										Total Risk Across All Exposure Routes/Pathways	1.6E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.21
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron	785	ug/L	785	ug/L	M	2.1E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	9.7E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Iron	785	ug/L	785	ug/L	M	9.1E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	4.2E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.22
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron	785	ug/L	785	ug/L	M	1.1E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	4.9E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Iron	785	ug/L	785	ug/L	M	4.5E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	2.1E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.23
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Vinyl Chloride	1	mg/kg	1	mg/kg	M	8.1E-09	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	1.5E-08
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	2.4E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.8E-08
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	6.8E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.0E-07
	Vanadium	118	mg/kg	118	mg/kg	M	9.5E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										1.3E-07
Dermal	Vinyl Chloride	1	mg/kg	1	mg/kg	M	8.7E-10	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	1.6E-09
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	1.1E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	8.2E-09
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	7.3E-09	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.1E-08
	Vanadium	118	mg/kg	118	mg/kg	M	3.4E-08	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										2.1E-08
										Total Risk Across All Exposure Routes/Pathways	1.6E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.24
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Vinyl Chloride	1	mg/kg	1	mg/kg	M	2.0E-09	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	3.8E-09
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	6.0E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.4E-09
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	1.7E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.5E-08
	Vanadium	118	mg/kg	118	mg/kg	M	2.4E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										3.4E-08
Dermal	Vinyl Chloride	1	mg/kg	1	mg/kg	M	4.3E-11	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	8.2E-11
	Benzo(a)pyrene	0.3	mg/kg	0.3	mg/kg	M	5.6E-11	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.1E-10
	Arsenic	8.4	mg/kg	8.4	mg/kg	M	3.6E-10	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	5.5E-10
	Vanadium	118	mg/kg	118	mg/kg	M	1.7E-09	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										1.0E-09
										Total Risk Across All Exposure Routes/Pathways	3.5E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.25
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	0.2	ug/L	0.2	ug/L	M	5.4E-10	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	3.2E-10
	Acetone	725	ug/L	725	ug/L	M	1.9E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Ethyl Ether	120	ug/L	120	ug/L	M	3.2E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Trichloroethene	15.2	ug/L	15.2	ug/L	M	4.1E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	4.5E-10
	cis-1,2-Dichloroethene	9.1	ug/L	9.1	ug/L	M	2.4E-08	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Iron	1546	ug/L	1546	ug/L	M	4.1E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	119	ug/L	119	ug/L	M	3.2E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										7.7E-10
Dermal	1,1-Dichloroethene	0.2	ug/L	0.2	ug/L	M	4.0E-09	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	2.4E-09
	Acetone	725	ug/L	725	ug/L	M	1.1E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Ethyl Ether	120	ug/L	120	ug/L	M	4.3E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Trichloroethene	15.2	ug/L	15.2	ug/L	M	3.1E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.5E-09
	cis-1,2-Dichloroethene	9.1	ug/L	9.1	ug/L	M	1.1E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Iron	1546	ug/L	1546	ug/L	M	1.8E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	119	ug/L	119	ug/L	M	1.4E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										5.8E-09
										Total Risk Across All Exposure Routes/Pathways	6.6E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.26
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Sewers
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	9	ug/L	9	ug/L	M	1.2E-08	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	7.2E-09
	Acetone	28	ug/L	28	ug/L	M	3.8E-08	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Ethyl Ether	14	ug/L	14	ug/L	M	1.9E-08	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Trichloroethene	18	ug/L	18	ug/L	M	2.4E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.7E-10
	cis-1,2-Dichloroethene	6300	ug/L	6300	ug/L	M	8.5E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Iron	20800	ug/L	20800	ug/L	M	2.8E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	150	ug/L	150	ug/L	M	2.0E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										7.5E-09
Dermal	1,1-Dichloroethene	9	ug/L	9	ug/L	M	2.0E-09	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	1.2E-09
	Acetone	28	ug/L	28	ug/L	M	5.4E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Ethyl Ether	14	ug/L	14	ug/L	M	2.1E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Trichloroethene	18	ug/L	18	ug/L	M	1.6E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.7E-09
	cis-1,2-Dichloroethene	6300	ug/L	6300	ug/L	M	5.7E-08	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Iron	20800	ug/L	20800	ug/L	M	8.9E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	150	ug/L	150	ug/L	M	6.9E-08	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										2.9E-09
										Total Risk Across All Exposure Routes/Pathways	1.0E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.27
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.1E-05	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.6E-05
	(Total)										1.6E-05
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	5.5E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	8.3E-07
	(Total)										8.3E-07
										Total Risk Across All Exposure Routes/Pathways	1.7E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.28
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.2E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.8E-06
	(Total)										1.8E-06
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	3.7E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	5.5E-08
	(Total)										5.5E-08
										Total Risk Across All Exposure Routes/Pathways	1.8E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.29
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	5.0E-04	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	3.0E-04
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.7E-05	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	1.6E-06
	Chloroform	1.3	ug/L	1.3	ug/L	M	8.3E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	5.1E-08
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.5E-05	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.6E-07
											3.0E-04
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	4.5E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	2.7E-05
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	5.2E-07	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	4.7E-08
	Chloroform	1.3	ug/L	1.3	ug/L	M	4.9E-07	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	3.0E-09
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	1.7E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.8E-08
	(Total)										2.7E-05
										Total Risk Across All Exposure Routes/Pathways	2.7E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.30
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	9.5E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	5.7E-05
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	3.3E-06	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	3.0E-07
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.6E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	9.7E-09
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	2.8E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.1E-08
	(Total)										5.7E-05
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	7.0E-06	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	4.2E-06
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	8.1E-08	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	7.4E-09
	Chloroform	1.3	ug/L	1.3	ug/L	M	7.6E-08	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	4.7E-10
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	2.6E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.9E-09
	(Total)										4.2E-06
										Total Risk Across All Exposure Routes/Pathways	4.2E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.31
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	5.5E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	6.1E-09
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.2E-06	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	9.0E-06
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	3.8E-06	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.7E-06
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	3.8E-06	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.7E-06
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	2.8E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	2.1E-06
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	8.6E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	6.3E-07
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	7.9E-05	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.2E-04
	(Total)										1.4E-04
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.9E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.2E-10
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	2.8E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	2.0E-06
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	8.5E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	6.2E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	8.5E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	6.2E-07
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	6.4E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.7E-07
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	2.0E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.4E-07
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	4.1E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	6.2E-06
	(Total)										1.0E-05
										Total Risk Across All Exposure Routes/Pathways	1.5E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.32
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	1.1E-04	mg/m3	R	7.2E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	4.3E-08
	(Total)										4.3E-08
										Total Risk Across All Exposure Routes/Pathways	4.3E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.33
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	6.2E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	6.8E-10
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.4E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.0E-06
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.2E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	3.1E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	4.2E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	3.1E-07
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	3.2E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	2.3E-07
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	9.6E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	7.0E-08
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	8.8E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.3E-05
	(Total)										1.5E-05
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	1.9E-09	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.1E-11
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	1.9E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.4E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	5.7E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.2E-08
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	5.7E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.2E-08
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	4.3E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.1E-08
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.3E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	9.6E-09
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	2.7E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	4.1E-07
	(Total)										6.7E-07
										Total Risk Across All Exposure Routes/Pathways	1.6E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.34
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	2.1E-04	mg/m3	R	3.0E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	1.8E-08
	(Total)										1.8E-08
										Total Risk Across All Exposure Routes/Pathways	1.8E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.35
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.9E-04	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	1.1E-04
	Chloroform	1.3	ug/L	1.3	ug/L	M	8.3E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	5.1E-08
	Ethyl Ether	3950	ug/L	3950	ug/L	M	2.5E-02	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	3.5E-05	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	1.8E-06
	Trichloroethene	612	ug/L	612	ug/L	M	3.9E-03	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	4.3E-05
	Vinyl Chloride	85	ug/L	85	ug/L	M	5.4E-04	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	1.0E-03
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	3.4E-03	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
											1.2E-03
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	1.7E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	1.0E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	4.9E-07	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	3.0E-09
	Ethyl Ether	3950	ug/L	3950	ug/L	M	3.5E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	1.5E-05	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	7.9E-07
	Trichloroethene	612	ug/L	612	ug/L	M	4.5E-04	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	4.9E-06
	Vinyl Chloride	85	ug/L	85	ug/L	M	1.8E-05	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	3.3E-05
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	1.9E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										4.9E-05
										Total Risk Across All Exposure Routes/Pathways	4.9E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.36
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	3.5E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	2.1E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.6E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	9.7E-09
	Ethyl Ether	3950	ug/L	3950	ug/L	M	4.8E-03	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	6.6E-06	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	3.4E-07
	Trichloroethene	612	ug/L	612	ug/L	M	7.5E-04	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	8.2E-06
	Vinyl Chloride	85	ug/L	85	ug/L	M	1.0E-04	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	2.0E-04
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	6.4E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
											2.3E-04
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	2.6E-06	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	1.6E-06
	Chloroform	1.3	ug/L	1.3	ug/L	M	7.6E-08	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	4.7E-10
	Ethyl Ether	3950	ug/L	3950	ug/L	M	5.5E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	2.4E-06	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	1.2E-07
	Trichloroethene	612	ug/L	612	ug/L	M	7.0E-05	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	7.7E-07
	Vinyl Chloride	85	ug/L	85	ug/L	M	2.7E-06	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	5.2E-06
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	3.0E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										7.6E-06
										Total Risk Across All Exposure Routes/Pathways	7.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.37
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	6.0E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	4.4E-08
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.4E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.5E-07
	(Total)										4.0E-07
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.4E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	9.9E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	1.2E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.8E-08
	(Total)										2.8E-08
										Total Risk Across All Exposure Routes/Pathways	4.3E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.38
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	5.0E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.7E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.0E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.9E-08
	(Total)										3.3E-08
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	6.8E-11	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	5.0E-10
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	6.2E-10	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	9.2E-10
	(Total)										1.4E-09
										Total Risk Across All Exposure Routes/Pathways	3.5E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.39
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron	785	ug/L	785	ug/L	M	3.9E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	1.8E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Iron	785	ug/L	785	ug/L	M	1.4E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	6.3E-07	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.40
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Child Residents
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron	785	ug/L	785	ug/L	M	3.3E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	1.5E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Iron	785	ug/L	785	ug/L	M	1.1E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	5.3E-08	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.41
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.5E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	6.8E-06
	(Total)										6.8E-06
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.7E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	7.1E-07
	(Total)										7.1E-07
										Total Risk Across All Exposure Routes/Pathways	7.5E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.42
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	9.6	mg/kg	9.6	mg/kg	M	4.4E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	6.6E-07
	(Total)										6.6E-07
Dermal	Arsenic	9.6	mg/kg	9.6	mg/kg	M	1.3E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	2.0E-08
	(Total)										2.0E-08
										Total Risk Across All Exposure Routes/Pathways	6.8E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.43
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	7.3E-04	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	4.4E-04
		2.7	ug/L	2.7	ug/L	M	2.5E-05	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	2.3E-06
		1.3	ug/L	1.3	ug/L	M	1.2E-05	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	7.4E-08
		2.3	ug/L	2.3	ug/L	M	2.2E-05	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.4E-07
	(Total)										4.4E-04
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	9.4E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	5.6E-05
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.1E-06	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	1.0E-07
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.0E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	6.3E-09
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	3.5E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.9E-08
	(Total)										5.6E-05
										Total Risk Across All Exposure Routes/Pathways	5.6E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.44
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,1-Dichloroethene	77.5	ug/L	3.4E+01	ug/L	R	9.0E-04	mg/kg/day	1.8E-01	(mg/kg/day) $^{-1}$	1.6E-04
	1,2-Dichloroethane	2.7	ug/L	1.2E+00	ug/L	R	3.0E-05	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	2.8E-06
	Chloroform	1.3	ug/L	5.1E-01	ug/L	R	1.3E-05	mg/kg/day	8.1E-02	(mg/kg/day) $^{-1}$	1.1E-06
	Trichloroethene	2.3	ug/L	9.0E-01	ug/L	R	2.4E-05	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	1.4E-07
	(Total)										1.6E-04
										Total Risk Across All Exposure Routes/Pathways	1.6E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.45
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	9.9E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	6.0E-05
		2.7	ug/L	2.7	ug/L	M	3.5E-06	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	3.2E-07
		1.3	ug/L	1.3	ug/L	M	1.7E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	1.0E-08
		2.3	ug/L	2.3	ug/L	M	2.9E-06	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	3.2E-08
	(Total)										6.0E-05
Dermal	1,1-Dichloroethene	77.5	ug/L	77.5	ug/L	M	1.5E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	9.0E-06
	1,2-Dichloroethane	2.7	ug/L	2.7	ug/L	M	1.8E-07	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	1.6E-08
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.6E-07	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	1.0E-09
	Trichloroethene	2.3	ug/L	2.3	ug/L	M	5.6E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	6.2E-09
	(Total)										9.0E-06
										Total Risk Across All Exposure Routes/Pathways	9.0E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.46
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Upgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	1,1-Dichloroethene	77.5	ug/L	3.43E+01	ug/L	R	9.6E-05	mg/kg/day	1.8E-01	(mg/kg/day) $^{-1}$	1.7E-05
	1,2-Dichloroethane	2.7	ug/L	1.16E+00	ug/L	R	3.2E-06	mg/kg/day	9.1E-02	(mg/kg/day) $^{-1}$	2.9E-07
	Chloroform	1.3	ug/L	5.11E-01	ug/L	R	1.4E-06	mg/kg/day	8.1E-02	(mg/kg/day) $^{-1}$	1.2E-07
	Trichloroethene	2.3	ug/L	9.00E-01	ug/L	R	2.5E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	1.5E-08
	(Total)										1.7E-05
										Total Risk Across All Exposure Routes/Pathways	1.7E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.47
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.4E-07	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.6E-09
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	5.3E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.9E-06
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.6E-06	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.2E-06
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	6.9E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	5.0E-07
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.2E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	8.9E-07
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	3.7E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.7E-07
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.4E-05	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	5.1E-05
	(Total)										5.7E-05
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.5E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.7E-10
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	2.4E-07	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.8E-06
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	7.3E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	5.4E-07
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	3.1E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.3E-07
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	5.5E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.0E-07
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	1.7E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.2E-07
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.5E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	5.3E-06
	(Total)										8.4E-06
										Total Risk Across All Exposure Routes/Pathways	6.6E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.48
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	5.9E-05	mg/m3	R	5.6E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	3.3E-08
	(Total)										3.3E-08
										Total Risk Across All Exposure Routes/Pathways	3.3E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.49
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	2.3E-08	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	2.5E-10
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	5.2E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	3.8E-07
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	1.6E-07	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.1E-07
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	6.7E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	4.9E-08
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.2E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	8.7E-08
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	3.6E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	2.6E-08
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	3.3E-06	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	4.9E-06
	(Total)										5.6E-06
Dermal	Trichloroethene	0.504	mg/kg	0.504	mg/kg	M	6.9E-10	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	7.6E-12
	Benzo(a)pyrene	1.13	mg/kg	1.13	mg/kg	M	6.7E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	4.9E-08
	Benzo(b)fluoranthene	3.43	mg/kg	3.43	mg/kg	M	2.0E-08	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	1.5E-08
	Benzo(a)anthracene	1.46	mg/kg	1.46	mg/kg	M	8.7E-09	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	6.3E-09
	Dibenzo(a,h)anthracene	0.259	mg/kg	0.259	mg/kg	M	1.5E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.1E-08
	Indeno(1,2,3-cd)pyrene	0.788	mg/kg	0.788	mg/kg	M	4.7E-09	mg/kg/day	7.3E-01	(mg/kg/day) $^{-1}$	3.4E-09
	Arsenic	71.7	mg/kg	71.7	mg/kg	M	9.8E-08	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.5E-07
	(Total)										2.3E-07
										Total Risk Across All Exposure Routes/Pathways	5.8E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.50
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	0.504	mg/kg	1.1E-04	mg/m3	R	2.0E-06	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	1.2E-08
	(Total)										1.2E-08
										Total Risk Across All Exposure Routes/Pathways	1.2E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.51
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	2.7E-04	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	1.6E-04
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.2E-05	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	7.4E-08
	Ethyl Ether	3950	ug/L	3950	ug/L	M	3.7E-02	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	5.1E-05	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	2.6E-06
	Trichloroethene	612	ug/L	612	ug/L	M	5.7E-03	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	6.3E-05
	Vinyl Chloride	85	ug/L	85	ug/L	M	8.0E-04	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	1.5E-03
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	5.0E-03	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
											1.7E-03
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	3.5E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	2.1E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.0E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	6.3E-09
	Ethyl Ether	3950	ug/L	3950	ug/L	M	7.4E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	3.2E-05	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	1.7E-06
	Trichloroethene	612	ug/L	612	ug/L	M	9.4E-04	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.0E-05
	Vinyl Chloride	85	ug/L	85	ug/L	M	3.7E-05	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	7.0E-05
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	4.0E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										1.0E-04
										Total Risk Across All Exposure Routes/Pathways	1.8E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.52
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1-Dichloroethene	29	ug/L	1.28E+01	ug/L	R	3.4E-04	mg/kg/day	1.8E-01	(mg/kg/day) $^{-1}$	5.9E-05
	Chloroform	1.3	ug/L	5.11E-01	ug/L	R	1.3E-05	mg/kg/day	8.1E-02	(mg/kg/day) $^{-1}$	1.1E-06
	Ethyl Ether	3950	ug/L	1.54E+03	ug/L	R	4.0E-02	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	1.94E+00	ug/L	R	5.1E-05	mg/kg/day	2.0E-03	(mg/kg/day) $^{-1}$	1.0E-07
	Trichloroethene	612	ug/L	2.39E+02	ug/L	R	6.3E-03	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	3.8E-05
	Vinyl Chloride	85	ug/L	4.39E+01	ug/L	R	1.2E-03	mg/kg/day	3.0E-01	(mg/kg/day) $^{-1}$	3.5E-04
	cis-1,2-Dichloroethene	528	ug/L	2.25E+02	ug/L	R	5.9E-03	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										4.4E-04
										Total Risk Across All Exposure Routes/Pathways	4.4E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.53
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1-Dichloroethene	29	ug/L	29	ug/L	M	3.7E-05	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	2.2E-05
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.7E-06	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	1.0E-08
	Ethyl Ether	3950	ug/L	3950	ug/L	M	5.1E-03	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	6.9E-06	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	3.6E-07
	Trichloroethene	612	ug/L	612	ug/L	M	7.8E-04	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	8.6E-06
	Vinyl Chloride	85	ug/L	85	ug/L	M	1.1E-04	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	2.1E-04
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	6.8E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
											2.4E-04
Dermal	1,1-Dichloroethene	29	ug/L	29	ug/L	M	5.6E-06	mg/kg/day	6.0E-01	(mg/kg/day) $^{-1}$	3.4E-06
	Chloroform	1.3	ug/L	1.3	ug/L	M	1.6E-07	mg/kg/day	6.1E-03	(mg/kg/day) $^{-1}$	1.0E-09
	Ethyl Ether	3950	ug/L	3950	ug/L	M	1.2E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	5.41	ug/L	M	5.1E-06	mg/kg/day	5.2E-02	(mg/kg/day) $^{-1}$	2.7E-07
	Trichloroethene	612	ug/L	612	ug/L	M	1.5E-04	mg/kg/day	1.1E-02	(mg/kg/day) $^{-1}$	1.7E-06
	Vinyl Chloride	85	ug/L	85	ug/L	M	5.9E-06	mg/kg/day	1.9E+00	(mg/kg/day) $^{-1}$	1.1E-05
	cis-1,2-Dichloroethene	528	ug/L	528	ug/L	M	6.4E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										1.6E-05
										Total Risk Across All Exposure Routes/Pathways	2.5E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.54
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1-Dichloroethene	29	ug/L	1.28E+01	ug/L	R	3.6E-05	mg/kg/day	1.8E-01	(mg/kg/day) $^{-1}$	6.3E-06
	Chloroform	1.3	ug/L	5.11E-01	ug/L	R	1.4E-06	mg/kg/day	8.1E-02	(mg/kg/day) $^{-1}$	1.2E-07
	Ethyl Ether	3950	ug/L	1.54E+03	ug/L	R	4.3E-03	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Tetrachloroethene	5.41	ug/L	1.94E+00	ug/L	R	5.4E-06	mg/kg/day	2.0E-03	(mg/kg/day) $^{-1}$	1.1E-08
	Trichloroethene	612	ug/L	2.39E+02	ug/L	R	6.7E-04	mg/kg/day	6.0E-03	(mg/kg/day) $^{-1}$	4.0E-06
	Vinyl Chloride	85	ug/L	4.39E+01	ug/L	R	1.2E-04	mg/kg/day	3.0E-01	(mg/kg/day) $^{-1}$	3.7E-05
	cis-1,2-Dichloroethene	528	ug/L	2.25E+02	ug/L	R	6.3E-04	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										4.7E-05
										Total Risk Across All Exposure Routes/Pathways	4.7E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.55
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	2.6E-09	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.9E-08
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	1.0E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.5E-07
	(Total)										1.7E-07
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	2.6E-08	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.9E-07
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	2.3E-07	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	3.5E-07
	(Total)										5.3E-07
										Total Risk Across All Exposure Routes/Pathways	7.1E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.56
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	1.9E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	1.4E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	7.4E-09	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	1.1E-08
	(Total)										1.2E-08
Dermal	Benzo(a)pyrene	0.12	mg/kg	0.12	mg/kg	M	7.1E-10	mg/kg/day	7.3E+00	(mg/kg/day) $^{-1}$	5.2E-09
	Arsenic	4.7	mg/kg	4.7	mg/kg	M	6.5E-09	mg/kg/day	1.5E+00	(mg/kg/day) $^{-1}$	9.7E-09
	(Total)										1.5E-08
										Total Risk Across All Exposure Routes/Pathways	2.7E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.57
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron	785	ug/L	785	ug/L	M	3.4E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	1.6E-05	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Iron	785	ug/L	785	ug/L	M	3.4E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	1.6E-06	mg/kg/day	N/A	(mg/kg/day) $^{-1}$	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.58
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site 57 - Downgradient
Receptor Population: Adult Residents
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron	785	ug/L	785	ug/L	M	2.5E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	1.1E-06	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Iron	785	ug/L	785	ug/L	M	2.5E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	Manganese	363	ug/L	363	ug/L	M	1.1E-07	mg/kg/day	N/A	$(mg/kg/day)^{-1}$	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Full-Time Employees
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 57 - Upgradient	Arsenic	2.5E-06	- -	1.3E-06	3.8E-06	Arsenic	Skin	1.6E-02	- -	8.1E-03	2.4E-02
			(Total)	2.5E-06	- -	1.3E-06	3.8E-06	(Total)		1.6E-02	- -	8.1E-03	2.4E-02
						Total Risk Across[Soil]	3.8E-06					Total Hazard Index Across All Media and All Exposure Routes	2.4E-02

TABLE 9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Full-Time Employees
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 57 - Upgradient	Arsenic	2.2E-07	- -	2.3E-08	2.4E-07	Arsenic	Skin	6.9E-03	- -	7.1E-04	7.6E-03
			(Total)	2.2E-07	- -	2.3E-08	2.4E-07	(Total)		6.9E-03	- -	7.1E-04	7.6E-03
						Total Risk Across[Soil]	2.4E-07					Total Hazard Index Across All Media and All Exposure Routes	7.6E-03

TABLE 9.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Full-Time Employees
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 57 - Downgradient	Benzo(a)pyrene	2.2E-06	- -	4.8E-06	7.0E-06	Benzo(a)pyrene	N/A	- -	- -	- -	- -
			Benzo(b)fluoranthene	5.4E-07	- -	1.2E-06	1.7E-06	Benzo(b)fluoranthene	N/A	- -	- -	- -	- -
			Benzo(a)anthracene	2.9E-07	- -	6.6E-07	9.5E-07	Benzo(a)anthracene	N/A	- -	- -	- -	- -
			Dibenzo(a,h)anthracene	4.5E-07	- -	1.0E-06	1.4E-06	Dibenzo(a,h)anthracene	N/A	- -	- -	- -	- -
			Indeno(1,2,3-cd)pyrene	1.2E-07	- -	2.8E-07	4.0E-07	Indeno(1,2,3-cd)pyrene	N/A	- -	- -	- -	- -
			Arsenic	2.7E-05	- -	1.4E-05	4.1E-05	Arsenic	Skin	1.7E-01	- -	8.7E-02	2.5E-01
			(Total)	3.1E-05	- -	2.2E-05	5.2E-05	(Total)		1.7E-01	- -	8.7E-02	2.5E-01
						Total Risk Across[Soil]	5.2E-05					Total Hazard Index Across All Media and All Exposure Routes	2.5E-01

TABLE 9.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Full-Time Employees
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 57 - Downgradient	Benzo(a)pyrene	1.9E-07	--	8.5E-08	2.7E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	4.7E-08	--	2.1E-08	6.8E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(a)anthracene	2.6E-08	--	1.1E-08	3.7E-08	Benzo(a)anthracene	N/A	--	--	--	--
			Dibenzo(a,h)anthracene	3.9E-08	--	1.7E-08	5.7E-08	Dibenzo(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.1E-08	--	4.8E-09	1.6E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Arsenic	2.4E-06	--	2.4E-07	2.6E-06	Arsenic	Skin	7.4E-02	--	7.6E-03	8.1E-02
			(Total)	2.7E-06	--	3.8E-07	3.1E-06	(Total)		7.4E-02	--	7.6E-03	8.1E-02
						Total Risk Across[Soil]	3.1E-06					Total Hazard Index Across All Media and All Exposure Routes	8.1E-02

TABLE 9.5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Upgradient	Arsenic	9.7E-07	--	6.4E-08	1.0E-06	Arsenic	Skin	1.5E-01	--	1.0E-02	1.6E-01
			(Total)	9.7E-07	--	6.4E-08	1.0E-06	(Total)		1.5E-01	--	1.0E-02	1.6E-01
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	--	6.2E-08	5.8E-07	6.4E-07	1,1-Dichloroethene	Liver	--	--	7.5E-03	7.5E-03
			1,2-Dichloroethane	--	1.9E-10	1.0E-09	1.2E-09	1,2-Dichloroethane	N/A	--	5.3E-05	2.6E-05	7.9E-05
			Chloroform	--	1.3E-10	5.7E-11	1.9E-10	Chloroform	Liver	--	6.6E-04	6.5E-05	7.3E-04
			Trichloroethene	--	2.7E-11	3.3E-10	3.5E-10	Trichloroethene	N/A	--	--	3.5E-04	3.5E-04
			(Total)	--	6.2E-08	5.8E-07	6.4E-07	(Total)		--	7.2E-04	7.9E-03	8.7E-03

Total Risk Across[Soil]	1.0E-06
Total Risk Across[Groundwater]	6.4E-07
Total Risk Across All Media and All Exposure Routes	1.7E-06
Total Hazard Index Across All Media and All Exposure Routes	1.7E-01

TABLE 9.6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Upgradient	Arsenic	4.2E-07	--	5.6E-09	4.3E-07	Arsenic	Skin	6.6E-02	--	8.7E-04	6.7E-02
			(Total)	4.2E-07	--	5.6E-09	4.3E-07	(Total)		6.6E-02	--	8.7E-04	6.7E-02
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	--	3.1E-08	2.9E-07	3.2E-07	1,1-Dichloroethene	Liver	--	--	3.8E-03	3.8E-03
			1,2-Dichloroethane	--	9.6E-11	5.1E-10	6.1E-10	1,2-Dichloroethane	N/A	--	5.3E-05	1.3E-05	6.6E-05
			Chloroform	--	6.6E-11	2.8E-11	9.4E-11	Chloroform	Liver	--	6.6E-04	3.3E-05	7.0E-04
			Trichloroethene	--	1.3E-11	1.6E-10	1.8E-10	Trichloroethene	N/A	--	--	1.7E-04	1.7E-04
			(Total)	--	3.1E-08	2.9E-07	3.2E-07	(Total)		--	7.2E-04	4.0E-03	4.7E-03
						Total Risk Across(Soil)	4.3E-07					Total Hazard Index Across All Media and All Exposure Routes	7.1E-02
						Total Risk Across(Groundwater)	3.2E-07						
						isk Across All Media and All Exposure Routes	7.5E-07						

TABLE 9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	3.7E-10	6.4E-09	2.5E-11	6.8E-09	Trichloroethene	N/A	3.9E-04	--	6.0E-03	6.4E-03
			Benzo(a)anthracene	7.2E-08	--	2.1E-06	9.2E-06	Benzo(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	5.5E-07	--	1.6E-07	7.1E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1.7E-07	--	4.8E-08	2.2E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Dibenzo(a,h)anthracene	1.3E-07	--	3.6E-08	1.6E-07	Dibenzo(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.9E-08	--	1.1E-08	5.0E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Arsenic	7.2E-06	--	4.8E-07	7.7E-06	Arsenic	Skin	1.1E+00	--	3.0E-04	1.1E+00
			(Total)	8.2E-06	6.4E-09	7.5E-07	8.9E-06	(Total)		1.1E+00	--	6.3E-03	1.1E+00
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	--	2.3E-08	2.2E-07	2.4E-07	1,1-Dichloroethene	Liver	--	--	2.8E-03	2.8E-03
			Chloroform	--	1.3E-10	5.7E-11	1.9E-10	Chloroform	Liver	--	1.3E-03	6.5E-05	1.4E-03
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	--	--	3.1E-03	3.1E-03
			Tetrachloroethene	--	2.9E-11	1.1E-08	1.1E-08	Tetrachloroethene	Liver	--	7.4E-06	1.5E-03	1.5E-03
			Trichloroethene	--	7.1E-09	8.7E-08	9.4E-08	Trichloroethene	N/A	--	--	9.3E-02	9.3E-02
			Vinyl Chloride	--	1.2E-07	9.0E-07	1.0E-06	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	--	--	2.9E-02	2.9E-02
			(Total)	--	1.5E-07	1.2E-06	1.4E-06	(Total)		--	1.3E-03	1.3E-01	1.3E-01
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	7.1E-09	--	3.3E-09	1.0E-08	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	5.7E-08	--	6.1E-09	6.3E-08	Arsenic	Skin	8.8E-03	--	9.5E-04	9.8E-03
			(Total)	6.4E-08	--	9.4E-09	7.3E-08	(Total)		8.8E-03	--	9.5E-04	9.8E-03
Surface Water	Surface Water	Site 57 - Downgradient	Iron	--	--	--	--	Iron	Liver	4.9E-04	--	2.1E-04	7.0E-04
			Manganese	--	--	--	--	Manganese	CNS	3.4E-03	--	2.4E-02	2.8E-02
			(Total)	--	--	--	--	(Total)		3.9E-03	--	2.5E-02	2.9E-02

Total Risk Across Soil	8.9E-06
Total Risk Across Groundwater	1.4E-06
Total Risk Across Sediment	7.3E-08
Total Risk Across Surface Water	--
Total Risk Across All Media and All Exposure Routes	1.0E-05

Total Hazard Index Across All Media and All Exposure Routes	1.3E+00
Total Skin HI	1.1E+00
Total Liver HI	1.3E-02
Total CNS HI	2.8E-02

TABLE 9.8
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	1.6E-10	5.6E-09	2.2E-12	5.8E-09
			Benzo(a)anthracene	3.1E-08	5.6E-09	1.8E-09	3.9E-08
			Benzo(a)pyrene	2.4E-07	5.6E-09	1.4E-08	2.6E-07
			Benzo(b)fluoranthene	7.4E-08	0.0E+00	4.2E-09	7.8E-08
			Dibenzo(a,h)anthracene	5.6E-08	0.0E+00	3.2E-09	5.9E-08
			Indeno(1,2,3-cd)pyrene	1.7E-08	0.0E+00	9.7E-10	1.8E-08
			Arsenic	3.2E-06	0.0E+00	4.2E-08	3.2E-06
			(Total)	3.6E-06	1.7E-08	6.6E-08	3.7E-06
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	--	1.2E-08	1.1E-07	1.2E-07
			Chloroform	--	6.6E-11	2.8E-11	9.4E-11
			Ethyl Ether	--	--	--	--
			Tetrachloroethene	--	1.5E-11	5.5E-09	5.5E-09
			Trichloroethene	--	3.5E-09	4.4E-08	4.7E-08
			Vinyl Chloride	--	8.2E-08	4.5E-07	5.1E-07
			cis-1,2-Dichloroethene	--	--	--	--
			(Total)	--	7.7E-08	6.1E-07	6.8E-07
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	1.8E-09	--	1.6E-10	1.9E-09
			Arsenic	1.4E-08	--	3.1E-10	1.4E-08
			(Total)	1.6E-08	--	4.7E-10	1.6E-08
Surface Water	Surface Water	Site 57 - Downgradient	Iron	--	--	--	--
			Manganese	--	--	--	--
			(Total)	--	--	--	--

Chemical	Non-Carcinogenic Hazard Quotient				
	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Trichloroethene	N/A	1.7E-04	--	6.0E-03	6.2E-03
Benzo(a)anthracene	N/A	--	--	--	--
Benzo(a)pyrene	N/A	--	--	--	--
Benzo(b)fluoranthene	N/A	--	--	--	--
Dibenzo(a,h)anthracene	N/A	--	--	--	--
Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
Arsenic	Skin	4.9E-01	--	3.0E-04	4.9E-01
(Total)		4.9E-01	--	6.3E-03	5.0E-01
1,1-Dichloroethene	Liver	--	--	1.4E-03	1.4E-03
Chloroform	Liver	--	6.6E-04	3.3E-05	7.0E-04
Ethyl Ether	N/A	--	--	1.5E-03	1.5E-03
Tetrachloroethene	Liver	--	3.7E-06	7.3E-04	7.4E-04
Trichloroethene	N/A	--	--	4.6E-02	4.6E-02
Vinyl Chloride	N/A	--	--	--	--
cis-1,2-Dichloroethene	Blood	--	--	1.4E-02	1.4E-02
(Total)		--	6.7E-04	6.4E-02	6.5E-02
Benzo(a)pyrene	N/A	--	--	--	--
Arsenic	Skin	2.2E-03	--	4.7E-05	2.3E-03
(Total)		2.2E-03	--	4.7E-05	2.3E-03
Iron	Liver	2.5E-04	--	1.1E-04	3.5E-04
Manganese	CNS	1.7E-03	--	1.2E-02	1.4E-02
(Total)		2.0E-03	--	1.2E-02	1.4E-02

Total Risk Across[Soil]	3.7E-06
Total Risk Across[Groundwater]	6.8E-07
Total Risk Across[Sediment]	1.6E-08
Total Risk Across[Surface Water]	--
Total Risk Across All Media and All Exposure Routes	4.4E-06

Total Hazard Index Across All Media and All Exposure Routes	5.8E-01

Total Skin HI	4.9E-01
Total Liver HI	9.4E-03
Total CNS HI	1.4E-02

TABLE 9.9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site 57 - Sewers	Vinyl Chloride	1.5E-08	--	1.6E-09	1.7E-08	Vinyl Chloride	N/A	--	--	--	--
			Benzo(a)pyrene	1.8E-08	--	8.2E-09	2.6E-08	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	1.0E-07	--	1.1E-08	1.1E-07	Arsenic	Skin	1.6E-02	--	1.7E-03	1.7E-02
			Vanadium	--	--	--	--	Vanadium	N/A	9.5E-03	--	5.7E-03	1.5E-02
			(Total)	1.3E-07	--	2.1E-08	1.6E-07	(Total)		2.5E-02	--	7.4E-03	3.3E-02
Surface Water	Surface Water	Site 57 - Sewers	1,1-Dichloroethene	3.2E-10	--	2.4E-09	2.7E-09	1,1-Dichloroethene	Liver	4.2E-06	--	3.1E-05	3.5E-05
			Acetone	--	--	--	--	Acetone	Liver	1.4E-03	--	7.6E-04	2.1E-03
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	1.1E-04	--	1.5E-04	2.6E-04
			Trichloroethene	4.5E-10	--	3.5E-09	3.9E-09	Trichloroethene	N/A	4.8E-04	--	3.7E-03	4.1E-03
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	1.7E-04	--	7.9E-04	9.6E-04
			Iron	--	--	--	--	Iron	Liver	9.7E-04	--	4.2E-04	1.4E-03
			Manganese	--	--	--	--	Manganese	CNS	1.1E-03	--	8.0E-03	9.1E-03
			(Total)	7.7E-10	--	5.8E-09	6.6E-09	(Total)		4.2E-03	--	1.4E-02	1.8E-02
			Total Risk Across[Sediment]				1.6E-07	Total Hazard Index Across All Media and All Exposure Routes					5.1E-02
			Total Risk Across[Surface Water]				6.6E-09						
			Total Risk Across All Media and All Exposure Routes				1.6E-07						

TABLE 9.10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site 57 - Sewers	Vinyl Chloride	3.8E-09	--	8.2E-11	3.9E-09	Vinyl Chloride	N/A	--	--	--	--
			Benzo(a)pyrene	4.4E-09	--	4.1E-10	4.8E-09	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	2.5E-08	--	5.5E-10	2.6E-08	Arsenic	Skin	3.9E-03	--	8.5E-05	4.0E-03
			Vanadium	--	--	--	--	Vanadium	N/A	2.4E-03	--	2.8E-04	2.7E-03
			(Total)	3.4E-08	--	1.0E-09	3.5E-08	(Total)		6.3E-03	--	3.7E-04	6.7E-03
Surface Water	Surface Water	Site 57 - Sewers	1,1-Dichloroethene	7.2E-09	--	1.2E-09	8.4E-09	1,1-Dichloroethene	Liver	9.4E-05	--	1.5E-05	1.1E-04
			Acetone	--	--	--	--	Acetone	Liver	2.6E-05	--	3.8E-04	4.1E-04
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	6.6E-06	--	7.5E-05	8.1E-05
			Trichloroethene	2.7E-10	--	1.7E-09	2.0E-09	Trichloroethene	N/A	2.8E-04	--	1.8E-03	2.1E-03
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	5.9E-02	--	4.0E-04	6.0E-02
			Iron	--	--	--	--	Iron	Liver	6.5E-03	--	2.1E-04	6.7E-03
			Manganese	--	--	--	--	Manganese	CNS	7.0E-04	--	4.0E-03	4.7E-03
			(Total)	7.5E-09	--	2.9E-09	1.0E-08	(Total)		6.7E-02	--	6.9E-03	7.4E-02

Total Risk Across[Sediment]	3.5E-08
Total Risk Across[Surface Water]	1.0E-08
Total Risk Across All Media and All Exposure Routes	4.5E-08
Total Hazard Index Across All Media and All Exposure Routes	8.0E-02

TABLE 9.11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Upgradient	Arsenic	1.6E-05	- -	8.3E-07	1.7E-05	Arsenic	Skin	3.5E-01	- -	1.8E-02	3.7E-01
			(Total)	1.6E-05	- -	8.3E-07	1.7E-05	(Total)		3.5E-01	- -	1.8E-02	3.7E-01
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	3.0E-04	- -	2.7E-05	3.2E-04	1,1-Dichloroethene	Liver	5.5E-01	- -	4.9E-02	6.0E-01
			1,2-Dichloroethane	1.6E-06	- -	4.7E-08	1.6E-06	1,2-Dichloroethane	N/A	5.6E-03	- -	1.7E-04	5.9E-03
			Chloroform	5.1E-08	- -	3.0E-09	5.4E-08	Chloroform	Liver	8.3E-03	- -	4.9E-04	8.8E-03
			Trichloroethene	1.6E-07	- -	1.8E-08	1.8E-07	Trichloroethene	N/A	2.5E-02	- -	2.8E-03	2.7E-02
			(Total)	3.0E-04	- -	2.7E-05	3.3E-04	(Total)		5.9E-01	- -	5.3E-02	6.4E-01
						Total Risk Across[Soil]	1.7E-05					Total Hazard Index Across All Media and All Exposure Routes	1.0E+00
						Total Risk Across[Groundwater]	3.3E-04						
						I Risk Across All Media and All Exposure Routes	3.4E-04					Total Liver HI	6.1E-01
												Total Skin HI	3.7E-01

TABLE 9.12
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCTY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Upgradient	Arsenic	1.8E-06	- -	5.5E-08	1.8E-06	Arsenic	Skin	1.4E-01	- -	4.3E-03	1.4E-01
			(Total)	1.8E-06	- -	5.5E-08	1.8E-06	(Total)		1.4E-01	- -	4.3E-03	1.4E-01
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	5.7E-05	- -	4.2E-06	6.1E-05	1,1-Dichloroethene	Liver	3.7E-01	- -	2.7E-02	4.0E-01
			1,2-Dichloroethane	3.0E-07	- -	7.4E-09	3.1E-07	1,2-Dichloroethane	N/A	3.8E-03	- -	9.5E-05	3.9E-03
			Chloroform	9.7E-09	- -	4.7E-10	1.0E-08	Chloroform	Liver	5.6E-03	- -	2.7E-04	5.8E-03
			Trichloroethene	3.1E-08	- -	2.9E-09	3.4E-08	Trichloroethene	N/A	1.6E-02	- -	1.5E-03	1.8E-02
			(Total)	5.7E-05	- -	4.2E-06	6.1E-05	(Total)		3.9E-01	- -	2.9E-02	4.2E-01
							Total Risk Across[Soil] 1.8E-06						Total Hazard Index Across All Media and All Exposure Routes 5.6E-01
							Total Risk Across[Groundwater] 6.1E-05						
							isk Across All Media and All Exposure Routes 6.3E-05						

TABLE 9.13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	6.1E-09	4.3E-08	3.2E-10	5.0E-08	Trichloroethene	N/A	1.1E-03	--	5.6E-05	1.1E-03
			Benzo(a)pyrene	9.0E-06	--	2.0E-06	1.1E-05	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2.7E-06	--	6.2E-07	3.4E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2.7E-06	--	6.2E-07	3.4E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Dibenzo(a,h)anthracene	2.1E-06	--	4.7E-07	2.5E-06	Dibenzo(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6.3E-07	--	1.4E-07	7.7E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Arsenic	1.2E-04	--	6.2E-06	1.2E-04	Arsenic	Skin	3.1E+00	--	1.6E-01	3.2E+00
			(Total)	1.4E-04	4.3E-08	1.0E-05	1.5E-04	(Total)		3.1E+00	--	1.6E-01	3.2E+00
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	1.1E-04	--	1.0E-05	1.2E-04	1,1-Dichloroethene	Liver	2.1E-01	--	1.9E-02	2.2E-01
			Chloroform	5.1E-08	--	3.0E-09	5.4E-08	Chloroform	Liver	8.3E-03	--	4.9E-04	8.8E-03
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	1.3E+00	--	1.8E-02	1.3E+00
			Tetrachloroethene	1.8E-06	--	7.9E-07	2.6E-06	Tetrachloroethene	Liver	3.5E-02	--	1.5E-02	5.0E-02
			Trichloroethene	4.3E-05	--	4.9E-06	4.8E-05	Trichloroethene	N/A	6.5E+00	--	7.5E-01	7.3E+00
			Vinyl Chloride	1.0E-03	--	3.3E-05	1.1E-03	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	3.4E+00	--	1.9E-01	3.6E+00
			(Total)	1.2E-03	--	4.9E-05	1.2E-03	(Total)		1.1E+01	--	9.9E-01	1.2E+01
Surface Water	Surface Water	Site 57 - Downgradient	Iron	--	--	--	--	Iron	Liver	1.5E-03	--	1.5E-03	3.1E-03
			Manganese	--	--	--	--	Manganese	CNS	1.1E-02	--	1.1E-02	2.1E-02
			(Total)	--	--	--	--	(Total)		1.2E-02	--	1.2E-02	2.4E-02
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	4.4E-08	--	9.9E-09	5.4E-08	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	3.5E-07	--	1.8E-08	3.7E-07	Arsenic	Skin	9.2E-03	--	4.6E-04	9.6E-03
			(Total)	4.0E-07	--	2.8E-08	4.3E-07	(Total)		9.2E-03	--	4.6E-04	9.6E-03

Total Risk Across[Soil]	1.5E-04
Total Risk Across[Groundwater]	1.2E-03
Total Risk Across[Surface Water]	--
Total Risk Across[Sediment]	4.3E-07
Total Risk Across All Media and All Exposure Routes	1.4E-03

Total Hazard Index Across All Media and All Exposure Routes	1.6E+01
Total Skin HI	3.2E+00
Total Liver HI	2.9E-01
Total CNS HI	2.1E-02
Total Blood HI	3.6E+00

TABLE 9.14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	6.6E-10	1.8E-08	2.1E-11	1.9E-08	Trichloroethene	N/A	3.6E-04	--	1.1E-05	3.7E-04
			Benzo(a)pyrene	1.0E-06	--	1.4E-07	1.1E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	3.1E-07	--	4.2E-08	3.5E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(b)fluoranthene	3.1E-07	--	4.2E-08	3.5E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Dibenzo(a,h)anthracene	2.3E-07	--	3.1E-08	2.6E-07	Dibenzo(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	7.0E-08	--	9.6E-09	8.0E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Arsenic	1.3E-05	--	4.1E-07	1.4E-05	Arsenic	Skin	1.0E+00	--	3.2E-02	1.1E+00
			(Total)	1.5E-05	1.8E-08	6.7E-07	1.6E-05	(Total)		1.0E+00	--	3.2E-02	1.1E+00
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	2.1E-05	--	1.6E-06	2.3E-05	1,1-Dichloroethene	Liver	1.4E-01	--	1.0E-02	1.5E-01
			Chloroform	9.7E-09	--	4.7E-10	1.0E-08	Chloroform	Liver	5.6E-03	--	2.7E-04	5.8E-03
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	8.4E-01	--	9.6E-03	8.5E-01
			Tetrachloroethene	3.4E-07	--	1.2E-07	4.7E-07	Tetrachloroethene	Liver	2.3E-02	--	8.3E-03	3.1E-02
			Trichloroethene	8.2E-06	--	7.7E-07	9.0E-06	Trichloroethene	N/A	4.4E+00	--	4.1E-01	4.8E+00
			Vinyl Chloride	2.0E-04	--	5.2E-06	2.0E-04	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	2.3E+00	--	1.0E-01	2.4E+00
			(Total)	2.3E-04	--	7.6E-06	2.3E-04	(Total)		7.6E+00	--	5.4E-01	8.2E+00
Surface Water	Surface Water	Site 57 - Downgradient	Iron	--	--	--	--	Iron	Liver	3.8E-04	--	1.3E-05	4.0E-04
			Manganese	--	--	--	--	Manganese	CNS	2.7E-03	--	1.5E-03	4.2E-03
			(Total)	--	--	--	--	(Total)		3.0E-03	--	1.6E-03	4.6E-03
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	3.7E-09	--	5.0E-10	4.2E-09	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	2.9E-08	--	9.2E-10	3.0E-08	Arsenic	Skin	2.3E-03	--	7.2E-05	2.4E-03
			(Total)	3.3E-08	--	1.4E-09	3.5E-08	(Total)		2.3E-03	--	7.2E-05	2.4E-03

Total Risk Across[Soil]	1.6E-05
Total Risk Across[Groundwater]	2.3E-04
Total Risk Across[Surface Water]	--
Total Risk Across[Sediment]	3.5E-08
Total Risk Across All Media and All Exposure Routes	2.5E-04

Total Hazard Index Across All Media and All Exposure Routes	9.2E+00
Total Skin HI	1.1E+00
Total Liver HI	1.9E-01
Total CNS HI	4.2E-03
Total Blood HI	2.4E+00

TABLE 9.15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/SubsurfaceSoil	Surface/SubsurfaceSoil	Site 57 - Upgradient	Arsenic	6.8E-06	--	7.1E-07	7.5E-06	Arsenic	Skin	4.4E-02	--	4.6E-03	4.8E-02
			(Total)	6.8E-06	--	7.1E-07	7.5E-06	(Total)		4.4E-02	--	4.6E-03	4.8E-02
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	4.4E-04	1.6E-04	5.8E-05	6.5E-04	1,1-Dichloroethene	Liver	2.4E-01	--	3.0E-02	2.7E-01
			1,2-Dichloroethane	2.3E-06	2.8E-06	1.0E-07	5.2E-06	1,2-Dichloroethane	N/A	2.5E-03	6.3E-02	1.1E-04	6.6E-02
			Chloroform	7.4E-08	1.1E-06	6.3E-09	1.2E-06	Chloroform	Liver	3.6E-03	4.5E-01	3.0E-04	4.6E-01
			Trichloroethene	2.4E-07	1.4E-07	3.9E-08	4.2E-07	Trichloroethene	N/A	1.1E-02	--	1.7E-03	1.2E-02
			(Total)	4.4E-04	1.6E-04	5.8E-05	6.6E-04	(Total)		2.5E-01	5.2E-01	3.3E-02	8.0E-01
						Total Risk Across Soil	7.5E-06					Total Hazard Index Across All Media and All Exposure Routes	8.5E-01
						Total Risk Across Groundwater	6.6E-04						
						Total Risk Across All Media and All Exposure Routes	6.6E-04						

TABLE 9.16
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCTY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/SubsurfaceSoil	Surface/SubsurfaceSoil	Site 57 - Upgradient	Arsenic	6.6E-07	- -	2.0E-08	6.8E-07	Arsenic	Skin	1.5E-02	- -	4.4E-04	1.5E-02
			(Total)	6.6E-07	- -	2.0E-08	6.8E-07	(Total)		1.5E-02	- -	4.4E-04	1.5E-02
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	6.0E-05	1.7E-05	9.0E-06	8.5E-05	1,1-Dichloroethene	Liver	1.1E-01	- -	1.7E-02	1.3E-01
			1,2-Dichloroethane	3.2E-07	2.9E-07	1.6E-08	6.3E-07	1,2-Dichloroethane	N/A	1.2E-03	2.3E-02	5.8E-05	2.4E-02
			Chloroform	1.0E-08	1.2E-07	1.0E-09	1.3E-07	Chloroform	Liver	1.7E-03	1.7E-01	1.6E-04	1.7E-01
			Trichloroethene	3.2E-08	1.5E-08	6.2E-09	5.4E-08	Trichloroethene	N/A	4.9E-03	- -	9.4E-04	5.9E-03
			(Total)	6.0E-05	1.7E-05	9.0E-06	8.6E-05	(Total)		1.2E-01	1.9E-01	1.8E-02	3.3E-01
						Total Risk Across Soil	6.8E-07					Total Hazard Index Across All Media and All Exposure Routes	3.4E-01
						Total Risk Across Groundwater	8.6E-05						
						isk Across All Media and All Exposure Routes	8.7E-05						

TABLE 9.17
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	2.6E-09	3.3E-08	5.4E-07	5.7E-07	Trichloroethene	N/A	1.2E-04	--	1.2E-05	1.3E-04
			Benzo(a)pyrene	3.9E-06	--	2.3E-07	4.1E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1.2E-06	--	4.0E-07	1.6E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(a)anthracene	5.0E-07	--	1.2E-07	6.2E-07	Benzo(a)anthracene	N/A	--	--	--	--
			Dibenzo(a,h)anthracene	8.9E-07	--	5.3E-06	6.2E-06	Dibenzo(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.7E-07	--	8.4E-06	8.6E-06	Indeno(1,2,3-cd)pyrene	N/A	3.3E-01	--	3.4E-02	3.6E-01
			Arsenic	5.1E-05	--	6.6E-05	1.2E-04	Arsenic	Skin	3.3E-01	--	3.4E-02	3.6E-01
			(Total)	5.7E-05	3.3E-08	6.1E-05	1.4E-04	(Total)		6.6E-01	--	6.9E-02	7.2E-01
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	1.6E-04	5.9E-05	2.1E-05	2.4E-04	1,1-Dichloroethene	Liver	8.8E-02	--	1.1E-02	1.0E-01
			Chloroform	7.4E-08	1.1E-06	6.3E-09	1.2E-06	Chloroform	Liver	3.6E-03	4.5E-01	3.0E-04	4.6E-01
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	5.4E-01	--	1.1E-02	5.5E-01
			Tetrachloroethene	2.6E-06	1.0E-07	1.7E-06	4.4E-06	Tetrachloroethene	Liver	1.5E-02	1.1E-03	9.3E-03	2.5E-02
			Trichloroethene	6.3E-05	3.8E-05	1.0E-05	1.1E-04	Trichloroethene	N/A	2.8E+00	--	4.6E-01	3.3E+00
			Vinyl Chloride	1.5E-03	3.5E-04	7.0E-05	1.9E-03	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	1.4E+00	--	1.2E-01	1.6E+00
			(Total)	1.7E-03	4.4E-04	1.0E-04	2.3E-03	(Total)		4.9E+00	4.6E-01	6.1E-01	6.0E+00
Surface Water	Surface Water	Site 57 - Downgradient	Iron	--	--	--	--	Iron	Liver	3.3E-04	--	3.3E-05	3.6E-04
			Manganese	--	--	--	--	Manganese	CNS	2.3E-03	--	3.8E-03	6.1E-03
			(Total)	--	--	--	--	(Total)		2.6E-03	--	3.8E-03	6.4E-03
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	1.9E-08	--	1.9E-07	2.1E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	1.5E-07	--	3.5E-07	5.0E-07	Arsenic	Skin	9.8E-04	--	2.3E-03	3.2E-03
			(Total)	1.7E-07	--	5.3E-07	7.1E-07	(Total)		9.8E-04	--	2.3E-03	3.2E-03

Total Risk Across[Soil]	1.4E-04
Total Risk Across[Groundwater]	2.3E-03
Total Risk Across[Surface Water]	--
Total Risk Across[Sediment]	7.1E-07
Total Risk Across All Media and All Exposure Routes	2.4E-03

Total Hazard Index Across All Media and All Exposure Routes	6.7E+00
Total Liver HI	5.8E-01
Total CNS HI	6.1E-03
Total Blood HI	1.6E+00
Total Skin HI	3.2E-03

TABLE 9.18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	2.5E-10	1.2E-08	1.5E-08	2.7E-08	Trichloroethene	N/A	3.8E-05	--	1.2E-06	4.0E-05
			Benzo(a)pyrene	3.8E-07	--	6.3E-09	3.8E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1.1E-07	--	1.1E-08	1.3E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(a)anthracene	4.9E-08	--	3.4E-09	5.2E-08	Benzo(a)anthracene	N/A	--	--	--	--
			Dibenzo(a,h)anthracene	8.7E-08	--	1.5E-07	2.3E-07	Dibenzo(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.6E-08	--	2.3E-07	2.6E-07	Indeno(1,2,3-cd)pyrene	N/A	1.1E-01	--	3.3E-03	1.1E-01
			Arsenic	4.9E-06	--	5.8E-06	1.1E-05	Arsenic	Skin	1.1E-01	--	3.3E-03	1.1E-01
			(Total)	5.6E-06	1.2E-08	6.2E-06	1.2E-05	(Total)		2.2E-01	--	6.6E-03	2.3E-01
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	2.2E-05	6.3E-06	3.4E-06	3.2E-05	1,1-Dichloroethene	Liver	4.1E-02	6.3E-06	6.2E-03	4.8E-02
			Chloroform	1.0E-08	1.2E-07	1.0E-09	1.3E-07	Chloroform	Liver	1.7E-03	1.2E-07	1.6E-04	1.8E-03
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	2.5E-01	--	5.9E-03	2.6E-01
			Tetrachloroethene	3.6E-07	1.1E-08	2.7E-07	6.4E-07	Tetrachloroethene	Liver	6.9E-03	1.1E-08	5.1E-03	1.2E-02
			Trichloroethene	8.6E-06	4.0E-06	1.7E-06	1.4E-05	Trichloroethene	N/A	1.3E+00	4.0E-06	2.5E-01	1.6E+00
			Vinyl Chloride	2.1E-04	3.7E-05	1.1E-05	2.6E-04	Vinyl Chloride	N/A	--	3.7E-05	--	3.7E-05
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	6.8E-01	--	6.4E-02	7.4E-01
			(Total)	2.4E-04	4.7E-05	1.6E-05	3.0E-04	(Total)		2.3E+00	4.7E-05	3.3E-01	2.6E+00
Surface Water	Surface Water	Site 57 - Downgradient	Iron	--	--	--	--	Iron	Liver	8.2E-05	--	8.2E-06	9.0E-05
			Manganese	--	--	--	--	Manganese	CNS	5.7E-04	--	9.5E-04	1.5E-03
			(Total)	--	--	--	--	(Total)		6.5E-04	--	9.6E-04	1.6E-03
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	1.4E-09	--	5.2E-09	6.6E-09	Benzo(a)pyrene	N/A	--	--	--	--
			Arsenic	1.1E-08	--	9.7E-09	2.1E-08	Arsenic	Skin	2.5E-04	--	2.2E-04	4.6E-04
			(Total)	1.2E-08	--	1.5E-08	2.7E-08	(Total)		2.5E-04	--	2.2E-04	4.6E-04

Total Risk Across[Soil]	1.2E-05
Total Risk Across[Groundwater]	3.0E-04
Total Risk Across[Surface Water]	--
Total Risk Across[Sediment]	2.7E-08
Total Risk Across All Media and All Exposure Routes	3.1E-04

Total Hazard Index Across All Media and All Exposure Routes	2.8E+00
Total Liver HI	6.2E-02
Total CNS HI	1.5E-03
Total Blood HI	7.4E-01
Total Skin HI	4.6E-04

TABLE 9.19

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	8.7E-09	3.3E-08	1.2E-07	1.7E-07
			Benzo(a)pyrene	1.3E-05	- -	2.1E-06	1.5E-05
			Benzo(b)fluoranthene	3.9E-06	- -	1.0E-06	4.9E-06
			Benzo(a)anthracene	3.2E-06	- -	7.4E-07	4.0E-06
			Dibenzo(a,h)anthracene	3.0E-06	- -	2.3E-05	2.6E-05
			Indeno(1,2,3-cd)pyrene	9.0E-07	- -	2.4E-05	2.5E-05
			Arsenic	1.7E-04	- -	8.7E-05	2.6E-04
			(Total)	1.9E-04	3.3E-08	1.4E-04	3.3E-04
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	2.7E-04	5.9E-05	3.1E-05	3.6E-04
			Chloroform	1.3E-07	1.1E-06	9.3E-09	1.2E-06
			Ethyl Ether	- -	- -	- -	- -
			Tetrachloroethene	4.4E-06	1.0E-07	2.5E-06	7.0E-06
			Trichloroethene	1.1E-04	3.8E-05	1.5E-05	1.6E-04
			Vinyl Chloride	2.5E-03	3.5E-04	1.0E-04	3.0E-03
			cis-1,2-Dichloroethene	- -	- -	- -	- -
			(Total)	2.9E-03	4.4E-04	1.5E-04	3.5E-03
Surface Water	Surface Water	Site 57 - Downgradient	Iron	- -	- -	- -	- -
			Manganese	- -	- -	- -	- -
			(Total)	- -	- -	- -	- -
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	6.3E-08	- -	2.0E-07	2.6E-07
			Arsenic	5.0E-07	- -	3.7E-07	8.7E-07
			(Total)	5.7E-07	- -	5.6E-07	1.1E-06

Total Risk Across[Soil]	3.3E-04
Total Risk Across[Groundwater]	3.5E-03
Total Risk Across[Surface Water]	- -
Total Risk Across[Sediment]	1.1E-06
Total Risk Across All Media and All Exposure Routes	3.9E-03

TABLE 9.20

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Trichloroethene	9.3E-10	1.2E-08	1.5E-08	2.8E-08
			Benzo(a)pyrene	1.4E-06	- -	1.4E-07	1.5E-06
			Benzo(b)fluoranthene	4.2E-07	- -	5.3E-08	4.7E-07
			Benzo(a)anthracene	3.5E-07	- -	4.5E-08	4.0E-07
			Dibenzo(a,h)anthracene	3.2E-07	- -	1.8E-07	5.0E-07
			Indeno(1,2,3-cd)pyrene	9.7E-08	- -	2.4E-07	3.4E-07
			Arsenic	1.8E-05	- -	6.2E-06	2.4E-05
			(Total)	2.1E-05	1.2E-08	6.9E-06	2.8E-05
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	4.4E-05	6.3E-06	4.9E-06	5.5E-05
			Chloroform	2.0E-08	1.2E-07	1.5E-09	1.4E-07
			Ethyl Ether	- -	- -	- -	- -
			Tetrachloroethene	7.0E-07	1.1E-08	3.9E-07	1.1E-06
			Trichloroethene	1.7E-05	4.0E-06	2.4E-06	2.3E-05
			Vinyl Chloride	4.0E-04	3.7E-05	1.6E-05	4.6E-04
			cis-1,2-Dichloroethene	- -	- -	- -	- -
			(Total)	4.7E-04	4.7E-05	2.4E-05	5.4E-04
Surface Water	Surface Water	Site 57 - Downgradient	Iron	- -	- -	- -	- -
			Manganese	- -	- -	- -	- -
			(Total)	- -	- -	- -	- -
Sediment	Sediment	Site 57 - Downgradient	Benzo(a)pyrene	5.0E-09	- -	5.7E-09	1.1E-08
			Arsenic	4.0E-08	- -	1.1E-08	5.1E-08
			(Total)	4.5E-08	- -	1.6E-08	6.2E-08

Total Risk Across[Soil]	2.8E-05
Total Risk Across[Groundwater]	5.4E-04
Total Risk Across[Surface Water]	- -
Total Risk Across[Sediment]	6.2E-08
Total Risk Across All Media and All Exposure Routes	5.6E-04

TABLE 9.21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Potable Well	Trichloroethene	5.1E-07	--	5.8E-08	5.6E-07	Trichloroethene	N/A	7.7E-02	--	8.8E-03	8.5E-02
			(Total)	5.1E-07	--	5.8E-08	5.6E-07	(Total)		7.7E-02	--	8.8E-03	8.5E-02
						Total Risk Across Groundwater	5.6E-07					Total Hazard Index Across All Media and All Exposure Routes	8.5E-02
						Total Risk Across All Media and All Exposure Routes	5.6E-07						

TABLE 9.22
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCTY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Potable Well	Trichloroethene	9.7E-08	- -	9.0E-09	1.1E-07	Trichloroethene	N/A	5.1E-02	- -	4.8E-03	5.6E-02
			(Total)	9.7E-08	- -	9.0E-09	1.1E-07	(Total)		5.1E-02	- -	4.8E-03	5.6E-02
							Total Risk Across Groundwater	1.1E-07				Total Hazard Index Across All Media and All Exposure Routes	5.6E-02
							Total Risk Across All Media and All Exposure Routes	1.1E-07					

TABLE 9.23
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Potable Well	Trichloroethene	7.4E-07	4.4E-07	1.2E-07	1.3E-06	Trichloroethene	N/A	3.3E-02	- -	5.4E-03	3.8E-02
			(Total)	7.4E-07	4.4E-07	1.2E-07	1.3E-06	(Total)		3.3E-02	- -	5.4E-03	3.8E-02
						Total Risk Across Groundwater	1.3E-06					Total Hazard Index Across All Media and All Exposure Routes	3.8E-02
						Total Risk Across All Media and All Exposure Routes	1.3E-06						

TABLE 9.24
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCTY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Potable Well	Trichloroethene	1.0E-07	5.3E-08	1.9E-08	1.7E-07	Trichloroethene	N/A	1.5E-02	- -	2.9E-03	1.8E-02
			(Total)	1.0E-07	5.3E-08	1.9E-08	1.7E-07	(Total)		1.5E-02	- -	2.9E-03	1.8E-02
						Total Risk Across Groundwater	1.7E-07					Total Hazard Index Across All Media and All Exposure Routes	1.8E-02
						Total Risk Across All Media and All Exposure Routes	1.7E-07						

TABLE 9.25
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Lifelong Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Potable Well	Trichloroethene	1.3E-06	4.4E-07	1.8E-07	1.9E-06
			(Total)	1.3E-06	4.4E-07	1.8E-07	1.9E-06
						Total Risk Across Groundwater	1.9E-06
						Total Risk Across All Media and All Exposure Routes	1.9E-06

TABLE 9.26
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCTY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Lifelong Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Potable Well	Trichloroethene	2.0E-07	5.3E-08	2.8E-08	2.8E-07
			(Total)	2.0E-07	5.3E-08	2.8E-08	2.8E-07
						Total Risk Across Groundwater	2.8E-07
						Total Risk Across All Media and All Exposure Routes	2.8E-07

TABLE 10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Arsenic	--	--	--	--	Arsenic	Skin	1.1E+00	--	3.0E-04	1.1E+00
			(Total)	--	--	--	--	(Total)		1.1E+00	--	3.0E-04	1.1E+00
						Total Risk Across Soil	--					Total Hazard Index Across All Media and All Exposure Routes	1.1E+00

Total Skin HI 1.1E+00

TABLE 10.2
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	3.0E-04	--	2.7E-05	3.2E-04	1,1-Dichloroethene	Liver	--	--	--	--
			(Total)	3.0E-04	--	2.7E-05	3.2E-04	(Total)		--	--	--	--
						Total Risk Across[Groundwater]	3.2E-04						--

TABLE 10.3
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Arsenic	1.2E-04	--	6.2E-06	1.2E-04	Arsenic	Skin	3.1E+00	--	1.6E-01	3.2E+00
			(Total)	1.2E-04	--	6.2E-06	1.2E-04	(Total)		3.1E+00	--	1.6E-01	3.2E+00
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	1.1E-04	--	1.0E-05	1.2E-04	1,1-Dichloroethene	Liver	--	--	--	--
			Ethyl Ether	--	--	--	--	Ethyl Ether	N/A	1.3E+00	--	1.8E-02	1.3E+00
			Trichloroethene	--	--	--	--	Trichloroethene	N/A	6.5E+00	--	7.5E-01	7.3E+00
			Vinyl Chloride	1.0E-03	--	3.3E-05	1.1E-03	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	3.4E+00	--	1.9E-01	3.6E+00
			(Total)	1.1E-03	--	4.3E-05	1.2E-03	(Total)		1.1E+01	--	9.5E-01	1.2E+01

Total Risk Across[Soil]	1.2E-04
Total Risk Across[Groundwater]	1.2E-03
Total Risk Across All Media and All Exposure Routes	1.3E-03

Total Hazard Index Across All Media and All Exposure Routes	1.5E+01
Total Skin HI	3.2E+00
Total Blood HI	3.6E+00

TABLE 10.4
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURES
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Child Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface/Subsurface Soil	Surface/Subsurface Soil	Site 57 - Downgradient	Arsenic	--	--	--	--	Arsenic	Skin	1.0E+00	--	3.2E-02	1.1E+00
			(Total)	--	--	--	--	(Total)		1.0E+00	--	3.2E-02	1.1E+00
Groundwater	Groundwater	Site 57 - Downgradient	Trichloroethene	--	--	--	--	Trichloroethene	N/A	4.4E+00	--	4.1E-01	4.8E+00
			Vinyl Chloride	2.0E-04	--	5.2E-06	2.0E-04	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	2.3E+00	--	1.0E-01	2.4E+00
			(Total)	2.0E-04	--	5.2E-06	2.0E-04	(Total)		6.8E+00	--	5.1E-01	7.1E+00

Total Risk Across[Soil]	--
Total Risk Across[Groundwater]	2.0E-04
Total Risk Across All Media and All Exposure Routes	2.0E-04

Total Hazard Index Across All Media and All Exposure Routes	8.2E+00
Total Skin HI	1.1E+00
Total Blood HI	2.4E+00

TABLE 10.5
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Upgradient	1,1-Dichloroethene	4.4E-04	1.6E-04	5.6E-05	6.5E-04	1,1-Dichloroethene	Liver	--	--	--	--
			(Total)	4.4E-04	1.6E-04	5.6E-05	6.5E-04	(Total)		--	--	--	--
						Total Risk Across Groundwater	6.5E-04						--
						Total Risk Across All Media and All Exposure Routes	6.5E-04						

TABLE 10.6
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Surface/Subsurface Soil	Site 57 - Downgradient	Arsenic	5.1E-05	--	8.1E-05	1.3E-04	Arsenic	Skin	--	--	--	--
			(Total)	5.1E-05	--	8.1E-05	1.3E-04	(Total)		--	--	--	--
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	1.6E-04	5.9E-05	2.1E-05	2.4E-04	1,1-Dichloroethene	Liver	--	--	--	--
			Trichloroethene	6.3E-05	3.8E-05	1.0E-05	1.1E-04	Trichloroethene	N/A	2.8E+00	--	4.6E-01	3.3E+00
			Vinyl Chloride	1.5E-03	3.5E-04	7.0E-05	1.9E-03	Vinyl Chloride	N/A	--	--	--	--
			cis-1,2-Dichloroethene	--	--	--	--	cis-1,2-Dichloroethene	Blood	1.4E+00	--	1.2E-01	1.6E+00
			(Total)	1.7E-03	4.4E-04	1.0E-04	2.3E-03	(Total)		4.2E+00	--	5.7E-01	4.8E+00
						Total Risk Across[Soil]	1.3E-04					Total Hazard Index Across All Media and All Exposure Routes	4.8E+00
						Total Risk Across[Groundwater]	2.3E-03						
						Total Risk Across All Media and All Exposure Routes	2.4E-03					Total Blood HI	1.6E+00

TABLE 10.7
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Downgradient	Trichloroethene	8.6E-06	4.0E-06	1.7E-06	1.4E-05	Trichloroethene	N/A	1.3E+00	4.0E-06	2.5E-01	1.6E+00
			Vinyl Chloride	2.1E-04	3.7E-05	1.1E-05	2.6E-04	Vinyl Chloride	N/A	--	--	--	--
			(Total)	2.2E-04	4.1E-05	1.3E-05	2.7E-04	(Total)		1.3E+00	4.0E-06	2.5E-01	1.6E+00
						Total Risk Across[Groundwater]	2.7E-04					Total Hazard Index Across All Media and All Exposure Routes	1.6E+00
						Total Risk Across All Media and All Exposure Routes	2.7E-04						

TABLE 10.8
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
	Surface/Subsurface Soil	Site 57 - Downgradient	Arsenic	1.7E-04	- -	7.2E-05	2.4E-04
			(Total)	1.7E-04	- -	7.2E-05	2.4E-04
Groundwater	Groundwater	Site 57 - Downgradient	1,1-Dichloroethene	2.7E-04	5.9E-05	3.1E-05	3.6E-04
			Trichloroethene	1.1E-04	3.8E-05	1.5E-05	1.6E-04
			Vinyl Chloride	2.5E-03	3.5E-04	1.0E-04	3.0E-03
			cis-1,2-Dichloroethene	- -	- -	- -	- -
			(Total)	2.9E-03	4.4E-04	1.5E-04	3.5E-03
						Total Risk Across[Soil]	2.4E-04
						Total Risk Across[Groundwater]	3.5E-03
						Total Risk Across All Media and All Exposure Routes	3.8E-03

TABLE 10.9
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Adult Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 57 - Downgradient	Vinyl Chloride	4.0E-04	3.7E-05	1.6E-05	4.6E-04
			(Total)	4.0E-04	3.7E-05	1.6E-05	4.6E-04
						Total Risk Across[Groundwater]	4.6E-04
						Total Risk Across All Media and All Exposure Routes	4.6E-04

APPENDIX K.5

IEUBK LEAD MODELING RESULTS

HYPOTHETICAL CHILD RESIDENT EXPOSED TO DOWNGRADIENT SURFACE/SUBSURFACE SOIL
SITE 57 - FORMER DRUM STORAGE AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	102.0	102.0
1-2	102.0	102.0
2-3	102.0	102.0
3-4	102.0	102.0
4-5	102.0	102.0
5-6	102.0	102.0
6-7	102.0	102.0

Additional Dust Sources: None DEFAULT

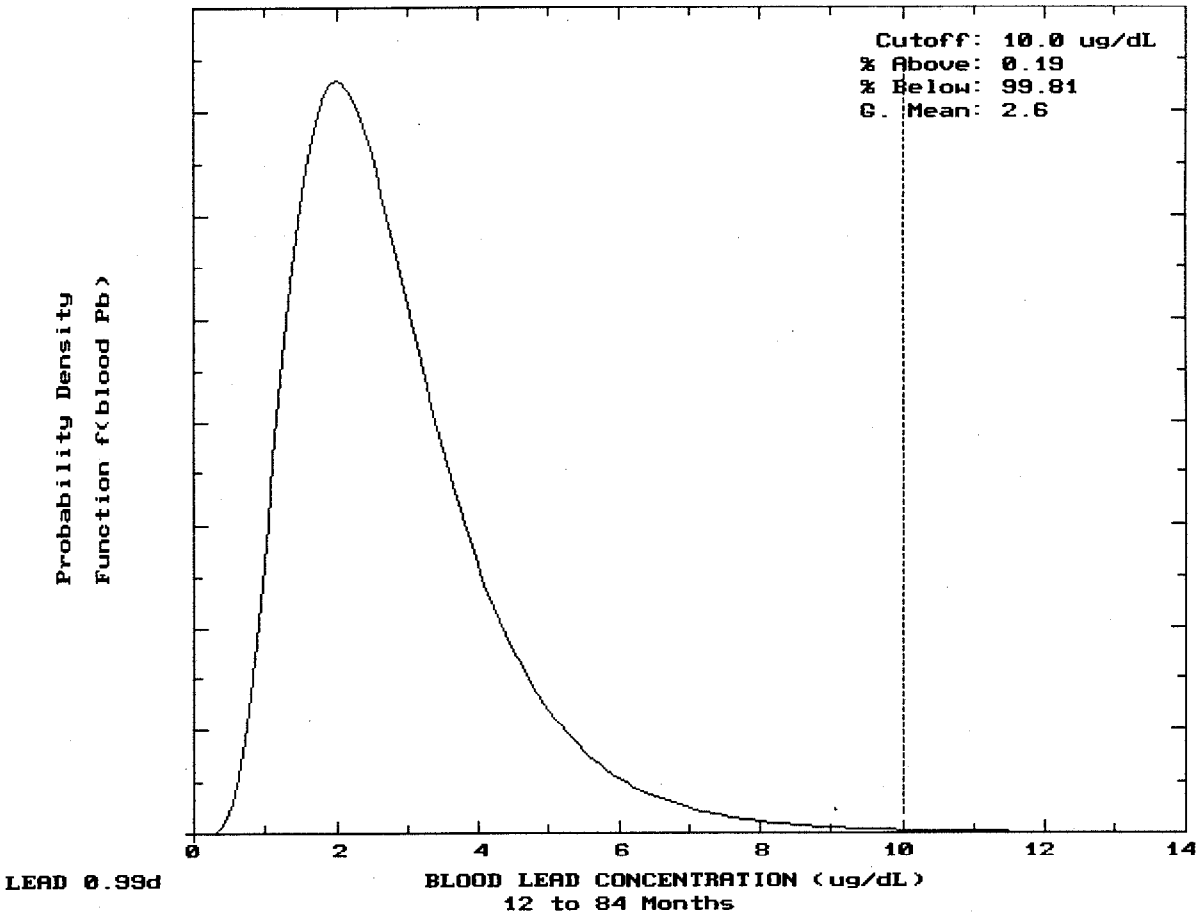
PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	3.0	5.44	2.45
1-2:	3.2	7.54	3.87
2-3:	3.0	8.00	3.89
3-4:	2.8	7.97	3.93
4-5:	2.4	6.97	2.95
5-6:	2.2	6.95	2.66
6-7:	2.0	7.15	2.52

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.60	0.38	0.00	0.02
1-2:	2.71	0.94	0.00	0.03
2-3:	3.06	0.98	0.00	0.06
3-4:	2.97	1.01	0.00	0.07
4-5:	2.89	1.06	0.00	0.07
5-6:	3.07	1.12	0.00	0.09
6-7:	3.39	1.14	0.00	0.09


Cutoff: 10.0 ug/dL
% Above: 0.19
% Below: 99.81
G. Mean: 2.6
Probability Density
Function f(blood Pb)
0
2
4
6
8
10
12
14
LEAD 0.99d
BLOOD LEAD CONCENTRATION (ug/dL)
12 to 84 Months

APPENDIX K.6

SUPPORTING CRITERIA

EPA Region III RBC Table

April 12, 1999

Drinking Water Regulations And Health Advisories

October 1996

DRINKING WATER REGULATIONS

AND HEALTH ADVISORIES

by

Office of Water
U.S. Environmental Protection Agency
Washington, D.C.

October 1996

Recycled/Recyclable
Printed on paper that contains
at least 50% recycled fiber.

These regulations and health advisory tables are revised approximately every 6 months by EPA's Office of Water. The tables may also be accessed on the Internet in the near future. The tables may be accessed from the Office of Science and Technology home page at:

http://www.epa.gov/OST.

Although no permanent mailing list is kept, copies may be ordered free of charge from the:

SAFE DRINKING WATER HOTLINE
1-800-426-4791
Monday thru Friday, 9:00 AM to 5:30 PM EST.

Publication numbers for the supportive technical documentation for the health advisories can be found on the Internet at:

http://www.wpa.gov/OST/pc/dwha.html

Copies of the supportive technical documentation for the health advisories can be order on the Internet at:

http://www.epa.gov/OST/orderpubs.html

or obtained for a fee from the:

Educational Resource Information Center (ERIC)
1929 Kenny Road
Columbus, OH 43210-1080
Telephone number (614) 292-6717
FAX (614) 292-0263
e-mail ERICSE@osu.edu
Payment by Purchase Order/check/Visa or Mastercard.

The Health Advisories available and their ERIC order numbers are included at the end of this publication. For further information regarding the Drinking Water Regulations and Health Advisories, call Barbara Corcoran in EPA's Office of Water at (202) 260-1332.

LEGEND

Abbreviations column descriptions are:

MCLG: Maximum Contaminant Level Goal. A non-enforceable concentration of a drinking water contaminant that is protective of adverse human health effects and allows an adequate margin of safety.

MCL: Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

RfD: Reference Dose. An estimate of a daily exposure to the human population that is likely to be without appreciable risk of deleterious effects over a lifetime.

DWEL: Drinking Water Equivalent Level. A lifetime exposure concentration protective of adverse, non-cancer health effects, that assumes all of the exposure to a contaminant is from a drinking water source.

The codes for the **Status Reg** and **Status HA** columns are as follows:

F	final
D	draft
L	listed for regulation
P	proposed
T	tentative (not officially proposed)

Other codes found in the table include the following:

NA	not applicable
PS	performance standard 0.5 NTU-1.0 NTU
TT	treatment technique

Large discrepancies between Lifetime and Longer-term HA values may occur because of the Agency's conservative policies, especially with regard to carcinogenicity, relative source contribution, and less-than-lifetime exposures in chronic toxicity testing. These factors can result in a cumulative UF (uncertainty factor) of up to 5 to 5000 when calculating a Lifetime HA.

The scheme for categorizing chemicals according to their carcinogenic potential is as follows:*

Group A: **Human carcinogen**	Sufficient evidence in epidemiologic studies to support causal association between exposure and cancer
Group B: **Probable human carcinogen**	Limited evidence in epidemiologic studies (Group B1) and/or sufficient evidence from animal studies (Group B2)
Group C: **Possible human carcinogen**	Limited evidence from animal studies and inadequate or no data in humans
Group D: **Not classifiable**	Inadequate or no human and animal evidence of carcinogenicity
Group E: **No evidence of carcinogenicity for humans**	No evidence of carcinogenicity in at least two adequate animal tests in different species *or* in adequate epidemiologic and animal studies

Drinking Water Health Advisories (HAs) are defined as follows:

One-day HA:	The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for up to 5 consecutive days of exposure, with a margin of safety.
Ten-day HA:	The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects up to 14 consecutive days of exposure, with a margin of safety.
Long-term HA:	The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects up to approximately 7 years (10% of an individual's lifetime) of exposure, with a margin of safety.
Lifetime HA:	The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure, with a margin of safety.

*EPA is in the process of revising the Cancer Guidelines.

Drinking Water Standards and Health Advisories

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
ORGANICS													
Acenaphthene	-	-	-	-	-	-	-	-	0.06	-	-	-	-
Acifluorfen	T	zero	-	F	2	2	0.1	0.4	0.013	0.4	-	0.1	B2
Acrylamide	F	zero	TT	F	1.5	0.3	0.02	0.07	0.0002	0.007	-	0.001	B2
Acrylonitrile	T	zero	-	D	-	-	-	-	-	-	-	0.006	B1*
Adipate (diethylhexyl)	F	0.4	0.4	-	20	20	20	60	0.6	20	0.4	3	C
Alachlor	F	zero	0.002	F	0.1	0.1	-	-	0.01	0.4	-	0.04	B2
Aldicarb**	D	0.007	0.007	D	-	-	-	-	0.001	0.035	0.007	-	D
Aldicarb sulfone**	D	0.007	0.007	D	-	-	-	-	0.001	0.035	0.007	-	D
Aldicarb sulfoxide**	D	0.007	0.007	D	-	-	-	-	0.001	0.035	0.007	-	D
Aldrin	-	-	-	D	0.0003	0.0003	0.0003	0.0003	0.00003	0.001	-	0.0002	B2
Ametryn	-	-	-	F	9	9	0.9	3	0.009	0.3	0.06	-	D
Ammonium sulfamate	-	-	-	F	20	20	20	80	0.28	8	2	-	D
Anthracene (PAH)***	-	-	-	-	-	-	-	-	0.3	-	-	-	D
Atrazine	F	0.003	0.003	F	0.1	0.1	0.05	0.2	0.035	0.2*	0.003*	-	C
Baygon	-	-	-	F	0.04	0.04	0.04	0.1	0.004	0.1	0.003	-	C
Bentazon	T	0.02	-	F	0.3	0.3	0.3	***1.0***	***0.032***	***1.0***	***0.2****	-	D
Benz(a)anthracene (PAH)	-	-	-	-	-	-	-	-	-	-	-	-	B2
Benzene	F	zero	0.005	F	0.2	0.2	-	-	-	-	-	0.1	A
Benzo(a)pyrene (PAH)	F	zero	0.0002	-	-	-	-	-	-	-	-	0.0002*	B2*
Benzo(b)fluoranthene (PAH)	-	-	-	-	-	-	-	-	-	-	-	-	B2
Benzo(g,h,i)perylene (PAH)	-	-	-	-	-	-	-	-	-	-	-	-	D
Benzo(k)fluoranthene (PAH)	-	-	-	-	-	-	-	-	-	-	-	-	B2
bis-2-Chloroisopropyl ether	-	-	-	F	4	4	4	13	0.04	1	0.3	-	D
Bromacil	L	-	-	F	5	5	3	9	0.13	5	0.09	-	C
Bromobenzene	L	-	-	D	-	-	-	-	-	-	-	-	-

* Under review.

**NOTE: The HA value or the MCLG/MCL value for any two or more of these three chemicals should remain at 0.007 mg/L because of similar mode of action.

***PAH = Polyaromatic hydrocarbon

*See 40CFR Parts 141 and 142

****Revised value based on change in RfD***

NOTE: Anthracene and Benzo(g,h,i)perylene — not proposed in Phase V.

NOTE: Changes from the last version are noted in italic and Bold Face print.

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Bromochloroacetonitrile	T	-	-	D	-	-	-	-	-	-	-	-	-
Bromochloromethane	-	-	-	F	0.1	1	0.1	0.5	0.013	0.05	0.01	-	-
Bromodichloromethane (THM)	P	zero	0.1*/0.08+	D	6	6	4	13	0.02	0.7	-	0.06	B2
Bromoform (THM)	P	zero	0.1*/0.08+	D	5	2	2	6	0.02	0.7	-	0.4	B2
Bromomethane	T	-	-	D	0.1	0.1	0.1	0.5	0.001	*0.05*	0.01	-	D
Butyl benzyl phthalate (PAE)***	-	-	-	-	-	-	-	-	0.2	7	-	-	C
Butylate	-	-	-	F	2	2	1	4	0.05	2	0.35	-	D
Butylbenzene n-	-	-	-	D	-	-	-	-	-	-	-	-	-
Butylbenzene sec-	-	-	-	D	-	-	-	-	-	-	-	-	-
Butylbenzene tert-	-	-	-	D	-	-	-	-	-	-	-	-	-
Carbaryl	-	-	-	F	1	1	1	1	0.1	4	0.7	-	D
Carbofuran	F	0.04	0.04	F	0.05	0.05	0.05	0.2	0.005	0.2	0.04	-	E
Carbon tetrachloride	F	zero	0.005	F	4	0.2	0.07	0.3	0.0007	0.03	-	0.03	B2
Carboxin	-	-	-	F	1	1	1	4	0.1	4	0.7	-	D
Chloral hydrate	P	0.04	0.06**	D	7	0.2	0.2	0.6	0.0002	0.06	0.06	-	C
Chloramben	-	-	-	F	3	3	0.2	0.5	0.015	0.5	0.1	-	D
Chlordane	F	zero	0.002	F	0.06	0.06	-	-	0.00006	0.002	-	0.003	B2
Chlorodibromomethane (THM)	P	0.06	0.1*/0.08+	D	6	6	2	8	0.02	0.7	0.06	-	C
Chloroethane	L	-	-	D	-	-	-	-	-	-	-	-	B
Chloroform (THM)	P	zero	0.1*/0.08+	D	4	4	0.1	0.4	0.01	0.4	-	0.6	B2
Chloromethane	L	-	-	F	9	0.4	0.4	1	0.004	0.1	0.003	-	C
Chlorophenol (2-)	-	-	-	D	0.5	0.5	0.5	2.0	0.005	0.2	0.04	-	D
p-Chlorophenyl methyl sulfide/sulfone/sulfoxide	-	-	-	**	-	-	-	-	-	-	-	-	D
Chloroplorin	L	-	-	-	-	-	-	-	-	-	-	-	-
Chlorothalonil	-	-	-	F	0.2	0.2	0.2	0.5	0.015	0.5	-	0.15	B2
Chlorotoluene o-	L	-	-	F	2	2	2	7	0.02	0.7	0.1	-	D
Chlorotoluene p-	L	-	-	F	2	2	2	7	0.02	0.7	0.1	-	D
Chlorpyrifos	-	-	-	F	0.03	0.03	0.03	0.1	0.003	0.1	0.02	-	D
Chrysene (PAH)	-	-	-	-	-	-	-	-	-	-	-	-***	B2
Cyanazine****	T	0.001	-	D	0.1	0.1	0.02	0.07	0.002	0.07	0.001****	-	C

* Current MCL **A HA will not be developed due to insufficient data; a "Database Deficiency Report has been published.

+ 1994 Proposed rule for Disinfectants and Disinfection By-products : Total for all THMs combined cannot exceed the 0.08 level.

**Total for all haloacetic acids cannot exceed 0.06 level. ***PAE = phthalate acid ester ****Draft HA updated for the Phase VIB regulation, which has been postponed. It includes the change of the cancer classification from D to C, thus justifying the use of an additional 10-fold safety factor for the lifetime HA.

Drinking Water Standards and Health Advisories

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Cyanogen chloride	T	-	-	-	-	-	-	-	-	-	-	-	-
Cymene p-	-	-	-	D	-	-	-	-	-	-	-	-	-
2,4-D	F	0.07	0.07	F	1	0.3	0.1	0.4	0.01	0.4	0.07	-	D
DCPA (Dacthal)	L	-	-	F	80	80	5	20	0.01	-	-	-	D
Dalapon	F	0.2	0.2	F	3	3	0.3	0.9	0.026	0.9	0.2	-	D
Di(2-ethylhexyl)adipate	F	0.4	0.4	-	20	20	20	60	0.6	20	0.4	3	C
Diazinon	-	-	-	F	0.02	0.02	0.005	0.02	0.00009	0.003	0.0006	-	E
Dibromoacetonitrile	L	-	-	D	2	2	2	8	0.02	0.8	0.02	-	C
Dibromochloropropane (DBCP)	F	zero	0.0002	F	0.2	0.05	-	-	-	-	-	0.003	B2
Dibromomethane	L	-	-	-	-	-	-	-	-	-	-	-	D
Dibutyl phthalate (PAE)	-	-	-	-	-	-	-	-	0.1	4	-	-	D
Dicamba	L	-	-	F	0.3	0.3	0.3	1	0.03	1	0.2	-	D
Dichloroacetaldehyde	L	-	-	D	-	-	-	-	-	-	-	-	-
Dichloroacetic acid	P	zero	0.06**	D	1	1	1	4	0.004	0.1	-	-**	B2
Dichloroacetonitrile	L	-	-	D	1	1	0.8	3	0.008	0.3	0.006	-	C
Dichlorobenzene o-	F	0.6	0.6	F	9	9	9	30	0.09	3	0.6	-	D
Dichlorobenzene m- *	-	-	-	F	9	9	9	30	0.09	3	0.6	-	D
Dichlorobenzene p-	F	0.075	0.075	F	10	10	10	40	0.1	4	0.075	-	C
Dichlorodifluoromethane	L	-	-	F	40	40	9	30	0.2	5	1	-	D
Dichloroethane (1,2-)	F	zero	0.005	F	0.7	0.7	0.7	2.6	-	-	-	0.04	B2
Dichloroethylene (1,1-)	F	0.007	0.007	F	2	1	1	4	0.009	0.4	0.007	-	C
Dichloroethylene (cis-1,2-)	F	0.07	0.07	F	4	3	3	11	0.01	0.4	0.07	-	D
Dichloroethylene (trans-1,2-)	F	0.1	0.1	F	20	2	2	6	0.02	0.6	0.1	-	D
Dichloromethane	F	zero	0.005	F	10	2	-	-	0.06	2	-	0.5	B2
Dichlorophenol (2,4-)	-	-	-	D	0.03	0.03	0.03	0.1	0.003	0.1	0.02	-	D
Dichloropropane (1,1-)	-	-	-	D	-	-	-	-	-	-	-	-	-
Dichloropropane (1,2-)	F	zero	0.005	F	-	0.09	-	-	-	-	-	0.06	B2
Dichloropropane (1,3-)	L	-	-	D	-	-	-	-	-	-	-	-	-

* The values for m-dichlorobenzene are based on data for o-dichlorobenzene.

** A quantitative risk estimate has not been determined.

** Total for all haloacetic acids cannot exceed 0.06 level.

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Dichloropropane (2,2-)	L	-	-	D	-	-	-	-	-	-	-	-	-
Dichloropropene (1,1-)	L	-	-	D	-	-	-	-	-	-	-	-	-
Dichloropropene (1,3-)	T	zero	-	F	0.03	0.03	0.03	0.09	0.0003	0.01	-	0.02	B2
Dieldrin	-	-	-	F	0.0005	0.0005	0.0005	0.002	0.00005	0.002	-	0.0002	B2
Diethyl phthalate (PAE)	-	-	-	D	-	-	-	-	0.8	30	5	-	D
Diethylene glycol dinitrate	-	-	-	*	-	-	-	-	-	-	-	-	-
Di(2-ethylhexyl)phthalate (PAE)	F	zero	0.006	D	-	-	-	-	0.02	0.7	-	0.3	B2
Diisopropyl methylphosphonate	-	-	-	F	8	8	8	30	0.08	3	0.6	-	D
Dimethrin	-	-	-	F	10	10	10	40	0.3	10	2	-	D
Dimethyl methylphosphonate	-	-	-	F	2	2	2	6	0.2	7	0.1	0.7	C
Dimethyl phthalate (PAE)	-	-	-	-	-	-	-	-	-	-	-	-	D
1,3-Dinitrobenzene	-	-	-	F	0.04	0.04	0.04	0.14	0.0001	0.005	0.001	-	D
Dinitrotoluene (2,4-)	L	-	-	F	0.50	0.50	0.30	1	0.002	0.1	-	0.005	B2
Dinitrotoluene (2,6-)	L	-	-	F	0.40	0.40	0.40	1	0.001	0.04	-	0.005	B2
tg 2,6 & 2,4 dinitrotoluene **	-	-	-	-	-	-	-	-	-	-	-	0.005	B2
Dinoseb	F	0.007	0.007	F	0.3	0.3	0.01	0.04	0.001	0.04	0.007	-	D
Dioxane p-	-	-	-	F	4	0.4	-	-	-	-	-	0.7	B2
Diphenamid	-	-	-	F	0.9	0.3	0.3	1	0.03	1	0.2	-	D
Diphenylamine	-	-	-	F	1	1	0.3	1	0.03	1	0.2	-	D
Diquat	F	0.02	0.02	-	-	-	-	-	0.0022	0.08	0.02	-	D
Disulfoton	-	-	-	F	0.01	0.01	0.003	0.009	0.00004	0.001	0.0003	-	E
Dithiane (1,4-)	-	-	-	F	0.4	0.4	0.4	1	0.01	0.4	0.08	-	D
Diuron	-	-	-	F	1	1	0.3	0.9	0.002	0.07	0.01	-	D
Endothall	F	0.1	0.1	F	0.8	0.8	0.2	0.2	0.02	0.7	0.1	-	D
Endrin	F	0.002	0.002	F	0.02	0.02	0.003	0.01	0.0003	0.01	0.002	-	D
Epichlorohydrin	F	zero	TT	F	0.1	0.1	0.07	0.07	0.002	0.07	-	0.4	B2
Ethylbenzene	F	0.7	0.7	F	30	3	1	3	0.1	3	0.7	-	D
Ethylene dibromide (EDB)	F	zero	0.00005	F	0.008	0.008	-	-	-	-	-	0.00004	B2
Ethylene glycol	-	-	-	F	20	6	6	20	2	40	7	-	D
ETU	L	-	-	F	0.3	0.3	0.1	0.4	0.00008	0.003	-	0.03	B2
Fenamiphos	-	-	-	F	0.009	0.009	0.005	0.02	0.00025	0.009	0.002	-	D

* An HA will not be developed due to insufficient data; a "Database Deficiency Report" has been published.

** tg = technical grade

Drinking Water Standards and Health Advisories

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Fluometron	-	-	-	F	2	2	2	5	0.013	0.4	0.09		D
Fluorene (PAH)	-	-	-	-	-	-	-	-	0.04	-	-	-	D
Fluorotrichloromethane	L	-	-	F	7	7	3	10	0.3	10	2	-	D
Fog Oil	-	-	-	D	-	-	-	-	-	-	-	-	-
Fonofos	-	-	-	F	0.02	0.02	0.02	0.07	0.002	0.07	0.01	-	D
Formaldehyde	D	-	-	D	10	5	5	20	0.15	5	1	-	B1**
Gasoline, unleaded (benzene)	-	-	-	D	-	-	-	-	-	-	0.005	-	-
Glyphosate	F	0.7	0.7	F	20	20	1	1	0.1	4	0.7	-	E
Heptachlor	F	zero	0.0004	F	0.01	0.01	0.005	0.005	0.0005	0.02	-	0.0008	B2
Heptachlor epoxide	F	zero	0.0002	F	0.01	-	0.0001	0.0001	1E-5	0.0004	-	0.0004	B2
Hexachlorobenzene	F	zero	0.001	F	0.05	0.05	0.05	0.2	0.0008	0.03	-	0.002	B2
Hexachlorobutadiene	T	0.001	-	F	0.3	0.3	0.1	0.4	0.002	0.07	0.001	-	C
Hexachlorocyclopentadiene	F	0.05	0.05	-	-	-	-	-	0.007	0.2	-	-	D
Hexachloroethane	L	-	-	F	5	5	0.1	0.5	0.001	0.04	0.001	-	C
Hexane (n-)	-	-	-	F	10	4	4	10	-	-	-	-	D
Hexazinone	-	-	-	F	3	3	3	9	0.033*	1*	0.2*	-	D
HMX	-	-	-	F	5	5	5	20	0.05	2	0.4	-	D
Indeno(1,2,3,-c,d)pyrene (PAH)	-	-	-	D	-	-	-	-	-	-	-	-***	B2
Isophorone	L	-	-	F	15	15	15	15	0.2	7	0.1	4	C
Isopropyl methylphosphonate	-	-	-	D	30	30	30	100	0.1	4.0	0.7	-	D
Isopropylbenzene	-	-	-	D	-	-	-	-	-	-	-	-	-
Lindane	F	0.0002	0.0002	F	1	1	0.03	0.1	0.0003	0.01	0.0002	-	C
Malathion	-	-	-	F	0.2	0.2	0.2	0.8	0.02	0.8	0.2	-	D
Maleic hydrazide	-	-	-	F	10	10	5	20	0.5	20	4	-	D
MCPA	-	-	-	F	0.1	0.1	0.1	0.4	0.0015	0.05	0.01	-	E
Methomyl	L	-	-	F	0.3	0.3	0.3	0.3	0.025	0.9	0.2	-	D
Methoxychlor	F	0.04	0.04	F	0.05	0.05	0.05	0.2	0.005	0.2	0.04	-	D
Methyl ethyl ketone*	-	-	-	F	-	-	-	-	-	-	-	-	D
Methyl parathion	-	-	-	F	0.3	0.3	0.03	0.1	0.00025	0.009	0.002	-	D

* Under review.

** Carcinogenicity based on inhalation exposure.

***See 40CFR Parts 141 and 142

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Methyl tert butyl ether	L	-	-	D	24	24	3	12	0.03	1.0	0.02-0.2+		C***
Metolachlor	L	-	-	F	2	2	2	5.0	0.1	3.5	0.07	-	C
Metribuzin	L	-	-	F	5	5	0.3	0.5	0.013**	0.5	0.1	-	D
Monochloroacetic acid	L	-	-	D	-	-	-	-	-	-	-	-	-
Monochlorobenzene	F	0.1	0.1	F	2	2	2	7	0.02	0.7	0.1	-	D
Naphthalene	-	-	-	F	0.5	0.5	0.4	1	0.004	0.1	0.02	-	D
Nitrocellulose (non-toxic)	-	-	-	F	-	-	-	-	-	-	-	-	-
Nitroguanidine	-	-	-	F	10	10	10	40	0.1	4	0.7	-	D
Nitrophenol p-	-	-	-	F	0.8	0.8	0.8	3	0.008	0.3	0.06	-	D
Oxamyl (Vydate)	F	0.2	0.2	F	0.2	0.2	0.2	0.9	0.025	0.9	0.2	-	E
Paraquat	-	-	-	F	0.1	0.1	0.05	0.2	0.0045	0.2	0.03	-	E
Pentachloroethane	-	-	-	D	-	-	-	-	-	-	-	-	-
Pentachlorophenol	F	zero	0.001	F	1	0.3	0.3	1	0.03	1	-	0.03	B2
Phenanthrene (PAH)	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	-	-	-	D	6	6	6	20	0.6	20	4	-	D
Picloram	F	0.5	0.5	F	20	20	0.7	2	0.07	2	0.5	-	D
Polychlorinated biphenyls (PCBs)	F	zero	0.0005	P	-	-	-	-	-	-	-	0.0005	B2
Prometon	L	-	-	F	0.2	0.2	0.2	0.5	0.015*	0.5*	0.1*	-	D
Pronamide	-	-	-	F	0.8	0.8	0.8	3	0.075	3	0.05	-	C
Propachlor	-	-	-	F	0.5	0.5	0.1	0.5	0.013	0.5	0.09	-	D
Propazine	-	-	-	F	1	1	0.5	2	0.02	0.7	0.01	-	C
Propham	-	-	-	F	5	5	5	20	0.02	0.6	0.1	-	D
Propylbenzene n-	-	-	-	D	-	-	-	-	-	-	-	-	-
Pyrene (PAH)	-	-	-	-	-	-	-	-	0.03	-	-	-	D
RDX	-	-	-	F	0.1	0.1	0.1	0.4	0.003	0.1	0.002	0.03	C
Simazine	F	0.004	0.004	F	0.07	0.07	0.07	0.07	0.005	0.2	0.004	-	C
Styrene	F	0.1	0.1	F	20	2	2	7	0.2	7	0.1	-	C
2,4,5-T	L	-	-	F	0.8	0.8	0.8	1	0.01	0.35	0.07	-	D
2,3,7,8-TCDD (Dioxin)	F	zero	3E-08	F	1E-06	1E-07	1E-08	4E-08	1E-09	4E-08	-	2E-08	B2

* Under review. NOTE: Phenanthrene — not proposed.

** The RfD for metribuzin was revised Dec. 1994 to 0.013 mg/kg/day. Based on this revised RfD the Lifetime HA would be 0.1 mg/l assuming a 20% relative source contribution for drinking water. This information has not been incorporated in the Health Advisory document.

*** Tentative.

+ If the cancer classification C is accepted, the Lifetime HA is *0.02*; otherwise it is 0.200 mg/L

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg /day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Tebuthiuron	-	-	-	F	3	3	0.7	2	0.07	2	0.5	-	D
Terbacil	-	-	-	F	0.3	0.3	0.3	0.9	0.013	0.4	0.09	-	E
Terbufos	-	-	-	F	0.005	0.005	0.001	0.005	0.00013	0.005	0.0009	-	D
Tetrachloroethane (1,1,1,2-)	L	-	-	F	2	2	0.9	3	0.03	1	0.07	0.1	C
Tetrachloroethane (1,1,2,2-)	L	-	-	D	-	-	-	-	-	-	-	-	-
Tetrachloroethylene	F	zero	0.005	F	2	2	1	5	0.01	0.5	-	0.07	-
Tetranitromethane	-	-	-	**	-	-	-	-	-	-	-	-	-
Toluene	F	1	1	F	20	2	2	7	0.2	7	1	-	D
Toxaphene	F	zero	0.003	F	-	-	-	-	0.1*	-	-	0.003	B2
2,4,5-TP	F	0.05	0.05	F	0.2	0.2	0.07	0.3	0.0075	0.3	0.05	-	D
1,1,2-Trichloro-1,2,2-trifluoroethane	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroacetic acid	P	0.3	0.06**	D	4	4	4	13	0.1	4.0	0.3	-	C
Trichloroacetonitrile	L	-	-	D	0.05	0.05	-	-	-	-	-	-	-
Trichlorobenzene (1,2,4-)	F	0.07	0.07	F	0.1	0.1	0.1	0.5	0.01	0.04	0.07	-	D
Trichlorobenzene (1,3,5-)	-	-	-	F	0.6	0.6	0.6	2	0.006	0.2	0.04	-	D
Trichloroethane (1,1,1-)	F	0.2	0.2	F	100	40	40	100	0.035	1	0.2	-	D
Trichloroethane (1,1,2-)	F	0.003	0.005	F	0.6	0.4	0.4	1	0.004	0.1	0.003	-	C
Trichloroethanol (2,2,2-)	L	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene	F	zero	0.005	F	-	-	-	-	-	0.3	-	0.3	B2
Trichlorophenol (2,4,6-)	L	-	-	D	-	-	-	-	-	-	-	0.3	B2
Trichloropropane (1,1,1-)	-	-	-	D	-	-	-	-	-	-	-	-	-
Trichloropropane (1,2,3-)	L	-	-	F	0.6	0.6	0.6	2	0.006	0.2	0.04	0.5	B2
Trifluralin	L	-	-	F	0.08	0.08	0.08	0.3	0.0075	0.3	0.005	0.5	C
Trimethylbenzene (1,2,4-)	-	-	-	D	-	-	-	-	-	-	-	-	-
Trimethylbenzene (1,3,5-)	-	-	-	D	-	-	-	-	-	-	-	-	-
Trinitroglycerol	-	-	-	F	0.005	0.005	0.005	0.005	-	-	0.005	-	-
Trinitrotoluene	-	-	-	F	0.02	0.02	0.02	0.02	0.0005	0.02	0.002	0.1	C
Vinyl chloride	F	zero	0.002	F	3	3	0.01	0.05	-	-	-	0.0015	A
Xylenes	F	10	10	F	40	40	40	100	2	60	10	-	D

* Under review.

** A HA will not be developed due to insufficient data; a "Database Deficiency Report" has been published.

** Total for all haloacetic acids cannot exceed 0.06 mg/l level.

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg /day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
INORGANICS													
Aluminum	L	-	-	D	-	-	-	-	-	-	-	-	-
Ammonia	-	-	-	D	-	-	-	-	-	-	30	-	D
Antimony	F	0.006	0.006	F	0.01	0.01	0.01	0.015	0.0004	0.01	0.003	-	D
Arsenic	*	-	0.05	D	-	-	-	-	-	-	-	0.002	A
Asbestos (fibers/l >10μm length)	F	7 MFL	7 MFL	-	-	-	-	-	-	-	-	700 MFL	A
Barium	F	2	2	F	-	-	-	-	0.07	2	2	-	D
Beryllium	F	0.004	0.004	D	30	30	4	20	0.005	0.2	-	0.0008	B2
Boron	L	-	-	D	4	0.9	0.9	3	0.09	3	0.6	*	D
Bromate	L	zero	0.01	-	-	-	-	-	-	-	-	-	-
Cadmium	F	0.005	0.005	F	0.04	0.04	0.005	0.02	0.0005	0.02	0.005	-	D
Chloramine	P	4***	4	D	1	1	1	1	0.1	3.3	3/4***	-	-
Chlorate	L	-	-	D	-	-	-	-	-	-	-	-	-
Chlorine	P	4	4	D	-	-	-	-	0.1	-	-	-	D
Chlorine dioxide	T	0.3	0.8	D	-	-	-	-	0.01	0.35	0.3	-	D
Chlorite	L	0.08	1	D	-	-	-	-	0.003	0.1	0.08	-	D
Chromium (total)	F	0.1	0.1	F	1	1	0.2	0.8	0.005	0.2	0.1	-	D
Copper (at tap)	F	1.3	TT**	-	-	-	-	-	-	-	-	-	D
Cyanide	F	0.2	0.2	F	0.2	0.2	0.2	0.8	0.022	0.8	0.2	-	D
Fluoride*	F	4	4	-	-	-	-	-	0.12	-	-	-	-
Hypochlorite	P	4[1]	-	-	-	-	-	-	-	-	-	-	-
Hypochlorous acid	P	4[1]	-	-	-	-	-	-	-	-	-	-	-
Lead (at tap)	F	zero	TT**	-	-	-	-	-	-	-	-	-	B2
Manganese	L	-	-	-	-	-	-	-	0.14[2]	-	-	-	-
Mercury (inorganic)	F	0.002	0.002	F	-	-	-	0.002	0.0003	0.01	0.002	-	D
Molybdenum	L	-	-	D	*0.02*	*0.02*	*0.01*	0.05	0.005	0.2	0.04	-	D
Nickel	F	0.1[4]	0.1[4]	F	1	1	0.5	1.7	0.02	0.8	0.1	-	D
Nitrate (as N)	F	10	10	F	-	10*	-	-	1.6	-	-	-	*

* Under review.
** Copper — action level 1.3 mg/L, Lead — action level 0.015 mg/L
*** Measured as free chlorine.
[1] Regulated as chlorine.
[2] In food.
[3] In water.
[4] Being remanded

Drinking Water Standards and Health Advisories

October 1996

Chemicals	Standards			Status HA	Health Advisories								Cancer Group
					10-kg Child			70-kg Adult					
	Status Reg.	MCLG (mg/l)	MCL (mg/l)		One-day (mg/l)	Ten-day (mg/l)	Longer-term (mg/l)	Longer-term (mg/l)	RfD (mg/kg/day)	DWEL (mg/l)	Lifetime (mg/l)	mg/l at 10^{-4} Cancer Risk	
Nitrite (as N)	F	1	1	F	-	1*	-	-	0.16*	-	-	-	*
Nitrate + Nitrite (both as N)	F	10	10	F	-	-	-	-	-	-	-	-	-
Selenium	F	0.05	0.05	-	-	-	-	-	0.005	-	-	-	D
Silver	-	-	-	D	0.2	0.2	0.2	0.2	0.005	0.2	0.1	-	-
Sodium	-	-	-	D	-	-	-	-	-	20**	-	-	D
Strontium	L	-	-	D	25	25	25	90	0.6	90	17	-	-
Sulfate	P	500	500	D	-	-	-	-	-	-	-	-	-
Thallium	F	0.0005	0.002	F	0.007	0.007	0.007	0.02	0.00007	0.0023	0.0005	-	D
Vanadium	T	-	-	D	-	-	-	-	-	-	-	-	D
White phosphorous	-	-	-	F	-	-	-	-	0.00002	0.0005	0.0001		D
Zinc	L	-	-	D	6	6	3	10	0.3	10	2	-	D
Zinc chloride (measured as Zinc)	L	-	-	F	6	6	3	10	0.3	10	2	-	
RADIONUCLIDES													
Beta particle and photon activity (formerly man-made radionuclides)	F	++	4 mrem	-	-	-	-	-	-	-	-	4 mrem/y	A
Gross alpha particle activity	F	++	15 pCi/L	-	-	-	-	-	-	-	-	15 pCi/L	A
Combined Radium 226 & 228	F	++	5 pCi/L	-	-	-	-	-	-	-	-	20 pCi/L	A
Radon+	P	zero	300 pCi/L	-	-	-	-	-	-	-	-	150 pCi/L	A
Uranium+	P	zero	20 µg/L	-	-	-	-	-	0.003	-	-	*	A

* Under review. ** Guidance.
+ 1991 Proposed National Primary Drinking Water Rule for Radionuclides
++No final MCLG, but zero proposed in 1991.

Secondary Maximum Contaminant Levels

Chemicals	Status	SMCLs (mg/L)
Aluminum	F	0.05 to 0.2
Chloride	F	250
Color	F	15 color units
Copper	F	1.0
Corrosivity	F	non-corrosive
Fluoride*	F	2.0
Foaming agents	F	0.5
Iron	F	0.3
Manganese	F	0.05
Odor	F	3 threshold odor numbers
pH	F	6.5 — 8.5
Silver	F	0.1
Sulfate	F	250
Total dissolved solids (TDS)	F	500
Zinc	F	5

Status Codes: P — proposed, F — final

* Under review.

Secondary Drinking Water Standards are unenforceable federal guidelines regarding taste, odor, color and certain other non-aesthetic effects of drinking water. EPA recommends them to the States as reasonable goals, but federal law does not require water systems to comply with them. States may, however, adopt their own enforceable regulations governing these concerns. To be safe, check your State's drinking water rules.

Microbiology

	Status	MCLG	MCL
Cryptosporidium	L	-	-
Giardia lamblia	F	zero	TT
Legionella	F#	zero	TT
Standard Plate Count	F#	NA	TT
Total Coliforms	F	zero	**
Turbidity	F	NA	PS
Viruses	F#	zero	TT

Key: PS, TT, F, defined as previously stated.

\# Final for systems using surface water; also being considered for regulation under groundwater disinfection rule.

Federal Ambient Water Quality Criteria

April 1999

United States
Environmental Protection
Agency

Office of Water
4304

EPA 822-Z-99-001
April 1999

EPA

National Recommended Water Quality Criteria– Correction

SUMMARY: EPA is publishing a compilation of its national recommended water quality criteria for 157 pollutants, developed pursuant to section 304(a) of the Clean Water Act (CWA or the Act). These recommended criteria provide guidance for States and Tribes in adopting water quality standards under section 303(c) of the CWA. Such standards are used in implementing a number of environmental programs, including setting discharge limits in National Pollutant Discharge Elimination System (NPDES) permits. These water quality criteria are not regulations, and do not impose legally binding requirements on EPA, States, Tribes or the public.

This notice also describes changes in EPA s process for deriving new and revised 304(a) criteria. Comments provided to the Agency about the content of this Notice will be considered in future publications of water quality criteria and in carrying out the process for deriving water quality criteria. With this improved process the public will have more opportunity to provide data and views for consideration by EPA. The public may send any comments or observations regarding the compilation format or the process for deriving new or revised water quality criteria to the Agency now, or anytime while the process is being implemented.

ADDRESSES: A copy of the notice, "National Recommended Water Quality Criteria" is available from the U.S. EPA, National Center for Environmental Publications and Information, 11029 Kenwood Road, Cincinnati, Ohio, 45242, phone (513) 489-8190. The publication is also available electronically at: http://www.epa.gov/ost. Send an original and 3 copies of written comments to W-98-24 Comment Clerk, Water Docket, MC 4104, US EPA, 401 M Street, S.W., Washington, D.C. 20460. Comments may also be submitted electronically to OW-Docket@epamail.epa.gov. Comments should be submitted as a WP5.1, 6.1 or an ASCII file with no form of encryption. The documents cited in the compilation of recommended criteria are available for inspection from 9:00 to 4:00 p.m., Monday through Friday, excluding legal holidays, at the Water Docket, EB57, East Tower Basement, USEPA, 401 M St., S.W., Washington, D.C., 20460. For access to these materials, please call (202) 260-3027 to schedule an appointment.

FOR FURTHER INFORMATION CONTACT: Cindy A. Roberts, Health and Ecological Criteria Division (4304), U.S. EPA, 401 M. Street, S.W., Washington, D.C., 20460; (202) 260-2787; roberts.cindy@epamail.epa.gov.

SUPPLEMENTARY INFORMATION:

I. What are Water Quality Criteria?

Section 304(a)(1) of the Clean Water Act requires EPA to develop and publish, and from time to time revise, criteria for water quality accurately reflecting the latest scientific knowledge. Water quality criteria developed under section 304(a) are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. Section 304(a) criteria do not reflect consideration of economic impacts or the technological feasibility of meeting the chemical concentrations in ambient water. Section 304(a) criteria provide guidance to States and Tribes in adopting water quality standards that ultimately provide a basis for controlling discharges or releases of pollutants. The criteria also provide

guidance to EPA when promulgating federal regulations under section 303(c) when such action is necessary.

II. What is in the Compilation Published Today?

EPA is today publishing a compilation of its national recommended water quality criteria for 157 pollutants. This compilation is also available in hard copy at the address given above.

The compilation is presented as a summary table containing EPA s water quality criteria for 147 pollutants, and for an additional 10 pollutants, criteria solely for organoleptic effects. For each set of criteria, EPA lists a *Federal Register* citation, EPA document number or Integrated Risk Information System (IRIS) entry (www.epa.gov/ngispgm3/iris/irisdat). Specific information pertinent to the derivation of individual criteria may be found in cited references. If no criteria are listed for a pollutant, EPA does not have any national recommended water quality criteria.

These water quality criteria are the Agency s current recommended 304(a) criteria, reflecting the latest scientific knowledge. They are generally applicable to the waters of the United States. EPA recommends that States and Tribes use these water quality criteria as guidance in adopting water quality standards pursuant to section 303(c) of the Act and the implementing federal regulations at 40 CFR 131. Water quality criteria derived to address site-specific situations are not included; EPA recommends that States and Tribes follow EPA's technical guidance in the "Water Quality Standards Handbook - 2nd Edition," EPA, August 1994, in deriving such site-specific criteria. EPA recognizes that in limited circumstances there may be regulatory voids in the absence of State or Tribal water quality standards for specific pollutants. However, States and Tribes should utilize the existing State and Tribal narrative criteria to address such situations; States and Tribes may consult EPA criteria documents and cites in the summary table for additional information.

The national recommended water quality criteria include: previously published criteria that are unchanged; criteria that have been recalculated from earlier criteria; and newly calculated criteria, based on peer-reviewed assessments, methodologies and data, that have not been previously published.

The information used to calculate the water quality criteria is not included in the summary table. Most information has been previously published by the Agency in a variety of sources, and the summary table cites those sources.

When using these 304(a) criteria as guidance in adopting water quality standards, EPA recommends States and Tribes consult the citations referenced in the summary table for additional information regarding the derivation of individual criteria.

The Agency intends to revise the compilation of national recommended water quality criteria from time to time to keep States and Tribes informed as to the most current recommended water quality criteria.

III. How Are National Recommended Water Quality Criteria Used?

Once new or revised 304(a) criteria are published by EPA, the Agency expects States and Tribes to adopt promptly new or revised numeric water quality criteria into their standards consistent with one of the three options in 40 CFR 131.11. These options are: (1) adopt the recommended section 304(a) criteria; (2) adopt section 304(a) criteria modified to reflect site-specific conditions; or, (3) adopt criteria derived using other scientifically defensible methods. In adopting criteria under option (2) or (3), States and Tribes must adopt water quality criteria sufficient to protect the designated uses of their waters. When establishing a numerical value based on 304(a) criteria, States and Tribes may reflect site specific conditions or use other scientifically defensible methods. However, States and Tribes should not selectively apply data or selectively use endpoints, species, risk levels, or exposure parameters in deriving criteria; this would not accurately characterize risk and would not result in criteria protective of designated uses.

EPA emphasizes that, in the course of carrying out its responsibilities under section 303(c), it reviews State and Tribal water quality standards to assess the need for new or revised water quality criteria. EPA generally believes that five years from the date of EPA s publication of new or revised water quality criteria is a reasonable time by which States and Tribes should take action to adopt new or revised water quality criteria necessary to protect the designated uses of their waters. This period is intended to accommodate those States and Tribes that have begun a triennial review and wish to complete the actions they have underway, deferring initiating adoption of new or revised section 304(a) criteria until the next triennial review.

IV. What is the Status of Existing Criteria While They Are Under Revision?

The question of the status of the existing section 304(a) criteria often arises when EPA announces that it is beginning a reassessment of existing criteria. The general answer is that water quality criteria published by EPA remain the Agency s recommended water quality criteria until EPA revises or withdraws the criteria. For example, while undertaking recent reassessments of dioxin, PCBs, and other chemicals, EPA has consistently upheld the use of the current section 304(a) criteria for these chemicals and considers them to be scientifically sound until new, peer reviewed, scientific assessments indicate changes are needed. Therefore, the criteria in today s notice are and will continue to be the Agency s national recommended water quality criteria for States and Tribes to use in adopting or revising their water quality standards until superseded by the publication of revised criteria, or withdrawn by notice in the *Federal Register*.

V. What is the Process for Developing New or Revised Criteria?

Section 304(a)(1) of the CWA requires the Agency to develop and publish, and from time to time revise, criteria for water quality accurately reflecting the latest scientific knowledge. The Agency has developed an improved process that it intends to use when deriving new criteria or conducting a major reassessment of existing criteria. The purpose of the improved process is to

provide expanded opportunities for public input, and to make the process more efficient.

When deriving new criteria, or when initiating a major reassessment of existing criteria, EPA will take the following steps.

1. EPA will first undertake a comprehensive review of available data and information.

2. EPA will publish a notice in the *Federal Register* and on the Internet announcing its assessment or reassessment of the pollutant. The notice will describe the data available to the Agency, and will solicit any additional pertinent data or views that may be useful in deriving new or revised criteria. EPA is especially interested in hearing from the public regarding new data or information that was unavailable to the Agency, and scientific views as to the application of the relevant Agency methodology for deriving water quality criteria.

3. After public input is received and evaluated, EPA will then utilize information obtained from both the Agency s literature review and the public to develop draft recommended water quality criteria.

4. EPA will initiate a peer review of the draft criteria. Agency peer review consists of a documented critical review by qualified independent experts. Information about EPA peer review practices may be found in the Science Policy Council s Peer Review Handbook (EPA 100-B-98-001, www.epa.gov).

5. Concurrent with the peer review in step four, EPA will publish a notice in the *Federal Register* and on the Internet, of the availability of the draft water quality criteria and solicit views from the public on issues of science pertaining to the information used in deriving the draft criteria. The Agency believes it is important to provide the public with the opportunity to provide scientific views on the draft criteria even though we are not required to invite and respond to written comments.

6. EPA will evaluate the results of the peer review, and prepare a response document for the record in accordance with EPA's Peer Review Handbook. EPA at the same time will consider views provided by the public on issues of science. Major scientific issues will be addressed in the record whether from the peer review or the public.

7. EPA will then revise the draft criteria as necessary, and announce the availability of the final water quality criteria in the *Federal Register* and on the Internet.

VI. What is the Process for Minor Revisions to Criteria?

In addition to developing new criteria, and conducting major reassessments of existing criteria, EPA also from time to time recalculates criteria based on new information pertaining to individual components of the criteria. For example, in today s notice, EPA has recalculated a number of criteria based on new, peer-reviewed data contained in EPA's IRIS. Because such

recalculations normally result in only minor changes to the criteria, do not ordinarily involve a change in the underlying scientific methodologies, and reflect peer-reviewed data, EPA will typically publish such recalculated criteria directly as the Agency s recommended water quality criteria. If it appears that a recalculation results in a significant change EPA will follow the process of peer review and public input outlined above. Further, when EPA recalculates national water quality criteria in the course of proposing or promulgating state-specific federal water quality standards pursuant to section 303(c), EPA will offer an opportunity for national public input on the recalculated criteria.

VII. How Does the Process Outlined Above Improve Public Input and Efficiency?

In the past, EPA developed draft criteria documents and announced their availability for public comment in the *Federal Register*. This led to new data and views coming to EPA s attention after draft criteria had already been developed. Responding to new data would sometimes lead to extensive revisions.

The steps outlined above improve the criteria development process in the following ways.

1. The new process is Internet-based which is in line with EPA policy for public access and dissemination of information gathered by EPA. Use of the Internet will allow the public to be more engaged in the criteria development process than previously and to more knowledgeably follow criteria development. For new criteria or major revisions, EPA will announce its intentions to derive the new or revised criteria on the Internet and include a list of the available literature. This will give the public an opportunity to provide additional data that might not otherwise be identified by the Agency.

2. The public now has two opportunities to contribute data and views, before development and during development, instead of a single opportunity after development.

3. EPA has instituted broader and more formal peer review procedures. This independent scientific review is a more rigorous disciplinary practice to ensure technical improvements in Agency decision making. Previously, EPA used the public comment process outlined above to obtain peer review. The new process allows for both public input and a formal peer review, resulting in a more thorough and complete evaluation of the criteria.

4. Announcing the availability of the draft water quality criteria on the Internet will give the public an opportunity to provide input on issues of science in a more timely manner.

VIII. Where Can I Find More Information About Water Quality Criteria and Water Quality Standards?

For more information about water quality criteria and Water Quality Standards refer to the following: *Water Quality Standards Handbook* (EPA 823-B94-005a); *Advanced Notice of Proposed Rule Making (ANPRM)*, (63FR36742); *Water Quality Criteria and Standards Plan --*

Priorities for the Future (EPA 822-R-98-003); *Guidelines and Methodologies Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents* (45FR79347); *Draft Water Quality Criteria Methodology Revisions: Human Health* (63FR43755, EPA 822-Z-98-001); and *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (EPA 822/R-85-100); *National Strategy for the Development of Regional Nutrient Criteria* (EPA 822-R-98-002).

These publications may also be accessed through EPA s National Center for Environmental Publications and Information (NCEPI) or on the Office of Science and Technology s Home-page (www.epa.gov/OST).

IX. What Are the National Recommended Water Quality Criteria?

The following compilation and its associated footnotes and notes presents the national recommended water quality criteria.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR PRIORITY TOXIC POLLUTANTS

	Priority Pollutant	CAS Number	Freshwater CMC (μg/L)	Freshwater CCC (μg/L)	Saltwater CMC (μg/L)	Saltwater CCC (μg/L)	Human Health For Consumption of: Water + Organism (μg/L)	Human Health For Consumption of: Organism Only (μg/L)	FR Cite/ Source
1	Antimony	7440360					14 B,Z	4300 B	57FR60848
2	Arsenic	7440382	340 A,D,K	150 A,D,K	69 A,D,bb	36 A,D,bb	0.018 C,M,S	0.14 C,M,S	62FR42160 57FR60848
3	Beryllium	7440417					J,Z	J	62FR42160
4	Cadmium	7440439	4.3 D,E,K	2.2 D,E,K	42 D,bb	9.3 D,bb	J,Z	J	62FR42160
5a	Chromium III	16065831	570 D,E,K	74 D,E,K			J,Z Total	J	EPA820/B-96-001 62FR42160
5b	Chromium VI	18540299	16 D,K	11 D,K	1,100 D,bb	50 D,bb	J, Z Total	J	62FR42160
6	Copper	7440508	13 D,E,K,cc	9.0 D,E,K,cc	4.8 D,cc,ff	3.1 D,cc,ff	1,300 U		62FR42160
7	Lead	7439921	65 D,E,bb,gg	2.5 D,E,bb,gg	210 D,bb	8.1 D,bb	J	J	62FR42160
8	Mercury	7439976	1.4 D,K,hh	0.77 D,K,hh	1.8 D,ee,hh	0.94 D,ee,hh	0.050 B	0.051 B	62FR42160
9	Nickel	7440020	470 D,E,K	52 D,E,K	74 D,bb	8.2 D,bb	610 B	4,600 B	62FR42160
10	Selenium	7782492	L,R,T	5.0 T	290 D,bb,dd	71 D,bb,dd	170 Z	11,000	62FR42160 IRIS 09/01/91
11	Silver	7440224	3.4 D,E,G		1.9 D,G				62FR42160
12	Thallium	7440280					1.7 B	6.3 B	57FR60848
13	Zinc	7440666	120 D,E,K	120 D,E,K	90 D,bb	81 D,bb	9,100 U	69,000 U	62FR42160 IRIS 10/01/92

	Priority Pollutant	CAS Number	Freshwater CMC (μg/L)	Freshwater CCC (μg/L)	Saltwater CMC (μg/L)	Saltwater CCC (μg/L)	Human Health For Consumption of: Water + Organism (μg/L)	Human Health For Consumption of: Organism Only (μg/L)	FR Cite/ Source
14	Cyanide	57125	22 K,Q	5.2 K,Q	1 Q,bb	1 Q,bb	700 B,Z	220,000 B,H	EPA820/B-96-001 57FR60848
15	Asbestos	1332214					7 million fibers/L I		57FR60848
16	2,3,7,8-TCDD Dioxin	1746016					1.3E-8 C	1.4E-8 C	62FR42160
17	Acrolein	107028					320	780	57FR60848
18	Acrylonitrile	107131					0.059 B,C	0.66 B,C	57FR60848
19	Benzene	71432					1.2 B,C	71 B,C	62FR42160
20	Bromoform	75252					4.3 B,C	360 B,C	62FR42160
21	Carbon Tetrachloride	56235					0.25 B,C	4.4 B,C	57FR60848
22	Chlorobenzene	108907					680 B,Z	21,000 B,H	57FR60848
23	Chlorodibromomethane	124481					0.41 B,C	34 B,C	62FR42160
24	Chloroethane	75003							
25	2-Chloroethylvinyl Ether	110758							
26	Chloroform	67663					5.7 B,C	470 B,C	62FR42160
27	Dichlorobromomethane	75274					0.56 B,C	46 B,C	62FR42160
28	1,1-Dichloroethane	75343							
29	1,2-Dichloroethane	107062					0.38 B,C	99 B,C	57FR60848
30	1,1-Dichloroethylene	75354					0.057 B,C	3.2 B,C	57FR60848

	Priority Pollutant	CAS Number	Freshwater CMC (µg/L)	Freshwater CCC (µg/L)	Saltwater CMC (µg/L)	Saltwater CCC (µg/L)	Human Health For Consumption of: Water + Organism (µg/L)	Human Health For Consumption of: Organism Only (µg/L)	FR Cite/ Source
31	1,2-Dichloropropane	78875					0.52 B,C	39 B,C	62FR42160
32	1,3-Dichloropropene	542756					10 B	1,700 B	57FR60848
33	Ethylbenzene	100414					3,100 B,Z	29,000 B	62FR42160
34	Methyl Bromide	74839					48 B	4000 B	62FR42160
35	Methyl Chloride	74873					J	J	62FR42160
36	Methylene Chloride	75092					4.7 B,C	1600 B,C	62FR42160
37	1,1,2,2-Tetrachloroethane	79345					0.17 B,C	11 B,C	57FR60848
38	Tetrachloroethylene	127184					0.8 C	8.85 C	57FR60848
39	Toluene	108883					6,800 B,Z	200,000 B	62FR42160
40	1,2-Trans-Dichloroethylene	156605					700 B,Z	140,000 B	62FR42160
41	1,1,1-Trichloroethane	71556					J,Z	J	62FR42160
42	1,1,2-Trichloroethane	79005					0.60 B,C	42 B,C	57FR60848
43	Trichloroethylene	79016					2.7 C	81 C	57FR60848
44	Vinyl Chloride	75014					2.0 C	525 C	57FR60848
45	2-Chlorophenol	95578					120 B,U	400 B,U	62FR42160
46	2,4-Dichlorophenol	120832					93 B,U	790 B,U	57FR60848
47	2,4-Dimethylphenol	105679					540 B,U	2,300 B,U	62FR42160
48	2-Methyl-4,6-Dinitrophenol	534521					13.4	765	57FR60848
49	2,4-Dinitrophenol	51285					70 B	14,000 B	57FR60848
50	2-Nitrophenol	88755							
51	4-Nitrophenol	100027							
52	3-Methyl-4-Chlorophenol	59507					U	U	

	Priority Pollutant	CAS Number	Freshwater CMC (µg/L)	Freshwater CCC (µg/L)	Saltwater CMC (µg/L)	Saltwater CCC (µg/L)	Human Health For Consumption of: Water + Organism (µg/L)	Human Health For Consumption of: Organism Only (µg/L)	FR Cite/ Source
53	Pentachlorophenol	87865	19 F,K	15 F,K	13 bb	7.9 bb	0.28 B,C	8.2 B,C,H	62FR42160
54	Phenol	108952					21,000 B,U	4,600,000 B,H,U	62FR42160 57FR60848
55	2,4,6-Trichlorophenol	88062					2.1 B,C,U	6.5 B,C	62FR42160
56	Acenaphthene	83329					1,200 B,U	2,700 B,U	62FR42160
57	Acenaphthylene	208968							
58	Anthracene	120127					9,600 B	110,000 B	62FR42160
59	Benzidine	92875					0.00012 B,C	0.00054 B,C	57FR60848
60	BenzoaAnthracene	56553					0.0044 B,C	0.049 B,C	62FR42160
61	BenzoaPyrene	50328					0.0044 B,C	0.049 B,C	62FR42160
62	BenzobFluoranthene	205992					0.0044 B,C	0.049 B,C	62FR42160
63	BenzoghiPerylene	191242							
64	BenzokFluoranthene	207089					0.0044 B,C	0.049 B,C	62FR42160
65	Bis2-ChloroethoxyMethane	111911							
66	Bis2-ChloroethylEther	111444					0.031 B,C	1.4 B,C	57FR60848
67	Bis2-ChloroisopropylEther	39638329					1,400 B	170,000 B	62FR42160 57FR60848
68	Bis2-EthylhexylPhthalate[X]	117817					1.8 B,C	5.9 B,C	57FR60848
69	4-Bromophenyl Phenyl Ether	101553							
70	Butylbenzyl Phthalate[W]	85687					3,000 B	5,200 B	62FR42160
71	2-Chloronaphthalene	91587					1,700 B	4,300 B	62FR42160

	Priority Pollutant	CAS Number	Freshwater CMC (µg/L)	Freshwater CCC (µg/L)	Saltwater CMC (µg/L)	Saltwater CCC (µg/L)	Human Health For Consumption of: Water + Organism (µg/L)	Human Health For Consumption of: Organism Only (µg/L)	FR Cite/ Source
72	4-Chlorophenyl Phenyl Ether	7005723							
73	Chrysene	218019					0.0044 B,C	0.049 B,C	62FR42160
74	Dibenzoa,hAnthracene	53703					0.0044 B,C	0.049 B,C	62FR42160
75	1,2-Dichlorobenzene	95501					2,700 B,Z	17,000 B	62FR42160
76	1,3-Dichlorobenzene	541731					400	2,600	62FR42160
77	1,4-Dichlorobenzene	106467					400 Z	2600	62FR42160
78	3,3'-Dichlorobenzidine	91941					0.04 B,C	0.077 B,C	57FR60848
79	Diethyl Phthalate[W]	84662					23,000 B	120,000 B	57FR60848
80	Dimethyl Phthalate[W]	131113					313,000	2,900,000	57FR60848
81	Di-n-Butyl Phthalate[W]	84742					2,700 B	12,000 B	57FR60848
82	2,4-Dinitrotoluene	121142					0.11 C	9.1 C	57FR60848
83	2,6-Dinitrotoluene	606202							
84	Di-n-Octyl Phthalate	117840							
85	1,2-Diphenylhydrazine	122667					0.040 B,C	0.54 B,C	57FR60848
86	Fluoranthene	206440					300 B	370 B	62FR42160
87	Fluorene	86737					1,300 B	14,000 B	62FR42160
88	Hexachlorobenzene	118741					0.00075 B,C	0.00077 B,C	62FR42160
89	Hexachlorobutadiene	87683					0.44 B,C	50 B,C	57FR60848
90	Hexachlorocyclopentadiene	77474					240 B,U,Z	17,000 B,H,U	57FR60848
91	Hexachloroethane	67721					1.9 B,C	8.9 B,C	57FR60848

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92	Ideno1,2,3-cdPyrene	193395					0.0044 B,C	0.049 B,C	62FR42160
93	Isophorone	78591					36 B,C	2,600 B,C	IRIS 11/01/97
94	Naphthalene	91203							
95	Nitrobenzene	98953					17 B	1,900 B,H,U	57FR60848
96	N-Nitrosodimethylamine	62759					0.00069 B,C	8.1 B,C	57FR60848
97	N-Nitrosodi-n-Propylamine	621647					0.005 B,C	1.4 B,C	62FR42160
98	N-Nitrosodiphenylamine	86306					5.0 B,C	16 B,C	57FR60848
99	Phenanthrene	85018							
100	Pyrene	129000					960 B	11,000 B	62FR42160
101	1,2,4-Trichlorobenzene	120821					260 Z	940	IRIS 11/01/96
102	Aldrin	309002	3.0 G		1.3 G		0.00013 B,C	0.00014 B,C	62FR42160
103	alpha-BHC	319846					0.0039 B,C	0.013 B,C	62FR42160
104	beta-BHC	319857					0.014 B,C	0.046 B,C	62FR42160
105	gamma-BHC (Lindane)	58899	0.95 K		0.16 G		0.019 C	0.063 C	62FR42160
106	delta-BHC	319868							
107	Chlordane	57749	2.4 G	0.0043 G,aa	0.09 G	0.004 G,aa	0.0021 B,C	0.0022 B,C	62FR42160 IRIS02/07/98
108	4,4'-DDT	50293	1.1 G	0.001 G,aa	0.13 G	0.001 G,aa	0.00059 B,C	0.00059 B,C	62FR42160
109	4,4'-DDE	72559					0.00059 B,C	0.00059 B,C	62FR42160
110	4,4'-DDD	72548					0.00083 B,C	0.00084 B,C	62FR42160

	Priority Pollutant	CAS Number	Freshwater CMC (µg/L)	Freshwater CCC (µg/L)	Saltwater CMC (µg/L)	Saltwater CCC (µg/L)	Human Health For Consumption of: Water + Organism (µg/L)	Human Health For Consumption of: Organism Only (µg/L)	FR Cite/ Source
111	Dieldrin	60571	0.24 K	0.056 K,O	0.71 G	0.0019 G,aa	0.00014 B,C	0.00014 B,C	62FR42160
112	alpha-Endosulfan	959988	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	110 B	240 B	62FR42160
113	beta-Endosulfan	33213659	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	110 B	240 B	62FR42160
114	Endosulfan Sulfate	1031078					110 B	240 B	62FR42160
115	Endrin	72208	0.086 K	0.036 K,O	0.037 G	0.0023 G,aa	0.76 B	0.81 B,H	62FR42160
116	Endrin Aldehyde	7421934					0.76 B	0.81 B,H	62FR42160
117	Heptachlor	76448	0.52 G	0.0038 G,aa	0.053 G	0.0036 G,aa	0.00021 B,C	0.00021 B,C	62FR42160
118	Heptachlor Epoxide	1024573	0.52 G,V	0.0038 G,V,aa	0.053 G,V	0.0036 G,V,aa	0.00010 B,C	0.00011 B,C	62FR42160
119	Polychlorinated Biphenyls PCBs:			0.014 N,aa		0.03 N,aa	0.00017 B,C,P	0.00017 B,C,P	62FR42160 63FR16182
120	Toxaphene	8001352	0.73	0.0002 aa	0.21	0.0002 aa	0.00073 B,C	0.00075 B,C	62FR42160

Footnotes:

A This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EPA 440/5-84-033, January 1985), Species Mean Acute Values are given for both arsenic (III) and arsenic (V) for five species and the ratios of the SMAVs for each species range from 0.6 to 1.7. Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.

B This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of April 8, 1998. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.

C This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

D Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. (Conversion Factors for saltwater CCCs are not currently available. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs). See "Office of Water Policy and Technical

Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria," October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC4100, Washington, DC 20460; and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble- Conversion Factors for Dissolved Metals.

E The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L. Criteria values for other hardness may be calculated from the following: CMC (dissolved) = $\exp\{m_A [\ln(\text{hardness})] + b_A\}$ (CF), or CCC (dissolved) = $\exp\{m_C [\ln(\text{hardness})] + b_C\}$ (CF) and the parameters specified in Appendix B to the Preamble- Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent.

F Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC = exp(1.005(pH)-4.869); CCC = exp(1.005(pH)-5.134). Values displayed in table correspond to a pH of 7.8.

G This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-80-047), Heptachlor (440/5-80-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

H No criterion for protection of human health from consumption of aquatic organisms excluding water was presented in the 1980 criteria document or in the *1986 Quality Criteria for Water*. Nevertheless, sufficient information was presented in the 1980 document to allow the calculation of a criterion, even though the results of such a calculation were not shown in the document.

I This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act (SDWA).

J EPA has not calculated human health criterion for this contaminant. However, permit authorities should address this contaminant in NPDES permit actions using the State's existing narrative criteria for toxics.

K This recommended criterion is based on a 304(a) aquatic life criterion that was issued in the *1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water*, (EPA-820-B-96-001, September 1996). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the difference between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. None of the decisions concerning the derivation of this criterion were affected by any considerations that are specific to the Great Lakes.

L The CMC = 1/[(f1/CMC1) + (f2/CMC2)] where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 μg/l and 12.83 μg/l, respectively.

M EPA is currently reassessing the criteria for arsenic. Upon completion of the reassessment the Agency will publish revised criteria as appropriate.

N PCBs are a class of chemicals which include aroclors, 1242, 1254, 1221, 1232, 1248, 1260, and 1016, CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825 and 12674112 respectively. The aquatic life criteria apply to this set of PCBs.

O The derivation of the CCC for this pollutant did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels.

P This criterion applies to total pcbs, i.e., the sum of all congener or all isomer analyses.

Q This recommended water quality criterion is expressed as μg free cyanide (as CN)/L.

R This value was announced (61FR58444-58449, November 14, 1996) as a proposed GLI 303(c) aquatic life criterion. EPA is currently working on this criterion and so this value might change substantially in the near future.

S This recommended water quality criterion refers to the inorganic form only.

T This recommended water quality criterion is expressed in terms of total recoverable metal in the water column. It is scientifically acceptable to use the conversion factor of 0.922 that was used in the GLI to convert this to a value that is expressed in terms of dissolved metal.

U The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

V This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.

W Although EPA has not published a final criteria document for this compound it is EPA's understanding that sufficient data exist to allow calculation of aquatic criteria. It is anticipated that industry intends to publish in the peer reviewed literature draft aquatic life criteria generated in accordance with EPA Guidelines. EPA will review such criteria for possible issuance as national WQC.

X There is a full set of aquatic life toxicity data that show that DEHP is not toxic to aquatic organisms at or below its solubility limit.

Y This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.

Z A more stringent MCL has been issued by EPA. Refer to drinking water regulations (40 CFR 141) or Safe Drinking Water Hotline (1-800-426-4791) for values.

aa This CCC is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

bb This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5-84-033), Cadmium (EPA 440/5-84-032), Chromium (EPA 440/5-84-029), Copper (EPA 440/5-84-031), Cyanide (EPA 440/5-84-028), Lead (EPA 440/5-84-027), Nickel (EPA 440/5-86-004), Pentachlorophenol (EPA 440/5-86-009), Toxaphene, (EPA 440/5-86-006), Zinc (EPA 440/5-87- 003).

cc When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Ratios might be appropriate.

dd The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 μg/L in salt water because the saltwater CCC does not take into account uptake via the food chain.

ee This recommended water quality criterion was derived on page 43 of the mercury criteria document (EPA 440/5-84-026, January 1985). The saltwater CCC of 0.025 ug/L given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

ff This recommended water quality criterion was derived in *Ambient Water Quality Criteria Saltwater Copper Addendum* (Draft, April 14, 1995) and was promulgated in the Interim final National Toxics Rule (60FR22228-222237, May 4, 1995).

gg EPA is actively working on this criterion and so this recommended water quality criterion may change substantially in the near future.

hh This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criterion was derived.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR NON PRIORITY POLLUTANTS

	Non Priority Pollutant	CAS Number	Freshwater CMC (µg/L)	Freshwater CCC (µg/L)	Saltwater CMC (µg/L)	Saltwater CCC (µg/L)	Human Health For Consumption of: Water + Organism (µg/L)	Human Health For Consumption of: Organism Only (µg/L)	FR Cite/Source
1	Alkalinity	--		20000 F					Gold Book
2	Aluminum pH 6.5 - 9.0	7429905	750 G,I	87 G,I,L					53FR33178
3	Ammonia	7664417	FRESHWATER CRITERIA ARE pH DEPENDENT -- SEE DOCUMENT D SALTWATER CRITERIA ARE pH AND TEMPERATURE DEPENDENT						EPA822-R-98-008 EPA440/5-88-004
4	Aesthetic Qualities	--	NARRATIVE STATEMENT-- SEE DOCUMENT						Gold Book
5	Bacteria	--	FOR PRIMARY RECREATION AND SHELLFISH USES -- SEE DOCUMENT						Gold Book
6	Barium	7440393					1,000 A		Gold Book
7	Boron	--	NARRATIVE STATEMENT-- SEE DOCUMENT						Gold Book
8	Chloride	16887006	860000 G	230000 G					53FR19028
9	Chlorine	7782505	19	11	13	7.5	C		Gold Book
10	Chlorophenoxy Herbicide 2,4,5,-TP	93721					10 A		Gold Book
11	Chlorophenoxy Herbicide 2,4-D	94757					100 A,C		Gold Book
12	Chloropyrifos	2921882	0.083 G	0.041 G	0.011 G	0.0056 G			Gold Book
13	Color	--	NARRATIVE STATEMENT-- SEE DOCUMENT F						Gold Book
14	Demeton	8065483		0.1 F		0.1 F			Gold Book
15	Ether, Bis Chloromethyl	542881					0.00013 E	0.00078 E	IRIS 01/01/91
16	Gases, Total Dissolved	--	NARRATIVE STATEMENT -- SEE DOCUMENT F						Gold Book
17	Guthion	86500		0.01 F		0.01 F			Gold Book
18	Hardness	--	NARRATIVE STATEMENT-- SEE DOCUMENT						Gold Book

	Non Priority Pollutant	CAS Number	Freshwater CMC (μg/L)	Freshwater CCC (μg/L)	Saltwater CMC (μg/L)	Saltwater CCC (μg/L)	Human Health For Consumption of: Water + Organism (μg/L)	Human Health For Consumption of: Organism Only (μg/L)	FR Cite/Source
19	Hexachlorocyclo-hexane-Technical	319868					0.0123	0.0414	Gold Book
20	Iron	7439896		1000 F			300 A		Gold Book
21	Malathion	121755		0.1 F		0.1 F			Gold Book
22	Manganese	7439965					50 A	100 A	Gold Book
23	Methoxychlor	72435		0.03 F		0.03 F	100 A,C		Gold Book
24	Mirex	2385855		0.001 F		0.001 F			Gold Book
25	Nitrates	14797558					10,000 A		Gold Book
26	Nitrosamines	--					0.0008	1.24	
27	Dinitrophenols	25550587					70	14,000	Gold Book
28	Nitrosodibutylamine,N	924163					0.0064 A	0.587 A	Gold Book
29	Nitrosodiethylamine,N	55185					0.0008 A	1.24 A	Gold Book
30	Nitrosopyrrolidine,N	930552					0.016	91.9	Gold Book
31	Oil and Grease	--	NARRATIVE STATEMENT -- SEE DOCUMENT F						Gold Book
32	Oxygen, Dissolved	7782447	WARMWATER AND COLDWATER MATRIX -- SEE DOCUMENT O						Gold Book
33	Parathion	56382	0.065 J	0.013 J					Gold Book
34	Pentachlorobenzene	608935					3.5 E	4.1 E	IRIS 03/01/88
35	pH	--		6.5 - 9 F		6.5 - 8.5 F,K	5 - 9		Gold Book
36	Phosphorus Elemental	7723140				0.1 F,K			Gold Book
37	Phosphate Phosphorus	--	NARRATIVE STATEMENT-- SEE DOCUMENT						Gold Book

	Non Priority Pollutant	CAS Number	Freshwater CMC (µg/L)	Freshwater CCC (µg/L)	Saltwater CMC (µg/L)	Saltwater CCC (µg/L)	Human Health For Consumption of: Water + Organism (µg/L)	Human Health For Consumption of: Organism Only (µg/L)	FR Cite/Source
38	Solids Dissolved and Salinity	--					250,000 A		Gold Book
39	Solids Suspended and Turbidity	--	NARRATIVE STATEMENT -- SEE DOCUMENT F						Gold Book
40	Sulfide-Hydrogen Sulfide	7783064		2.0 F		2.0 F			Gold Book
41	Tainting Substances	--	NARRATIVE STATEMENT-- SEE DOCUMENT						Gold Book
42	Temperature	--	SPECIES DEPENDENT CRITERIA -- SEE DOCUMENT M						Gold Book
43	Tetrachlorobenzene,1,2,4,5-	95943					2.3 E	2.9 E	IRIS03/01/91
44	Tributyltin TBT	--	0.46 N	0.063 N	0.37 N	0.010 N			62FR42554
45	Trichlorophenol,2,4,5-	95954					2,600 B,E	9800 B,E	IRIS 03/01/88

Footnotes:

A This human health criterion is the same as originally published in the Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value is now published in the Gold Book.

B The organoleptic effect criterion is more stringent than the value presented in the non priority pollutants table.

C A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Safe Drinking Water Act. Refer to drinking water regulations 40CFR141 or Safe Drinking Water Hotline (1-800-426-4791) for values.

D According to the procedures described in the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, except possibly where a very sensitive species is important at a site, freshwater aquatic life should be protected if both conditions specified in Appendix C to the Preamble- Calculation of Freshwater Ammonia Criterion are satisfied.

E This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of April 8, 1998. The fish tissue bioconcentration factor (BCF) used to derive the original criterion was retained in each case.

F The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976).

G This value is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Aluminum (EPA 440/5-86-008); Chloride (EPA 440/5-88-001); Chloropyrifos (EPA 440/5-86-005).

I This value is expressed in terms of total recoverable metal in the water column.

J This value is based on a 304(a) aquatic life criterion that was issued in the *1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water* (EPA-820-B-96-001). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the differences between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. No decision concerning this criterion was affected by any considerations that are specific to the Great Lakes.

K According to page 181 of the Red Book:

For open ocean waters where the depth is substantially greater than the euphotic zone, the pH should not be changed more than 0.2 units from the naturally occurring variation or any case outside the range of 6.5 to 8.5. For shallow, highly productive coastal and estuarine areas where naturally occurring pH variations approach the lethal limits of some species, changes in pH should be avoided but in any case should not exceed the limits established for fresh water, i.e., 6.5-9.0.

L There are three major reasons why the use of Water-Effect Ratios might be appropriate. (1) The value of 87 μg/l is based on a toxicity test with the striped bass in water with pH= 6.5-6.6 and hardness <10 mg/L. Data in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time. (2) In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide. (3) EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 μg aluminum/L, when either total recoverable or dissolved is measured.

M U.S. EPA. 1973. Water Quality Criteria 1972. EPA-R3-73-033. National Technical Information Service, Springfield, VA.; U.S. EPA. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA-600/3-77-061. National Technical Information Service, Springfield, VA.

N This value was announced (62FR42554, August 7, 1997) as a proposed 304(a) aquatic life criterion. Although EPA has not responded to public comment, EPA is publishing this as a 304(a) criterion in today's notice as guidance for States and Tribes to consider when adopting water quality criteria.

O U.S. EPA. 1986. Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5-86-003. National Technical Information Service, Springfield, VA.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR ORGANOLEPTIC EFFECTS

	Pollutant	CAS Number	Organoleptic Effect Criteria (μg/L)	FR Cite/Source
1	Acenaphthene	83329	20	Gold Book
2	Monochlorobenzene	108907	20	Gold Book
3	3-Chlorophenol	--	0.1	Gold Book
4	4-Chlorophenol	106489	0.1	Gold Book
5	2,3-Dichlorophenol	--	0.04	Gold Book
6	2,5-Dichlorophenol	--	0.5	Gold Book
7	2,6-Dichlorophenol	--	0.2	Gold Book
8	3,4-Dichlorophenol	--	0.3	Gold Book
9	2,4,5-Trichlorophenol	95954	1	Gold Book
10	2,4,6-Trichloropehnol	88062	2	Gold Book
11	2,3,4,6-Tetrachlorophenol	--	1	Gold Book
12	2-Methyl-4-Chlorophenol	--	1800	Gold Book
13	3-Methyl-4-Chlorophenol	59507	3000	Gold Book
14	3-Methyl-6-Chlorophenol	--	20	Gold Book
15	2-Chlorophenol	95578	0.1	Gold Book
16	Copper	7440508	1000	Gold Book
17	2,4-Dichlorophenol	120832	0.3	Gold Book
18	2,4-Dimethylpehnol	105679	400	Gold Book
19	Hexachlorocyclopentadiene	77474	1	Gold Book
20	Nitrobenzene	98953	30	Gold Book

	Pollutant	CAS Number	Organoleptic Effect Criteria (μg/L)	FR Cite/Source
21	Pentachlorophenol	87865	30	Gold Book
22	Phenol	108952	300	Gold Book
23	Zinc	7440666	5000	45 FR79341

General Notes:

1. These criteria are based on organoleptic (taste and odor) effects. Because of variations in chemical nomenclature systems, this listing of pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service (CAS) registry numbers, which provide a unique identification for each chemical.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA

Additional Notes:

1. Criteria Maximum Concentration and Criterion Continuous Concentration

The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two of the six parts of a aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States.

2. Criteria Recommendations for Priority Pollutants, Non Priority Pollutants and Organoleptic Effects

This compilation lists all priority toxic pollutants and some non priority toxic pollutants, and both human health effect and organoleptic effect criteria issued pursuant to CWA §304(a). Blank spaces indicate that EPA has no CWA §304(a) criteria recommendations. For a number of non-priority toxic pollutants not listed, CWA §304(a) "water + organism" human health criteria are not available, but, EPA has published MCLs under the SDWA that may be used in establishing water quality standards to protect water supply designated uses. Because of variations in chemical nomenclature systems, this listing of toxic pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service CAS registry numbers, which provide a unique identification for each chemical.

3. Human Health Risk

The human health criteria for the priority and non priority pollutants are based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

4. Water Quality Criteria published pursuant to Section 304(a) or Section 303(c) of the CWA

Many of the values in the compilation were published in the proposed California Toxics Rule (CTR, 62FR42160). Although such values were published pursuant to Section 303(c) of the CWA, they represent the Agency's most recent calculation of water quality criteria and thus are published today as the Agency's 304(a) criteria. Water quality criteria published in the proposed CTR may be revised when EPA takes final action on the CTR.

5. Calculation of Dissolved Metals Criteria

The 304(a) criteria for metals, shown as dissolved metals, are calculated in one of two ways. For freshwater metals criteria that are hardness-dependent, the dissolved metal criteria were calculated using a hardness of 100 mg/l as $CaCO_3$ for illustrative purposes only. Saltwater and freshwater metals' criteria that are not hardness-dependent are calculated by multiplying the total recoverable criteria before rounding by the appropriate conversion factors. The final dissolved metals' criteria in the table are rounded to two significant figures. Information regarding the calculation of hardness dependent conversion factors are included in the footnotes.

6. Correction of Chemical Abstract Services Number

The Chemical Abstract Services number (CAS) for Bis(2-Chloroisoprpyl) Ether, has been corrected in the table. The correct CAS number for this chemical is 39638-32-9. Previous publications listed 108-60-1 as the CAS number for this chemical.

7. Maximum Contaminant Levels

The compilation includes footnotes for pollutants with Maximum Contaminant Levels (MCLs) more stringent than the recommended water quality criteria in the compilation. MCLs for these pollutants are not included in the compilation, but can be found in the appropriate drinking water regulations (40 CFR 141.11-16 and 141.60-63), or can be accessed through the Safe Drinking Water Hotline (800-426-4791) or the Internet (http://www.epa.gov/ost/tools/dwstds-s.html).

8. Organoleptic Effects

The compilation contains 304(a) criteria for pollutants with toxicity-based criteria as well as non-toxicity based criteria. The basis for the non-toxicity based criteria are organoleptic effects (e.g., taste and odor) which would make water and edible aquatic life unpalatable but not toxic to humans. The table includes criteria for organoleptic effects for 23 pollutants. Pollutants with organoleptic effect criteria more stringent than the criteria based on toxicity (e.g., included in both the priority and non-priority pollutant tables) are footnoted as such.

9. Category Criteria

In the 1980 criteria documents, certain recommended water quality criteria were published for categories of pollutants rather than for individual pollutants within that category. Subsequently, in a series of separate actions, the Agency derived criteria for specific pollutants within a category. Therefore, in this compilation EPA is replacing criteria representing categories with individual pollutant criteria (e.g., 1,3-dichlorobenzene, 1,4-dichlorobenzene and 1,2-dichlorobenzene).

10. Specific Chemical Calculations

A. Selenium

(1) Human Health

In the 1980 Selenium document, a criterion for the protection of human health from consumption of water and organisms was calculated based on a BCF of 6.0 L/kg and a maximum water-related contribution of 35 μg Se/day. Subsequently, the EPA Office of Health and Environmental Assessment issued an errata notice (February 23, 1982), revising the BCF for selenium to 4.8 L/kg. In 1988, EPA issued an addendum (ECAO-CIN-668) revising the human health criteria for selenium. Later in the final National Toxic Rule (NTR, 57 FR 60848), EPA withdrew previously published selenium human health criteria, pending Agency review of new epidemiological data.

This compilation includes human health criteria for selenium, calculated using a BCF of 4.8 L/kg along with the current IRIS RfD of 0.005 mg/kg/day. EPA included these recommended water quality criteria in the compilation because the data necessary for calculating a criteria in accordance with EPA's 1980 human health methodology are available.

(2) Aquatic Life

This compilation contains aquatic life criteria for selenium that are the same as those published in the proposed CTR. In the CTR, EPA proposed an acute criterion for selenium based on the criterion proposed for selenium in the Water Quality Guidance for the Great Lakes System (61 FR 58444). The GLI and CTR proposals take into account data showing that selenium's two most prevalent oxidation states, selenite and selenate, present differing potentials for aquatic toxicity, as well as new data indicating that various forms of selenium are additive. The new approach produces a different selenium acute criterion concentration, or CMC, depending upon the relative proportions of selenite, selenate, and other forms of selenium that are present.

EPA notes it is currently undertaking a reassessment of selenium, and expects the 304(a) criteria for selenium will be revised based on the final reassessment (63FR26186). However, until such time as revised water quality criteria for selenium are published by the Agency, the recommended water quality criteria in this compilation are EPA's current 304(a) criteria.

B. 1,2,4-Trichlorobenzene and Zinc

Human health criteria for 1,2,4-trichlorobenzene and zinc have not been previously published. Sufficient information is now available for calculating water quality criteria for the protection of human health from the consumption of aquatic organisms and the consumption of aquatic organisms and water for both these compounds. Therefore, EPA is publishing criteria for these pollutants in this compilation.

C. Chromium (III)

The recommended aquatic life water quality criteria for chromium (III) included in the compilation are based on the values presented in the document titled: *1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water*, however, this document contains criteria based on the total recoverable fraction. The chromium (III) criteria in this compilation were calculated by applying the conversion factors used in the Final Water Quality Guidance for the Great Lakes System (60 FR 15366) to the 1995 Update document values.

D. Ether, Bis (Chloromethyl), Pentachlorobenzene, Tetrachlorobenzene 1,2,4,5-, Trichlorphenol

Human health criteria for these pollutants were last published in EPA's *Quality Criteria for Water 1986* or "Gold Book". Some of these criteria were calculated using Acceptable Daily Intake (ADIs) rather than RfDs. Updated q1*s and RfDs are now available in IRIS for ether, bis (chloromethyl), pentachlorobenzene, tetrachlorobenzene 1,2,4,5-, and trichlorophenol, and were used to revise the water quality criteria for these compounds. The recommended water quality criteria for ether, bis (chloromethyl) were revised using an updated q1*, while criteria for pentachlorobenzene, and tetrachlorobenzene 1,2,4,5-, and trichlorophenol were derived using an updated RfD value.

E. PCBs

In this compilation EPA is publishing aquatic life and human health criteria based on total PCBs rather than individual arochlors. These criteria replace the previous criteria for the seven individual arochlors. Thus, there are criteria for a total of 102 of the 126 priority pollutants.

Appendix A - Conversion Factors for Dissolved Metals

Metal	Conversion Factor freshwater CMC	Conversion Factor freshwater CCC	Conversion Factor saltwater CMC	Conversion Factor saltwater CCC[1]
Arsenic	1.000	1.000	1.000	1.000
Cadmium	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]	0.994	0.994
Chromium III	0.316	0.860	--	--
Chromium VI	0.982	0.962	0.993	0.993
Copper	0.960	0.960	0.83	0.83
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]	0.951	0.951
Mercury	0.85	0.85	0.85	0.85
Nickel	0.998	0.997	0.990	0.990
Selenium	--	--	0.998	0.998
Silver	0.85	--	0.85	--
Zinc	0.978	0.986	0.946	0.946

Appendix B - Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent

Chemical	m_A	b_A	m_C	b_C	Freshwater Conversion Factors (CF)	
					Acute	Chronic
Cadmium	1.128	-3.6867	0.7852	-2.715	1.136672-[ln (hardness)(0.041838)]	1.101672-[ln (hardness)(0.041838)]
Chromium III	0.8190	3.7256	0.8190	0.6848	0.316	0.860
Copper	0.9422	-1.700	0.8545	-1.702	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	1.46203-[ln (hardness)(0.145712)]	1.46203-[ln (hardness)(0.145712)]
Nickel	0.8460	2.255	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.52	--	--	0.85	--
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Appendix C - Calculation of Freshwater Ammonia Criterion

1. The one-hour average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CMC calculated using the following equation:

$$CMC = \frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{pH-7.204}}$$

In situations where salmonids do not occur, the CMC may be calculated using the following equation:

$$CMC = \frac{0.411}{1 + 10^{7.204-pH}} + \frac{58.4}{1 + 10^{pH-7.204}}$$

2. The thirty-day average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CCC calculated using the following equation:

$$CCC = \frac{0.0858}{1 + 10^{7.688-pH}} + \frac{3.70}{1 + 10^{pH-7.688}}$$

and the highest four-day average within the 30-day period does not exceed twice the CCC.

Dermal Permeability Constants

EPA/600/8-91/011B
January 1992
Interim Report

DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS

Exposure Assessment Group
Office of Health and Environmental Assessment
U.S. Environmental Protection Agency
Washington, D.C. 20460

Table 5-8. K_p, τ, t^*, and B for Common Pollutants

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t^* (hr)	B
ORGANICS:						
Acetaldehyde	75070		7.2e-04	1.6e-01	3.9e-01	6.0e-05
Acetamide	60355		1.1e-04	2.0e-01	4.8e-01	5.5e-06
Acetylaminofluorene, 2-	53963		1.7e-02	2.0e+00	7.7e+00	1.7e-01
Acrolein	107028		7.4e-04	1.9e-01	4.6e-01	7.9e-05
Acrylamide	79061		2.4e-04	2.4e-01	5.7e-01	2.1e-05
Acrylonitrile	107131		1.4e-03	1.8e-01	4.4e-01	1.8e-04
Aldrin	309002		1.6e-03	1.5e+01	3.6e+01	1.0e-01
Allyl chloride	107051		7.0e-03	2.6e-01	6.2e-01	2.8e-03
Amino-2-methylanthraquinone, 1-	82280		6.6e-03	2.4e+00	5.9e+00	6.3e-02
Aminoanthraquinone, 2-	117793		2.8e-03	2.0e+00	4.8e+00	1.4e-02
Aminoazobenzene, p-	60093		8.7e-03	1.4e+00	3.3e+00	4.2e-02
Aminoazotoluene, o-	97563		4.9e-02	2.1e+00	1.6e+01	8.3e-01
Aminobiphenyl, 4-	92671		1.7e-02	9.4e-01	2.3e+00	6.3e-02
Aniline	62533	4.1e-02	2.2e-03	3.2e-01	7.8e-01	7.9e-04
Anisidine, o-	90040		1.7e-03	6.7e-01	1.6e+00	1.5e-03
Auramine	492808		1.5e-02	3.7e+00	2.1e+01	3.5e-01
Benzene	71432	1.1e-01	2.1e-02	2.6e-01	6.3e-01	1.3e-02
Benzidine	92875		1.3e-03	1.2e+00	2.8e+00	2.2e-03
Benzo-a-anthracene	56553		8.1e-01	2.2e+00	1.0e+01	4.6e+01
Benzo-a-pyrene	50328		1.2e+00	2.9e+00	1.4e+01	1.3e+02
Benzo-b-fluoranthene	205992		1.2e+00	3.0e+00	1.4e+01	1.3e+02
Benzoic acid	65850		7.3e-03	4.9e-01	1.2e+00	7.4e-03
Benzotrichloride	98077		1.5e-02	1.4e+00	3.2e+00	8.3e-02
Benzyl chloride	100447		1.4e-02	5.2e-01	1.2e+00	2.0e-02
Bis(2-chloroethyl)ether	111444		2.1e-03	6.5e-01	1.6e+00	1.9e-03

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
Bromodichloromethane	75274		5.8e-03	8.7e-01	2.1e+00	1.2e-02
Bromoform	75252		2.6e-03	3.0e+00	7.3e+00	2.3e-02
Bromomethane	74839		3.5e-03	3.3e-01	8.0e-01	1.5e-03
Bromophenol, p-	106412	3.6e-02	1.3e-02	9.9e-01	2.4e+00	4.5e-02
Butadiene, 1,3-	106990		2.3e-02	1.9e-01	4.5e-01	9.8e-03
Butanediol, 2,3-	513859	5.0e-05	1.2e-04	3.1e-01	7.4e-01	1.2e-05
Butanol, n-	71363	2.5e-03	1.9e-03	2.5e-01	5.9e-01	4.5e-04
Butoxyethanol, 2-	111762	1.2e-02	1.4e-03	4.6e-01	1.1e+00	6.8e-04
Captan	133062		1.3e-03	5.9e+00	1.4e+01	2.2e-02
Carbon disulfide	75150	5.0e-01	2.4e-02	2.7e-01	6.5e-01	1.7e-02
Carbon tetrachloride	56235		2.2e-02	7.6e-01	1.8e+00	6.8e-02
Chlordane	57749		5.2e-02	2.8e+01	1.3e+02	3.5e+01
Chlordane (cis)	5103719		4.6e-02	2.8e+01	1.3e+02	3.0e+01
Chlordane (trans)	5103742		4.6e-02	2.8e+01	1.3e+02	3.0e+01
Chlorobenzene	108907		4.1e-02	4.3e-01	1.0e+00	6.9e-02
Chlorocresol	59507	5.0e-02	4.1e-02	6.5e-01	1.9e+00	1.3e-01
Chlorodibromomethane	124481		3.9e-03	1.6e+00	3.9e+00	1.7e-02
Chloroethane	75003		8.0e-03	2.2e-01	5.2e-01	2.7e-03
Chloroform	67663	1.3e-01	8.9e-03	4.7e-01	1.1e+00	9.3e-03
Chloromethane	74873		4.2e-03	1.8e-01	4.3e-01	8.1e-04
Chlorophenol, o-	95578	3.3e-02	1.1e-02	5.3e-01	1.3e+00	1.4e-02
Chlorophenol, p-	106489	3.6e-02	1.6e-02	5.3e-01	1.3e+00	2.5e-02
Chlorothalonil	1897456		2.5e-02	3.7e+00	2.8e+01	7.2e-01
Chloroxylenol		6.0e-02	3.0e-04	5.6e-01	1.3e+00	1.0e-04
Chrysene	218019		8.1e-01	2.2e+00	1.0e+01	4.6e+01
Cresidine, p-	120718		4.3e-03	6.0e-01	1.4e+00	4.7e-03
Cresol, m-	108394	1.5e-02	1.0e-02	4.0e-01	9.6e-01	9.1e-03

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
Cresol, o-	95487	1.6e-02	1.0e-02	4.0e-01	9.6e-01	8.9e-03
Cresol, p-	106445	1.8e-02	1.0e-02	4.0e-01	9.6e-01	8.7e-03
DDD	72548		2.8e-01	7.8e+00	3.7e+01	6.3e+01
DDE	72559		2.4e-01	7.6e+00	3.6e+01	4.9e+01
DDT	50293		4.3e-01	1.3e+01	6.0e+01	2.3e+02
Decanol	112301	8.0e-02	1.7e-01	8.1e-01	5.6e+00	1.3e+00
Di-2-ethylhexyl phthalate	117817		3.3e-02	2.1e+01	1.0e+02	1.3e+01
Diaminoanisole, 2,4-	615054		2.3e-04	6.1e-01	1.5e+00	7.6e-05
Diaminotoluene	95807		6.0e-04	4.9e-01	1.2e+00	2.2e-04
Diaminotoluene, 2,4-	101804		3.3e-03	1.5e+00	3.5e+00	1.1e-02
Dibenzo(a,h)anthracene	53703		2.7e+00	4.4e+00	2.1e+01	6.9e+02
Dibutyl phthalate	84742		3.3e-02	4.3e+00	2.9e+01	1.3e+00
Dichlorobenzene, 1,2-	95501		6.1e-02	6.9e-01	3.2e+00	2.4e-01
Dichlorobenzene, 1,3-	541731		8.7e-02	6.9e-01	4.1e+00	4.0e-01
Dichlorobenzene, 1,4-	106467		6.2e-02	6.9e-01	3.3e+00	2.5e-01
Dichlorobenzidine, 3,3'	91941		1.7e-02	3.1e+00	1.7e+01	3.2e-01
Dichlorodifluoromethane	75718		1.2e-02	4.8e-01	1.1e+00	1.4e-02
Dichloroethane, 1,1-	75343		8.9e-03	3.5e-01	8.4e-01	6.2e-03
Dichloroethane, 1,2-	107062		5.3e-03	3.5e-01	8.4e-01	3.0e-03
Dichloroethylene, 1,1-	75354		1.6e-02	3.4e-01	8.2e-01	1.3e-02
Dichloroethylene, 1,2- (trans)	540590		1.0e-02	3.4e-01	8.2e-01	7.2e-03
Dichlorophenol, 2,4-	120832	6.0e-02	2.3e-02	8.6e-01	2.1e+00	8.3e-02
Dichloropropane, 1,2-	78875		1.0e-02	4.3e-01	1.0e+00	1.0e-02
Dichloropropene, 1,3-	542756		5.5e-03	4.2e-01	1.0e+00	4.0e-03
Dichlorvos	62737		9.5e-04	1.9e+00	4.7e+00	3.0e-03
Dieldrin	60571		1.6e-02	1.8e+01	9.4e+01	3.6e+00
Diepoxybutane	1464535		2.8e-05	2.9e-01	7.0e-01	1.4e-06

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
Diethyl phthalate	84662		4.8e-03	2.0e+00	4.7e+00	3.0e-02
Diethyl sulfate	64675		1.4e-03	7.6e-01	1.8e+00	1.4e-03
Dimethoxybenzidine, 3,3'-	119904		1.0e-03	3.1e+00	7.5e+00	6.5e-03
Dimethyl phthalate	131113		1.6e-03	1.3e+00	3.2e+00	3.6e-03
Dimethyl sulfate	77781		2.2e-03	5.1e-01	1.2e+00	1.4e-03
Dimethylamine, n-nitroso-	62759		2.7e-04	2.5e-01	5.9e-01	2.7e-05
Dimethylaminoazobenzene, 4-	60117		1.4e-01	2.1e+00	1.0e+01	3.8e+00
Dimethylbenzidine, 3,3'-	119937		4.4e-03	1.7e+00	4.1e+00	2.2e-02
Dimethylcarbamyl chloride	79447		4.2e-04	4.0e-01	9.5e-01	1.0e-04
Dimethylhydrazine, 1,1-	57147		7.1e-05	2.0e-01	4.9e-01	3.2e-06
Dimethylphenol, 2,4-	105679	1.1e-01	1.5e-02	4.9e-01	1.2e+00	2.0e-02
Dimethylphenol, 3,4-	95658	4.0e-02	1.3e-02	4.9e-01	1.2e+00	1.7e-02
Dinitrophenol, 2,4-	51285	3.2e-03	1.8e-03	1.2e+00	2.8e+00	3.5e-03
Dinitrotoluene, 2,4-	121142		3.8e-03	1.1e+00	2.7e+00	9.5e-03
Dinitrotoluene, 2,6-	606202		2.5e-03	1.1e+00	2.7e+00	5.2e-03
Dioxane, 1,4-	123911	4.0e-04	3.6e-04	3.0e-01	7.2e-01	5.4e-05
Diphenylamine, n-nitroso-	86306		2.0e-02	1.4e+00	4.5e+00	1.3e-01
Diphenylhydrazine, 1,2-	122667		1.8e-02	1.2e+00	2.8e+00	8.7e-02
Dipropylamine, n-nitroso-	621647		2.8e-03	5.4e-01	1.3e+00	2.3e-03
Endrin	72208		1.6e-02	1.8e+01	9.4e+01	3.6e+00
Epichlorohydrin	106898		3.7e-04	3.2e-01	7.6e-01	6.2e-05
Ethanol	64175	8.0e-04	6.0e-04	1.7e-01	4.0e-01	4.9e-05
Ethanol, 2-(2-butoxyethoxy)-	112345		4.4e-05	8.5e-01	2.0e+00	1.2e-05
Ethanol, 2-(2-ethoxyethoxy)-	111900		2.5e-04	5.7e-01	1.4e+00	8.3e-05
Ethanol, 2-(2-methoxyethoxy)-	111773		1.8e-04	4.7e-01	1.1e+00	3.8e-05
Ethoxyethanol, 2-	110805	3.0e-04	4.6e-04	3.1e-01	7.4e-01	7.9e-05
Ethoxyethyl acetate, 2-	111159		8.6e-04	5.6e-01	1.3e+00	4.5e-04

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
Ethyl acrylate	140885		4.0e-03	3.6e-01	8.6e-01	2.1e-03
Ethyl carbamate	51796		4.3e-04	3.1e-01	7.3e-01	7.1e-05
Ethyl ether	60297	1.7e-02	2.9e-03	2.5e-01	5.9e-01	7.8e-04
Ethylbenzene	100414	1.0e+00	7.4e-02	3.9e-01	1.3e+00	1.4e-01
Ethylene oxide	75218		6.3e-04	1.6e-01	3.9e-01	5.0e-05
Ethylenedibromide	106934		3.3e-03	1.2e+00	2.9e+00	9.1e-03
Ethyleneimine	151564		1.7e-04	1.6e-01	3.8e-01	7.6e-06
Ethylenethiourea	96457		1.7e-04	3.4e-01	8.1e-01	2.2e-05
Ethylphenol, p-	123079	3.5e-02	1.4e-02	4.7e-01	1.1e+00	1.8e-02
Fluoranthene	206440		3.6e-01	1.5e+00	7.3e+00	8.9e+00
Formaldehyde	50000		2.2e-03	1.3e-01	3.2e-01	2.2e-04
Glycerol	56815	1.4e-04	2.9e-05	3.2e-01	7.7e-01	1.7e-06
Heptachlor	76448		1.1e-02	1.7e+01	9.4e+01	1.9e+00
Heptanol	111706	3.8e-02	1.9e-02	4.5e-01	1.1e+00	2.6e-02
Hexachlorobenzene	118741		2.1e-01	4.8e+00	2.3e+01	2.0e+01
Hexachlorobutadiene	87683		1.2e-01	3.4e+00	1.7e+01	6.0e+00
Hexachloroethane	67721		4.2e-02	2.4e+00	1.9e+01	8.5e-01
Hexamethylphosphoramide	680319		1.6e-04	1.1e+00	2.6e+00	1.1e-04
Hexanol	111273	3.0e-02	1.3e-02	3.7e-01	8.8e-01	1.1e-02
Hydrazine/Hydrazine sulfate	302012		4.1e-05	1.4e-01	3.3e-01	8.5e-07
Indeno(1,2,3-CD)pyrene	193395		1.9e+00	4.2e+00	2.0e+01	3.8e+02
Isophorone	78591		4.2e-03	6.1e-01	1.5e+00	4.7e-03
Lindane	58899		1.4e-02	5.2e+00	3.5e+01	5.2e-01
Mechlorethamine	51752		1.2e-03	7.8e-01	1.9e+00	1.2e-03
Methanol	67561	1.6e-03	3.5e-04	1.4e-01	3.3e-01	1.7e-05
Methoxyethanol, 2-	109864		1.9e-04	2.5e-01	6.1e-01	1.7e-05
Methoxypropan-2-ol, 1-	107982		4.0e-04	3.1e-01	7.4e-01	6.6e-05

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
Methyl ethyl ketone	78933	5.0e-03	1.1e-03	2.4e-01	5.8e-01	1.9e-04
Methyl hydroxybenzoate	99763	9.1e-03	5.2e-03	7.4e-01	1.8e+00	8.3e-03
Methyl iodide	74884		3.1e-03	6.4e-01	1.5e+00	3.2e-03
Methylaziridine, 2-	75558		3.2e-04	1.9e-01	4.7e-01	2.5e-05
Methylene bis(2-chloroaniline), 4,4'-	101144		2.8e-02	3.7e+00	3.0e+01	8.7e-01
Methylene bis(N,N'-dimethyl)aniline, 4,4'-	101611		1.3e-01	3.1e+00	1.5e+01	5.6e+00
Methylene chloride	75092		4.5e-03	2.9e-01	6.9e-01	1.8e-03
Methylenedianiline, 4,4'-	101779		1.6e-03	1.4e+00	3.4e+00	3.9e-03
Michler's ketone	90948		3.4e-02	3.8e+00	ERR	1.2e+00
Mustard Gas	505602		5.6e-03	8.2e-01	2.0e+00	1.1e-02
Naphthalene	91203		6.9e-02	5.3e-01	2.2e+00	2.0e-01
Naphthol, b-	135193	2.8e-02	2.6e-02	6.6e-01	1.6e+00	6.9e-02
Naphthylamine, 1-	134327		1.0e-02	6.5e-01	1.6e+00	1.8e-02
Naphthylamine, 2-	91598		1.1e-02	6.5e-01	1.6e+00	1.9e-02
Nitrilotriacetic acid	139139		9.7e-05	1.3e+00	3.1e+00	6.6e-05
Nitro-o-anisidine, 5-	99592		2.5e-03	7.5e-01	1.8e+00	2.9e-03
Nitrobiphenyl, 4-	92933		5.5e-02	1.4e+00	1.0e+01	5.9e-01
Nitrofen	1836755		3.0e-01	4.7e+00	2.2e+01	3.4e+01
Nitrophenol, 2-	88755	1.0e-01	5.0e-03	6.2e-01	1.5e+00	6.2e-03
Nitrophenol, 2-amino-4-	99570	7.0e-04	2.0e-03	7.6e-01	1.8e+00	2.3e-03
Nitrophenol, 3-	554847	5.6e-03	7.1e-03	6.2e-01	1.5e+00	1.0e-02
Nitrophenol, 4-	100027	5.6e-03	6.1e-03	6.2e-01	1.5e+00	8.1e-03
Nitrophenol, 4-amino-2-	119346	3.0e-03	1.1e-03	7.6e-01	1.8e+00	9.1e-04
Nitropropane, 2-	79469		1.0e-03	4.1e-01	9.8e-01	3.6e-04
Nitroso-di-n-butylamine, n-	924163		4.8e-03	8.1e-01	1.9e+00	8.3e-03
Nitroso-N-ethylurea, n-	759739		5.4e-04	4.5e-01	1.1e+00	1.7e-04

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
Nitroso-N-methylurea, n-	684935		4.3e-04	3.7e-01	8.9e-01	9.3e-05
Nitrosodiethanolamine, n-	1116547	5.0e-06	2.2e-05	5.7e-01	1.4e+00	2.6e-06
Nitrosodiethylamine, n-	55185		1.2e-03	3.0e-01	7.2e-01	3.0e-04
Nitrosodiphenylamine, p-	156105		3.6e-02	1.4e+00	7.6e+00	3.2e-01
Nitrosomethylvinylamine, n-	4549400		5.7e-04	2.9e-01	7.0e-01	9.9e-05
Nitrosomorpholine, n-	59892		1.8e-04	4.5e-01	1.1e+00	3.6e-05
Nitrosonornicotine, n-	16543558		1.7e-04	1.1e+00	2.5e+00	1.1e-04
Nitrosopiperidine, n-	100754		2.5e-05	1.2e+01	2.9e+01	2.3e-04
Nonanol	143088	6.0e-02	7.3e-02	6.6e-01	3.4e+00	2.9e-01
Octanol	111875	6.1e-02	3.9e-02	5.4e-01	1.3e+00	9.3e-02
Parathion	56382		1.7e-02	5.2e+00	3.8e+01	6.8e-01
PCB-chlorobiphenyl, 4-	2051629		1.3e+00	5.3e+00	2.5e+01	3.2e+02
PCB-hexachlorobiphenyl	26601649		7.1e-01	1.4e+01	6.6e+01	5.2e+02
Pentachloronitrobenzene	82688		5.9e-02	5.5e+00	2.8e+01	4.4e+00
Pentachlorophenol	87865		6.5e-01	3.7e+00	1.7e+01	7.2e+01
Pentanol	71410	6.0e-03	7.1e-03	3.0e-01	7.2e-01	3.6e-03
Pentanone, 4-methyl-2-	108101		3.3e-03	3.6e-01	8.6e-01	1.5e-03
Phenanthrene	85018		2.3e-01	1.1e+00	5.6e+00	2.9e+00
Phenol	108952	8.2e-03	5.5e-03	3.3e-01	7.9e-01	2.9e-03
Phenol, 4,6-dinitro-2-methyl-	534521		3.8e-03	1.4e+00	3.4e+00	1.3e-02
Propanol	71238	1.7e-03	1.3e-03	2.0e-01	4.9e-01	2.0e-04
Propiolactone, beta-	57578		3.3e-04	2.4e-01	5.8e-01	3.5e-05
Propylene oxide	75569		8.9e-04	2.0e-01	4.7e-01	1.1e-04
Resorcinol	108463	2.4e-04	1.5e-03	4.1e-01	9.9e-01	6.3e-04
Safrole	94597		1.5e-02	8.5e-01	2.0e+00	4.6e-02
Styrene	100425	6.7e-01	5.5e-02	3.8e-01	9.1e-01	8.9e-02
Styrene oxide	96093		4.9e-03	4.7e-01	1.1e+00	4.1e-03

Table 5-8. (continued)

Chemical	CAS No.	Measured Kp (cm/hr)	Estimated Kp (cm/hr)	τ (hr)	t* (hr)	B
TCDD	1746016		1.4e+00	8.1e+00	3.8e+01	6.3e+02
Tetrachlorethylene	127184	3.7e-01	4.8e-02	9.0e-01	4.3e+00	2.5e-01
Tetrachloroethane, 1,1,2,2-	79345		9.0e-03	9.2e-01	2.2e+00	2.5e-02
Thioacetamide	62555		2.1e-03	2.5e-01	6.0e-01	5.1e-04
Thiodianiline, 4,4'-	139651		2.5e-03	1.8e+00	4.4e+00	1.1e-02
Thiourea	62566	9.6e-05	1.4e-04	2.5e-01	6.1e-01	1.1e-05
Thymol	89838	5.3e-02	5.1e-02	7.2e-01	3.0e+00	2.0e-01
Toluene	108883	1.0e+00	4.5e-02	3.2e-01	7.7e-01	5.4e-02
Toluidine hydrochloride, o-	636215		2.1e-03	6.5e-01	1.6e+00	1.9e-03
Toluidine, o-	95534		3.7e-03	3.9e-01	9.4e-01	2.1e-03
Toxaphene	8001352		1.5e-02	2.9e+01	1.4e+02	6.6e+00
Trichlorobenzene, 1,2,4-	120821		1.0e-01	1.1e+00	9.3e+00	9.5e-01
Trichloroethane, 1,1,1-	71556		1.7e-02	5.7e-01	1.4e+00	3.1e-02
Trichloroethane, 1,1,2-	79005		8.4e-03	5.7e-01	1.4e+00	1.1e-02
Trichloroethylene	79016	2.3e-01	1.6e-02	5.5e-01	1.3e+00	2.6e-02
Trichlorofluoromethane	75694		1.7e-02	6.0e-01	1.4e+00	3.4e-02
Trichlorophenol, 2,4,6-	88062	5.9e-02	5.0e-02	1.4e+00	9.2e+00	4.9e-01
Tris(2,3-dibromopropyl)phosphate	126727		3.6e-04	1.6e+03	7.6e+03	9.5e+00
Tris(aziridinyl)-para-benzoquinone	68768		8.3e-06	2.3e+00	5.4e+00	4.6e-06
Urea	57136	1.2e-04	2.6e-05	2.0e-01	4.9e-01	7.8e-07
Vinyl bromide	593602		5.5e-03	3.9e-01	9.4e-01	3.7e-03
Vinyl chloride	75014		7.3e-03	2.1e-01	5.1e-01	2.3e-03
Water	7732185	1.5e-03	1.6e-04	1.1e-01	2.7e-01	4.2e-06
Xylene, m-	108383		8.0e-02	3.9e-01	1.4e+00	1.6e-01

APPENDIX K.7

SCREENING CRITERIA FOR ESSENTIAL NUTRIENTS

SCREENING CRITERIA FOR ESSENTIAL NUTRIENTS
DERIVATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS OF ESSENTIAL NUTRIENTS FOR HHCPC SELECTION

Certain inorganics (calcium, magnesium, potassium, and sodium) that are present as naturally occurring constituents in soil and groundwater are required in limited intakes to maintain normal human physiological functions and are, therefore, considered essential nutrients. The Risk Assessment Guidance for Superfund (RAGS), Volume I, Part A, regarding the treatment of essential nutrients in selection of human health contaminants of potential concern (COPCs), states that essential nutrients need not be quantitatively evaluated in a public health risk assessment if they are (1) present at low concentrations (only slightly above background) and (2) toxic only at doses much higher than those which might be related to exposure at the site (USEPA, 1989). The focus of this section of the document is the technical approach for determining that an analyte is "toxic only at doses higher than those associated with exposures at the site" and a mechanism for making that determination by employing soil and groundwater screening concentrations. The screening concentrations are used to streamline the process and to eliminate the need to calculate essential nutrient doses as part of COPCs selection at every site. If the maximum concentration of an essential nutrient does not exceed the appropriate screening concentration shown below, the essential nutrient is considered nontoxic. Essential nutrients are not retained as COPCs if they are detected at concentrations that are either consistent with background or do not exceed the screening concentrations.

Currently, no published essential nutrient screening concentrations for use in risk assessment COPC selection are available. Therefore, surface soil and groundwater screening concentrations of essential nutrients have been derived that, when contacted in accordance with the exposure assumptions described below, are not expected to result in adverse health effects. The screening concentrations for groundwater and surface soil are presented in Table 1. The essential nutrient concentrations in surface sol and groundwater are to be compared directly to the nutrient screening concentrations for the purposes of COPC selection.

DOCUMENTATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS

The essential nutrient toxicity screening concentrations were derived in two steps: first, a "nontoxic" dose was identified for each essential nutrient; second, the soil and groundwater concentrations associated with the "nontoxic" doses were calculated using standard residential exposure assumptions. The details of the derivation of the screening values are presented below.

Identification of Nontoxic Doses. The identification of doses which are not toxic is often accomplished by identifying reference doses (RfDs), which are published by USEPA. These RfDs represent doses, including a margin of safety, to which even sensitive subpopulations could be exposed for a lifetime without adverse noncarcinogenic effects. Because no RfDs for calcium, magnesium, potassium, or sodium are available in the Integrated Risk Information System (IRIS) (USEPA, 1999b) or the Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997a), other published nontoxic doses were sought out. Recommended Dietary Allowances (RDAs) prepared by the Food and Nutrition Board (FNB) of the National Research Council (NRC, 1989) have been selected here to represent nontoxic doses.

TABLE 1

ESSENTIAL NUTRIENT SCREENING CONCENTRATIONS FOR SURFACE SOIL AND GROUNDWATER

Essential Nutrient	Surface Soil Screening Concentration (mg/kg)	Groundwater Screening Concentration (µg/l)
Calcium	1,000,000(1)	1,055,398
Magnesium	460,468	118,807
Potassium	1,000,000(1)	297,016
Sodium	1,000,000(1)	396,022

1 Actual calculated screening concentration is greater than 1,000,000 milligrams per kilogram, indicating that this essential nutrient would not be present at toxic levels in surface soil.

Notes: As described below, screening concentrations for surface sol and groundwater represent conservative screening concentrations for other media. These surface soil and groundwater screening concentrations are used to screen sediment, subsurface soil, sludge, and surface water, respectively.

mg/kg = milligrams per kilogram.
µg/l = micrograms per liter

RDAs are defined by the FNB as "the levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons." It is assumed here that because the RDA represents a requirement for good nutrition, it also represents a dose that is nontoxic. Although some essential nutrients (arsenic for example) have been classified as carcinogens, none of the five nutrients discussed here have been classified as carcinogens. The available RDA data for calcium, magnesium, potassium, and sodium are presented in Table 2. From this data set, RDAs for children were preferentially selected to coincide with the child exposure scenario. RDAs were converted from units of milligrams per day to units of milligrams per kilogram per day by dividing the RDA by the child resident body weight of 15 kilograms (USEPA, 1991). Dermal RDAs were developed by adjusting the oral RDA to compensate for the oral absorption efficiency in a manner similar to that presented in Appendix A of RAGS, Volume I, Part A (USEPA, 1989).

TABLE 2

RECOMMENDED DIETARY ALLOWANCES[1]

Nutrient	RDA	Age (years)	Oral Absorption (Percent)	Typical Dietary Intake (mg/day)	Toxicity Threshold (mg/day)	Oral RDA (mg/kg/day)[2]	Dermal RDA (mg/kg/day)[3]
Calcium	800 (mg/day) 1,200 (mg/day) 800 (mg/day)	1 - 10 11 - 24 >24	40	743 (average of all ages) 1,179 743 (average of all ages); 530 (women ages 35-50)	NA NA >2,500	53.3	21.2
Magnesium	6 (mg/kg/day) 4.5 (mg/kg/day)	1 - 15 >15	50	193 (age 1-5) 207 - 329	NA NA	6	3
Potassium	15 - 20 (mg/kg/day) 1,600 - 2,000 (mg/day)	1 - 10 >20	90	1,500 2,500	NA 18,000 (hyperkalemia)	15	13.5
Sodium	300 (mg/day) 500 (mg/day)	2 - 5 Adult	90[4]	NA 1,800 - 5,000	NA 2,400 (Intake not to be exceeded)	20 20	18 18

1 All data are from the National Resource Council (1989).
2 Adjusted oral recommended daily allowance (RDA) calculated by dividing the RDA (milligrams per kilogram) by the bodyweight of a child ages 1 to 6 (15 kilogram) (USEPA, 1991); RDAs provided in milligrams per kilogram per day were modified.
3 Adjusted dermal RDA calculated by multiplying the oral RDA by the oral absorption efficiency (USEPA, 1989).
4 Oral absorption data not available; value for potassium used as a surrogate based on physio-chemical similarities.

Notes: RDA = recommended daily allowance.
mg/day = milligrams per day.
mg/kg = milligrams per kilogram.
mg/kg/day = milligrams per kilogram per day.

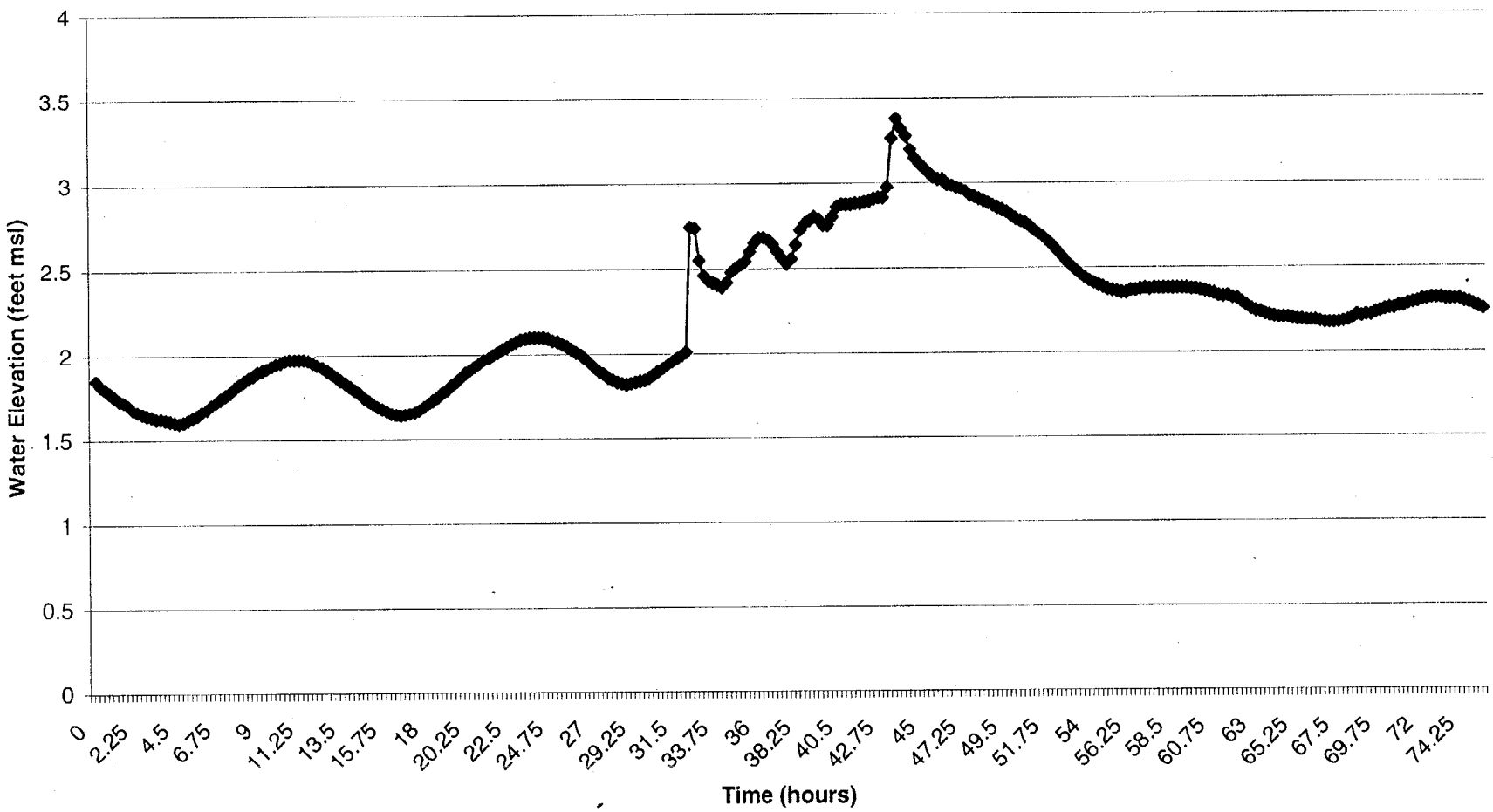
To derive screening concentrations that would be protective to the majority of the exposed population, the exposure assumptions for the most sensitive receptor (e.g., a child resident) were used. For groundwater, screening concentrations were based on ingestion of groundwater as drinking water. For surface soil, screening concentrations were based on ingestion of surface soil and dermal contact with surface soil. Child resident exposure to surface soil and groundwater used as drinking water is usually greater than or equal to oral and dermal exposure to media treated as soil and groundwater, respectively, for exposure assessment. Therefore, screening values for surface soil represent conservative screening values for sediment, subsurface soil, and sludge, and screening values for groundwater used as drinking water represent conservative screening values for surface water.

The calculated essential nutrient screening concentrations for surface soil and groundwater are presented in Table 1. These values represent the concentrations of individual essential nutrients in media that if contacted in accordance with the exposure parameters used to derive the screening concentration, it would theoretically results in the receptor receiving his or her recommended dietary allowance of an essential nutrient solely from the contacted media. For some nutrients, the calculated screening concentrations exceed 1,000,000 mg/kg (i.e., 100 percent). Such concentrations indicate that no concentration of nutrient in the particular medium would result in an intake that exceeds the RDA, given the exposure assumptions on which the screening value is based. Because these screening concentrations do not take into account the additivity of exposures between media (and other dietary intakes, including food), a receptor exposed to essential nutrients that are present in multiple media at the screening concentrations would, in essence, be receiving more than his or her recommended dietary allowance of nutrient. However, data provided in Table 2 indicate that the toxicity threshold for most essential nutrients is several times greater than the RDA; the RDA is not a toxicity threshold value. Therefore, these screening concentrations do not represent concentrations which, if exceeded, would necessarily result in deleterious effects.

APPENDIX L

Tidal Study Data

FIGURE 6-4
TIDAL STUDY AT S57TW003
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND.



TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

Time (min)	Change in Groundwater Elevation (feet)	Adjusted Change in Groundwater Elevation (feet)	Initial Depth to Water Surface (feet)	Water Surface Elevation (msl)	Time (hours)	Time (days)	Date	Military Time
0	-3.945	0	5.27	1.85	0	0	1/22/99	13:51:13
15	-3.976	-0.031		1.819	0.25	0.010417		
30	-3.996	-0.051		1.799	0.5	0.020833		
45	-4.015	-0.07		1.78	0.75	0.03125		
60	-4.04	-0.095		1.755	1	0.041667		
75	-4.059	-0.114		1.736	1.25	0.052083		
90	-4.072	-0.127		1.723	1.5	0.0625		
105	-4.091	-0.146		1.704	1.75	0.072917		
120	-4.116	-0.171		1.679	2	0.083333		
135	-4.129	-0.184		1.666	2.25	0.09375		
150	-4.142	-0.197		1.653	2.5	0.104167		
165	-4.154	-0.209		1.641	2.75	0.114583		
180	-4.161	-0.216		1.634	3	0.125		
195	-4.173	-0.228		1.622	3.25	0.135417		
210	-4.173	-0.228		1.622	3.5	0.145833		
225	-4.18	-0.235		1.615	3.75	0.15625		
240	-4.186	-0.241		1.609	4	0.166667		
255	-4.192	-0.247		1.603	4.25	0.177083		
270	-4.199	-0.254		1.596	4.5	0.1875		
285	-4.192	-0.247		1.603	4.75	0.197917		
300	-4.18	-0.235		1.615	5	0.208333		
315	-4.167	-0.222		1.628	5.25	0.21875		
330	-4.154	-0.209		1.641	5.5	0.229167		
345	-4.129	-0.184		1.666	5.75	0.239583		
360	-4.116	-0.171		1.679	6	0.25		
375	-4.091	-0.146		1.704	6.25	0.260417		
390	-4.072	-0.127		1.723	6.5	0.270833		
405	-4.053	-0.108		1.742	6.75	0.28125		
420	-4.034	-0.089		1.761	7	0.291667		
435	-4.015	-0.07		1.78	7.25	0.302083		
450	-3.989	-0.044		1.806	7.5	0.3125		
465	-3.97	-0.025		1.825	7.75	0.322917		
480	-3.951	-0.006		1.844	8	0.333333		
495	-3.932	0.013		1.863	8.25	0.34375		
510	-3.919	0.026		1.876	8.5	0.354167		
525	-3.9	0.045		1.895	8.75	0.364583		
540	-3.888	0.057		1.907	9	0.375		
555	-3.875	0.07		1.92	9.25	0.385417		
570	-3.862	0.083		1.933	9.5	0.395833		
585	-3.849	0.096		1.946	9.75	0.40625		
600	-3.843	0.102		1.952	10	0.416667		

TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

615	-3.83	0.115		1.965	10.25	0.427083		
630	-3.824	0.121		1.971	10.5	0.4375		
645	-3.824	0.121		1.971	10.75	0.447917		
660	-3.824	0.121		1.971	11	0.458333		
675	-3.824	0.121		1.971	11.25	0.46875		
690	-3.83	0.115		1.965	11.5	0.479167		
705	-3.843	0.102		1.952	11.75	0.489583		
720	-3.856	0.089		1.939	12	0.5		
735	-3.869	0.076		1.926	12.25	0.510417		
750	-3.888	0.057		1.907	12.5	0.520833		
765	-3.907	0.038		1.888	12.75	0.53125		
780	-3.926	0.019		1.869	13	0.541667		
795	-3.945	0		1.85	13.25	0.552083		
810	-3.964	-0.019		1.831	13.5	0.5625		
825	-3.983	-0.038		1.812	13.75	0.572917		
840	-4.002	-0.057		1.793	14	0.583333		
855	-4.021	-0.076		1.774	14.25	0.59375		
870	-4.046	-0.101		1.749	14.5	0.604167		
885	-4.065	-0.12		1.73	14.75	0.614583		
900	-4.084	-0.139		1.711	15	0.625		
915	-4.103	-0.158		1.692	15.25	0.635417		
930	-4.116	-0.171		1.679	15.5	0.645833		
945	-4.129	-0.184		1.666	15.75	0.65625		
960	-4.142	-0.197		1.653	16	0.666667		
975	-4.148	-0.203		1.647	16.25	0.677083		
990	-4.154	-0.209		1.641	16.5	0.6875		
1005	-4.148	-0.203		1.647	16.75	0.697917		
1020	-4.142	-0.197		1.653	17	0.708333		
1035	-4.135	-0.19		1.66	17.25	0.71875		
1050	-4.123	-0.178		1.672	17.5	0.729167		
1065	-4.103	-0.158		1.692	17.75	0.739583		
1080	-4.084	-0.139		1.711	18	0.75		
1095	-4.065	-0.12		1.73	18.25	0.760417		
1110	-4.046	-0.101		1.749	18.5	0.770833		
1125	-4.021	-0.076		1.774	18.75	0.78125		
1140	-4.002	-0.057		1.793	19	0.791667		
1155	-3.976	-0.031		1.819	19.25	0.802083		
1170	-3.957	-0.012		1.838	19.5	0.8125		
1185	-3.932	0.013		1.863	19.75	0.822917		
1200	-3.907	0.038		1.888	20	0.833333		
1215	-3.888	0.057		1.907	20.25	0.84375		
1230	-3.869	0.076		1.926	20.5	0.854167		
1245	-3.849	0.096		1.946	20.75	0.864583		
1260	-3.83	0.115		1.965	21	0.875		
1275	-3.818	0.127		1.977	21.25	0.885417		
1290	-3.799	0.146		1.996	21.5	0.895833		
1305	-3.786	0.159		2.009	21.75	0.90625		

TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

1320	-3.767	0.178		2.028	22	0.916667		
1335	-3.754	0.191		2.041	22.25	0.927083		
1350	-3.735	0.21		2.06	22.5	0.9375		
1365	-3.722	0.223		2.073	22.75	0.947917		
1380	-3.71	0.235		2.085	23	0.958333		
1395	-3.703	0.242		2.092	23.25	0.96875		
1410	-3.697	0.248		2.098	23.5	0.979167		
1425	-3.697	0.248		2.098	23.75	0.989583		
1440	-3.697	0.248		2.098	24	1	1/23/99	13:51:13
1455	-3.697	0.248		2.098	24.25	1.010417		
1470	-3.703	0.242		2.092	24.5	1.020833		
1485	-3.716	0.229		2.079	24.75	1.03125		
1500	-3.722	0.223		2.073	25	1.041667		
1515	-3.735	0.21		2.06	25.25	1.052083		
1530	-3.748	0.197		2.047	25.5	1.0625		
1545	-3.767	0.178		2.028	25.75	1.072917		
1560	-3.786	0.159		2.009	26	1.083333		
1575	-3.799	0.146		1.996	26.25	1.09375		
1590	-3.824	0.121		1.971	26.5	1.104167		
1605	-3.849	0.096		1.946	26.75	1.114583		
1620	-3.875	0.07		1.92	27	1.125		
1635	-3.9	0.045		1.895	27.25	1.135417		
1650	-3.913	0.032		1.882	27.5	1.145833		
1665	-3.938	0.007		1.857	27.75	1.15625		
1680	-3.951	-0.006		1.844	28	1.166667		
1695	-3.964	-0.019		1.831	28.25	1.177083		
1710	-3.97	-0.025		1.825	28.5	1.1875		
1725	-3.976	-0.031		1.819	28.75	1.197917		
1740	-3.97	-0.025		1.825	29	1.208333		
1755	-3.964	-0.019		1.831	29.25	1.21875		
1770	-3.957	-0.012		1.838	29.5	1.229167		
1785	-3.951	-0.006		1.844	29.75	1.239583		
1800	-3.938	0.007		1.857	30	1.25		
1815	-3.919	0.026		1.876	30.25	1.260417		
1830	-3.9	0.045		1.895	30.5	1.270833		
1845	-3.881	0.064		1.914	30.75	1.28125		
1860	-3.862	0.083		1.933	31	1.291667		
1875	-3.843	0.102		1.952	31.25	1.302083		
1890	-3.824	0.121		1.971	31.5	1.3125		
1905	-3.805	0.14		1.99	31.75	1.322917		
1920	-3.786	0.159		2.009	32	1.333333		
1935	-3.049	0.896		2.746	32.25	1.34375		
1950	-3.056	0.889		2.739	32.5	1.354167		
1965	-3.246	0.699		2.549	32.75	1.364583		
1980	-3.335	0.61		2.46	33	1.375		
1995	-3.367	0.578		2.428	33.25	1.385417		
2010	-3.38	0.565		2.415	33.5	1.395833		

TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

2025	-3.392	0.553		2.403	33.75	1.40625		
2040	-3.405	0.54		2.39	34	1.416667		
2055	-3.38	0.565		2.415	34.25	1.427083		
2070	-3.316	0.629		2.479	34.5	1.4375		
2085	-3.291	0.654		2.504	34.75	1.447917		
2100	-3.272	0.673		2.523	35	1.458333		
2115	-3.253	0.692		2.542	35.25	1.46875		
2130	-3.195	0.75		2.6	35.5	1.479167		
2145	-3.145	0.8		2.65	35.75	1.489583		
2160	-3.113	0.832		2.682	36	1.5		
2175	-3.113	0.832		2.682	36.25	1.510417		
2190	-3.126	0.819		2.669	36.5	1.520833		
2205	-3.151	0.794		2.644	36.75	1.53125		
2220	-3.195	0.75		2.6	37	1.541667		
2235	-3.233	0.712		2.562	37.25	1.552083		
2250	-3.265	0.68		2.53	37.5	1.5625		
2265	-3.24	0.705		2.555	37.75	1.572917		
2280	-3.157	0.788		2.638	38	1.583333		
2295	-3.068	0.877		2.727	38.25	1.59375		
2310	-3.03	0.915		2.765	38.5	1.604167		
2325	-3.011	0.934		2.784	38.75	1.614583		
2340	-2.992	0.953		2.803	39	1.625		
2355	-3.005	0.94		2.79	39.25	1.635417		
2370	-3.037	0.908		2.758	39.5	1.645833		
2385	-3.037	0.908		2.758	39.75	1.65625		
2400	-2.992	0.953		2.803	40	1.666667		
2415	-2.935	1.01		2.86	40.25	1.677083		
2430	-2.922	1.023		2.873	40.5	1.6875		
2445	-2.922	1.023		2.873	40.75	1.697917		
2460	-2.922	1.023		2.873	41	1.708333		
2475	-2.916	1.029		2.879	41.25	1.71875		
2490	-2.916	1.029		2.879	41.5	1.729167		
2505	-2.91	1.035		2.885	41.75	1.739583		
2520	-2.903	1.042		2.892	42	1.75		
2535	-2.891	1.054		2.904	42.25	1.760417		
2550	-2.884	1.061		2.911	42.5	1.770833		
2565	-2.884	1.061		2.911	42.75	1.78125		
2580	-2.821	1.124		2.974	43	1.791667		
2595	-2.535	1.41		3.26	43.25	1.802083		
2610	-2.42	1.525		3.375	43.5	1.8125		
2625	-2.478	1.467		3.317	43.75	1.822917		
2640	-2.522	1.423		3.273	44	1.833333		
2655	-2.605	1.34		3.19	44.25	1.84375		
2670	-2.655	1.29		3.14	44.5	1.854167		
2685	-2.687	1.258		3.108	44.75	1.864583		
2700	-2.713	1.232		3.082	45	1.875		
2715	-2.738	1.207		3.057	45.25	1.885417		

TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

2730	-2.763	1.182		3.032	45.5	1.895833		
2745	-2.776	1.169		3.019	45.75	1.90625		
2760	-2.776	1.169		3.019	46	1.916667		
2775	-2.808	1.137		2.987	46.25	1.927083		
2790	-2.814	1.131		2.981	46.5	1.9375		
2805	-2.827	1.118		2.968	46.75	1.947917		
2820	-2.833	1.112		2.962	47	1.958333		
2835	-2.846	1.099		2.949	47.25	1.96875		
2850	-2.871	1.074		2.924	47.5	1.979167		
2865	-2.878	1.067		2.917	47.75	1.989583		
2880	-2.891	1.054		2.904	48	2	1/24/99	13:51:13
2895	-2.903	1.042		2.892	48.25	2.010417		
2910	-2.916	1.029		2.879	48.5	2.020833		
2925	-2.929	1.016		2.866	48.75	2.03125		
2940	-2.941	1.004		2.854	49	2.041667		14:51:13
2955	-2.954	0.991		2.841	49.25	2.052083		
2970	-2.967	0.978		2.828	49.5	2.0625		
2985	-2.986	0.959		2.809	49.75	2.072917		
3000	-3.005	0.94		2.79	50	2.083333		15:51:13
3015	-3.018	0.927		2.777	50.25	2.09375		
3030	-3.03	0.915		2.765	50.5	2.104167		
3045	-3.049	0.896		2.746	50.75	2.114583		
3060	-3.075	0.87		2.72	51	2.125		16:51:13
3075	-3.094	0.851		2.701	51.25	2.135417		
3090	-3.113	0.832		2.682	51.5	2.145833		
3105	-3.138	0.807		2.657	51.75	2.15625		
3120	-3.164	0.781		2.631	52	2.166667		17:51:13
3135	-3.195	0.75		2.6	52.25	2.177083		
3150	-3.227	0.718		2.568	52.5	2.1875		
3165	-3.259	0.686		2.536	52.75	2.197917		
3180	-3.284	0.661		2.511	53	2.208333		
3195	-3.31	0.635		2.485	53.25	2.21875		
3210	-3.335	0.61		2.46	53.5	2.229167		
3225	-3.354	0.591		2.441	53.75	2.239583		
3240	-3.373	0.572		2.422	54	2.25		
3255	-3.386	0.559		2.409	54.25	2.260417		
3270	-3.399	0.546		2.396	54.5	2.270833		
3285	-3.411	0.534		2.384	54.75	2.28125		
3300	-3.424	0.521		2.371	55	2.291667		
3315	-3.43	0.515		2.365	55.25	2.302083		
3330	-3.437	0.508		2.358	55.5	2.3125		
3345	-3.443	0.502		2.352	55.75	2.322917		
3360	-3.443	0.502		2.352	56	2.333333		
3375	-3.43	0.515		2.365	56.25	2.34375		
3390	-3.43	0.515		2.365	56.5	2.354167		
3405	-3.424	0.521		2.371	56.75	2.364583		
3420	-3.418	0.527		2.377	57	2.375		

TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

3435	-3.424	0.521		2.371	57.25	2.385417		
3450	-3.418	0.527		2.377	57.5	2.395833		
3465	-3.418	0.527		2.377	57.75	2.40625		
3480	-3.418	0.527		2.377	58	2.416667		
3495	-3.418	0.527		2.377	58.25	2.427083		
3510	-3.418	0.527		2.377	58.5	2.4375		
3525	-3.418	0.527		2.377	58.75	2.447917		
3540	-3.418	0.527		2.377	59	2.458333		
3555	-3.418	0.527		2.377	59.25	2.46875		
3570	-3.424	0.521		2.371	59.5	2.479167		
3585	-3.424	0.521		2.371	59.75	2.489583		
3600	-3.43	0.515		2.365	60	2.5		
3615	-3.437	0.508		2.358	60.25	2.510417		
3630	-3.443	0.502		2.352	60.5	2.520833		
3645	-3.449	0.496		2.346	60.75	2.53125		
3660	-3.462	0.483		2.333	61	2.541667		
3675	-3.468	0.477		2.327	61.25	2.552083		
3690	-3.462	0.483		2.333	61.5	2.5625		
3705	-3.475	0.47		2.32	61.75	2.572917		
3720	-3.481	0.464		2.314	62	2.583333		
3735	-3.5	0.445		2.295	62.25	2.59375		
3750	-3.519	0.426		2.276	62.5	2.604167		
3765	-3.538	0.407		2.257	62.75	2.614583		
3780	-3.551	0.394		2.244	63	2.625		
3795	-3.557	0.388		2.238	63.25	2.635417		
3810	-3.57	0.375		2.225	63.5	2.645833		
3825	-3.576	0.369		2.219	63.75	2.65625		
3840	-3.583	0.362		2.212	64	2.666667		
3855	-3.589	0.356		2.206	64.25	2.677083		
3870	-3.589	0.356		2.206	64.5	2.6875		
3885	-3.589	0.356		2.206	64.75	2.697917		
3900	-3.595	0.35		2.2	65	2.708333		
3915	-3.602	0.343		2.193	65.25	2.71875		
3930	-3.602	0.343		2.193	65.5	2.729167		
3945	-3.608	0.337		2.187	65.75	2.739583		
3960	-3.608	0.337		2.187	66	2.75		
3975	-3.608	0.337		2.187	66.25	2.760417		
3990	-3.615	0.33		2.18	66.5	2.770833		
4005	-3.621	0.324		2.174	66.75	2.78125		
4020	-3.621	0.324		2.174	67	2.791667		
4035	-3.621	0.324		2.174	67.25	2.802083		
4050	-3.621	0.324		2.174	67.5	2.8125		
4065	-3.615	0.33		2.18	67.75	2.822917		
4080	-3.608	0.337		2.187	68	2.833333		
4095	-3.595	0.35		2.2	68.25	2.84375		
4110	-3.576	0.369		2.219	68.5	2.854167		
4125	-3.583	0.362		2.212	68.75	2.864583		

TIDE STUDY DATA FROM LOCATION S57TW003

SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD MARYLAND

4140	-3.576	0.369		2.219	69	2.875		
4155	-3.576	0.369		2.219	69.25	2.885417		
4170	-3.564	0.381		2.231	69.5	2.895833		
4185	-3.557	0.388		2.238	69.75	2.90625		
4200	-3.545	0.4		2.25	70	2.916667		
4215	-3.538	0.407		2.257	70.25	2.927083		
4230	-3.538	0.407		2.257	70.5	2.9375		
4245	-3.526	0.419		2.269	70.75	2.947917		
4260	-3.526	0.419		2.269	71	2.958333		
4275	-3.513	0.432		2.282	71.25	2.96875		
4290	-3.507	0.438		2.288	71.5	2.979167		
4305	-3.5	0.445		2.295	71.75	2.989583		
4320	-3.488	0.457		2.307	72	3	1/25/99	13:51:13
4335	-3.488	0.457		2.307	72.25	3.010417		
4350	-3.481	0.464		2.314	72.5	3.020833		
4365	-3.481	0.464		2.314	72.75	3.03125		
4380	-3.481	0.464		2.314	73	3.041667		
4395	-3.488	0.457		2.307	73.25	3.052083		
4410	-3.488	0.457		2.307	73.5	3.0625		
4425	-3.488	0.457		2.307	73.75	3.072917		
4440	-3.488	0.457		2.307	74	3.083333		
4455	-3.5	0.445		2.295	74.25	3.09375		
4470	-3.507	0.438		2.288	74.5	3.104167		
4485	-3.519	0.426		2.276	74.75	3.114583		
4500	-3.532	0.413		2.263	75	3.125		
4515	-3.545	0.4		2.25	75.25	3.135417		

APPENDIX M

Slug Test Data

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57
SUBJECT: SLUG TEST WELL 57MW001 FALLING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRTOWRAMSEY / CHECKED BY: RMB 3/8/99	APPROVED BY: / DATE:

FQ.

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

r = 0.083 feet (RISER RADIUS)
R = 0.083 feet (SCREEN RADIUS)
L = 10 feet (INPUT LENGTH)
T_o = 1.58 MIN (TIME @ 37%)

SUB:

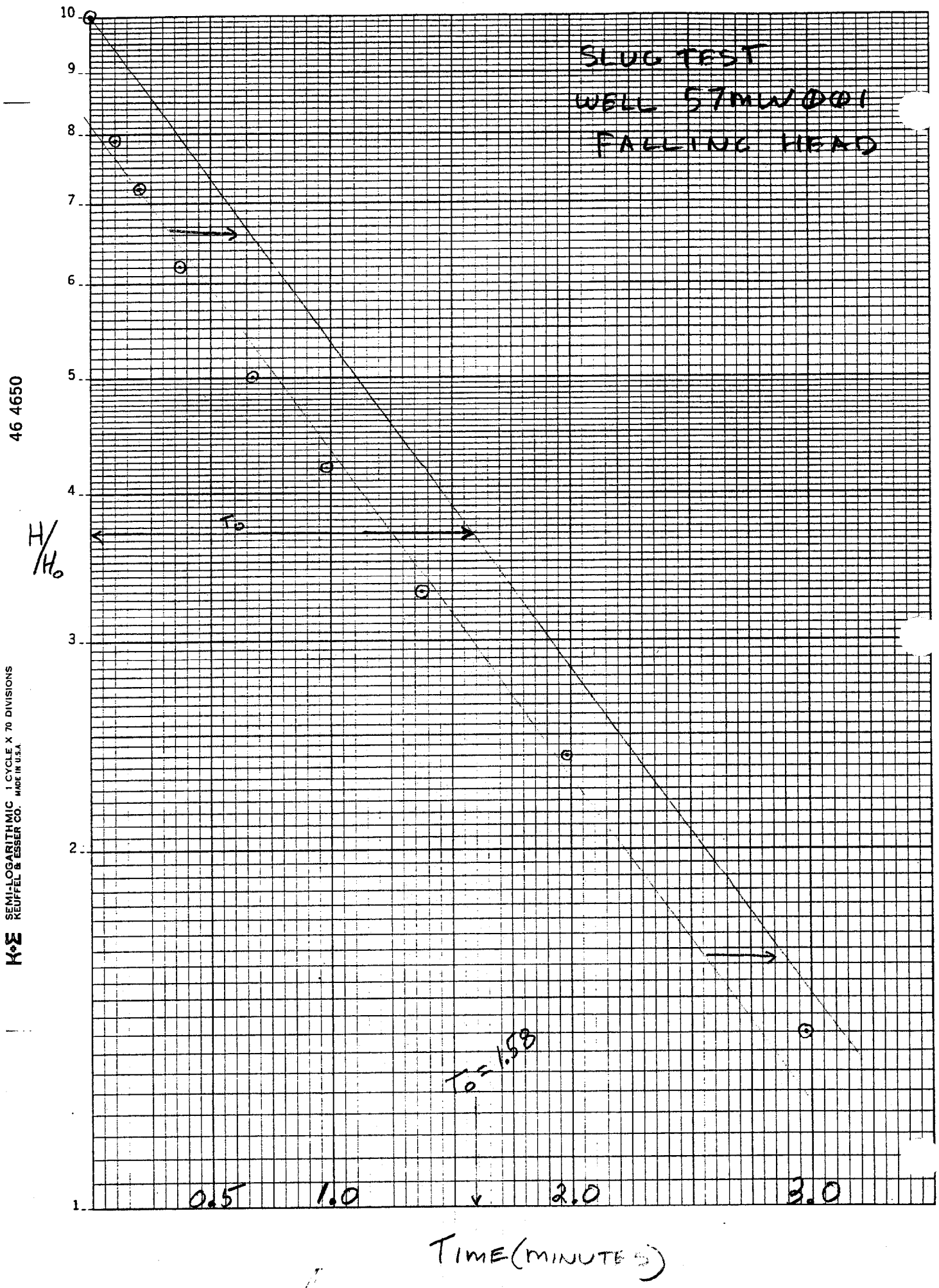
$$K = \frac{(.083)^2 \ln(10/.083)}{2(10)(1.58)}$$

$$= \frac{0.033}{31.6}$$

$K = 1.0 \times 10^{-3}$ ft/MIN

$K = 5.3 \times 10^{-4}$ cm/sec

$K = 1.44$ ft/day


SLUG TEST
WELL 57MW001
FALLING HEAD
H/H₀
T₀
T₀ = 1.58
10
9
8
7
6
5
4
3
2
1
0.5
1.0
2.0
3.0
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD NSWC SITE 57 WELL/BORING NO.: S57MW01

PROJECT NO.: 7129 GEOLOGIST: FRED WRAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10', 16.18-26.18 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 7.65 TPVC DATE: 1-26-99

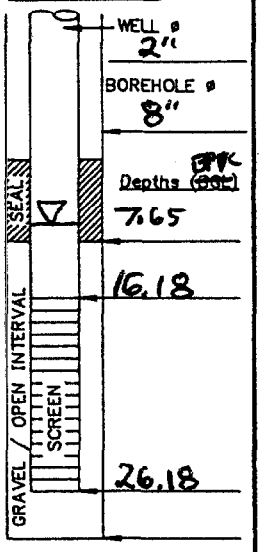
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 4.70' x 0.145' PAGE 1 OF 2

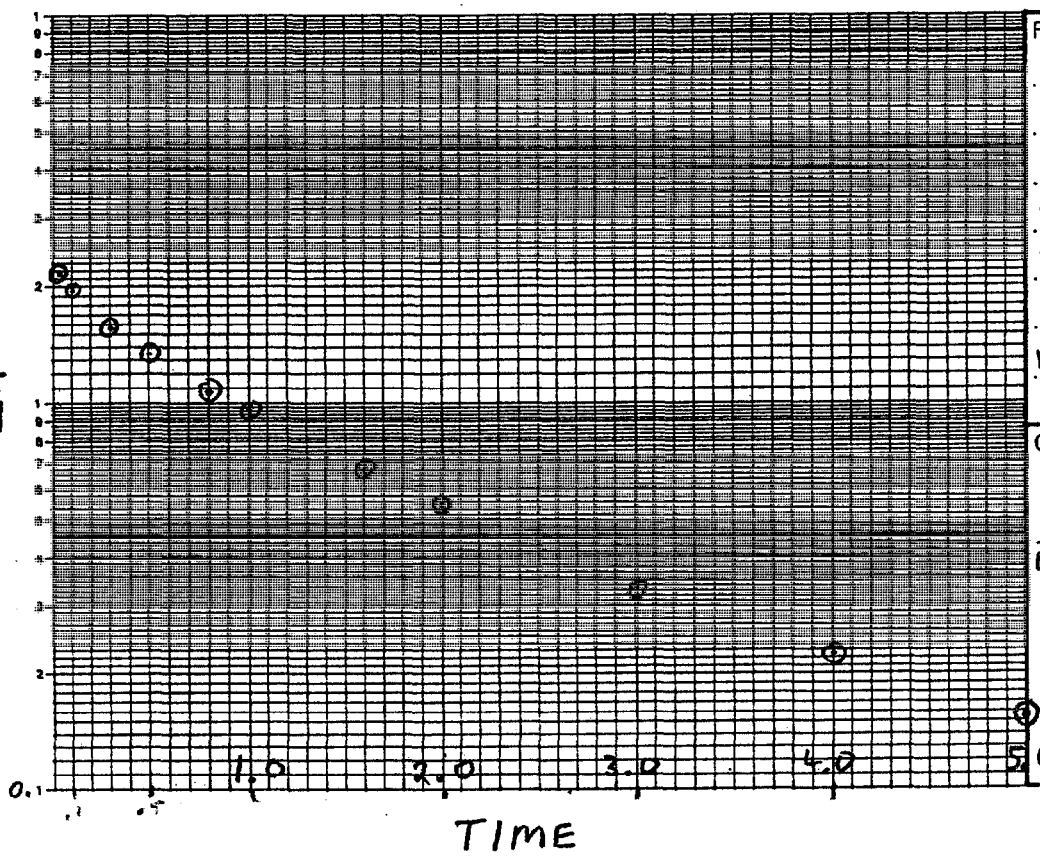
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		1.888	0.2500		1.646
0.0083		2.047	0.300		1.57
0.0166		3.675	0.400		1.443
0.025		2.148	0.500		1.341
0.050		2.053	0.600		1.245
0.0666		2.047	0.800		1.093
0.075		2.028	0.950		0.998
0.0916		1.977	1.000		0.966
0.100		1.958	1.6		0.686
0.150		1.830	2.0		0.553
0.175		1.780	3.0		0.343
0.200		1.729	4.0		0.222

WELL SCHEMATIC



Indicate SWL Depth on Drawing



REMARKS:

5.0	0.152
6.0	0.101
7.0	0.069
8.0	0.044
10.0	0.025
12.0	0.006
14.0	0.000

START 0910 HR

CALCS, SKETCH MAPS, ETC.:

7.65'
6.00
13.65

STOP TEST @ 0930

SE2000
Environmental Logger
01/26 21:05

Unit# 2000 Test 1

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW01
Reference	0.000
PSI at Ref.	3.567
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 09:11:33

Elapsed Time	INPUT 1	H/H₀
0.0000	1.888	
0.0083	2.047	
0.0166	3.675	
0.0250	2.148	
0.0333	2.059	
0.0416	2.314	1.0
0.0500	2.053	
0.0583	2.085	
0.0666	2.047	
0.0750	2.028	
0.0833	2.002	
0.0916	1.977	
0.1000	1.956	
0.1083	2.047	
0.1166	1.805	
0.1250	1.919	
0.1333	1.862	
0.1416	1.837	0.79
0.1500	1.830	
0.1583	1.811	
0.1666	1.792	
0.1750	1.780	
0.1833	1.760	
0.1916	1.748	
0.2000	1.729	
0.2083	1.716	
0.2166	1.697	
0.2250	1.684	
0.2333	1.671	
0.2416	1.659	0.72
0.2500	1.646	

0.2583	1.633	
0.2666	1.621	
0.2750	1.602	
0.2833	1.595	
0.2916	1.582	
0.3000	1.570	
0.3083	1.557	
0.3166	1.544	
0.3250	1.532	
0.3333	1.525	
0.3500	1.500	
0.3666	1.481	
0.3833	1.462	
0.4000	1.443	
0.4166	1.423	0.62
0.4333	1.404	
0.4500	1.385	
0.4666	1.373	
0.4833	1.354	
0.5000	1.341	
0.5166	1.322	
0.5333	1.309	
0.5500	1.290	
0.5666	1.277	
0.5833	1.265	
0.6000	1.245	
0.6166	1.233	
0.6333	1.220	
0.6500	1.207	
0.6666	1.195	
0.6833	1.176	
0.7000	1.169	
0.7166	1.150	0.50
0.7333	1.137	
0.7500	1.131	
0.7666	1.118	
0.7833	1.106	
0.8000	1.093	
0.8166	1.080	
0.8333	1.067	
0.8500	1.055	
0.8666	1.048	
0.8833	1.036	
0.9000	1.023	
0.9166	1.017	
0.9333	1.004	
0.9500	0.998	
0.9666	0.985	
0.9833	0.972	
1.0000	0.966	0.42
1.2000	0.858	
1.4000	0.762	0.33
1.6000	0.686	
1.8000	0.616	
2.0000	0.553	0.24
2.2000	0.502	
2.4000	0.451	
2.6000	0.413	
2.8000	0.375	
3.0000	0.343	0.14

3.2000	0.317
3.4000	0.286
3.6000	0.266
3.8000	0.241
4.0000	0.222
4.2000	0.203
4.4000	0.190
4.6000	0.177
4.8000	0.158
5.0000	0.152
5.2000	0.139
5.4000	0.127
5.6000	0.114
5.8000	0.108
6.0000	0.101
6.2000	0.088
6.4000	0.088
6.6000	0.076
6.8000	0.076
7.0000	0.069
7.2000	0.063
7.4000	0.057
7.6000	0.050
7.8000	0.050
8.0000	0.044
8.2000	0.044
8.4000	0.044
8.6000	0.038
8.8000	0.038
9.0000	0.031
9.2000	0.031
9.4000	0.031
9.6000	0.025
9.8000	0.025
10.0000	0.025
12.0000	0.006
14.0000	0.000
16.0000	0.000
18.0000	0.000
20.0000	0.006

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIANHEAD NSWC	JOB NUMBER: 7129 SITE 57
SUBJECT: SLUG TEST WELL 57MW001 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FREDW. RAMSER / CHECKED BY: RMB 3/8/99	APPROVED BY: / DATE:

EQ.

$$K = \frac{r^2 \ln (L/R)}{2LT_o}$$

$r = 0.083$ feet — RISER RADIUS
$R = 0.083$ feet — SCREEN RADIUS
$L = 10.0$ feet — INPUT LENGTH
$T_o = 2.42$ min — TIME @ 37%

SUB

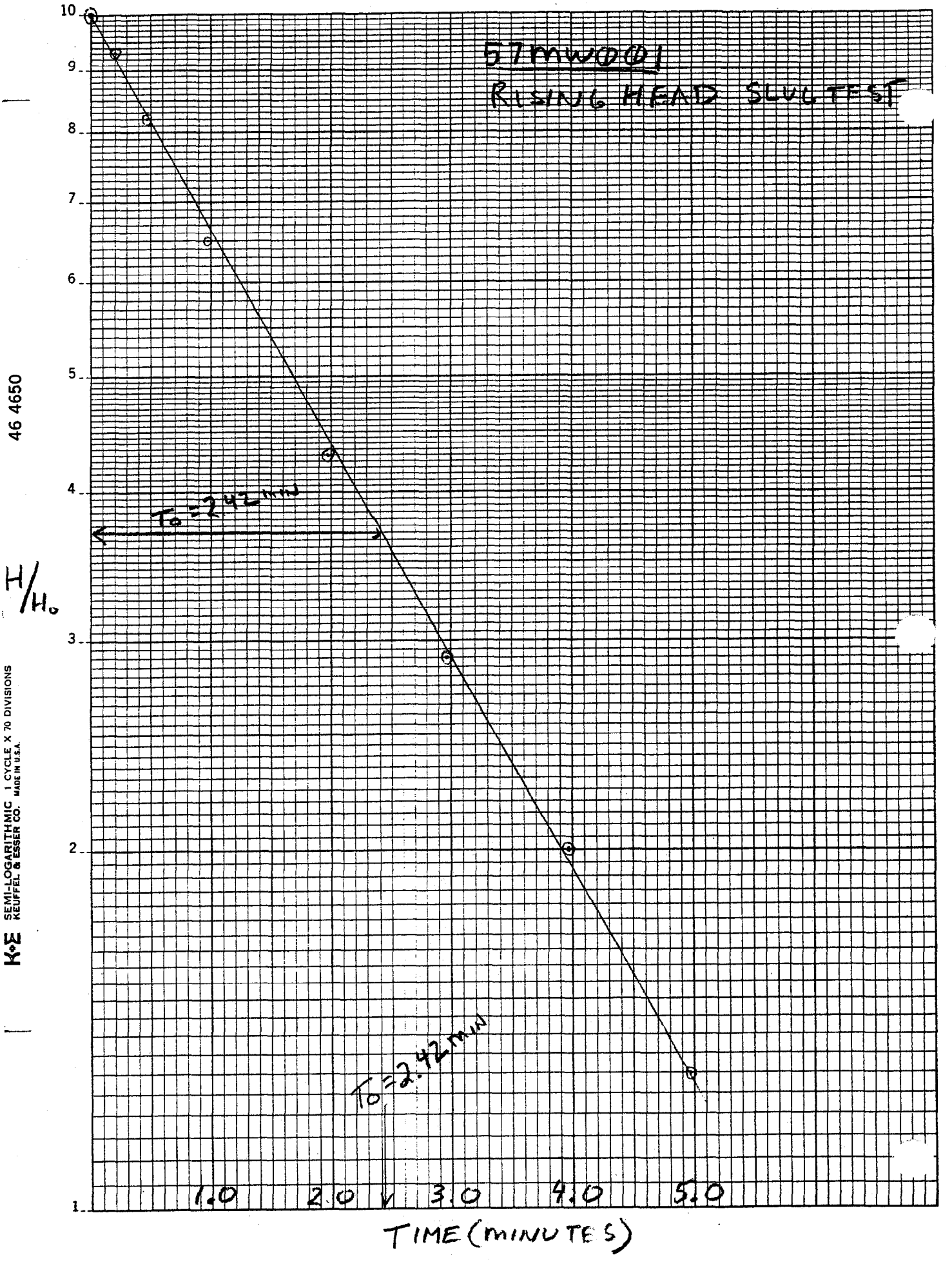
$$K = \frac{(0.083)^2 \ln (10/.083)}{2(10)(2.42)}$$

$$= \frac{0.033}{48.4}$$

$$K = 6.8 \times 10^{-4} \text{ ft/min}$$

$$K = 3.5 \times 10^{-4} \text{ cm/sec}$$

$$K = 0.98 \text{ ft/day}$$


57MW001
RISING HEAD SLUG TEST
H/Ho
TIME (MINUTES)
To = 2.42 min
To = 2.42 min
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 4650

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW01

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10, 16.18-26.18 TEST NO.: 2

STATIC WATER LEVEL (Depth/Elevation): 7.65 DATE: 1-26-99

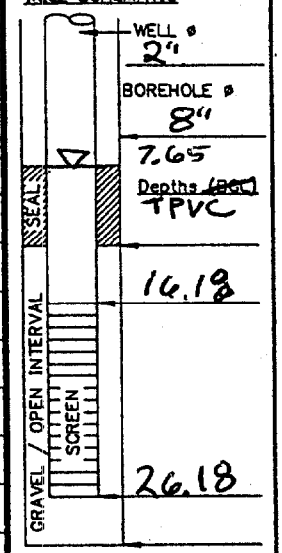
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7' PAGE 2 OF 2

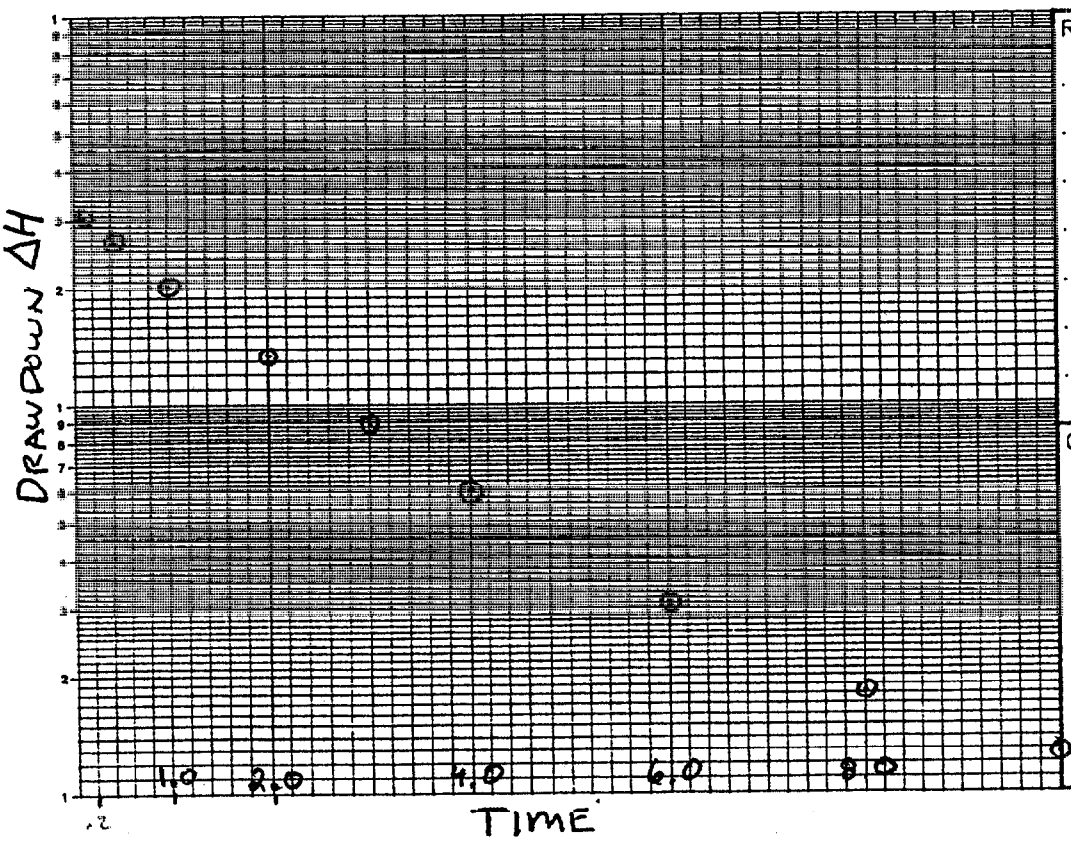
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	4.0		-0.603
0.025		-3.087	5.0		-0.425
0.050		-3.062	6.0		-0.311
0.100		-3.011	7.0		-0.235
0.2		-2.897	8.0		-0.184
0.4		-2.656	10.0		-0.127
0.6		-2.427	12.0		-0.101
0.8		-2.217	14.0		-0.088
1.0		-2.033	20.0		-0.082
2.0		-1.334			
2.6		-1.048			
3.0		-0.869			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

CALCS, SKETCH MAPS, ETC.:

STOPPED TEST @ 1000

SE2000
Environmental Logger
01/26 21:08

Unit# 2000 Test 2

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW01
Reference	0.000
PSI at Ref.	3.567
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 09:36:03

Elapsed Time	INPUT 1	H/H_o
0.0000	0.000	
0.0083	0.000	
0.0166	-2.001	
0.0250	-3.087	1.0
0.0333	-3.081	
0.0416	-3.075	
0.0500	-3.062	
0.0583	-3.056	
0.0666	-3.049	
0.0750	-3.037	
0.0833	-3.030	
0.0916	-3.018	
0.1000	-3.011	
0.1083	-2.999	
0.1166	-2.992	
0.1250	-2.979	
0.1333	-2.973	
0.1416	-2.967	
0.1500	-2.954	
0.1583	-2.941	
0.1666	-2.935	
0.1750	-2.929	
0.1833	-2.916	
0.1916	-2.903	
0.2000	-2.897	
0.2083	-2.884	
0.2166	-2.878	
0.2250	-2.865	0.93
0.2333	-2.859	
0.2416	-2.846	
0.2500	-2.840	
0.2583	-2.827	

pg 2 or 3

57MW01

TEST 2

0.2666	-2.814	
0.2750	-2.808	
0.2833	-2.795	
0.2916	-2.789	
0.3000	-2.776	
0.3083	-2.770	
0.3166	-2.757	
0.3250	-2.744	
0.3333	-2.738	
0.3500	-2.719	
0.3666	-2.694	
0.3833	-2.675	
0.4000	-2.656	
0.4166	-2.636	
0.4333	-2.617	
0.4500	-2.598	
0.4666	-2.573	
0.4833	-2.560	
0.5000	-2.535	0.82
0.5166	-2.516	
0.5333	-2.497	
0.5500	-2.484	
0.5666	-2.465	
0.5833	-2.446	
0.6000	-2.427	
0.6166	-2.408	
0.6333	-2.389	
0.6500	-2.370	
0.6666	-2.357	
0.6833	-2.338	
0.7000	-2.319	
0.7166	-2.300	
0.7333	-2.287	
0.7500	-2.268	
0.7666	-2.249	
0.7833	-2.236	
0.8000	-2.217	
0.8166	-2.204	
0.8333	-2.185	
0.8500	-2.166	
0.8666	-2.154	
0.8833	-2.141	
0.9000	-2.122	
0.9166	-2.103	
0.9333	-2.090	
0.9500	-2.077	
0.9666	-2.058	
0.9833	-2.046	
1.0000	-2.033	0.65
1.2000	-1.861	
1.4000	-1.709	
1.6000	-1.576	
1.8000	-1.448	
2.0000	-1.334	0.42
2.2000	-1.232	
2.4000	-1.137	
2.6000	-1.048	
2.8000	-0.966	
3.0000	-0.889	0.24
3.2000	-0.819	

57MW01
TEST 2

3.4000	-0.756	
3.6000	-0.699	
3.8000	-0.654	
4.0000	-0.603	0.10
4.2000	-0.559	
4.4000	-0.521	
4.6000	-0.483	
4.8000	-0.451	
5.0000	-0.425	0.13
5.2000	-0.394	
5.4000	-0.368	
5.6000	-0.349	
5.8000	-0.330	
6.0000	-0.311	
6.2000	-0.292	
6.4000	-0.273	
6.6000	-0.260	
6.8000	-0.247	
7.0000	-0.235	
7.2000	-0.222	
7.4000	-0.209	
7.6000	-0.197	
7.8000	-0.190	
8.0000	-0.184	
8.2000	-0.177	
8.4000	-0.165	
8.6000	-0.158	
8.8000	-0.152	
9.0000	-0.146	
9.2000	-0.146	
9.4000	-0.139	
9.6000	-0.133	
9.8000	-0.127	
10.0000	-0.127	
12.0000	-0.101	
14.0000	-0.088	
16.0000	-0.082	
18.0000	-0.082	
20.0000	-0.082	
22.0000	-0.069	

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129	SITE 57
SUBJECT SLUG TEST WELL 57MW02 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FREDW RAMSER	CHECKED BY RMB 3/4/99	APPROVED BY	DATE

EQ.

$$K = \frac{r^2 \ln (L/R)}{2 L T_0}$$

$r = 0.083$ feet — RISER RADIUS
$R = 0.083$ feet — SCREEN RADIUS
$L = (14.15 - 8.16)$ 5.99 feet — INPUT LENGTH
$T_0 = 2.625$ MIN — TIME @ 37%

SUB:

$$K = \frac{(.083)^2 \ln(5.99/.083)}{2(5.99)(2.625)}$$

$$= \frac{.029}{31.45}$$

$$\underline{K = 9.4 \times 10^{-4} \text{ ft/min}}$$

$$\underline{K = 1.35 \text{ ft/day}}$$

$$\underline{K = 4.8 \times 10^{-4} \text{ cm/sec}}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW02

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10' / 4.15'-14.15' TEST NO.: 3

STATIC WATER LEVEL (Depth/Elevation): 8.16 DATE: 1-26-99

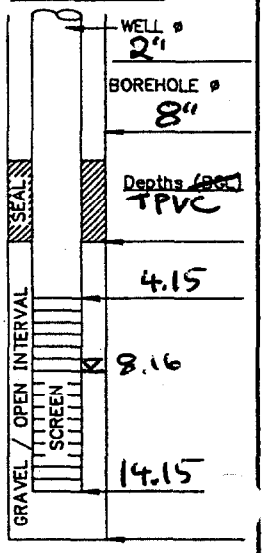
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7' PAGE 1 OF

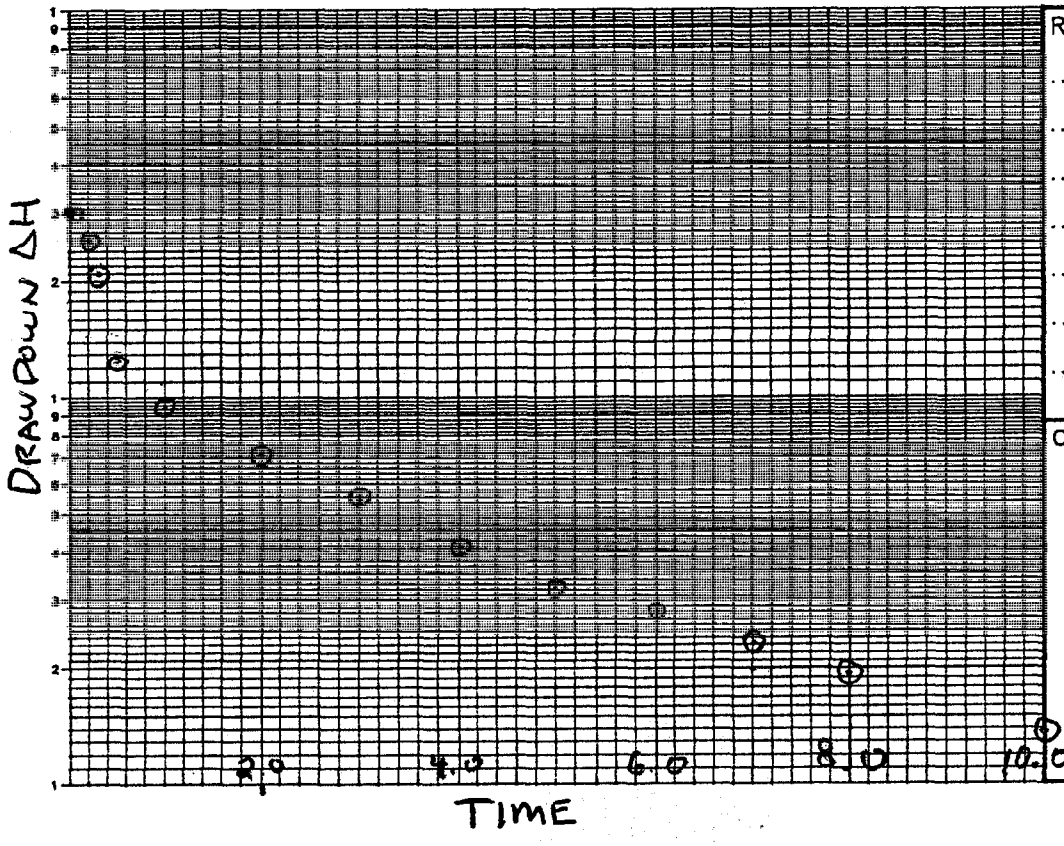
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TRANSDUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0000		0.000	4.0		-0.438
0.0166		-3.149	5.0		-0.355
0.05		-3.162	6.0		-0.285
0.1		-3.022	7.0		-0.235
0.2		-2.559	8.0		-0.196
0.3		-2.191	10		-0.139
0.5		-1.238	12		-0.120
0.75		-1.060	14		-0.101
1.0		-0.952	16		-0.088
2.0		-0.711			
2.6		-0.609			
3.0		-0.552			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

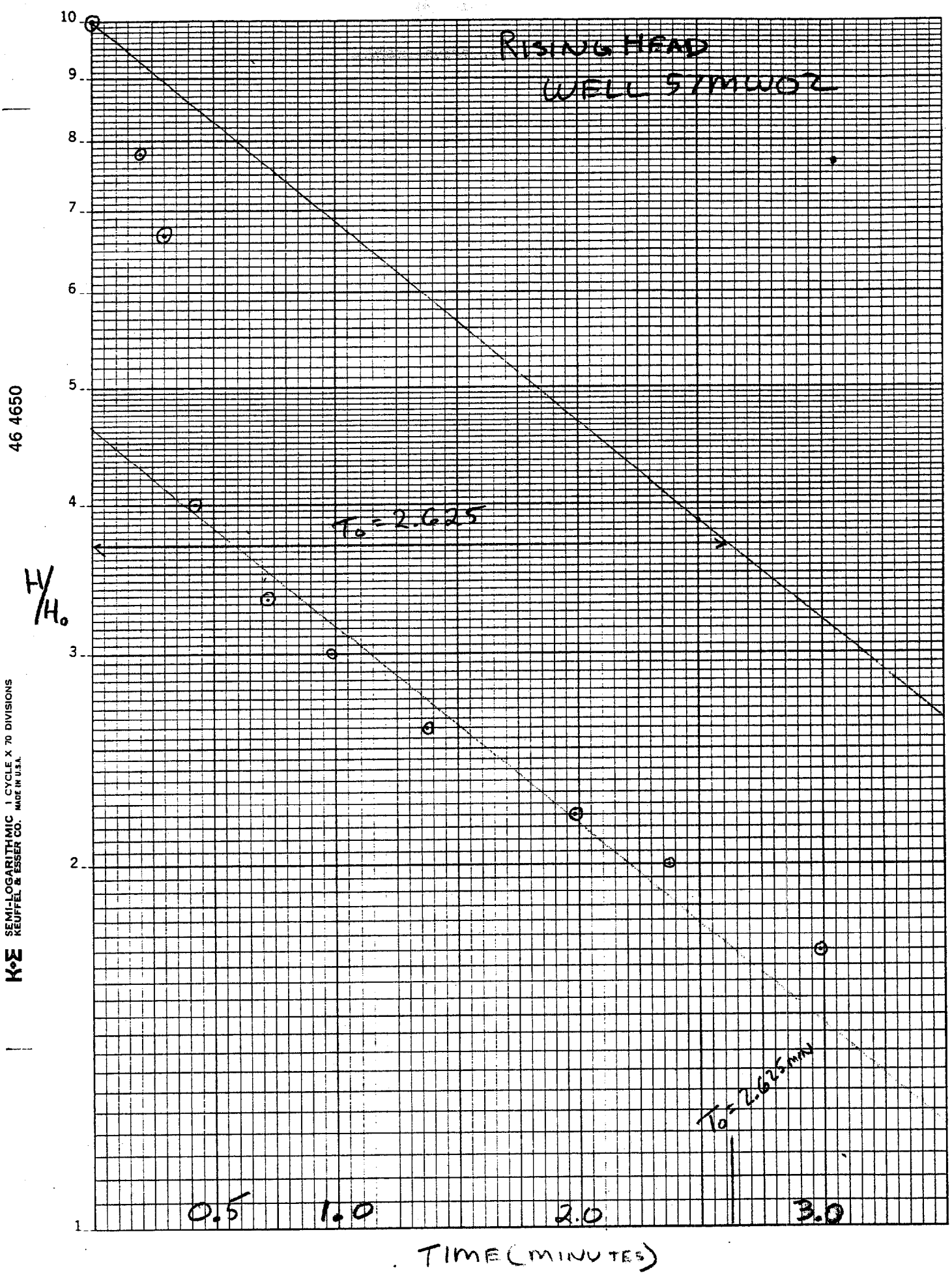


REMARKS:

START 1056

STOP 1117

CALCS, SKETCH MAPS, ETC.:


RISING HEAD
WELL 57MW02
$T_o = 2.625$
$T_o = 2.625$ MIN
H/H₀
10
9
8
7
6
5
4
3
2
1
0.5
1.0
2.0
3.0
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

SE2000
Environmental Logger
01/26 21:10

Unit# 2000 Test 3

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW02
Reference	0.000
PSI at Ref.	2.581
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 10:56:16

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	-6.912	
0.0166	-3.149	
0.0250	-3.219	1.0
0.0333	-3.200	
0.0416	-3.181	
0.0500	-3.162	
0.0583	-3.137	
0.0666	-3.118	
0.0750	-3.092	
0.0833	-3.067	
0.0916	-3.041	
0.1000	-3.022	
0.1083	-2.997	
0.1166	-2.971	
0.1250	-2.946	
0.1333	-2.921	
0.1416	-2.610	
0.1500	-2.641	
0.1583	-2.629	
0.1666	-2.616	
0.1750	-2.597	
0.1833	-2.591	
0.1916	-2.572	
0.2000	-2.559	
0.2083	-2.546	
0.2166	-2.527	
0.2250	-2.514	0.78
0.2333	-2.502	
0.2416	-2.483	
0.2500	-2.470	

TEST 3

0.2583	-2.457	
0.2666	-2.445	
0.2750	-2.432	
0.2833	-2.203	
0.2916	-2.197	
0.3000	-2.191	
0.3083	-2.184	
0.3166	-2.172	
0.3250	-2.165	0.67
0.3333	-2.159	
0.3500	-2.140	
0.3666	-2.114	
0.3833	-2.102	
0.4000	-1.359	
0.4166	-1.333	
0.4333	-1.314	
0.4500	-1.295	0.40
0.4666	-1.276	
0.4833	-1.257	
0.5000	-1.238	
0.5166	-1.225	
0.5333	-1.206	
0.5500	-1.194	
0.5666	-1.161	
0.5833	-1.168	
0.6000	-1.156	
0.6166	-1.143	
0.6333	-1.130	
0.6500	-1.117	
0.6666	-1.105	
0.6833	-1.098	
0.7000	-1.086	
0.7166	-1.079	
0.7333	-1.073	
0.7500	-1.060	0.33
0.7666	-1.054	
0.7833	-1.048	
0.8000	-1.041	
0.8166	-1.029	
0.8333	-1.022	
0.8500	-1.016	
0.8666	-1.009	
0.8833	-1.003	
0.9000	-0.997	
0.9166	-0.984	
0.9333	-0.978	
0.9500	-0.971	
0.9666	-0.965	
0.9833	-0.959	
1.0000	-0.952	0.30
1.2000	-0.895	
1.4000	-0.838	0.26
1.6000	-0.794	
1.8000	-0.749	
2.0000	-0.711	0.22
2.2000	-0.673	
2.4000	-0.641	0.20
2.6000	-0.609	
2.8000	-0.584	
3.0000	-0.552	0.17

TEST 3

3.2000	-0.527	
3.4000	-0.501	0.16
3.6000	-0.482	
3.8000	-0.457	
4.0000	-0.438	
4.2000	-0.419	
4.4000	-0.400	
4.6000	-0.387	
4.8000	-0.368	
5.0000	-0.355	
5.2000	-0.336	
5.4000	-0.323	
5.6000	-0.311	
5.8000	-0.298	
6.0000	-0.285	
6.2000	-0.273	
6.4000	-0.266	
6.6000	-0.254	
6.8000	-0.241	
7.0000	-0.235	
7.2000	-0.228	
7.4000	-0.215	
7.6000	-0.209	
7.8000	-0.203	
8.0000	-0.196	
8.2000	-0.190	
8.4000	-0.184	
8.6000	-0.177	
8.8000	-0.171	
9.0000	-0.165	
9.2000	-0.158	
9.4000	-0.158	
9.6000	-0.152	
9.8000	-0.146	
10.0000	-0.139	
12.0000	-0.120	
14.0000	-0.101	
16.0000	-0.088	
18.0000	-0.069	
20.0000	-0.069	

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57
SUBJECT: SLUG TEST WELL 57MW04 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED W. RAMSER / CHECKED BY: RMB 3/8/99	APPROVED BY: / DATE:

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

$r = 0.083$ ft — RISER RADIUS
$R = 0.083$ ft — SCREEN RADIUS
$L = 8.99$ — INPUT LENGTH
$T_o = 0.5$ min — TIME @ 37%

SUB:

$$K = \frac{(.083)^2 \ln\left(\frac{8.99}{.083}\right)}{2(8.99)(0.5)}$$

$$= \frac{.0323}{8.99}$$

$$K = 3.6 \times 10^{-3} \text{ ft/min}$$

$$K = 5.2 \text{ ft/day}$$

$$K = 1.8 \times 10^{-3} \text{ cm/sec}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD SITE 57 WELL/BORING NO.: S57MW04

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10 7.97-17.97 TEST NO.: 9

STATIC WATER LEVEL (Depth/Elevation): 8.98 DATE: 1-26-99

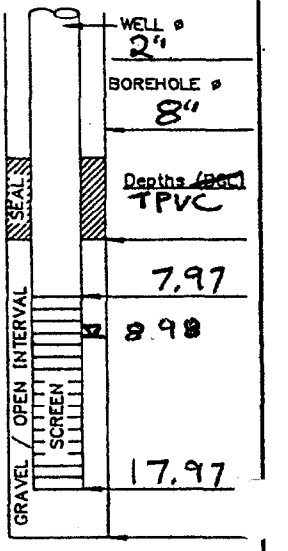
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

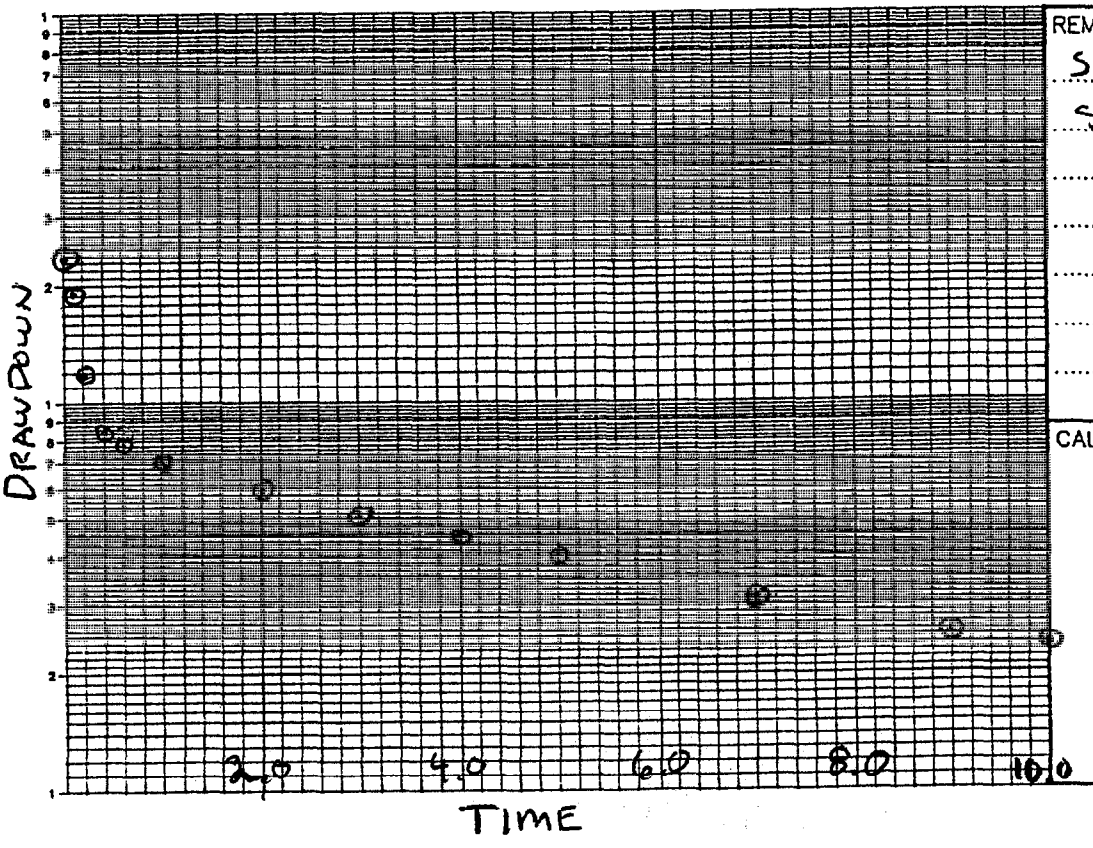
METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7 PAGE 1 OF 1

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0000	3.0		-0.514
0.05		-2.351	4.0		-0.457
0.10		-1.900	5.0		-0.400
0.15		-1.487	10.0		-0.235
0.20		-1.194	18.0		-0.108
0.30		-0.940	7.0		-0.317
0.40		-0.858	9.0		-0.254
0.50		-0.813	24.0		-0.063
0.60		-0.781			
0.70		-0.756			
1.0		-0.705			
2.0		-0.597			

WELL SCHEMATIC



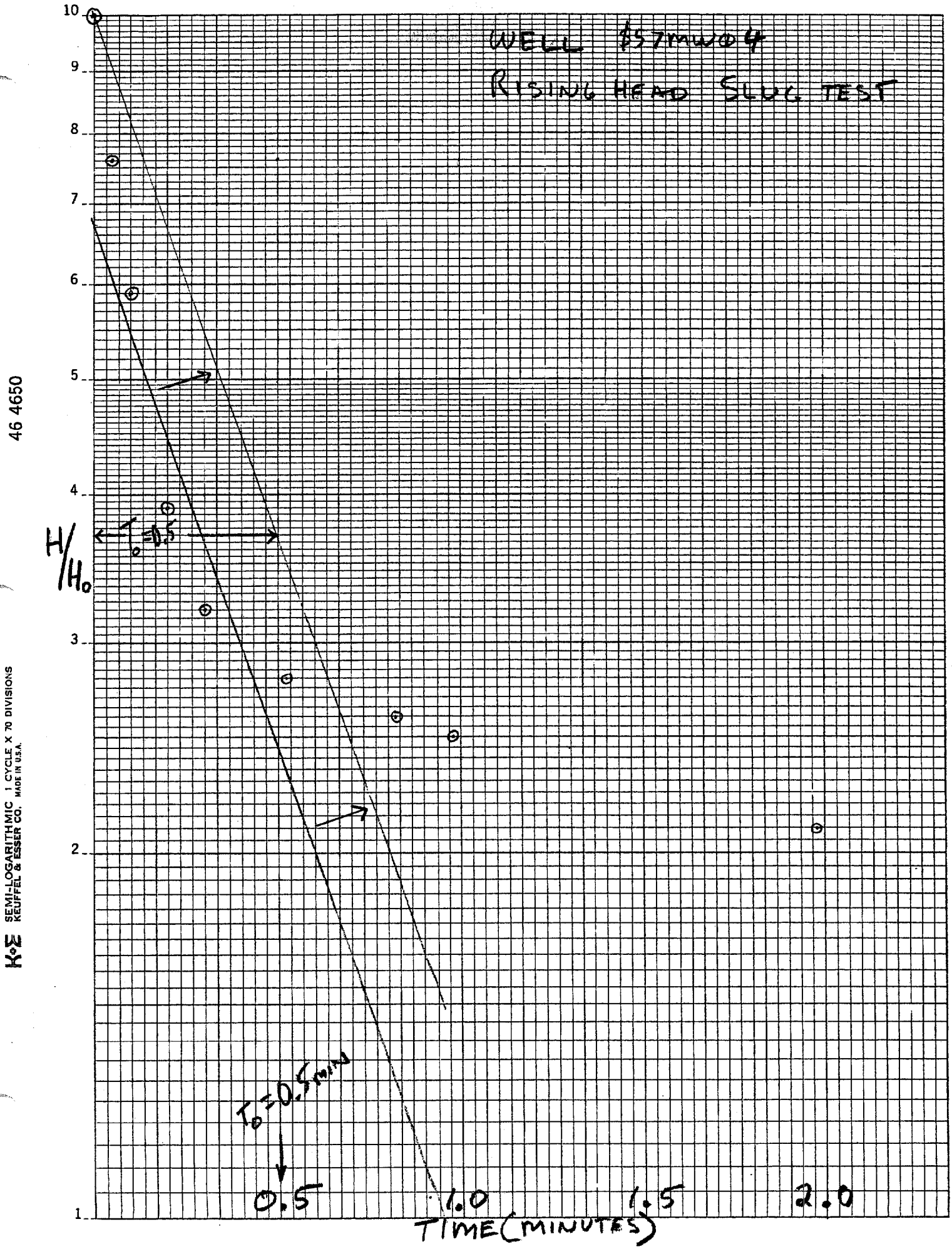


REMARKS:

START 1754

STOP 1817

CALCS, SKETCH MAPS, ETC.:


WELL S57MW04
RISING HEAD SLUG TEST
H/H0
T0=0.5
T0=0.5 min
10
9
8
7
6
5
4
3
2
1
0.5
1.0
1.5
2.0
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

[redacted]

SE2000
Environmental Logger
01/26 20:55

Unit# 2000 Test 9

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW04
Reference	0.000
PSI at Ref.	3.835
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 17:52:57

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	-0.108	
0.0166	-6.866	
0.0250	-2.834	1.0
0.0333	-1.900	
0.0416	-2.179	
0.0500	-2.351	
0.0583	-2.326	
0.0666	-2.237	
0.0750	-2.148	.76
0.0833	-2.059	
0.0916	-1.976	
0.1000	-1.900	
0.1083	-1.824	

Pg 2 of 3

TEST 9

0.1166	-1.754	
0.1250	-1.684	.59
0.1333	-1.614	
0.1416	-1.550	
0.1500	-1.487	
0.1583	-1.430	
0.1666	-1.372	
0.1750	-1.322	
0.1833	-1.271	
0.1916	-1.233	
0.2000	-1.194	
0.2083	-1.156	
0.2166	-1.125	
0.2250	-1.099	.39
0.2333	-1.074	
0.2416	-1.048	
0.2500	-1.029	
0.2583	-1.010	
0.2666	-0.997	
0.2750	-0.978	
0.2833	-0.966	
0.2916	-0.953	
0.3000	-0.940	
0.3083	-0.934	
0.3166	-0.928	
0.3250	-0.915	.32
0.3333	-0.908	
0.3500	-0.889	
0.3666	-0.877	
0.3833	-0.870	
0.4000	-0.858	
0.4166	-0.845	
0.4333	-0.839	
0.4500	-0.832	
0.4666	-0.826	
0.4833	-0.819	
0.5000	-0.813	
0.5166	-0.807	
0.5333	-0.800	
0.5500	-0.794	.28
0.5666	-0.788	
0.5833	-0.781	
0.6000	-0.781	
0.6166	-0.775	
0.6333	-0.769	
0.6500	-0.769	
0.6666	-0.762	
0.6833	-0.756	
0.7000	-0.756	
0.7166	-0.750	
0.7333	-0.750	
0.7500	-0.743	
0.7666	-0.743	
0.7833	-0.737	
0.8000	-0.737	
0.8166	-0.730	
0.8333	-0.730	
0.8500	-0.730	[illegible]

Pg 3 of 3

TEST 9

0.9000	-0.718	
0.9166	-0.718	
0.9333	-0.711	
0.9500	-0.711	
0.9666	-0.711	
0.9833	-0.705	
1.0000	-0.705	.25
1.2000	-0.673	
1.4000	-0.654	
1.6000	-0.629	
1.8000	-0.610	
2.0000	-0.597	.21
2.2000	-0.578	
2.4000	-0.559	
2.6000	-0.546	
2.8000	-0.533	
3.0000	-0.514	
3.2000	-0.508	
3.4000	-0.495	
3.6000	-0.483	
3.8000	-0.470	
4.0000	-0.457	
4.2000	-0.444	
4.4000	-0.432	
4.6000	-0.425	
4.8000	-0.413	
5.0000	-0.400	
5.2000	-0.394	
5.4000	-0.381	
5.6000	-0.375	
5.8000	-0.368	
6.0000	-0.355	
6.2000	-0.349	
6.4000	-0.336	
6.6000	-0.330	
6.8000	-0.324	
7.0000	-0.317	
7.2000	-0.311	
7.4000	-0.305	
7.6000	-0.298	
7.8000	-0.286	
8.0000	-0.286	
8.2000	-0.279	
8.4000	-0.273	
8.6000	-0.266	
8.8000	-0.260	
9.0000	-0.254	
9.2000	-0.247	
9.4000	-0.241	
9.6000	-0.241	
9.8000	-0.235	
10.0000	-0.235	
12.0000	-0.190	
14.0000	-0.158	
16.0000	-0.133	
18.0000	-0.108	
20.0000	-0.088	
22.0000	-0.069	

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST WELL 57MW05 FALLING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED W RAMSER	CHECKED BY RMB 3/11/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln (L/R)}{2 L T_o}$$

$r = 0.083$ feet
$R = 0.083$ feet
$L = 5$ feet
$T_o = 1.2$ min

SUB:

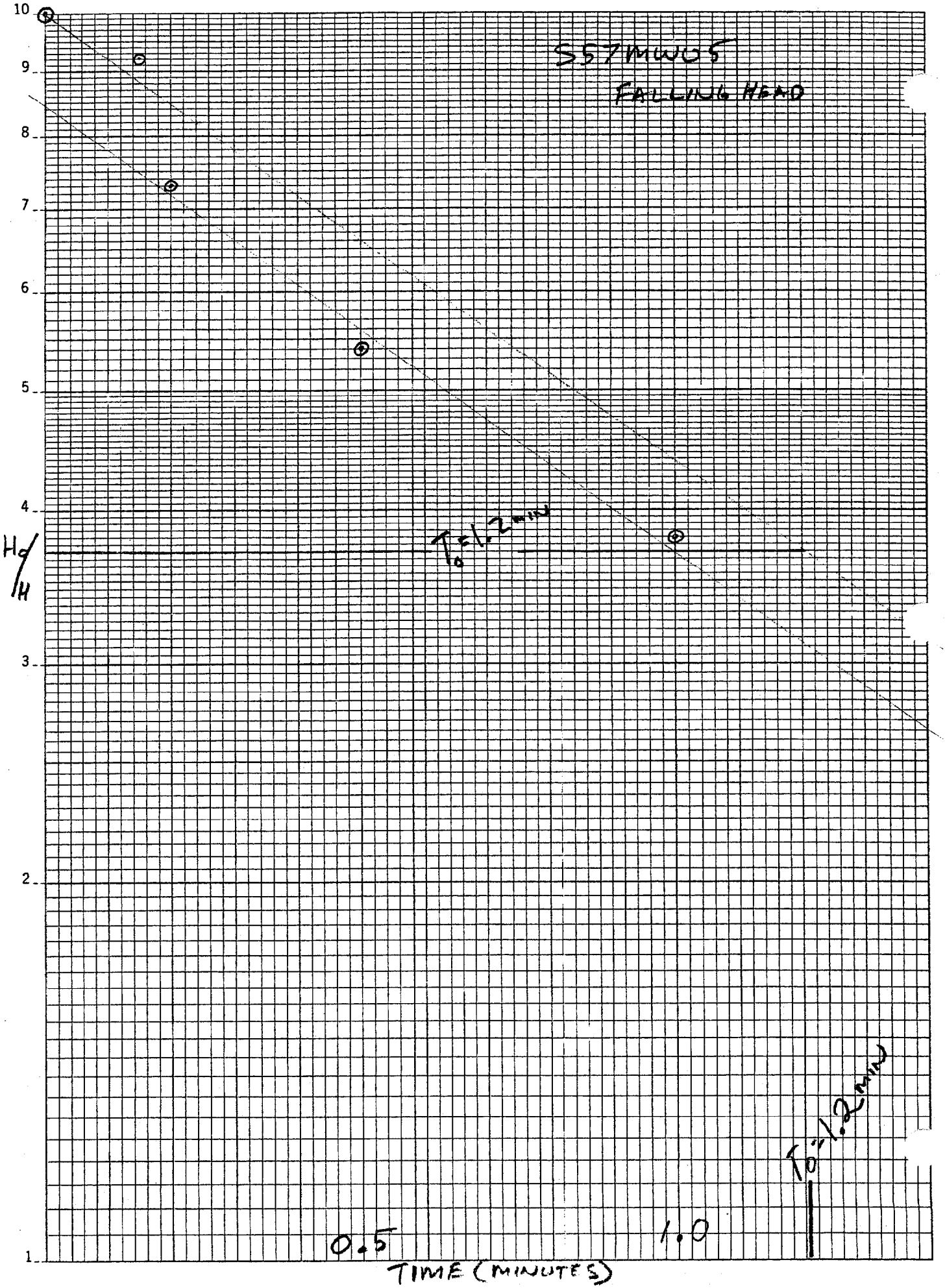
$$K = \frac{(.083)^2 (\ln 5/.083)}{2(5)(1.2)}$$

$$K = \frac{.028}{12}$$

$$\underline{K = 2.3 \times 10^{-3} \text{ ft/min}}$$

$$\underline{K = 3.4 \text{ ft/day}}$$

$$\underline{K = 1.2 \times 10^{-3} \text{ cm/sec}}$$



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD SITE 57 WELL/BORING NO.: S7MW05

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 5' TEST NO.: 10

STATIC WATER LEVEL (Depth/Elevation): 5.64 DATE: 1-27-99

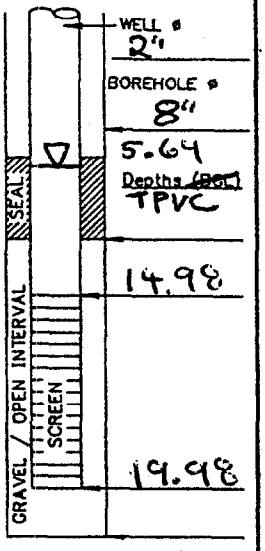
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 60.145 dia x 4.7 PAGE ..... OF .....

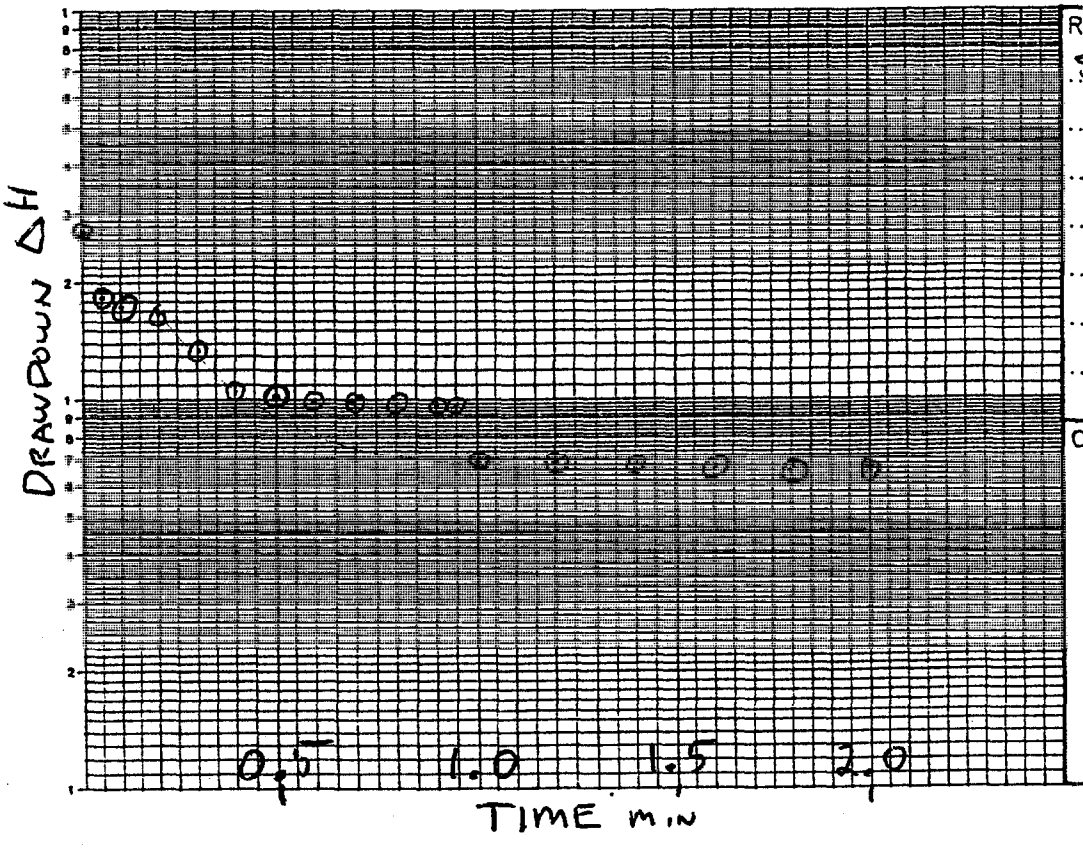
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TRANSDUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.006	2.0		0.673
0.033		3.730	3.0		0.660
0.0416		1.315	4.0		0.552
0.0500		1.842	5.0		0.546
0.10		1.734	10.0		0.546
0.15		1.709	20.0		0.559
0.20		1.696			
0.30		1.334			
0.40		1.041			
0.50		1.003			
0.60		0.997			
1.00		0.692			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

START TEST @ 0800

STOPPED 0830

CALCS, SKETCH MAPS, ETC.:

SE2000
Environmental Logger
01/27 23:24

Unit# 2000 Test 10

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW05
Reference	0.000
PSI at Ref.	2.443
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/27 07:56:36

Elapsed Time	INPUT 1	H_0/H
0.0000	0.006	
0.0083	0.006	
0.0166	5.224	
0.0250	4.340	
0.0333	3.730	
0.0416	1.315	
0.0500	1.842	1.0
0.0583	1.842	
0.0666	1.842	
0.0750	1.836	
0.0833	1.804	
0.0916	1.753	
0.1000	1.734	
0.1083	1.728	
0.1166	1.721	
0.1250	1.721	
0.1333	1.715	
0.1416	1.709	
0.1500	1.709	
0.1583	1.709	
0.1666	1.702	
0.1750	1.702	
0.1833	1.702	
0.1916	1.696	
0.2000	1.696	.92
0.2083	1.696	
0.2166	1.696	
0.2250	1.690	
0.2333	1.442	
0.2416	1.385	
0.2500	1.346	.73
0.2583	1.340	
0.2666	1.340	

0.2833 1.340

pg 2 of 3

0.2916	1.340	
0.3000	1.334	
0.3083	1.334	
0.3166	1.334	
0.3250	1.334	
0.3333	1.334	
0.3500	1.334	
0.3666	1.327	
0.3833	1.067	
0.4000	1.041	
0.4166	1.041	
0.4333	1.035	
0.4500	1.010	
0.4666	1.003	
0.4833	1.003	
0.5000	1.003	
0.5166	1.003	
0.5333	1.003	
0.5500	0.997	54
0.5666	0.997	
0.5833	0.997	
0.6000	0.997	
0.6166	0.991	
0.6333	0.991	
0.6500	0.991	
0.6666	0.991	
0.6833	0.991	
0.7000	0.991	
0.7166	0.984	
0.7333	0.984	
0.7500	0.984	
0.7666	0.984	
0.7833	0.984	
0.8000	0.984	
0.8166	0.984	
0.8333	0.978	
0.8500	0.984	
0.8666	0.978	
0.8833	0.978	
0.9000	0.978	
0.9166	0.978	
0.9333	0.978	
0.9500	0.978	
0.9666	0.978	
0.9833	0.705	
1.0000	0.692	38
1.2000	0.692	
1.4000	0.686	
1.6000	0.679	
1.8000	0.679	
2.0000	0.673	
2.2000	0.673	
2.4000	0.667	
2.6000	0.667	
2.8000	0.667	
3.0000	0.660	
3.2000	0.660	
3.4000	0.660	

4.0000	0.552
4.2000	0.552
4.4000	0.552
4.6000	0.552
4.8000	0.552
5.0000	0.546
5.2000	0.546
5.4000	0.546
5.6000	0.546
5.8000	0.546
6.0000	0.539
6.2000	0.546
6.4000	0.546
6.6000	0.546
6.8000	0.546
7.0000	0.546
7.2000	0.546
7.4000	0.546
7.6000	0.546
7.8000	0.546
8.0000	0.539
8.2000	0.539
8.4000	0.539
8.6000	0.546
8.8000	0.539
9.0000	0.539
9.2000	0.539
9.4000	0.539
9.6000	0.539
9.8000	0.546
10.0000	0.546
12.0000	0.539
14.0000	0.539
16.0000	0.546
18.0000	0.552
20.0000	0.559
22.0000	0.578
24.0000	0.584
26.0000	0.597
28.0000	0.603
30.0000	0.495
32.0000	0.508

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129	SITE 57
SUBJECT SLUG TEST WELL 57MW05 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED W RAMSER	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

$r = 0.083$ feet — RISER RADIUS
$R = 0.083$ feet — SCREEN RADIUS
$L = 5$ feet — INPUT LENGTH
$T_o = 0.883$ min — TIME @ 37%

SUB:

$$K = \frac{(.083)^2(\ln 5/0.083)}{2(5)(0.883)}$$

$$K = \frac{.028}{8.83}$$

$$\underline{K = 3.2 \times 10^{-3} \text{ ft/min}}$$

$$\underline{K = 4.6 \text{ ft/day}}$$

$$\underline{K = 1.6 \times 10^{-3} \text{ cm/sec}}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW05

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 5' TEST NO.: 11

STATIC WATER LEVEL (Depth/Elevation): 5.67 DATE: 1-27-99

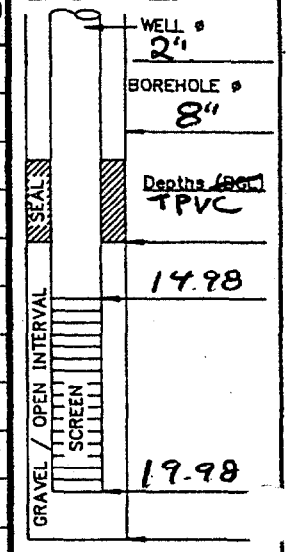
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7 PAGE 2 OF 2

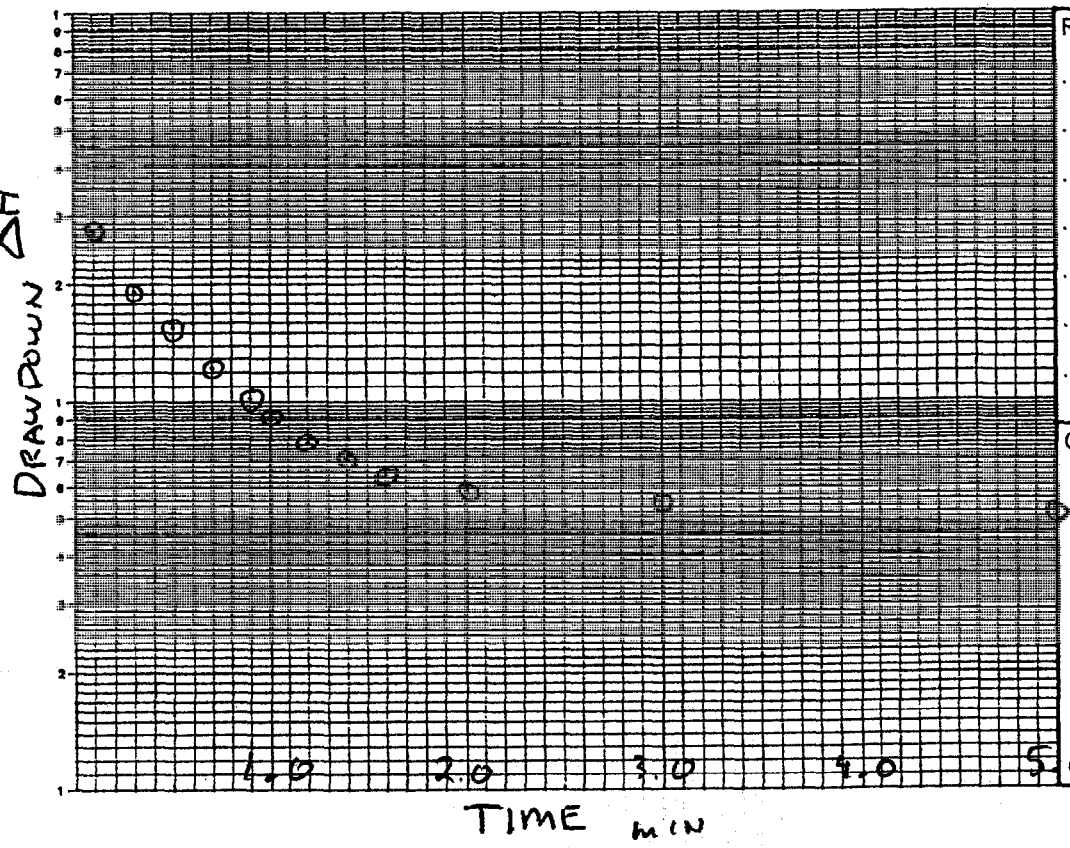
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	1.000		-0.921
0.025		-3.105	1.2		-0.794
0.05		-2.864	1.4		-0.711
0.10		-2.781	1.6		-0.654
0.20		-2.292	2.0		-0.590
0.30		-1.924	3.0		-0.533
0.40		-1.714	5.0		-0.508
0.50		-1.524	8.0		-0.495
0.60		-1.352	10.0		-0.489
0.70		-1.213	18.0		-0.482
0.80		-1.098	22.0		-0.495
0.90		-1.003			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



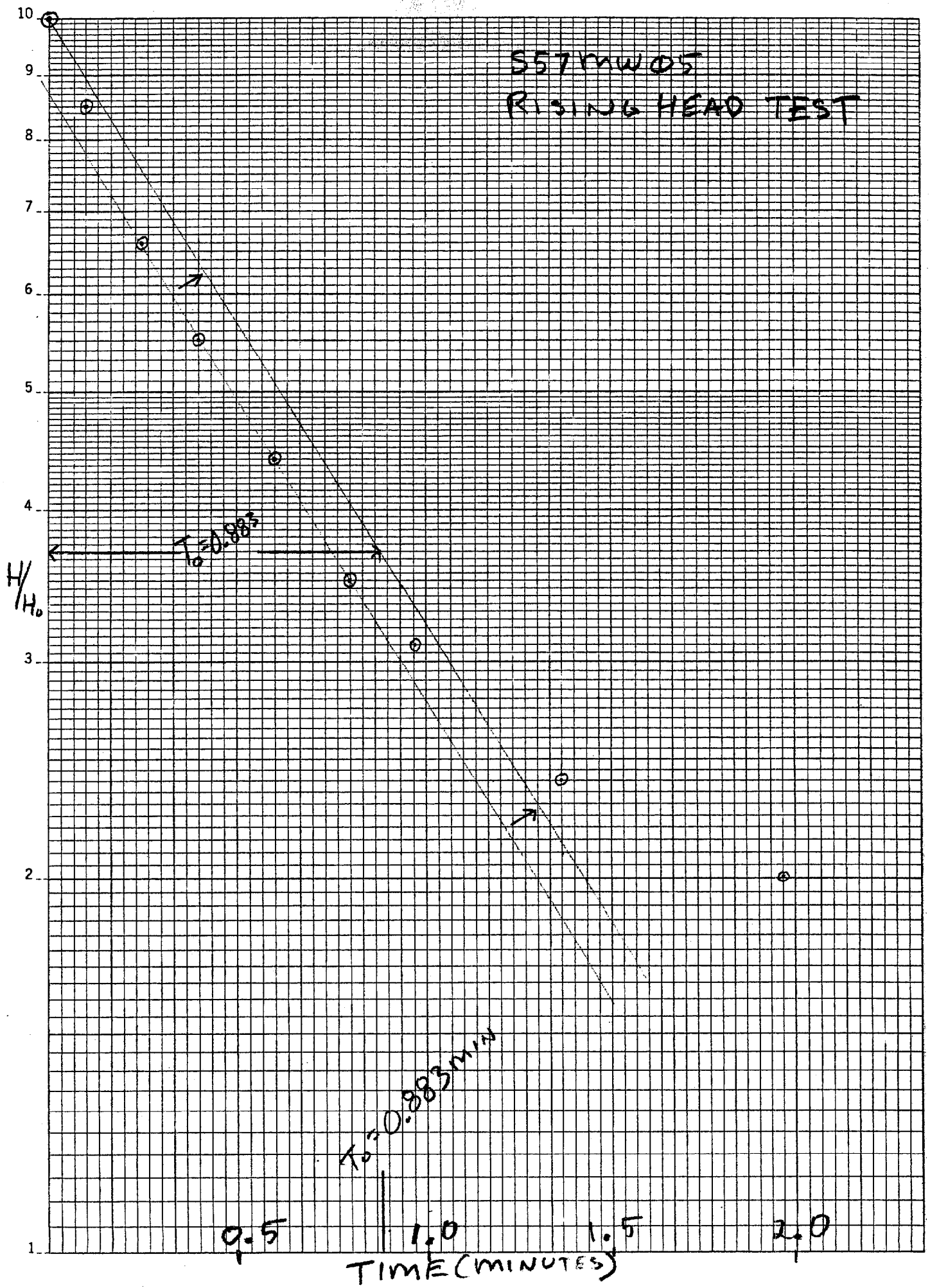
REMARKS:

STARTED 0835

STOP 0855

SWL = 5.67 0845

CALCS, SKETCH MAPS, ETC.:



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

RISING HEAD

SE2000
Environmental Logger
01/27 23:22

Unit# 2000 Test 11

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW05
Reference	0.000
PSI at Ref.	2.666
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/27 08:30:51

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	0.000	
0.0166	-4.114	
0.0250	-3.105	
0.0333	-2.991	1.0
0.0416	-2.864	
0.0500	-2.864	
0.0583	-2.857	
0.0666	-2.845	
0.0750	-2.832	
0.0833	-2.813	
0.0916	-2.800	
0.1000	-2.781	
0.1083	-2.762	
0.1166	-2.743	
0.1250	-2.724	
0.1333	-2.553	.85
0.1416	-2.553	
0.1500	-2.534	
0.1583	-2.515	
0.1666	-2.362	
0.1750	-2.349	
0.1833	-2.330	
0.1916	-2.311	
0.2000	-2.292	
0.2083	-2.127	
0.2166	-2.121	
0.2250	-2.102	
0.2333	-2.083	
0.2416	-2.070	
0.2500	-2.051	
0.2583	-2.032	
0.2666	-2.013	

0.2833	-1.970	.66
0.2916	-1.956	
0.3000	-1.924	
0.3083	-1.911	
0.3166	-1.892	
0.3250	-1.873	
0.3333	-1.854	
0.3500	-1.822	
0.3666	-1.784	
0.3833	-1.753	
0.4000	-1.714	
0.4166	-1.683	
0.4333	-1.651	.55
0.4500	-1.619	
0.4666	-1.587	
0.4833	-1.556	
0.5000	-1.524	
0.5166	-1.492	
0.5333	-1.467	
0.5500	-1.435	
0.5666	-1.410	
0.5833	-1.384	
0.6000	-1.352	
0.6166	-1.327	
0.6333	-1.302	.44
0.6500	-1.276	
0.6666	-1.257	
0.6833	-1.238	
0.7000	-1.213	
0.7166	-1.194	
0.7333	-1.175	
0.7500	-1.156	
0.7666	-1.137	
0.7833	-1.117	
0.8000	-1.098	
0.8166	-1.079	
0.8333	-1.060	.35
0.8500	-1.048	
0.8666	-1.029	
0.8833	-1.016	
0.9000	-1.003	
0.9166	-0.984	
0.9333	-0.971	
0.9500	-0.959	
0.9666	-0.946	
0.9833	-0.933	
1.0000	-0.921	.31
1.2000	-0.794	
1.4000	-0.711	.24
1.6000	-0.654	
1.8000	-0.616	
2.0000	-0.590	.20
2.2000	-0.571	
2.4000	-0.559	
2.6000	-0.546	
2.8000	-0.539	
3.0000	-0.533	
3.2000	-0.533	
3.4000	-0.527	

3.8000	-0.520
4.0000	-0.514
4.2000	-0.514
4.4000	-0.514
4.6000	-0.508
4.8000	-0.508
5.0000	-0.508
5.2000	-0.508
5.4000	-0.508
5.6000	-0.501
5.8000	-0.501
6.0000	-0.501
6.2000	-0.501
6.4000	-0.501
6.6000	-0.501
6.8000	-0.501
7.0000	-0.501
7.2000	-0.501
7.4000	-0.501
7.6000	-0.495
7.8000	-0.495
8.0000	-0.495
8.2000	-0.489
8.4000	-0.489
8.6000	-0.489
8.8000	-0.495
9.0000	-0.489
9.2000	-0.489
9.4000	-0.489
9.6000	-0.489
9.8000	-0.489
10.0000	-0.489
12.0000	-0.495
14.0000	-0.476
16.0000	-0.482
18.0000	-0.482
20.0000	-0.489
22.0000	-0.495
24.0000	-0.482

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST WELL #57MW06 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FREDW PAMSEYR	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln (L/R)}{2LT_0}$$

$r = 0.083$ feet (riser radius)
$R = 0.083$ feet (screen radius)
$L = 8.65$ feet (INPUT LENGTH)
$T_0 = 0.27$ min (TIME @ 37%)

SUB:

$$K = \frac{(.083)^2 \ln(8.65/.083)}{2(8.65)(0.27)}$$

$$K = \frac{0.032}{4.67}$$

$$K = 6.9 \times 10^{-3} \text{ ft/min}$$

$$K = 9.9 \text{ ft/day}$$

$$K = 3.5 \times 10^{-3} \text{ cm/sec}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD SITE 57 WELL/BORING NO.: S57MW06

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10', 4.39-14.39 TEST NO.: 12

STATIC WATER LEVEL (Depth/Elevation): 5.75 DATE: 1-27-99

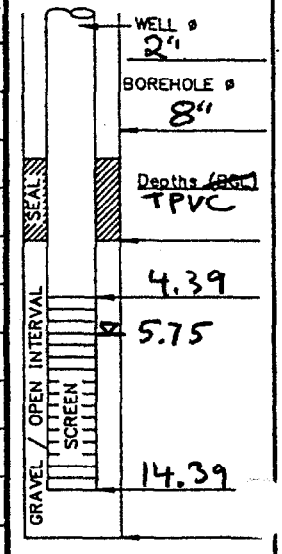
TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7 PAGE 1 OF

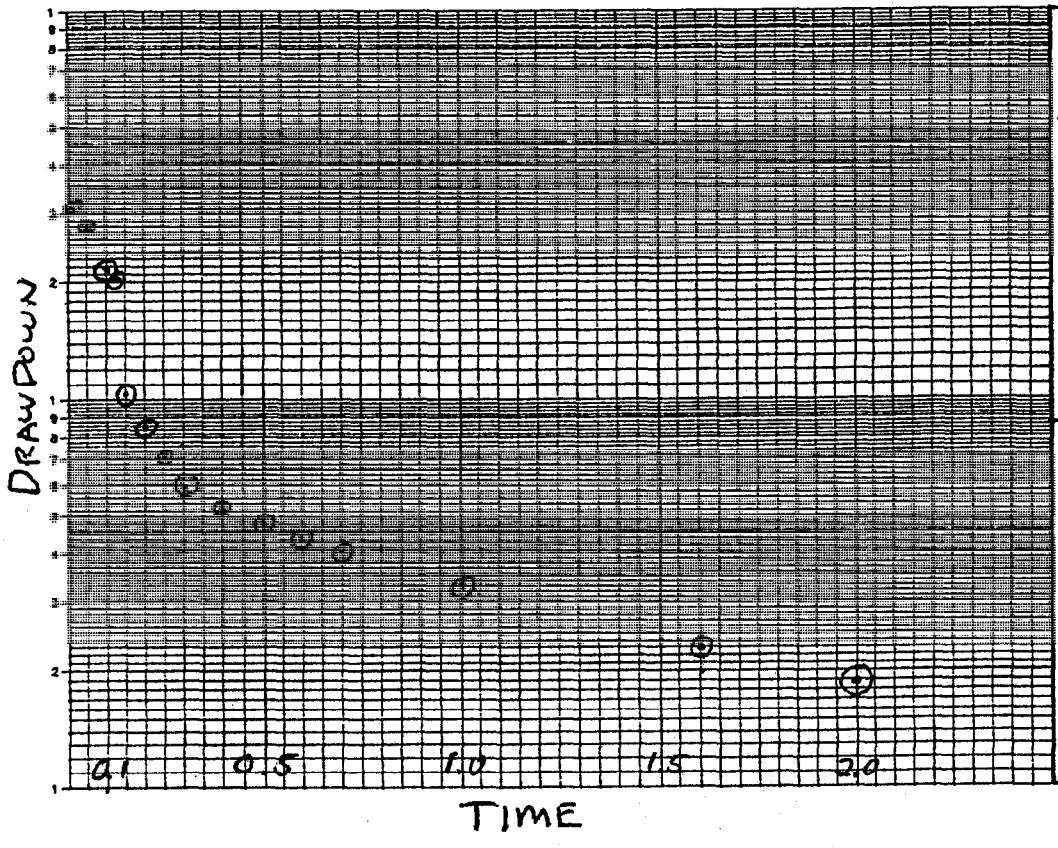
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	0.400		-0.533
0.0166		-3.196	0.500		-0.483
0.0250		-3.157	0.600		-0.444
0.0333		-3.132	0.700		-0.406
0.0416		-2.973	1.00		-0.330
0.0500		-2.783	2.00		-0.190
0.0750		-2.554	3.00		-0.120
0.1000		-2.166	4.00		-0.082
0.1250		-2.090	5.00		-0.063
0.1500		-1.086	10.00		-0.031
0.200		-0.870	20.00		-0.038
0.300		-0.622	30.00		-0.031

WELL SCHEMATIC



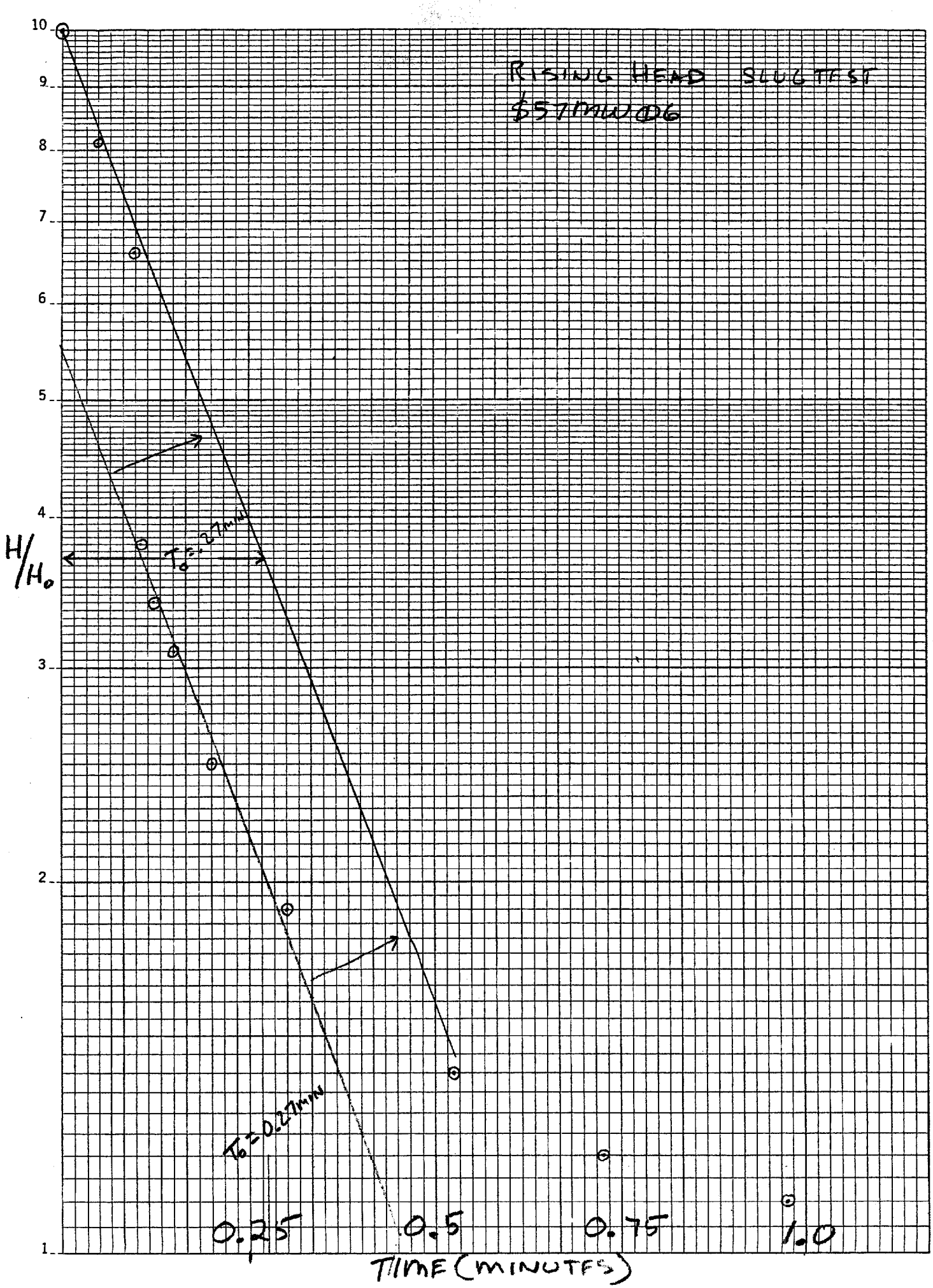
▽ Indicate SWL Depth on Drawing



REMARKS:

INSERT SLUG @ 0910
START TEST @ 0931
STOP TEST @ 1007
1.6 = -0.228

CALCS, SKETCH MAPS, ETC.:


RISING HEAD SLUG TEST
S57MW006
10
9
8
7
6
5
4
3
2
1
H/H₀
T₀=.27MIN
T₀=0.27MIN
0.25
0.5
0.75
1.0
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

SE2000
Environmental Logger
01/27 23:20

Unit# 2000 Test 12

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW06
Reference	0.000
PSI at Ref.	3.628
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/27 09:30:05

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	-5.862	
0.0166	-3.196	
0.0250	-3.157	1.0
0.0333	-3.132	
0.0416	-2.973	
0.0500	-2.783	
0.0583	-2.776	
0.0666	-2.573	
0.0750	-2.554	.81
0.0833	-2.192	
0.0916	-2.185	
0.1000	-2.166	
0.1083	-2.141	
0.1166	-2.116	
0.1250	-2.090	.66
0.1333	-1.194	.38
0.1416	-1.137	
0.1500	-1.086	.34
0.1583	-1.042	
0.1666	-1.004	
0.1750	-0.966	.31
0.1833	-0.934	
0.1916	-0.902	
0.2000	-0.870	
0.2083	-0.838	
0.2166	-0.813	
0.2250	-0.788	.25
0.2333	-0.762	
0.2416	-0.743	
0.2500	-0.718	
0.2583	-0.699	
0.2666	-0.680	

0.2916	-0.635	
0.3000	-0.622	
0.3083	-0.616	
0.3166	-0.603	
0.3250	-0.597	.19
0.3333	-0.584	
0.3500	-0.572	
0.3666	-0.559	
0.3833	-0.546	
0.4000	-0.533	
0.4166	-0.527	
0.4333	-0.514	
0.4500	-0.508	
0.4666	-0.502	
0.4833	-0.489	
0.5000	-0.483	
0.5166	-0.476	
0.5333	-0.470	
0.5500	-0.463	.14
0.5666	-0.457	
0.5833	-0.451	
0.6000	-0.444	
0.6166	-0.438	
0.6333	-0.432	
0.6500	-0.425	
0.6666	-0.419	
0.6833	-0.413	
0.7000	-0.406	
0.7166	-0.406	
0.7333	-0.400	
0.7500	-0.394	.12
0.7666	-0.387	
0.7833	-0.381	
0.8000	-0.375	
0.8166	-0.375	
0.8333	-0.368	
0.8500	-0.368	
0.8666	-0.362	
0.8833	-0.355	
0.9000	-0.355	
0.9166	-0.349	
0.9333	-0.343	
0.9500	-0.343	
0.9666	-0.336	
0.9833	-0.330	
1.0000	-0.330	.11
1.2000	-0.292	
1.4000	-0.260	
1.6000	-0.228	
1.8000	-0.209	
2.0000	-0.190	
2.2000	-0.171	
2.4000	-0.152	
2.6000	-0.139	
2.8000	-0.127	
3.0000	-0.120	
3.2000	-0.108	
3.4000	-0.101	

4.0000	-0.082
4.2000	-0.082
4.4000	-0.076
4.6000	-0.069
4.8000	-0.069
5.0000	-0.063
5.2000	-0.063
5.4000	-0.057
5.6000	-0.057
5.8000	-0.057
6.0000	-0.057
6.2000	-0.050
6.4000	-0.050
6.6000	-0.050
6.8000	-0.044
7.0000	-0.044
7.2000	-0.044
7.4000	-0.044
7.6000	-0.044
7.8000	-0.038
8.0000	-0.044
8.2000	-0.044
8.4000	-0.038
8.6000	-0.038
8.8000	-0.038
9.0000	-0.031
9.2000	-0.031
9.4000	-0.031
9.6000	-0.031
9.8000	-0.031
10.0000	-0.031
12.0000	-0.031
14.0000	-0.031
16.0000	-0.038
18.0000	-0.031
20.0000	-0.038
22.0000	-0.038
24.0000	-0.038
26.0000	-0.031
28.0000	-0.031
30.0000	-0.031
32.0000	-0.031
34.0000	-0.044
36.0000	-0.050

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST WELL 57MW07 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED W RAMSER	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

$r =$	0.083	feet	riser radius
$R =$	0.083	feet	screen radius
$L =$	10	feet	input length
$T_o =$	13.6	MIN	Time @ 37%

SUB:

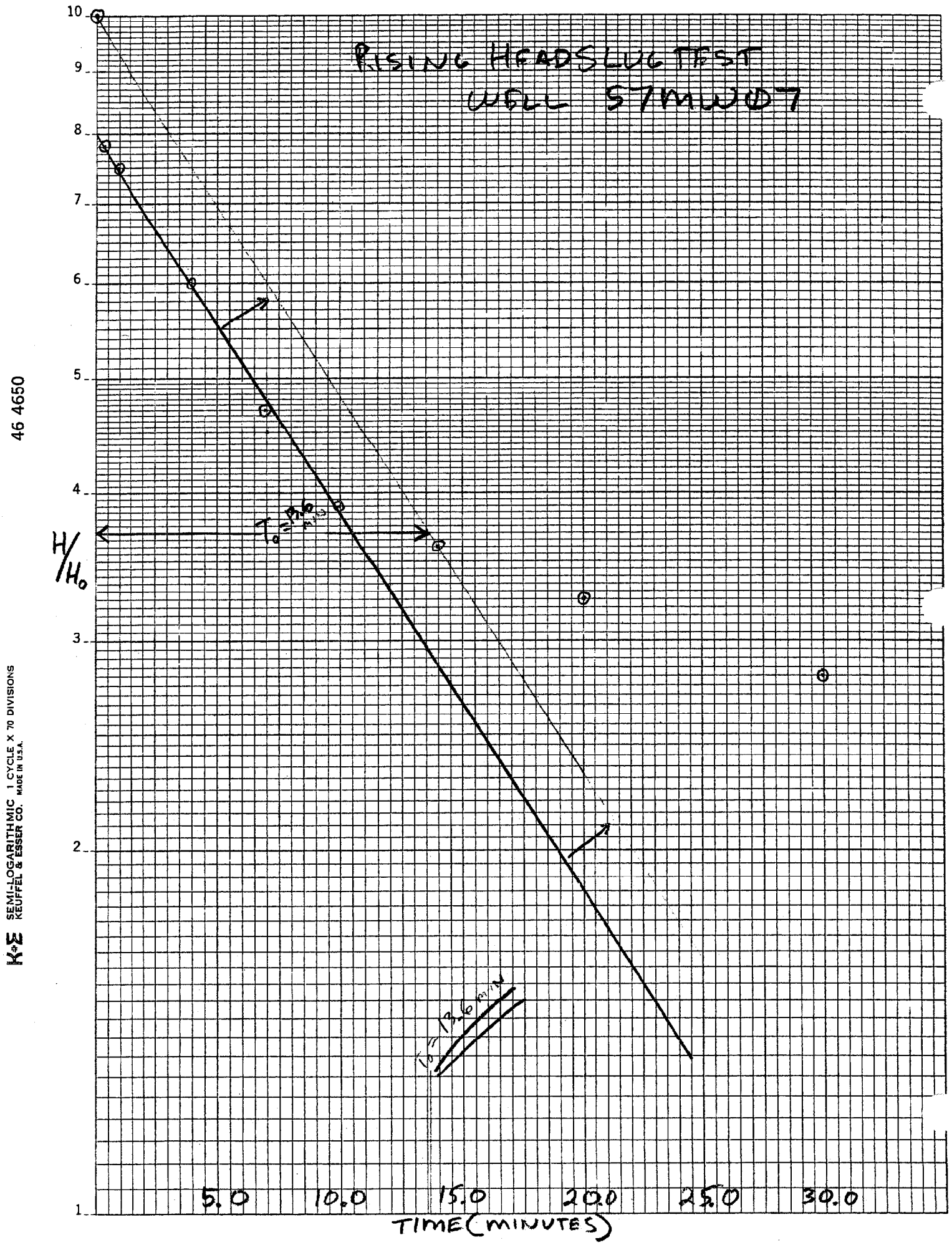
$$K = \frac{(.083)^2 \ln(10/.083)}{2(10)(13.6)}$$

$$K = \frac{.033}{272}$$

$$\underline{K = 1.2 \times 10^{-4} \text{ ft/min}}$$

$$\underline{K = 0.17 \text{ ft/day}}$$

$$\underline{K = 6.1 \times 10^{-5} \text{ cm/sec}}$$


RISING HEADSLUG TEST
WELL 57MW07
H/H0
10
9
8
7
6
5
4
3
2
1
5.0
10.0
15.0
20.0
25.0
30.0
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD NSWC WELL/BORING NO.: S57MW07

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10', 17.96 - 27.96 TEST NO.: 15

STATIC WATER LEVEL (Depth/Elevation): 9.13 TPVC DATE: 1-27-99

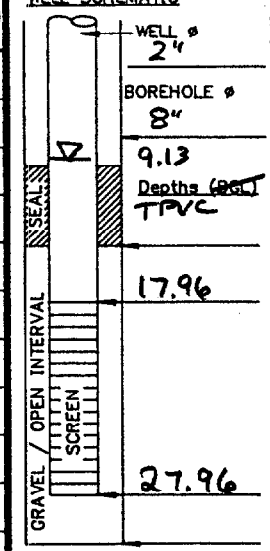
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145' dia x 4.7' PAGE ... OF ...

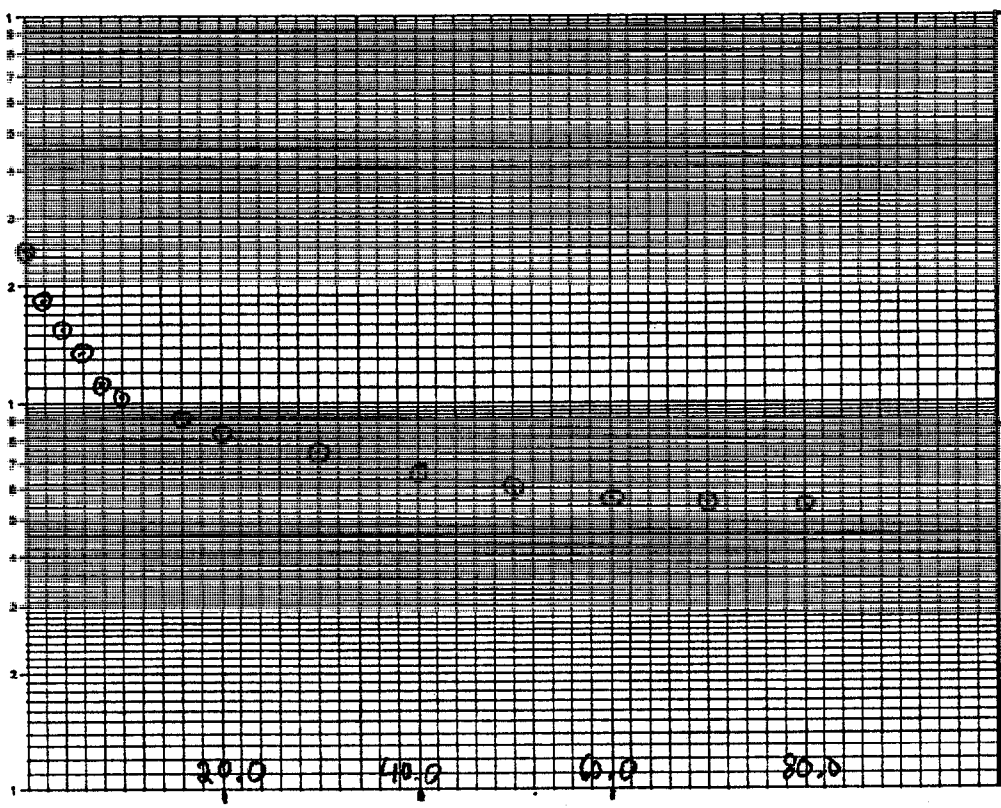
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, H_2O SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	30		-0.743
0.025		-2.566	40		-0.660
0.1		-2.337	50		-0.616
0.4		-2.070	60		-0.571
1.0		-1.969	70		-0.559
2.0		-1.854	80		-0.546
4.0		-1.581			
6.0		-1.353			
8.0		-1.143			
10.0		-1.035			
16.0		-0.902			
20.0		-0.838			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

STOP @ 1647

CALCS, SKETCH MAPS, ETC.:

SE2000
Environmental Logger
01/27 23:14

Unit# 2000 Test 15

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW07
Reference	0.000
PSI at Ref.	2.972
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/27 15:21:27

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	-1.334	
0.0166	-3.632	
0.0250	-2.566	
0.0333	-2.642	1.0
0.0416	-2.432	
0.0500	-2.369	
0.0583	-2.369	
0.0666	-2.363	
0.0750	-2.356	
0.0833	-2.350	
0.0916	-2.343	
0.1000	-2.337	
0.1083	-2.331	
0.1166	-2.331	
0.1250	-2.324	
0.1333	-2.318	
0.1416	-2.312	
0.1500	-2.305	
0.1583	-2.305	
0.1666	-2.299	
0.1750	-2.293	
0.1833	-2.293	
0.1916	-2.293	
0.2000	-2.286	
0.2083	-2.286	
0.2166	-2.286	
0.2250	-2.286	
0.2333	-2.280	
0.2416	-2.255	
0.2500	-2.102	
0.2583	-2.102	
0.2666	-2.102	

pg 2 of 4

TEST 15

0.2833	-2.096	
0.2916	-2.096	
0.3000	-2.096	
0.3083	-2.089	
0.3166	-2.089	
0.3250	-2.089	
0.3333	-2.083	
0.3500	-2.077	
0.3666	-2.077	
0.3833	-2.070	
0.4000	-2.070	
0.4166	-2.064	
0.4333	-2.058	.78
0.4500	-2.058	
0.4666	-2.051	
0.4833	-2.045	
0.5000	-2.045	
0.5166	-2.039	
0.5333	-2.039	
0.5500	-2.039	
0.5666	-2.032	
0.5833	-2.032	
0.6000	-2.026	
0.6166	-2.026	
0.6333	-2.020	
0.6500	-2.020	
0.6666	-2.020	
0.6833	-2.013	
0.7000	-2.013	
0.7166	-2.007	
0.7333	-2.007	
0.7500	-2.007	
0.7666	-2.001	
0.7833	-2.001	
0.8000	-2.001	
0.8166	-1.994	
0.8333	-1.994	
0.8500	-1.994	
0.8666	-1.988	
0.8833	-1.988	
0.9000	-1.988	
0.9166	-1.981	
0.9333	-1.981	
0.9500	-1.981	
0.9666	-1.975	
0.9833	-1.975	
1.0000	-1.969	.75
1.2000	-1.943	
1.4000	-1.924	
1.6000	-1.905	
1.8000	-1.886	
2.0000	-1.854	
2.2000	-1.823	
2.4000	-1.797	
2.6000	-1.772	
2.8000	-1.746	
3.0000	-1.721	
3.2000	-1.689	

TEST 15

3.8000	-1.607	
4.0000	-1.581	.60
4.2000	-1.556	
4.4000	-1.537	
4.6000	-1.511	
4.8000	-1.492	
5.0000	-1.473	
5.2000	-1.448	
5.4000	-1.423	
5.6000	-1.397	
5.8000	-1.378	
6.0000	-1.353	
6.2000	-1.334	
6.4000	-1.308	
6.6000	-1.289	
6.8000	-1.264	
7.0000	-1.238	.47
7.2000	-1.219	
7.4000	-1.200	
7.6000	-1.181	
7.8000	-1.162	
8.0000	-1.143	
8.2000	-1.130	
8.4000	-1.118	
8.6000	-1.105	
8.8000	-1.092	
9.0000	-1.080	
9.2000	-1.067	
9.4000	-1.054	
9.6000	-1.048	
9.8000	-1.035	
10.0000	-1.035	.39
12.0000	-0.978	
14.0000	-0.940	.36
16.0000	-0.902	
18.0000	-0.864	
20.0000	-0.838	.32
22.0000	-0.832	
24.0000	-0.800	
26.0000	-0.775	
28.0000	-0.756	
30.0000	-0.743	.28
32.0000	-0.730	
34.0000	-0.717	
36.0000	-0.686	
38.0000	-0.673	
40.0000	-0.660	.25
42.0000	-0.648	
44.0000	-0.635	
46.0000	-0.628	
48.0000	-0.622	
50.0000	-0.616	
52.0000	-0.603	
54.0000	-0.597	
56.0000	-0.590	
58.0000	-0.590	
60.0000	-0.571	
62.0000	-0.565	

66.0000	-0.553
68.0000	-0.565
70.0000	-0.559
72.0000	-0.559
74.0000	-0.552
76.0000	-0.552
78.0000	-0.546
80.0000	-0.546
82.0000	-0.540
84.0000	-0.527

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57
SUBJECT: SLUG TEST WELL 57MW08 RISING HEAD	
BASED ON: HYDROLEV	DRAWING NUMBER:
BY: FRED W RAMSER	CHECKED BY: RMB 3/8/99
APPROVED BY:	DATE:

EQ

$$K = \frac{r^2 \ln(L/R)}{2LT_0}$$

$r = 0.083$ feet — riser radius
$R = 0.083$ feet — screen radius
$L = 8.35$ feet — Input length
$T_0 = 0.38$ min — Time @ 37%

SUB:

$$K = \frac{(0.083)^2 \ln(8.35/.083)}{2(8.35)(0.38)}$$

$$K = \frac{.032}{6.35}$$

$$\underline{K = 5.0 \times 10^{-3} \text{ ft/min}}$$

$$\underline{K = 7.2 \text{ ft/day}}$$

$$\underline{K = 2.5 \times 10^{-3} \text{ cm/sec}}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD NSWC SITE 57 WELL/BORING NO.: S57MW008

PROJECT NO.: 7129 GEOLOGIST: FREDWRAMMER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' TEST NO.: 16

STATIC WATER LEVEL (Depth/Elevation): 8.29 DATE: 1-27-99

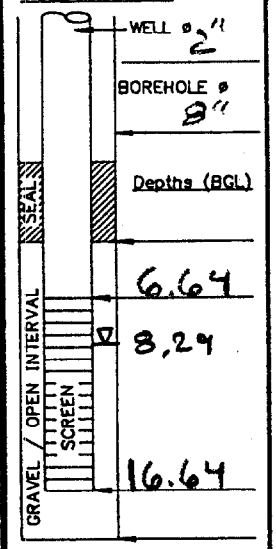
TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: [illegible] x 4.7' PAGE 1 OF 1

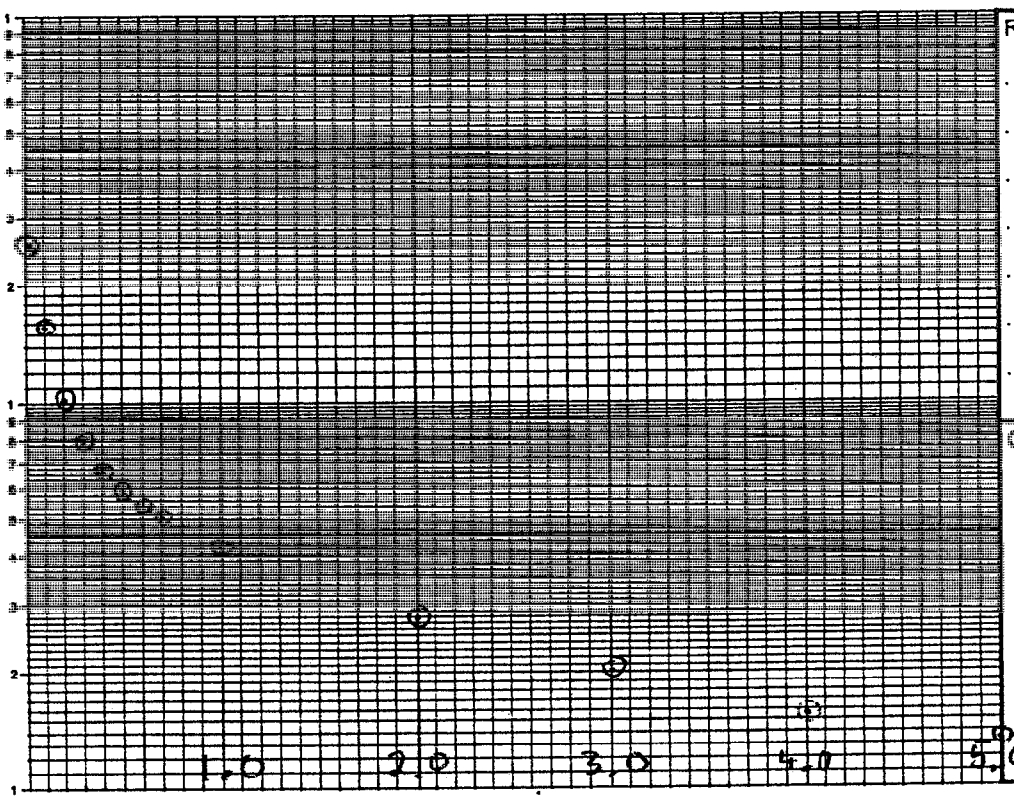
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X DOCK, H2O SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	3.0		-.203
0.025		-2.229	4.0		-.158
0.100		-1.569	5.0		-.133
0.200		-1.016	6.0		-.114
0.300		-0.788	7.0		-.095
0.400		-0.660	10.0		-.069
0.500		-0.591	20.0		-.050
0.600		-0.540			
0.700		-0.508			
0.800		-0.476			
1.0		-0.432			
2.0		-0.279			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

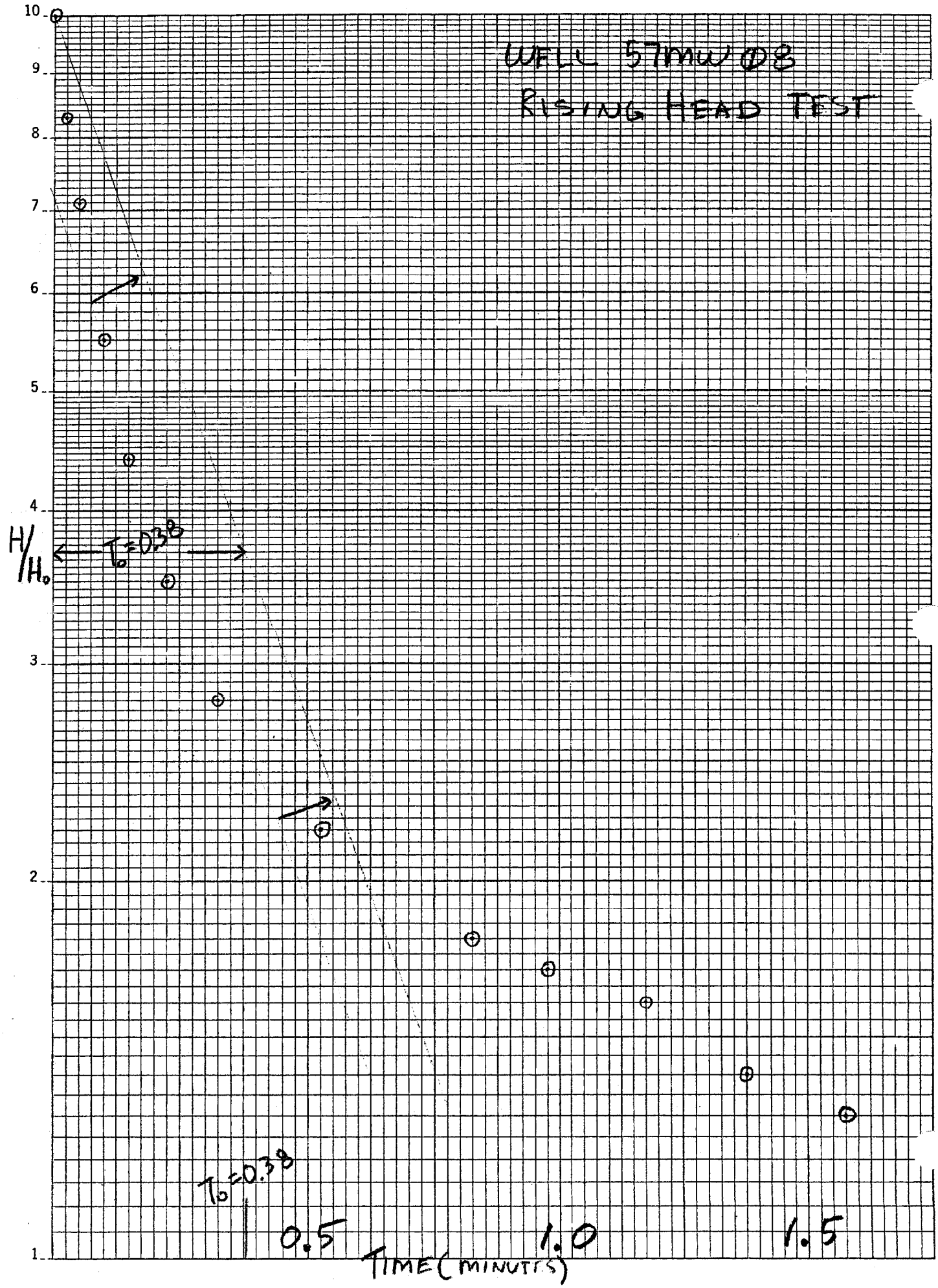


REMARKS:

START 1750

STOP 1810

CALCS, SKETCH MAPS, ETC.:



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

p

SE2000
Environmental Logger
01/27 23:12

Unit# 2000 Test 16

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW08
Reference	0.000
PSI at Ref.	3.603
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/27 17:47:50

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	-1.620	
0.0166	-3.723	
0.0250	-2.529	1.0
0.0333	-2.357	
0.0416	-2.205	
0.0500	-2.090	.83
0.0583	-1.982	
0.0666	-1.887	
0.0750	-1.798	.71
0.0833	-1.715	
0.0916	-1.645	
0.1000	-1.569	
0.1083	-1.506	
0.1166	-1.442	
0.1250	-1.379	.55
0.1333	-1.328	
0.1416	-1.277	
0.1500	-1.226	
0.1583	-1.188	
0.1666	-1.143	
0.1750	-1.112	.44
0.1833	-1.074	
0.1916	-1.048	
0.2000	-1.016	
0.2083	-0.991	
0.2166	-0.966	
0.2250	-0.940	
0.2333	-0.921	
0.2416	-0.896	
0.2500	-0.877	.35
0.2583	-0.864	
0.2666	-0.845	

pg 2 of 3
TEST 16

0.2916	-0.800	
0.3000	-0.788	
0.3083	-0.769	
0.3166	-0.756	
0.3250	-0.749	
0.3333	-0.737	
0.3500	-0.711	.23
0.3666	-0.692	
0.3833	-0.680	
0.4000	-0.660	
0.4166	-0.648	
0.4333	-0.635	
0.4500	-0.622	
0.4666	-0.610	
0.4833	-0.597	
0.5000	-0.591	
0.5166	-0.578	
0.5333	-0.572	
0.5500	-0.565	.22
0.5666	-0.559	
0.5833	-0.552	
0.6000	-0.540	
0.6166	-0.540	
0.6333	-0.527	
0.6500	-0.527	
0.6666	-0.521	
0.6833	-0.514	
0.7000	-0.508	
0.7166	-0.502	
0.7333	-0.495	
0.7500	-0.495	
0.7666	-0.489	
0.7833	-0.483	
0.8000	-0.476	
0.8166	-0.476	
0.8333	-0.470	
0.8500	-0.463	.18
0.8666	-0.463	
0.8833	-0.457	
0.9000	-0.451	
0.9166	-0.451	
0.9333	-0.444	
0.9500	-0.444	
0.9666	-0.438	
0.9833	-0.438	
1.0000	-0.432	.17
1.2000	-0.394	[illegible]
1.4000	-0.355	[illegible]
1.6000	-0.330	.13
1.8000	-0.298	
2.0000	-0.279	
2.2000	-0.254	
2.4000	-0.241	
2.6000	-0.228	
2.8000	-0.216	
3.0000	-0.203	
3.2000	-0.190	
3.4000	-0.184	

3.8000 -0.171

pg 3 of 3

TEST 16

4.0000	-0.158
4.2000	-0.158
4.4000	-0.146
4.6000	-0.146
4.8000	-0.139
5.0000	-0.133
5.2000	-0.127
5.4000	-0.120
5.6000	-0.120
5.8000	-0.114
6.0000	-0.114
6.2000	-0.108
6.4000	-0.101
6.6000	-0.101
6.8000	-0.101
7.0000	-0.095
7.2000	-0.095
7.4000	-0.088
7.6000	-0.088
7.8000	-0.088
8.0000	-0.082
8.2000	-0.082
8.4000	-0.082
8.6000	-0.082
8.8000	-0.076
9.0000	-0.076
9.2000	-0.076
9.4000	-0.069
9.6000	-0.069
9.8000	-0.069
10.0000	-0.069
12.0000	-0.057
14.0000	-0.050
16.0000	-0.050
18.0000	-0.050
20.0000	-0.050

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIANHEAD NSWC		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST WELL 57MW10 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED W RAMSER	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

EQ: $K = \frac{r^2 \ln(L/R)}{2LT_o}$

$r = 0.083$ feet (riser radius)
$R = 0.083$ feet (screen radius)
$L = 6.98$ feet (Input length)
$T_o = 1.07$ min (Time @ 37%)

SUB: $K = \frac{(0.083)^2 \ln(6.98/.083)}{2(6.98)(1.07)}$

$K = \frac{0.031}{14.94}$

$K = 2.1 \times 10^{-3}$ ft/min

$K = 3.0$ ft/day

$K = 1.1 \times 10^{-3}$ cm/sec

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW010

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10' / 5.88-15.88 TEST NO.: 13

STATIC WATER LEVEL (Depth/Elevation): 8.90' DATE: 1-27-99

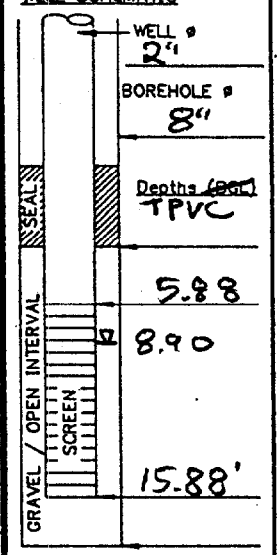
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 60.145dia x PAGE ... OF ...

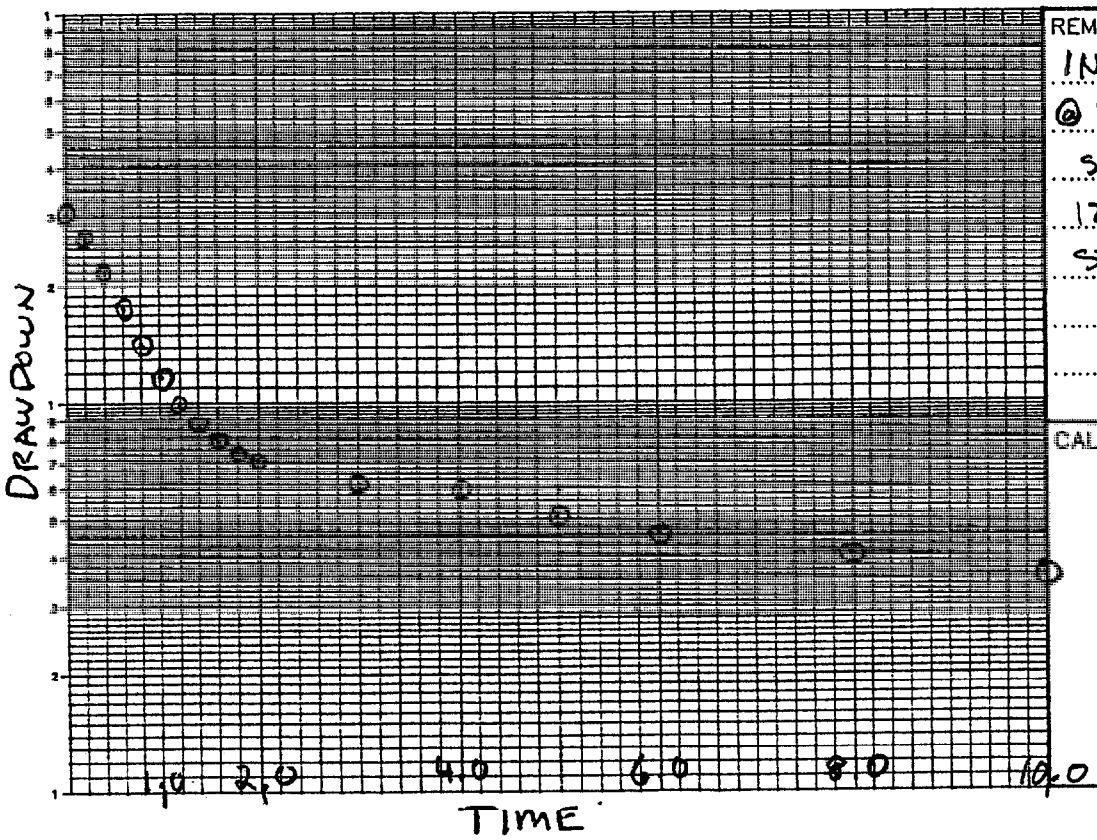
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): T-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	1.6		-0.800
0.025		-3.023	1.8		-0.762
0.100		-2.902	2.0		-0.724
0.200		-2.680	3.0		-0.622
0.300		-2.439	4.0		-0.559
0.400		-2.191	5.0		-0.514
0.500		-1.962	6.0		-0.470
0.600		-1.753	8.0		-0.419
0.800		-1.410	10.0		-0.362
1.000		-1.162	20.0		-0.216
1.200		-0.997	30.0		-0.133
1.400		-0.876	60.0		-0.057

WELL SCHEMATIC

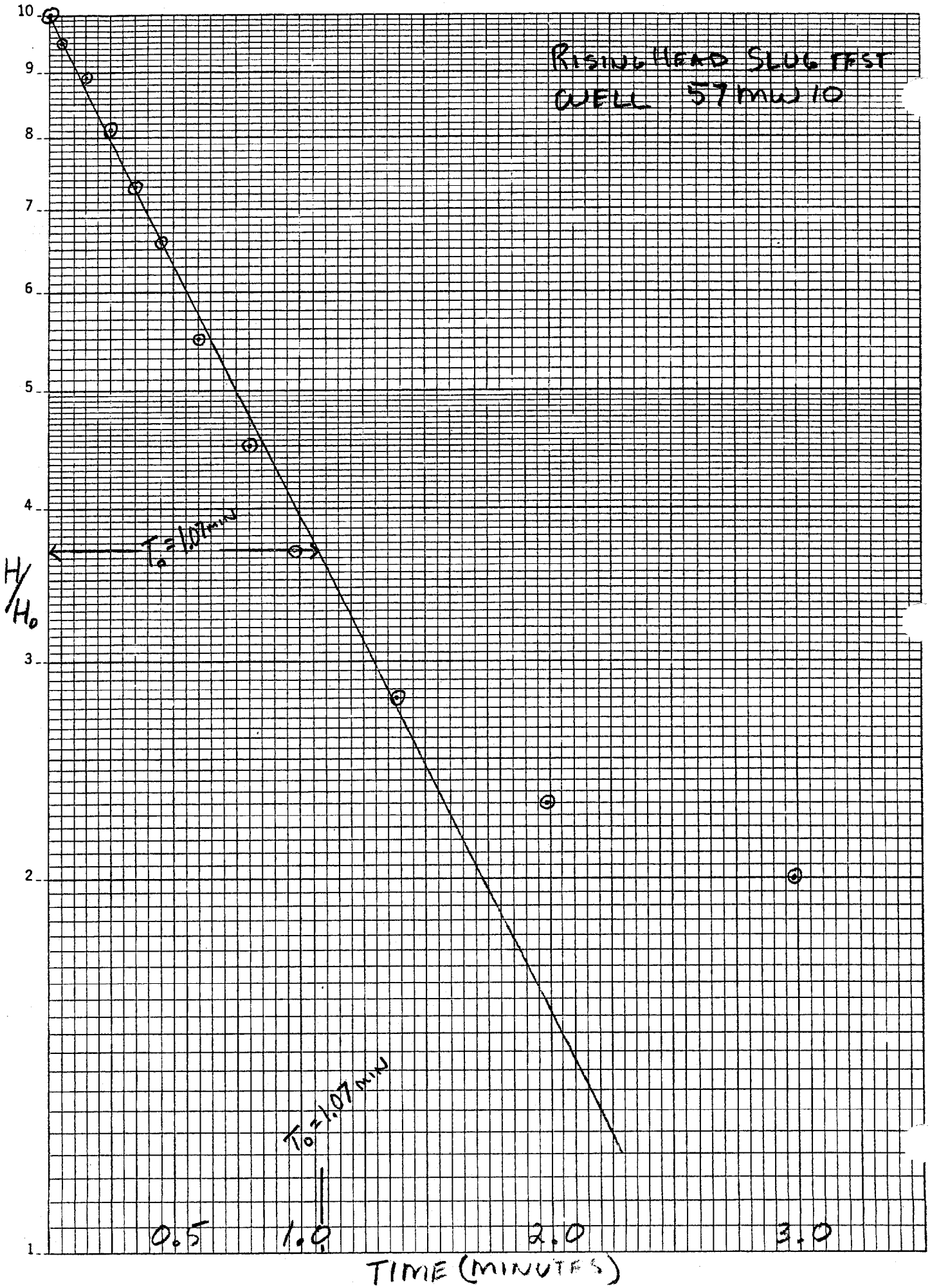


▽ Indicate SWL Depth on Drawing



REMARKS:
INSERT SLUG @ 1110 HRS
START TEST @ 1209
STOP @ 1330 HRS

CALCS, SKETCH MAPS, ETC.:



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

SE2000
Environmental Logger
01/27 23:18

Unit# 2000 Test 13

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW10
Reference	0.000
PSI at Ref.	3.022
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/27 12:06:38

Elapsed Time	INPUT 1	H/Ho
0.0000	0.000	
0.0083	-2.712	
0.0166	-3.112	1.0
0.0250	-3.023	
0.0333	-3.010	
0.0416	-2.998	
0.0500	-2.985	
0.0583	-2.972	
0.0666	-2.960	.95
0.0750	-2.947	
0.0833	-2.934	
0.0916	-2.915	
0.1000	-2.902	
0.1083	-2.890	
0.1166	-2.871	
0.1250	-2.852	
0.1333	-2.833	
0.1416	-2.820	
0.1500	-2.801	
0.1583	-2.782	
0.1666	-2.763	.89
0.1750	-2.744	
0.1833	-2.725	
0.1916	-2.706	
0.2000	-2.680	
0.2083	-2.661	
0.2166	-2.642	
0.2250	-2.623	
0.2333	-2.598	
0.2416	-2.579	
0.2500	-2.559	
0.2583	-2.540	
0.2666	-2.521	.81

0.2916	-2.458	
0.3000	-2.439	
0.3083	-2.413	
0.3166	-2.394	
0.3250	-2.375	
0.3333	-2.350	
0.3500	-2.312	
0.3666	-2.274	.73
0.3833	-2.229	
0.4000	-2.191	
0.4166	-2.153	
0.4333	-2.109	
0.4500	-2.070	
0.4666	-2.039	.66
0.4833	-1.994	
0.5000	-1.962	
0.5166	-1.924	
0.5333	-1.893	
0.5500	-1.855	
0.5666	-1.816	
0.5833	-1.785	
0.6000	-1.753	
0.6166	-1.715	.55
0.6333	-1.683	
0.6500	-1.651	
0.6666	-1.626	
0.6833	-1.594	
0.7000	-1.562	
0.7166	-1.537	
0.7333	-1.505	
0.7500	-1.480	
0.7666	-1.454	
0.7833	-1.429	
0.8000	-1.410	
0.8166	-1.384	.45
0.8333	-1.359	
0.8500	-1.340	
0.8666	-1.315	
0.8833	-1.296	
0.9000	-1.276	
0.9166	-1.251	
0.9333	-1.232	
0.9500	-1.213	
0.9666	-1.200	
0.9833	-1.181	
1.0000	-1.162	.37
1.2000	-0.997	
1.4000	-0.876	.28
1.6000	-0.800	
1.8000	-0.762	
2.0000	-0.724	.23
2.2000	-0.705	
2.4000	-0.679	
2.6000	-0.660	
2.8000	-0.641	
3.0000	-0.622	.20
3.2000	-0.609	
3.4000	-0.597	

TEST 13

4.0000	-0.559
4.2000	-0.552
4.4000	-0.533
4.6000	-0.527
4.8000	-0.521
5.0000	-0.514
5.2000	-0.501
5.4000	-0.495
5.6000	-0.489
5.8000	-0.476
6.0000	-0.470
6.2000	-0.463
6.4000	-0.457
6.6000	-0.457
6.8000	-0.444
7.0000	-0.444
7.2000	-0.432
7.4000	-0.432
7.6000	-0.425
7.8000	-0.419
8.0000	-0.419
8.2000	-0.413
8.4000	-0.406
8.6000	-0.400
8.8000	-0.393
9.0000	-0.393
9.2000	-0.387
9.4000	-0.381
9.6000	-0.374
9.8000	-0.368
10.0000	-0.362
12.0000	-0.330
14.0000	-0.298
16.0000	-0.266
18.0000	-0.247
20.0000	-0.216
22.0000	-0.190
24.0000	-0.171
26.0000	-0.152
28.0000	-0.146
30.0000	-0.133
32.0000	-0.120
34.0000	-0.114
36.0000	-0.108
38.0000	-0.095
40.0000	-0.095
42.0000	-0.088
44.0000	-0.082
46.0000	-0.082
48.0000	-0.076
50.0000	-0.069
52.0000	-0.069
54.0000	-0.063
56.0000	-0.063
58.0000	-0.063
60.0000	-0.057
62.0000	-0.057
64.0000	-0.057

68.0000	-0.044
70.0000	-0.044
72.0000	-0.044
74.0000	-0.044
76.0000	-0.044
78.0000	-0.050
80.0000	-0.050
82.0000	-0.044

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC		JOB NUMBER: 7129 SITE 57	
SUBJECT: SLUG TEST WELL 57MW011 RISING HEAD			
BASED ON: HVORSLEV		DRAWING NUMBER:	
BY: FRED W. RAMSER	CHECKED BY: RMB 3/8/99	APPROVED BY:	DATE:

EQ:

$$K = \frac{r^2 \ln(L/R)}{2 L T_o}$$

r = 0.083 feet (RISER radius)
R = 0.083 feet (SCREEN radius)
L = 10 feet (INPUT LENGTH)
T_o = 4.6 min (TIME @ 37% RECOVERY)

SUB:

$$K = \frac{(.083)^2 \ln(10/.083)}{2(10)(4.6)}$$

$$= \frac{0.033}{92}$$

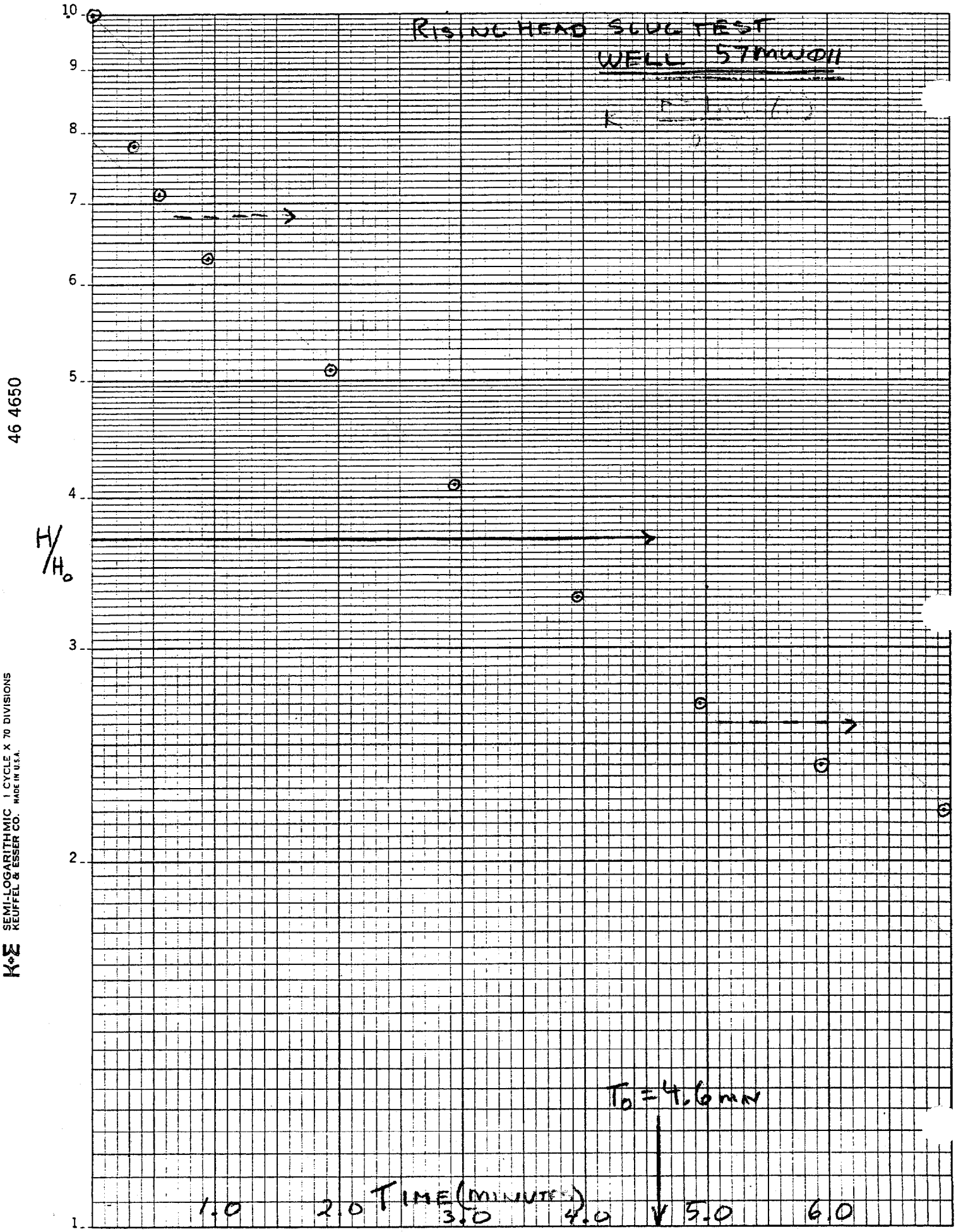
$$K = 3.6 \times 10^{-4}\ ft/min$$

$$= 3.6 \times 10^{-4}\ ft/min \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} \times \frac{1\ min}{60\ sec}$$

$$K = 1.8 \times 10^{-4}\ cm/sec$$

$$= 3.6 \times 10^{-4}\ ft/min \times \frac{60\ min}{1\ hr} \times \frac{24\ hr}{1\ day}$$

$$K = 0.52\ ft/day$$


RISING HEAD SLUG TEST
WELL 57MW011
K =
H/H0
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
TIME (MINUTES)
T0 = 4.6 MIN
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD NSWC SITE 57 WELL/BORING NO.: SS7 MW11

PROJECT NO.: 7129 GEOLOGIST: FRED WRAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10, 10.61 – 20.61 TEST NO.: 18

STATIC WATER LEVEL (Depth/Elevation): 9.84 TOC DATE: 1-28-99

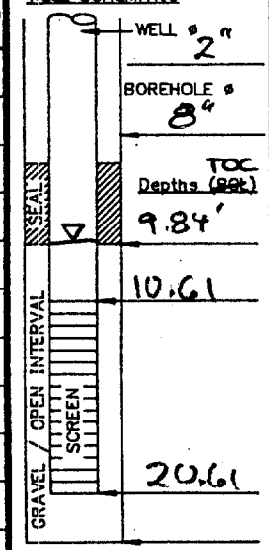
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 4.70' x 0.145' PAGE ..... OF .....

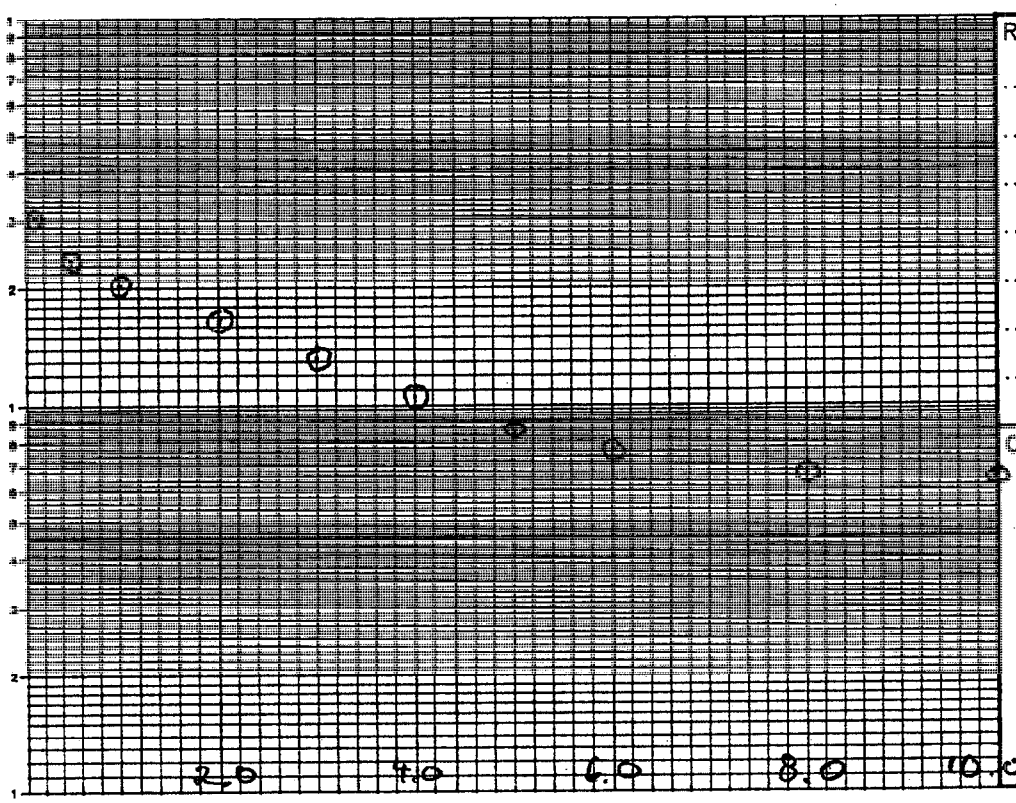
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0000		-0.006	6.0		-0.768
0.100		-3.092	7		-0.705
.2		-2.788	8		-0.673
.3		-2.616	9		-0.647
.5		-2.375	10.0		-0.628
.8		-2.134	12.0		-0.603
1.0		-2.013			
1.6		-1.759			
2.0		-1.638			
3.0		-1.308			
4.0		-1.048			
5.0		-0.870			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

START 1140

STOP 1152

CALCS, SKETCH MAPS, ETC.:

SE2000
Environmental Logger
02/08 15:46

Unit# 2000 Test 18

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW11
Reference	0.000
PSI at Ref.	2.730
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/28 11:37:00

Elapsed Time	INPUT 1	H/H_o
0.0000	-0.006	
0.0083	-7.604	
0.0166	-2.451	
0.0250	-3.226	
0.0333	-3.207	
0.0416	-3.200	
0.0500	-3.188	1
0.0583	-3.175	
0.0666	-3.162	
0.0750	-3.143	
0.0833	-3.124	
0.0916	-3.111	
0.1000	-3.092	
0.1083	-3.080	
0.1166	-3.054	
0.1250	-3.042	
0.1333	-2.915	
0.1416	-2.902	
0.1500	-2.889	0.91
0.1583	-2.870	
0.1666	-2.851	
0.1750	-2.838	
0.1833	-2.819	
0.1916	-2.807	
0.2000	-2.788	
0.2083	-2.775	
0.2166	-2.762	
0.2250	-2.743	
0.2333	-2.724	
0.2416	-2.711	
0.2500	-2.699	0.85
0.2583	-2.686	
0.2666	-2.673	
0.2750	-2.654	
0.2833	-2.642	

0.2916	-2.629	
0.3000	-2.616	
0.3083	-2.603	
0.3166	-2.591	
0.3250	-2.578	
0.3333	-2.572	
0.3500	-2.546	
0.3666	-2.527	
0.3833	-2.502	
0.4000	-2.483	0.79
0.4166	-2.464	
0.4333	-2.445	
0.4500	-2.426	
0.4666	-2.413	
0.4833	-2.394	
0.5000	-2.375	
0.5166	-2.362	
0.5333	-2.343	
0.5500	-2.330	
0.5666	-2.311	
0.5833	-2.299	
0.6000	-2.286	0.71
0.6166	-2.273	
0.6333	-2.254	
0.6500	-2.242	
0.6666	-2.235	
0.6833	-2.216	
0.7000	-2.210	
0.7166	-2.197	
0.7333	-2.184	
0.7500	-2.172	
0.7666	-2.159	
0.7833	-2.146	
0.8000	-2.134	
0.8166	-2.121	
0.8333	-2.115	
0.8500	-2.102	
0.8666	-2.089	
0.8833	-2.083	
0.9000	-2.070	
0.9166	-2.064	
0.9333	-2.051	
0.9500	-2.038	
0.9666	-2.032	
0.9833	-2.019	
1.0000	-2.013	0.63
1.2000	-1.911	
1.4000	-1.829	
1.6000	-1.759	
1.8000	-1.695	
2.0000	-1.638	0.51
2.2000	-1.575	
2.4000	-1.505	
2.6000	-1.435	
2.8000	-1.372	
3.0000	-1.308	0.41
3.2000	-1.251	
3.4000	-1.194	
3.6000	-1.137	
3.8000	-1.092	

4.0000	-1.048	0.33
4.2000	-1.003	
4.4000	-0.965	
4.6000	-0.927	
4.8000	-0.895	
5.0000	-0.870	0.27
5.2000	-0.844	
5.4000	-0.825	
5.6000	-0.806	
5.8000	-0.787	
6.0000	-0.768	0.24
6.2000	-0.755	
6.4000	-0.743	
6.6000	-0.730	
6.8000	-0.717	
7.0000	-0.705	0.22
7.2000	-0.698	
7.4000	-0.692	
7.6000	-0.686	
7.8000	-0.679	
8.0000	-0.673	
8.2000	-0.667	
8.4000	-0.660	
8.6000	-0.654	
8.8000	-0.654	
9.0000	-0.647	
9.2000	-0.641	
9.4000	-0.635	
9.6000	-0.635	
9.8000	-0.628	
10.0000	-0.628	
12.0000	-0.603	
14.0000	-0.590	

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST, WELL 57MW011 FALLING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED W. RAMSER	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

$$K = \frac{r^2 \ln(L/R)}{2 L T_o}$$

$r = 0.083$ feet — riser radius
$R = 0.083$ feet — screen radius
$L = 10$ feet — Input Length
$T_o = 3.1$ min — Time @ 37%

sub:

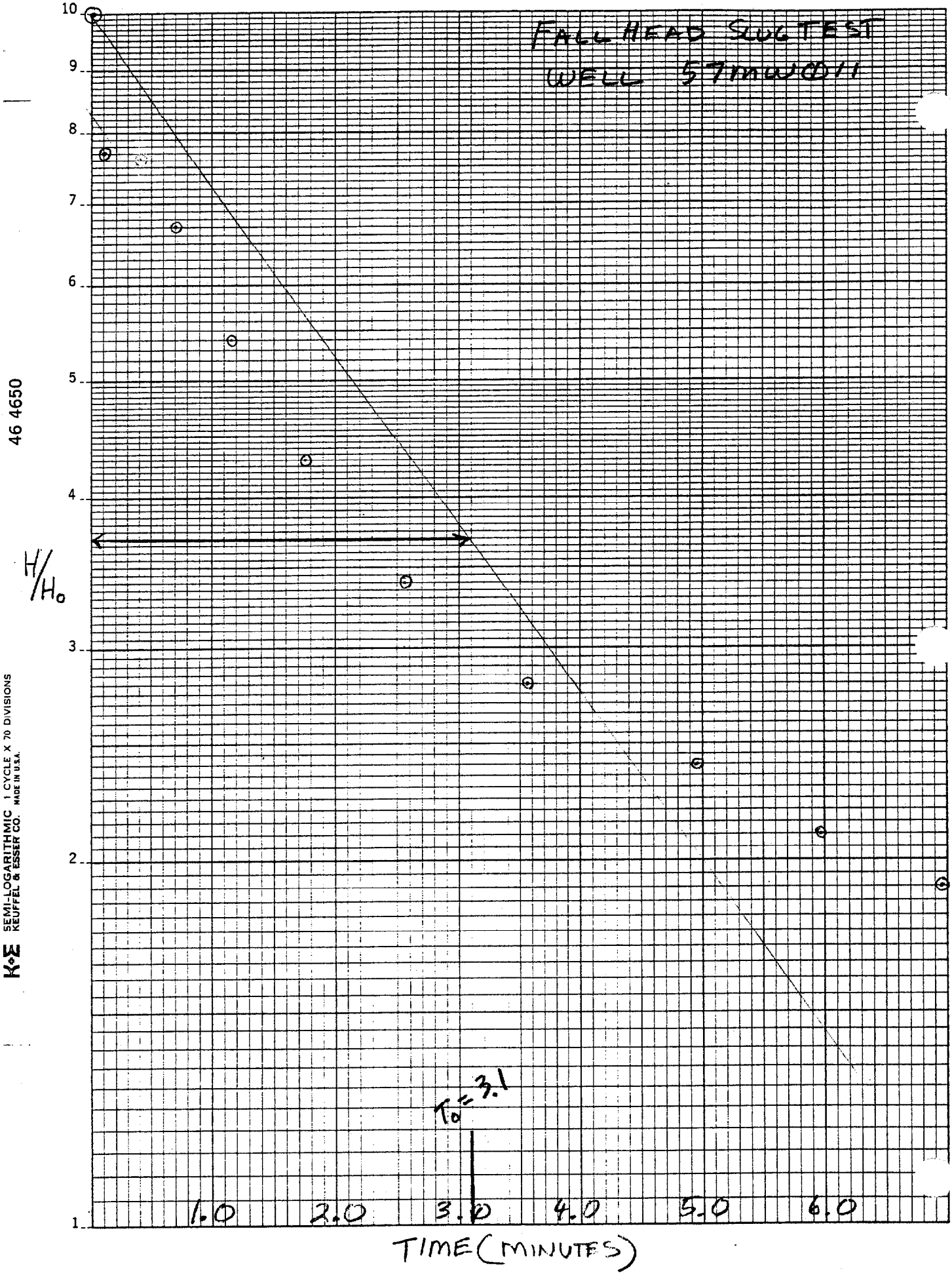
$$K = \frac{(0.083)^2 \ln(10/0.083)}{2(10)(3.1)}$$

$$= \frac{0.033}{62}$$

$$K = 5.3 \times 10^{-4} \text{ ft/min}$$

$$K = 2.7 \times 10^{-4} \text{ cm/sec}$$

$$K = 0.76 \text{ ft/day}$$


FALL HEAD SLUG TEST
WELL 57MW0011
H/Ho
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
TIME (MINUTES)
To = 3.1
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIAN HEAD NWSC WELL/BORING NO.: S57MW011

PROJECT NO.: 7129 GEOLOGIST: FRED WRAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' TEST NO.: 17

STATIC WATER LEVEL (Depth/Elevation): 5.79 (1-27-99), 9.84 (1-28-99) DATE: 1-28-99

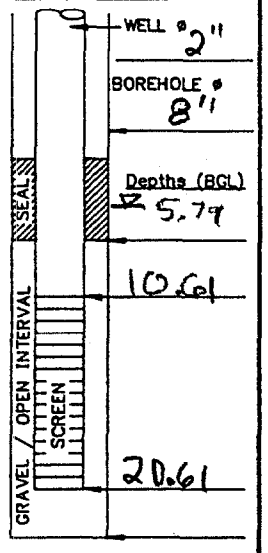
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 4.7 X .125' dia PAGE 1 OF

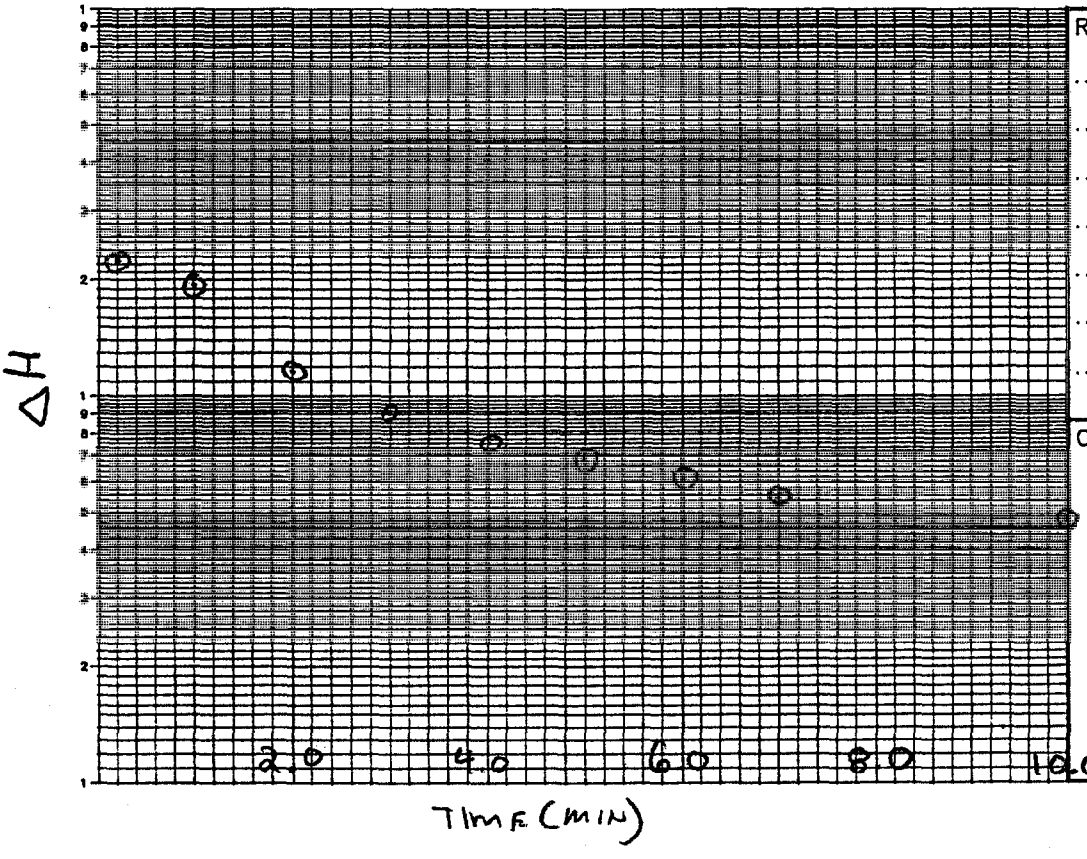
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.012	5.0		0.692
0.025		3.419	6.0		0.616
0.0333		2.929	7.0		0.565
0.050		2.300	10.0		0.482
0.2		2.230	20.0		0.425
0.7		1.957	30.0		0.406
1.0		1.944	50.0		0.400
1.6		1.359	56.0		0.387
2.0		1.175	92		0.381
2.4		1.061			
3.0		0.914			
4.0		0.762			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

START 0837

STOP 0932

REPO:

START 1000

STOP 1136

CALCS, SKETCH MAPS, ETC.:

SE2000
Environmental Logger
02/08 15:41

Unit# 2000 Test 17

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW11
Reference	0.000
PSI at Ref.	2.562
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/28 10:01:52

Elapsed Time	INPUT 1	H/H_0
0.0000	0.012	
0.0083	1.696	
0.0166	5.218	
0.0250	3.419	
0.0333	2.929	1.0
0.0416	2.274	
0.0500	2.300	
0.0583	2.452	
0.0666	2.332	
0.0750	2.332	
0.0833	2.312	
0.0916	2.319	
0.1000	2.344	
0.1083	2.306	
0.1166	2.306	
0.1250	2.268	
0.1333	2.268	0.77
0.1416	2.255	
0.1500	2.249	
0.1583	2.243	
0.1666	2.243	
0.1750	2.236	
0.1833	2.236	
0.1916	2.230	
0.2000	2.230	
0.2083	2.230	
0.2166	2.223	
0.2250	2.230	
0.2333	2.223	
0.2416	2.223	
0.2500	2.223	
0.2583	2.223	
0.2666	2.217	
0.2750	2.217	
0.2833	2.217	

0.2916	2.217	
0.3000	2.217	
0.3083	2.217	
0.3166	2.217	
0.3250	2.211	
0.3333	2.217	
0.3500	2.211	
0.3666	2.211	
0.3833	2.211	
0.4000	2.211	
0.4166	2.211	
0.4333	2.211	0.76
0.4500	2.204	
0.4666	2.204	
0.4833	2.204	
0.5000	2.204	
0.5166	2.204	
0.5333	2.204	
0.5500	2.204	
0.5666	2.204	
0.5833	2.204	
0.6000	2.204	
0.6166	2.204	
0.6333	2.204	
0.6500	2.198	
0.6666	2.026	
0.6833	1.969	
0.7000	1.957	
0.7166	1.957	
0.7333	1.957	0.67
0.7500	1.950	
0.7666	1.950	
0.7833	1.950	
0.8000	1.950	
0.8166	1.950	
0.8333	1.950	
0.8500	1.950	
0.8666	1.950	
0.8833	1.950	
0.9000	1.950	
0.9166	1.950	
0.9333	1.950	
0.9500	1.950	
0.9666	1.950	
0.9833	1.944	
1.0000	1.944	
1.2000	1.575	0.54
1.4000	1.467	
1.6000	1.359	
1.8000	1.264	0.43
2.0000	1.175	
2.2000	1.111	
2.4000	1.061	
2.6000	1.003	0.34
2.8000	0.965	
3.0000	0.914	
3.2000	0.857	
3.4000	0.825	
3.6000	0.819	0.28
3.8000	0.806	

4.0000	0.762	
4.2000	0.756	
4.4000	0.743	
4.6000	0.698	
4.8000	0.698	
5.0000	0.692	0.24
5.2000	0.673	
5.4000	0.641	
5.6000	0.616	
5.8000	0.616	
6.0000	0.616	0.21
6.2000	0.603	
6.4000	0.597	
6.6000	0.584	
6.8000	0.565	
7.0000	0.565	0.19
7.2000	0.546	
7.4000	0.546	
7.6000	0.546	
7.8000	0.527	
8.0000	0.514	
8.2000	0.514	
8.4000	0.514	
8.6000	0.520	
8.8000	0.520	
9.0000	0.508	
9.2000	0.495	
9.4000	0.495	
9.6000	0.495	
9.8000	0.495	
10.0000	0.482	
12.0000	0.431	
14.0000	0.438	
16.0000	0.444	
18.0000	0.425	
20.0000	0.425	
22.0000	0.406	
24.0000	0.412	
26.0000	0.400	
28.0000	0.406	
30.0000	0.406	
32.0000	0.406	
34.0000	0.406	
36.0000	0.412	
38.0000	0.412	
40.0000	0.412	
42.0000	0.419	
44.0000	0.393	
46.0000	0.406	
48.0000	0.400	
50.0000	0.400	
52.0000	0.393	
54.0000	0.393	
56.0000	0.387	
58.0000	0.387	
60.0000	0.381	
62.0000	0.387	
64.0000	0.381	
66.0000	0.387	
68.0000	0.387	

70.0000	0.393
72.0000	0.400
74.0000	0.400
76.0000	0.400
78.0000	0.400
80.0000	0.406
82.0000	0.406
84.0000	0.406
86.0000	0.412
88.0000	0.387
90.0000	0.381
92.0000	0.381

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST WELL S57MW12 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED WRAMSER	CHECKED BY RMB 3/18/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

$r = 0.083$ feet — Riser radius
$R = 0.083$ feet — screen radius
$L = 10$ feet — input length
$T_o = 0.225$ min — time @ 37%

SUB:

$$K = \frac{(0.083)^2 \ln(10/.083)}{2(10)(0.225)}$$

$$= \frac{0.033}{4.5}$$

$K = 7.3 \times 10^{-3}$ ft/min

$K = 10.6$ ft/day

$K = 3.7 \times 10^{-3}$ cm/sec

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW12

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10', 34.09-44.09 TEST NO.: 5

STATIC WATER LEVEL (Depth/Elevation): 5.98 TPVC DATE: 1-26-99

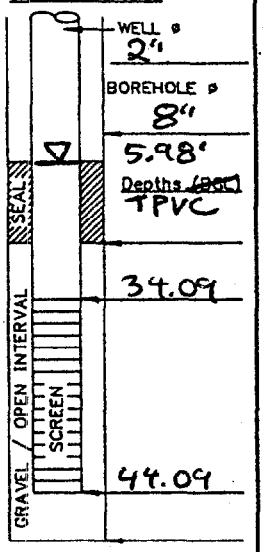
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7 PAGE ... OF ...

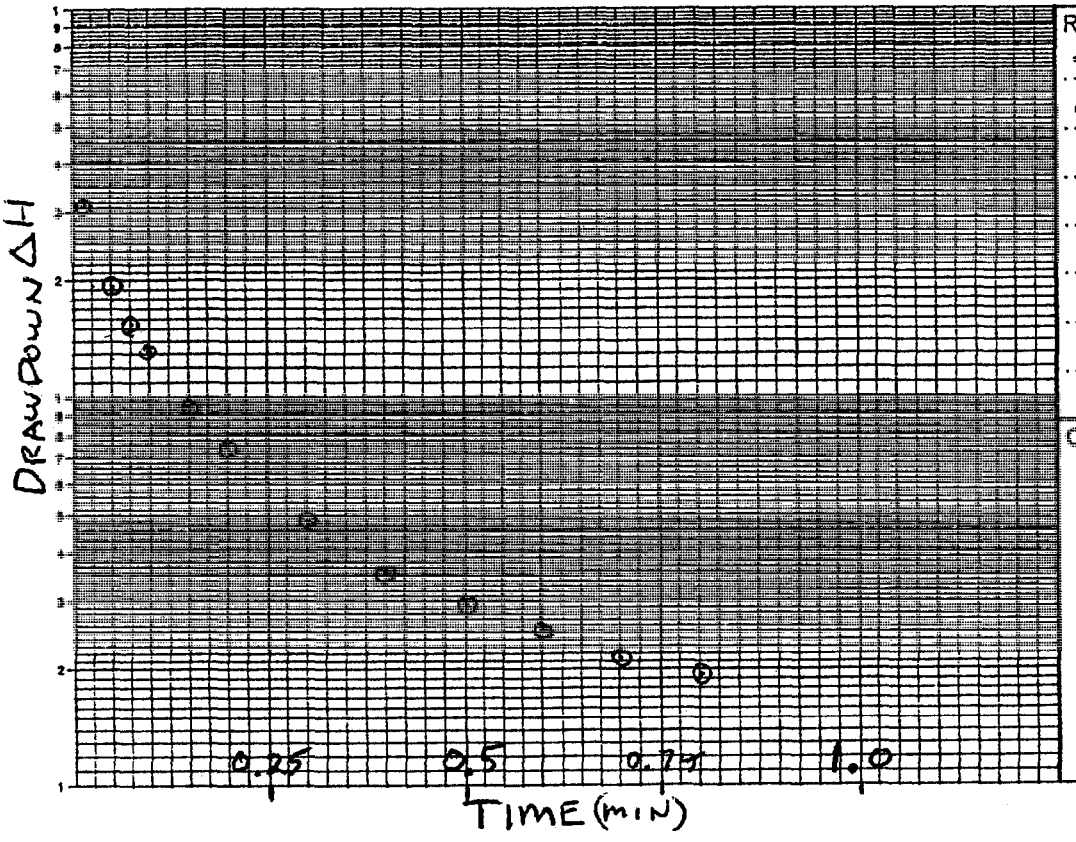
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TRANSDUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		-0.006	0.700		-0.215
0.0166		-3.187	0.800		-0.196
0.0416		-2.083	0.900		-0.177
0.05		-1.943	1.00		-0.165
0.075		-1.587	1.2		-0.146
0.100		-1.327	1.4		-0.127
0.1500		-0.965	1.6		-0.114
0.200		-0.743	2.0		-0.101
0.300		-0.495	3.0		-0.082
0.400		-0.368	4.0		-0.069
0.500		-0.298	6.0		-0.063
0.600		-0.254	20.0		-0.057

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

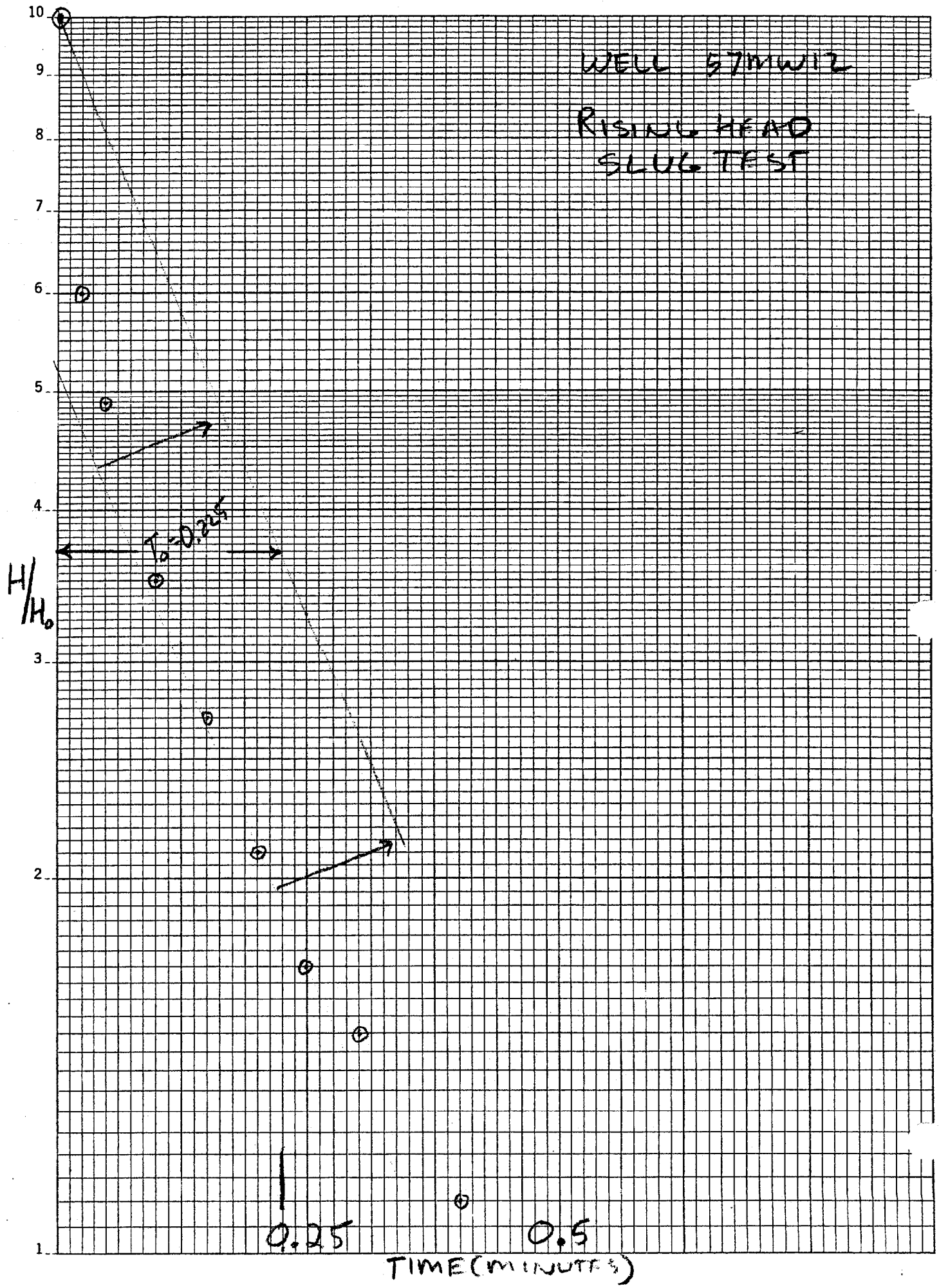


REMARKS:

START 1404

STOP 1425

CALCS, SKETCH MAPS, ETC.:


WELL 57MW12
RISING HEAD
SLUG TEST
$T_0 = 0.25$
H/H_0
10
9
8
7
6
5
4
3
2
1
0.25
0.5
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

SE2000
Environmental Logger
01/26 21:16

Unit# 2000 Test 5

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW12
Reference	0.000
PSI at Ref.	2.537
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 ' 01/26 14:02:45

Elapsed Time	INPUT 1	H/H_0
0.0000	-0.006	
0.0083	-0.768	
0.0166	-3.187	
0.0250	-3.143	
0.0333	-3.022	1.0
0.0416	-2.083	
0.0500	-1.943	
0.0583	-1.816	.60
0.0666	-1.702	
0.0750	-1.587	
0.0833	-1.492	.49
0.0916	-1.403	
0.1000	-1.327	
0.1083	-1.251	
0.1166	-1.187	
0.1250	-1.124	
0.1333	-1.067	.35
0.1416	-1.016	
0.1500	-0.965	
0.1583	-0.927	
0.1666	-0.882	
0.1750	-0.844	
0.1833	-0.813	.27
0.1916	-0.774	
0.2000	-0.743	
0.2083	-0.717	
0.2166	-0.686	
0.2250	-0.666	
0.2333	-0.641	.21
0.2416	-0.616	
0.2500	-0.597	
0.2583	-0.578	

0.2666	-0.558	
0.2750	-0.539	
0.2833	-0.527	.17
0.2916	-0.508	
0.3000	-0.495	
0.3083	-0.482	
0.3166	-0.470	
0.3250	-0.457	
0.3333	-0.444	.15
0.3500	-0.425	
0.3666	-0.406	
0.3833	-0.387	
0.4000	-0.368	
0.4166	-0.355	
0.4333	-0.343	.11
0.4500	-0.330	
0.4666	-0.317	
0.4833	-0.311	
0.5000	-0.298	
0.5166	-0.292	
0.5333	-0.279	
0.5500	-0.273	
0.5666	-0.266	
0.5833	-0.260	
0.6000	-0.254	
0.6166	-0.247	
0.6333	-0.241	
0.6500	-0.235	
0.6666	-0.228	
0.6833	-0.222	
0.7000	-0.215	
0.7166	-0.215	
0.7333	-0.209	
0.7500	-0.209	
0.7666	-0.203	
0.7833	-0.196	
0.8000	-0.196	
0.8166	-0.190	
0.8333	-0.190	
0.8500	-0.184	
0.8666	-0.184	
0.8833	-0.177	
0.9000	-0.177	
0.9166	-0.177	
0.9333	-0.171	
0.9500	-0.171	
0.9666	-0.165	
0.9833	-0.165	
1.0000	-0.165	
1.2000	-0.146	
1.4000	-0.127	
1.6000	-0.114	
1.8000	-0.107	
2.0000	-0.101	
2.2000	-0.095	
2.4000	-0.088	
2.6000	-0.088	
2.8000	-0.082	
3.0000	-0.082	
3.2000	-0.076	

3.4000	-0.076
3.6000	-0.076
3.8000	-0.069
4.0000	-0.069
4.2000	-0.069
4.4000	-0.069
4.6000	-0.069
4.8000	-0.069
5.0000	-0.069
5.2000	-0.063
5.4000	-0.063
5.6000	-0.063
5.8000	-0.063
6.0000	-0.063
6.2000	-0.057
6.4000	-0.057
6.6000	-0.057
6.8000	-0.057
7.0000	-0.057
7.2000	-0.057
7.4000	-0.057
7.6000	-0.057
7.8000	-0.057
8.0000	-0.057
8.2000	-0.057
8.4000	-0.057
8.6000	-0.050
8.8000	-0.050
9.0000	-0.057
9.2000	-0.050
9.4000	-0.050
9.6000	-0.050
9.8000	-0.050
10.0000	-0.050
12.0000	-0.050
14.0000	-0.050
16.0000	-0.057
18.0000	-0.057
20.0000	-0.057

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57	
SUBJECT SLUG TEST WELL 57MW012 FALLING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED W RAMSER	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln (L/R)}{2LT_o}$$

$r = 0.083$ feet (riser radius)
$R = 0.083$ feet (screen radius)
$L = 10$ feet (INPUT LENGTH)
$T_o = 0.525$ min Time @ 37%

SUB:

$$K = \frac{(0.083)^2 \ln(10/.083)}{2(10)0.525}$$

$$= \frac{0.033}{10.5}$$

$$K = \underline{3.1 \times 10^{-3} \text{ ft/min}}$$

$$\underline{K = 4.5 \text{ ft/day}}$$

$$\underline{K = 1.6 \times 10^{-3} \text{ cm/sec}}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW12

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10' 34.09 - 44.09' TEST NO.: 4

STATIC WATER LEVEL (Depth/Elevation): 5.98 DATE: 1-26-99

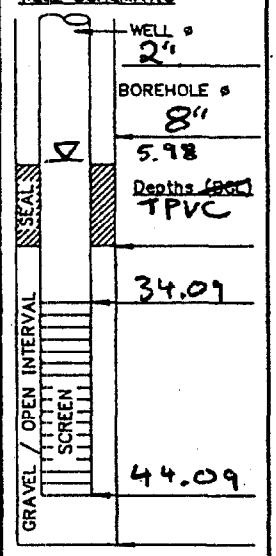
TEST TYPE (Rising/Falling/Constant Head): FALLING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 4.7 PAGE 1 OF

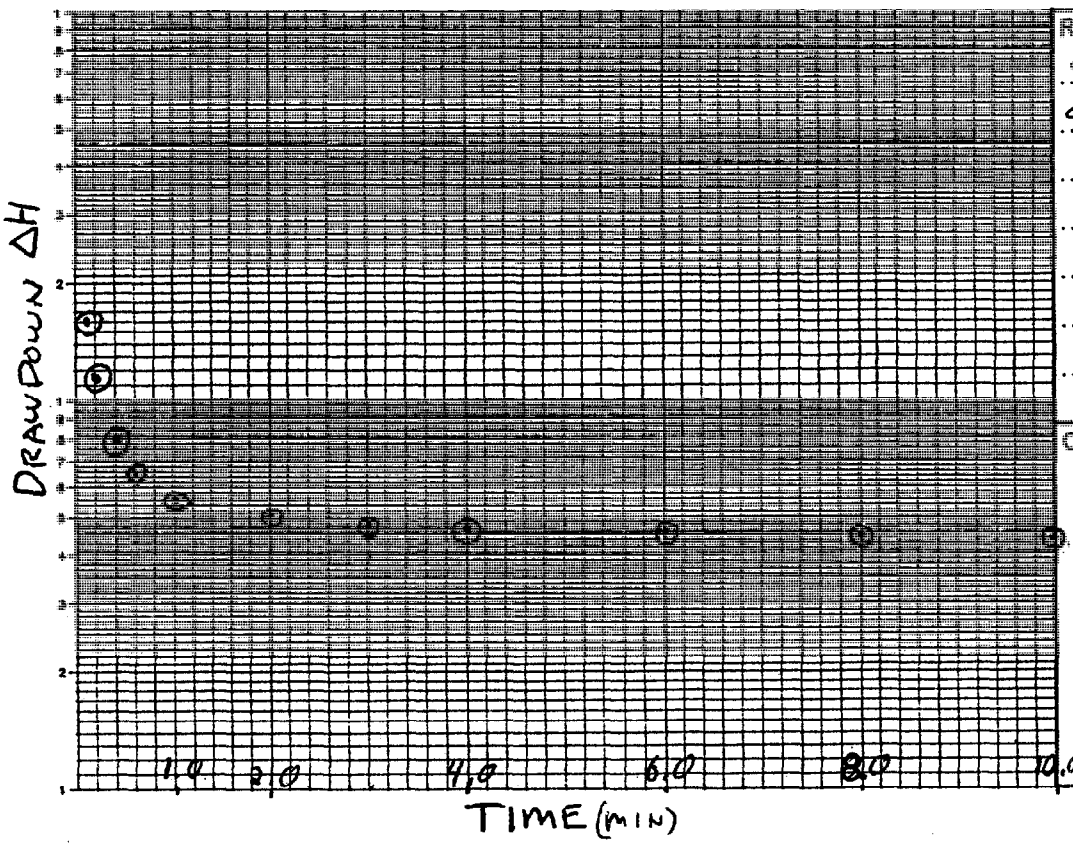
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.006	3.0		0.489
0.0166		2.478	4.0		0.476
0.0250		3.342	6.0		0.463
0.0333		2.573	8.0		0.457
0.0416		2.357	10.0		0.451
0.0500		1.817	20.0		0.431
0.1		1.639	30.0		0.419
0.2		1.175	60.0		0.387
0.4		0.800	130.0		0.381
0.6		0.660			
1.0		0.565			
2.0		0.501			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

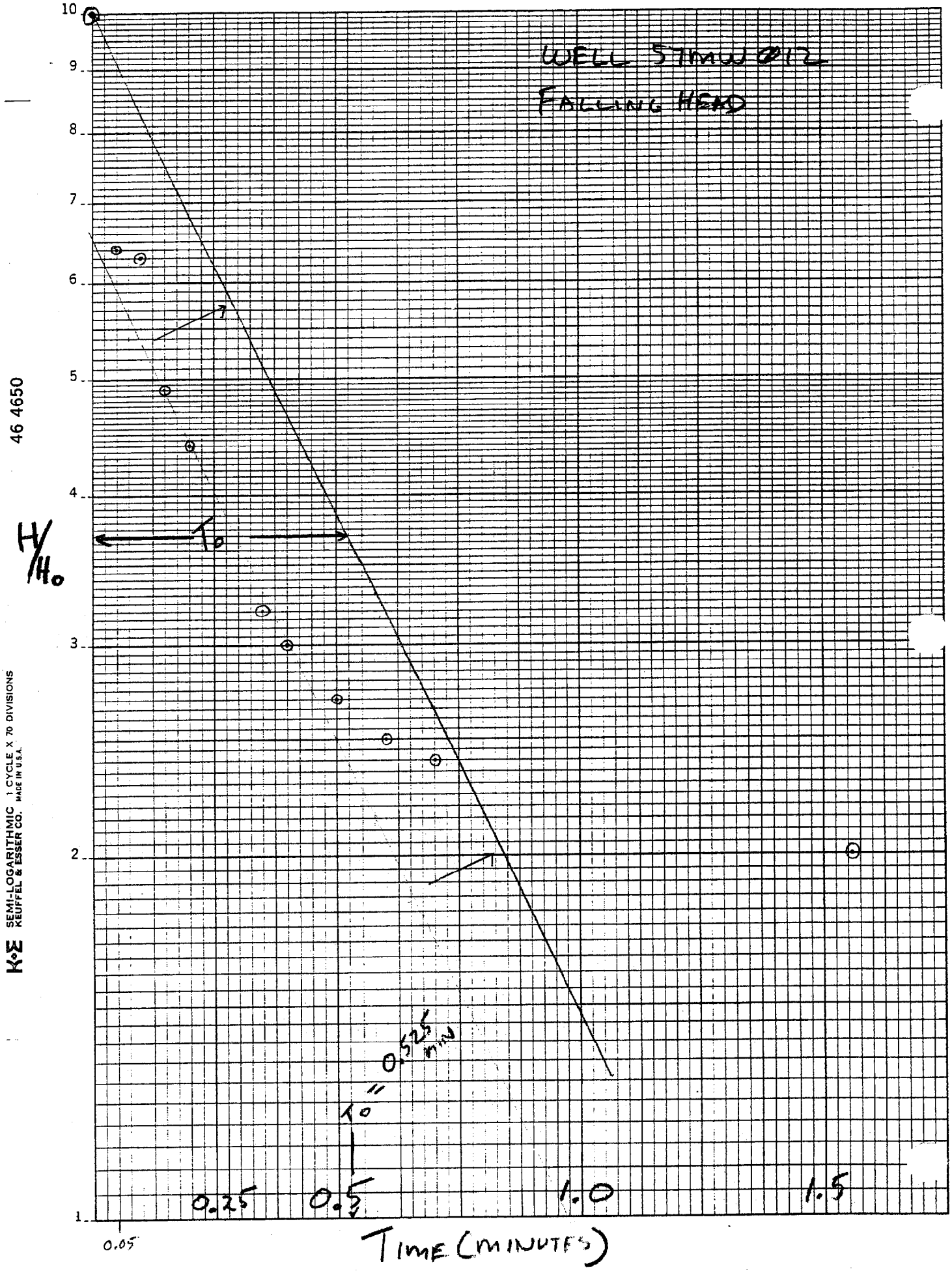


REMARKS:

START TEST 1145

STOP TEST 1400

CALCS, SKETCH MAPS, ETC.:


WELL 57MW012
FALLING HEAD
H/Ho
To
10
9
8
7
6
5
4
3
2
1
0.05
0.25
0.5
1.0
1.5
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

SE2000
Environmental Logger
01/26 21:13

Unit# 2000 Test 4

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW12

Reference	0.000
PSI at Ref.	2.529
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 11:43:02

Elapsed Time	INPUT 1	H/Ho
0.0000	0.006	
0.0083	0.006	
0.0166	2.478	
0.0250	3.342	
0.0333	2.573	1.0
0.0416	2.357	
0.0500	1.817	
0.0583	1.842	
0.0666	1.677	
0.0750	1.658	
0.0833	1.651	0.64
0.0916	1.645	
0.1000	1.639	
0.1083	1.632	
0.1166	1.626	
0.1250	1.626	
0.1333	1.620	0.63
0.1416	1.620	
0.1500	1.613	
0.1583	1.346	
0.1666	1.296	
0.1750	1.264	
0.1833	1.232	0.49
0.1916	1.200	
0.2000	1.175	
0.2083	1.143	
0.2166	1.118	
0.2250	1.118	
0.2333	1.118	0.44
0.2416	1.118	
0.2500	1.118	
0.2583	1.118	

0.2666	1.111	
0.2750	1.111	
0.2833	1.111	
0.2916	1.111	
0.3000	1.111	
0.3083	1.105	
0.3166	1.105	
0.3250	1.105	
0.3333	1.105	
0.3500	1.105	
0.3666	1.099	
0.3833	0.844	
0.4000	0.800	
0.4166	0.781	
0.4333	0.768	0.30
0.4500	0.756	
0.4666	0.743	
0.4833	0.724	
0.5000	0.717	
0.5166	0.705	
0.5333	0.698	[illegible]
0.5500	0.686	
0.5666	0.686	
0.5833	0.673	
0.6000	0.660	
0.6166	0.660	
0.6333	0.648	[illegible]
0.6500	0.648	
0.6666	0.635	
0.6833	0.628	
0.7000	0.622	
0.7166	0.622	
0.7333	0.616	0.24
0.7500	0.609	
0.7666	0.609	
0.7833	0.609	
0.8000	0.603	
0.8166	0.597	
0.8333	0.590	
0.8500	0.590	
0.8666	0.584	
0.8833	0.584	
0.9000	0.584	
0.9166	0.578	
0.9333	0.578	
0.9500	0.571	
0.9666	0.571	
0.9833	0.571	
1.0000	0.565	
1.2000	0.546	
1.4000	0.527	
1.6000	0.520	0.20
1.8000	0.514	
2.0000	0.501	
2.2000	0.501	
2.4000	0.495	
2.6000	0.489	
2.8000	0.489	
3.0000	0.489	
3.2000	0.482	

3.4000	0.482
3.6000	0.476
3.8000	0.476
4.0000	0.476
4.2000	0.470
4.4000	0.470
4.6000	0.470
4.8000	0.463
5.0000	0.463
5.2000	0.463
5.4000	0.463
5.6000	0.463
5.8000	0.463
6.0000	0.463
6.2000	0.463
6.4000	0.463
6.6000	0.463
6.8000	0.463
7.0000	0.463
7.2000	0.463
7.4000	0.463
7.6000	0.457
7.8000	0.457
8.0000	0.457
8.2000	0.457
8.4000	0.457
8.6000	0.457
8.8000	0.457
9.0000	0.451
9.2000	0.451
9.4000	0.451
9.6000	0.451
9.8000	0.451
10.0000	0.451
12.0000	0.444
14.0000	0.444
16.0000	0.438
18.0000	0.431
20.0000	0.431
22.0000	0.438
24.0000	0.431
26.0000	0.425
28.0000	0.419
30.0000	0.419
32.0000	0.419
34.0000	0.419
36.0000	0.419
38.0000	0.419
40.0000	0.425
42.0000	0.412
44.0000	0.412
46.0000	0.406
48.0000	0.412
50.0000	0.406
52.0000	0.406
54.0000	0.406
56.0000	0.406
58.0000	0.387
60.0000	0.387
62.0000	0.393

64.0000	0.381
66.0000	0.381
68.0000	0.387
70.0000	0.381
72.0000	0.381
74.0000	0.381
76.0000	0.374
78.0000	0.374
80.0000	0.368
82.0000	0.374
84.0000	0.381
86.0000	0.381
88.0000	0.387
90.0000	0.374
92.0000	0.381
94.0000	0.381
96.0000	0.381
98.0000	0.374
100.000	0.381
115.000	0.381
130.000	0.381

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIANHEAD NSWC		JOB NUMBER: 7129 SITE 57	
SUBJECT: SLUG TEST WELL 57MW013 RISING HEAD			
BASED ON: HVORSLEV ✓		DRAWING NUMBER:	
BY: FREDW. RAMSER	CHECKED BY: RMB 3/3/99	APPROVED BY:	DATE:

EQ:

$$K = \frac{r^2 \ln(L/R)}{2 L T_o}$$

r = 0.083 feet — riser radius
R = 0.083 feet — screen radius
L = 10 feet — Input Length
T_o = 5.1 — time @ 37%

SUB:

$$K = \frac{(.083)^2 \ln(10/.083)}{2(10)(5.1)}$$

$$K = \frac{0.033}{102}$$

$$K = 3.2 \times 10^{-4} \text{ ft/min}$$

$$K = 0.46 \text{ ft/day}$$

$$K = 1.6 \times 10^{-4} \text{ cm/sec}$$

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW013

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10', 7.76-17.76 TEST NO.: 7

STATIC WATER LEVEL (Depth/Elevation): 5.88 DATE: 1-26-99

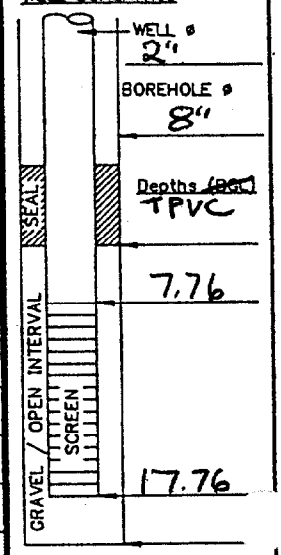
TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 2.9 PAGE 2 OF 2

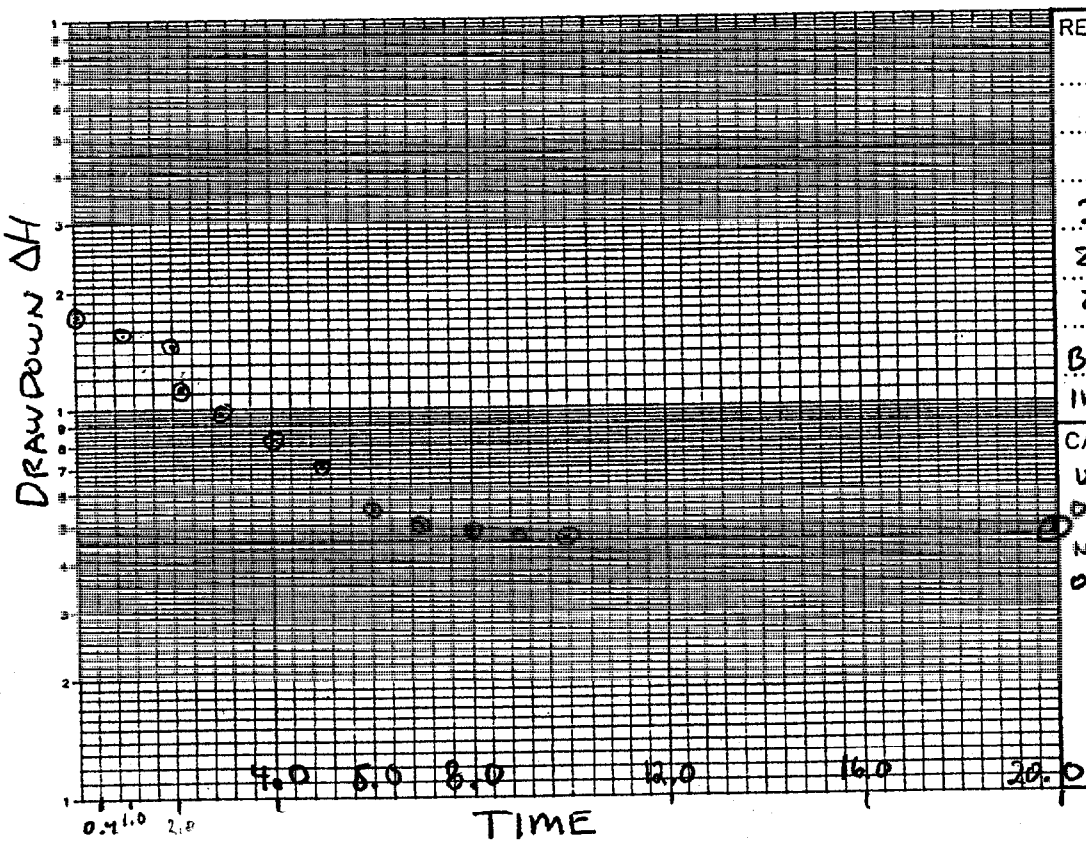
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		-0.088	7.0		-.501
0.0166		-1.753	8.00		-.489
0.0250		-1.765	9.0		-.482
0.100		-1.759	10.0		-.476
0.300		-1.696	20.0		-.482
0.500		-1.651	24.		-.476
1.000		-1.575			
2.000		-1.480			
3.000		-0.984			
4.000		-0.838			
5		-0.717			
6		-0.552			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

START 1535

STOP 1600

2.2 = -1.111

2.4 = -1.073

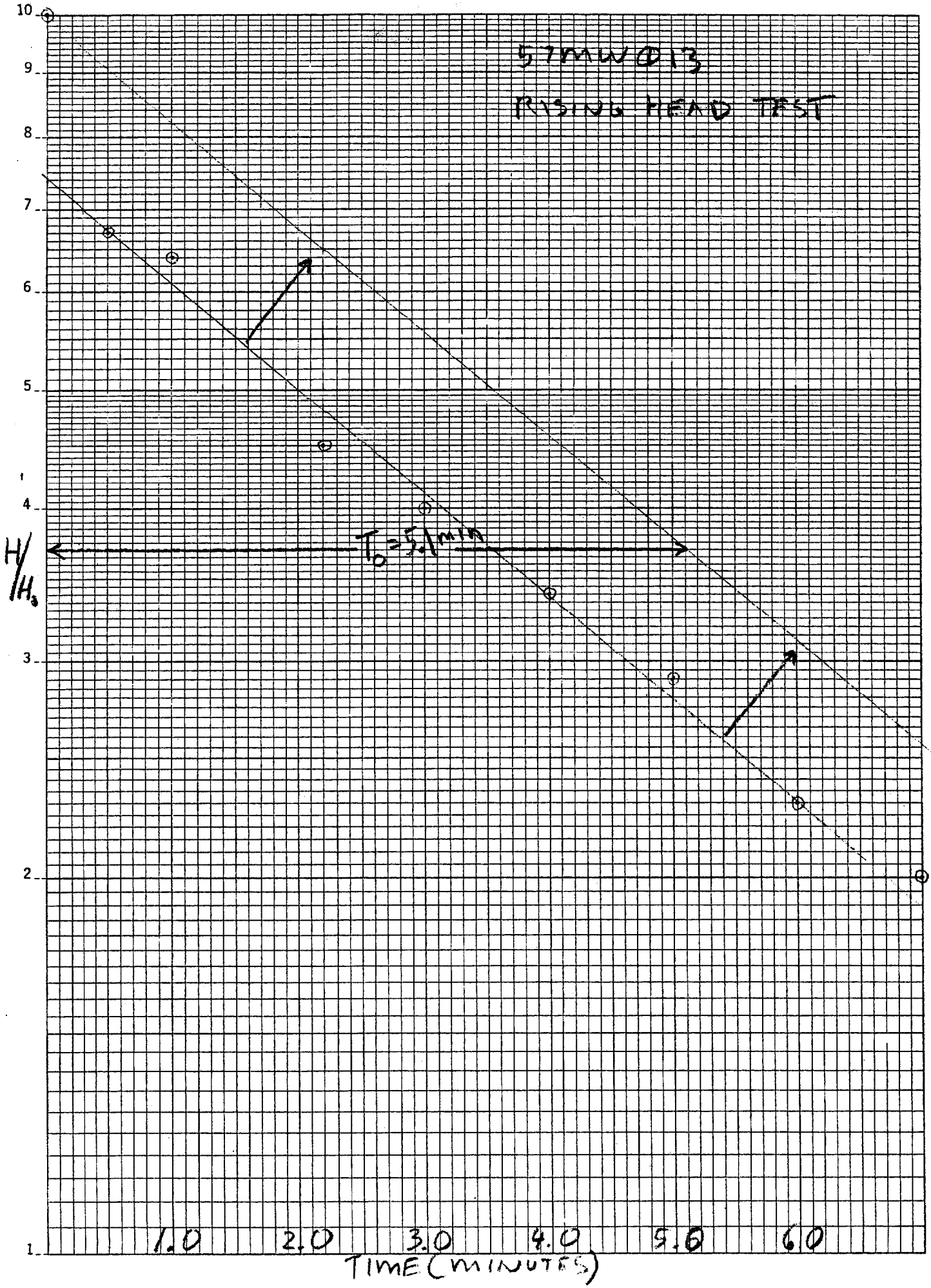
2.6 = -1.041

BENT RISER PREVENTS FULL INSERTION OF SLUG

CALCS, SKETCH MAPS, ETC.:

USED ONLY 2 SECTIONS OF SLUG TOTAL LENGTH = 1

NOISE MAY BE A RESULT OF WITHDRAWING SLUG



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

SE2000
Environmental Logger
01/26 21:21

Unit# 2000 Test 7

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW13
Reference	0.000
PSI at Ref.	2.785
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 15:33:33

Elapsed Time	INPUT 1	H/H₀
0.0000	-0.088	
0.0083	-2.451	1.0
0.0166	-1.753	
0.0250	-1.765	
0.0333	-1.765	
0.0416	-1.765	
0.0500	-1.765	
0.0583	-1.765	
0.0666	-1.765	
0.0750	-1.765	
0.0833	-1.759	
0.0916	-1.759	
0.1000	-1.759	
0.1083	-1.753	
0.1166	-1.753	
0.1250	-1.753	
0.1333	-1.753	
0.1416	-1.746	
0.1500	-1.746	
0.1583	-1.746	
0.1666	-1.746	
0.1750	-1.740	
0.1833	-1.740	
0.1916	-1.734	
0.2000	-1.734	
0.2083	-1.734	
0.2166	-1.727	
0.2250	-1.727	
0.2333	-1.727	
0.2416	-1.721	
0.2500	-1.715	

pg 2 of 3

TEST 7

0.2583	-1.715	
0.2666	-1.708	
0.2750	-1.708	
0.2833	-1.702	
0.2916	-1.702	
0.3000	-1.696	
0.3083	-1.696	
0.3166	-1.689	
0.3250	-1.689	
0.3333	-1.689	
0.3500	-1.683	
0.3666	-1.676	
0.3833	-1.676	
0.4000	-1.670	
0.4166	-1.670	
0.4333	-1.664	
0.4500	-1.664	
0.4666	-1.657	
0.4833	-1.657	
0.5000	-1.651	.67
0.5166	-1.651	
0.5333	-1.645	
0.5500	-1.638	
0.5666	-1.638	
0.5833	-1.632	
0.6000	-1.632	
0.6166	-1.626	
0.6333	-1.626	
0.6500	-1.619	
0.6666	-1.619	
0.6833	-1.613	
0.7000	-1.613	
0.7166	-1.613	
0.7333	-1.607	
0.7500	-1.607	
0.7666	-1.607	
0.7833	-1.600	
0.8000	-1.600	
0.8166	-1.594	
0.8333	-1.594	
0.8500	-1.594	
0.8666	-1.588	
0.8833	-1.588	
0.9000	-1.588	
0.9166	-1.588	
0.9333	-1.581	
0.9500	-1.581	
0.9666	-1.581	
0.9833	-1.575	
1.0000	-1.575	.64
1.2000	-1.556	
1.4000	-1.537	
1.6000	-1.518	
1.8000	-1.499	
2.0000	-1.480	
2.2000	-1.111	.45
2.4000	-1.073	
2.6000	-1.041	
2.8000	-1.010	
3.0000	-0.984	.40

TEST 7

3.2000	-0.952	
3.4000	-0.921	
3.6000	-0.895	
3.8000	-0.870	
4.0000	-0.838	.34
4.2000	-0.813	
4.4000	-0.794	
4.6000	-0.768	
4.8000	-0.743	
5.0000	-0.717	[illegible]
5.2000	-0.692	
5.4000	-0.654	
5.6000	-0.609	
5.8000	-0.578	
6.0000	-0.552	.22
6.2000	-0.533	
6.4000	-0.520	
6.6000	-0.514	
6.8000	-0.501	
7.0000	-0.501	.20
7.2000	-0.495	
7.4000	-0.495	
7.6000	-0.489	
7.8000	-0.489	
8.0000	-0.489	
8.2000	-0.489	
8.4000	-0.482	
8.6000	-0.482	
8.8000	-0.482	
9.0000	-0.482	
9.2000	-0.476	
9.4000	-0.476	
9.6000	-0.476	
9.8000	-0.476	
10.0000	-0.476	
12.0000	-0.476	
14.0000	-0.470	
16.0000	-0.482	
18.0000	-0.482	
20.0000	-0.482	
22.0000	-0.482	
24.0000	-0.476	
26.0000	-0.470	

END

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129	SITE 57
SUBJECT SLUG TEST WELL 57MW13			FALLING HEAD
BASED ON HORSLEV		DRAWING NUMBER	
BY FRED W RAMSER	CHECKED BY RMB 3/8/99	APPROVED BY	DATE

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

$r = 0.083$ feet — riser radius
$R = 0.083$ feet — screen radius
$L = 10$ feet — input length
$T_o = 3.1$ min — time @ 37%

SUB.

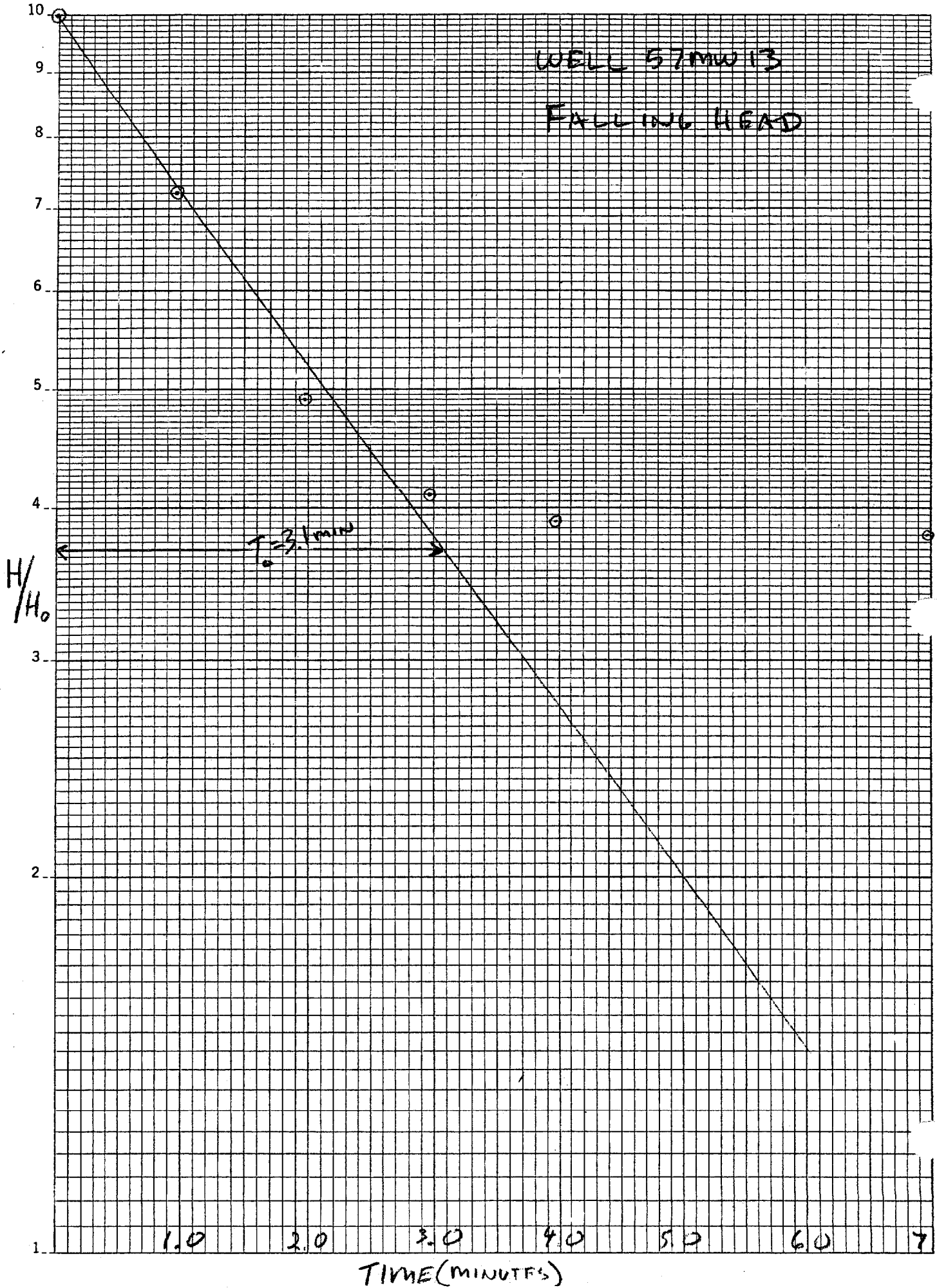
$$K = \frac{(.083)^2 \ln(10/.083)}{2(10)(3.1)}$$

$$K = \frac{.033}{62}$$

$K = 5.3 \times 10^{-4}$ ft/min

$K = 0.76$ ft/day

$K = 2.7 \times 10^{-4}$ cm/sec


WELL 57MW13
FALLING HEAD
T_o=3.1min
H/H₀
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
7
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

PROJECT NAME: INDIANHEAD SITE 57 WELL/BORING NO.: S57MW013

PROJECT NO.: 7129 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10' / 7.76-17.76 TEST NO.: 6

STATIC WATER LEVEL (Depth/Elevation): 5.88 DATE: 1-26-99

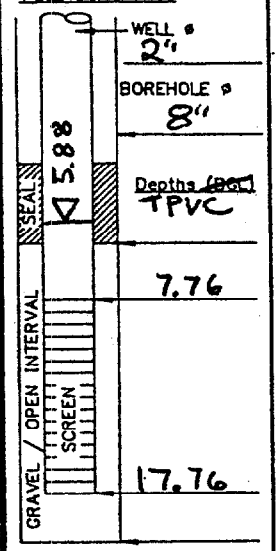
TEST TYPE (Rising/Falling/Constant Head): FALLING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.145 dia x 3.1' PAGE 1 OF 2

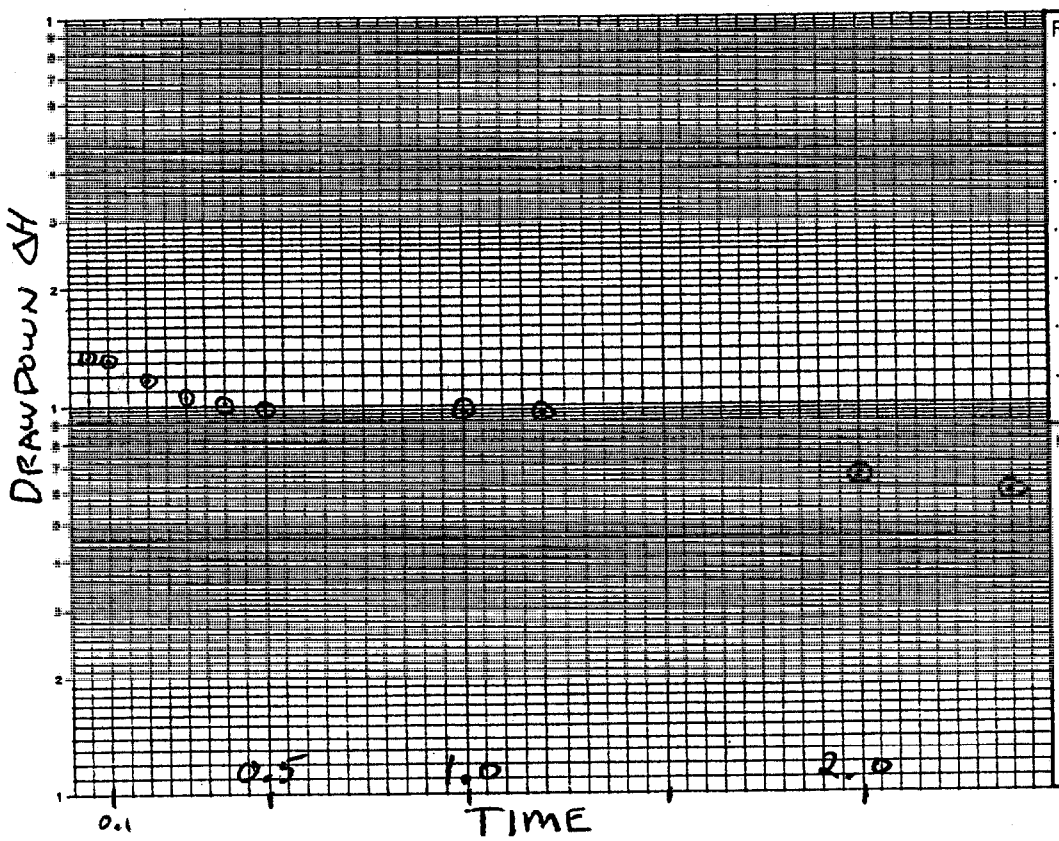
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): X-DUCER, WATER SURFACE

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.031	0.50		0.997
0.025		1.359	1.0		0.984
0.033		0.914	1.2		0.978
0.0416		1.353	2.0		0.660
0.0500		1.321	2.4		0.597
0.075		1.321	3.0		0.552
0.100		1.315	4.0		0.533
0.125		1.289	5.0		0.527
0.15		1.258	10.0 18.0		0.514 0.501
0.20		1.181	26.0		0.501
0.30		1.061			
0.40		1.010			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

START 1500

STOP 1530

CALCS, SKETCH MAPS, ETC.:

SE2000
Environmental Logger
01/26 21:19

Unit# 2000 Test 6

Setups:	INPUT 1
Type	Level (F)
Mode	Surface
I.D.	57MW13
Reference	0.000
PSI at Ref.	2.567
SG	1.000
Linearity	0.110
Scale factor	20.123
Offset	-0.026
Delay mSEC	50.000

Step 0 01/26 15:02:46

Elapsed Time	INPUT 1	H/Ho
0.0000	0.031	
0.0083	0.038	
0.0166	4.945	
0.0250	1.359	1.0
0.0333	0.914	
0.0416	1.353	
0.0500	1.321	
0.0583	1.327	
0.0666	1.321	
0.0750	1.321	
0.0833	1.321	
0.0916	1.321	
0.1000	1.315	
0.1083	1.308	
0.1166	1.302	
0.1250	1.289	
0.1333	1.277	
0.1416	1.264	
0.1500	1.258	
0.1583	1.245	
0.1666	1.232	
0.1750	1.219	
0.1833	1.207	
0.1916	1.194	
0.2000	1.181	
0.2083	1.169	
0.2166	1.156	
0.2250	1.149	
0.2333	1.137	
0.2416	1.124	
0.2500	1.118	

0.2583	1.105	
0.2666	1.099	
0.2750	1.086	
0.2833	1.080	
0.2916	1.067	
0.3000	1.061	
0.3083	1.054	
0.3166	1.048	
0.3250	1.041	
0.3333	1.029	
0.3500	1.022	
0.3666	1.016	
0.3833	1.010	
0.4000	1.010	
0.4166	1.003	
0.4333	1.003	
0.4500	1.003	
0.4666	1.003	
0.4833	1.003	
0.5000	0.997	
0.5166	0.997	
0.5333	0.997	
0.5500	0.997	
0.5666	0.997	
0.5833	0.997	
0.6000	0.997	
0.6166	0.997	
0.6333	0.991	
0.6500	0.991	
0.6666	0.991	
0.6833	0.991	
0.7000	0.991	
0.7166	0.991	
0.7333	0.991	
0.7500	0.991	
0.7666	0.991	
0.7833	0.984	
0.8000	0.991	
0.8166	0.991	
0.8333	0.991	
0.8500	0.991	
0.8666	0.984	
0.8833	0.984	
0.9000	0.991	
0.9166	0.984	
0.9333	0.984	
0.9500	0.984	
0.9666	0.984	
0.9833	0.984	
1.0000	0.984	.72
1.2000	0.978	
1.4000	0.978	
1.6000	0.978	
1.8000	0.978	
2.0000	0.660	.49
2.2000	0.609	
2.4000	0.597	
2.6000	0.571	
2.8000	0.559	
3.0000	0.552	.41

TEST 6

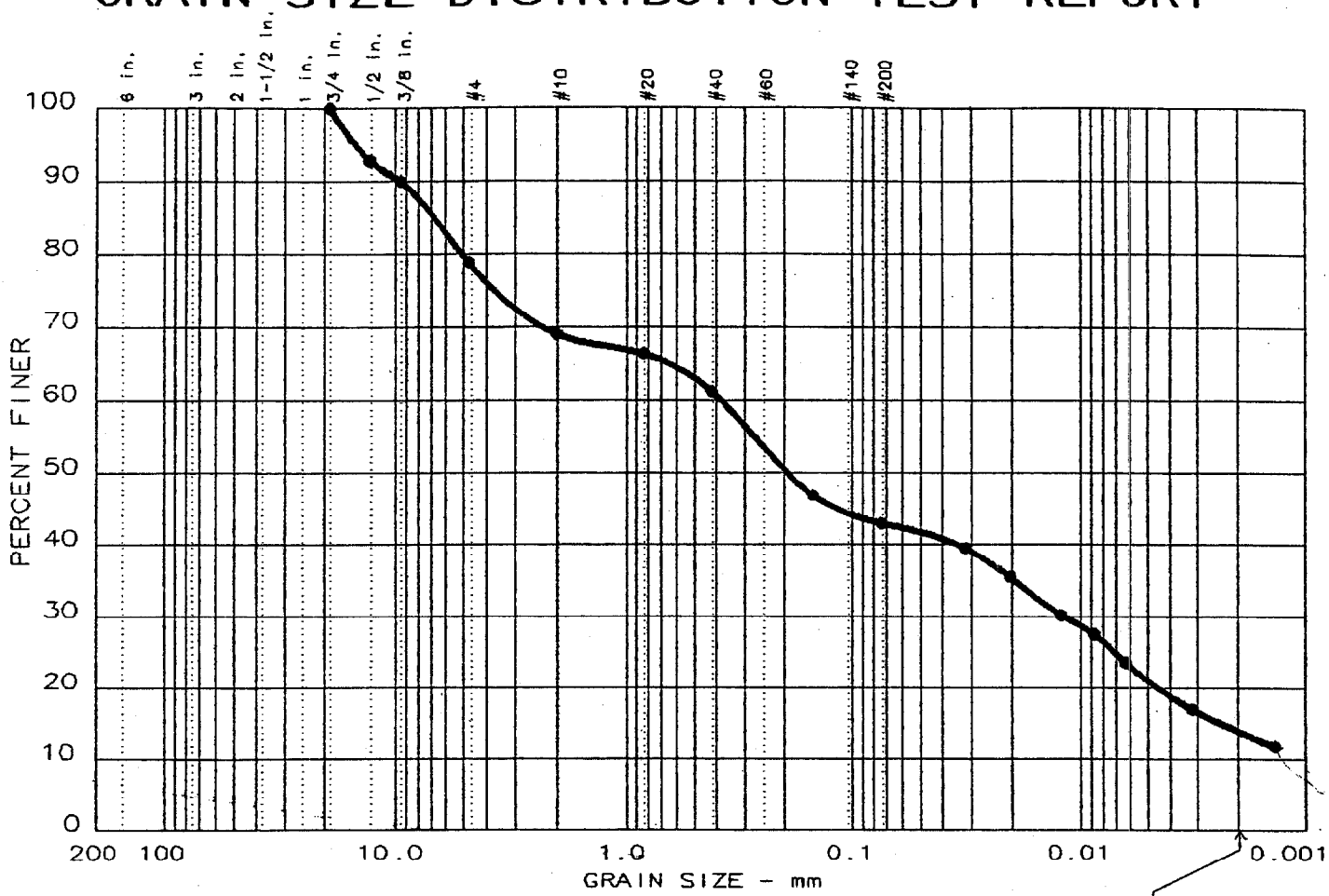
3.2000	0.546	
3.4000	0.540	
3.6000	0.540	
3.8000	0.533	
4.0000	0.533	.39
4.2000	0.533	
4.4000	0.527	
4.6000	0.527	
4.8000	0.527	
5.0000	0.527	
5.2000	0.527	
5.4000	0.527	
5.6000	0.527	
5.8000	0.520	
6.0000	0.520	
6.2000	0.520	
6.4000	0.520	
6.6000	0.520	
6.8000	0.520	
7.0000	0.520	.39
7.2000	0.520	
7.4000	0.520	
7.6000	0.520	
7.8000	0.520	
8.0000	0.520	.39
8.2000	0.520	
8.4000	0.520	
8.6000	0.520	
8.8000	0.520	
9.0000	0.520	
9.2000	0.520	
9.4000	0.520	
9.6000	0.520	
9.8000	0.520	
10.0000	0.514	
12.0000	0.514	.38
14.0000	0.508	
16.0000	0.501	
18.0000	0.501	
20.0000	0.514	
22.0000	0.508	
24.0000	0.501	
26.0000	0.501	
28.0000	0.508	

END

APPENDIX N

Geotechnical Data

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	21.2	35.9	29.0	13.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NA	NA	6.76	0.38	0.19	0.012	0.0023			

MATERIAL DESCRIPTION	USCS	AASHTO
● Group Name: Silty Sand With Gravel	SM	A-4(0.0)

Project No.: 98749

Project: Indian Head Site 57, Project No. 7129

● Location: S57-SB-0020401

Date: 2-4-99

Remarks:

Moisture Content: 21.2%

Unit Weight: 127.4 PCF

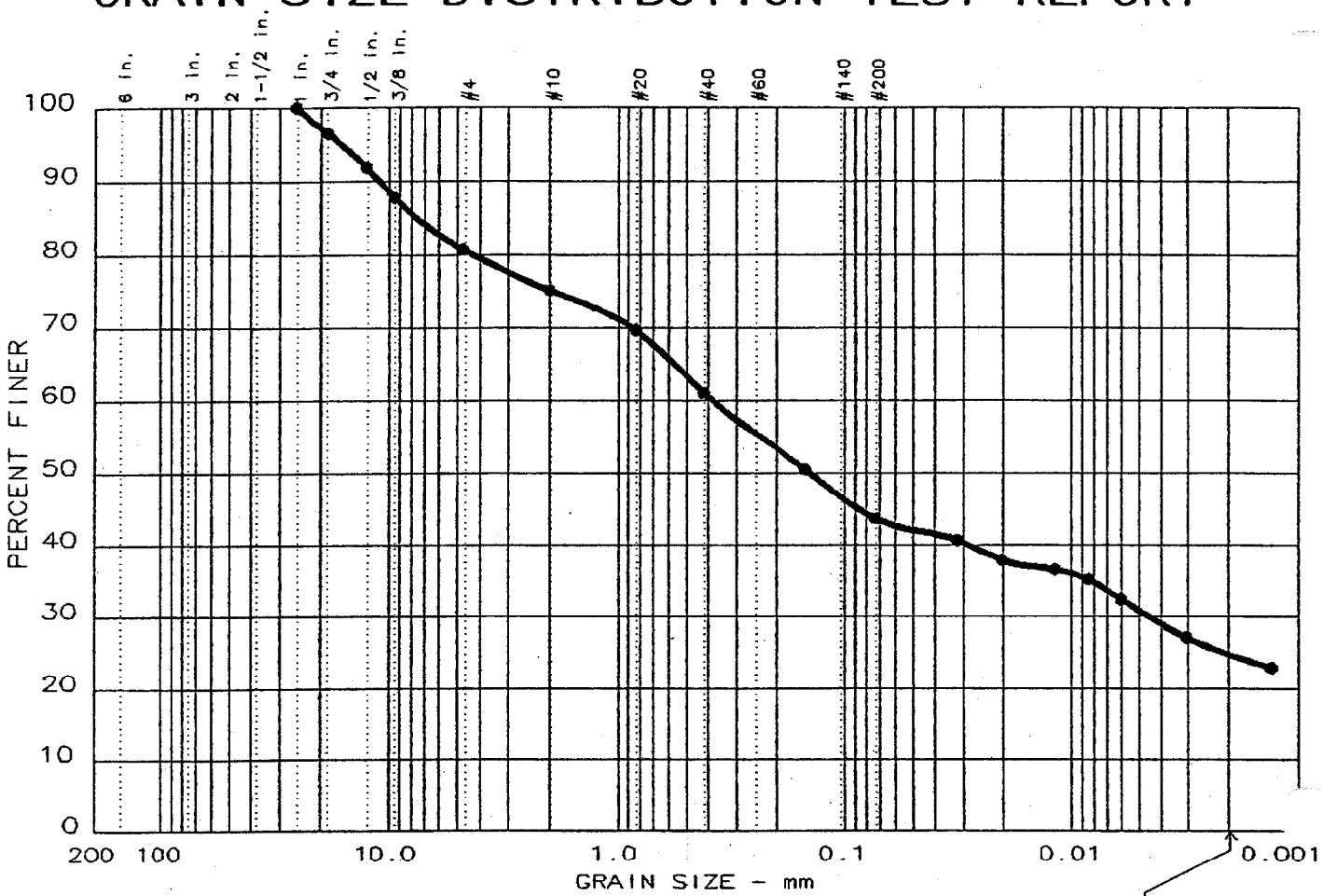
Specific Gravity: 2.66

GRAIN SIZE DISTRIBUTION TEST REPORT

ACKENHEIL ENGINEERS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75 mm	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	19.2	37.1	18.9	24.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NA	NA	7.50	0.38	0.14	0.005				

MATERIAL DESCRIPTION	USCS	AASHTO
● Group Name: Silty Sand With Gravel	SM	A-4(0.0)

Project No.: 98749

Project: Indian Head Site 57, Project No. 7129

● Location: S57-SB-0050401

Date: 2-4-99

Remarks:

Moisture Content: 14.5%

Unit Weight: 110.5 PCF

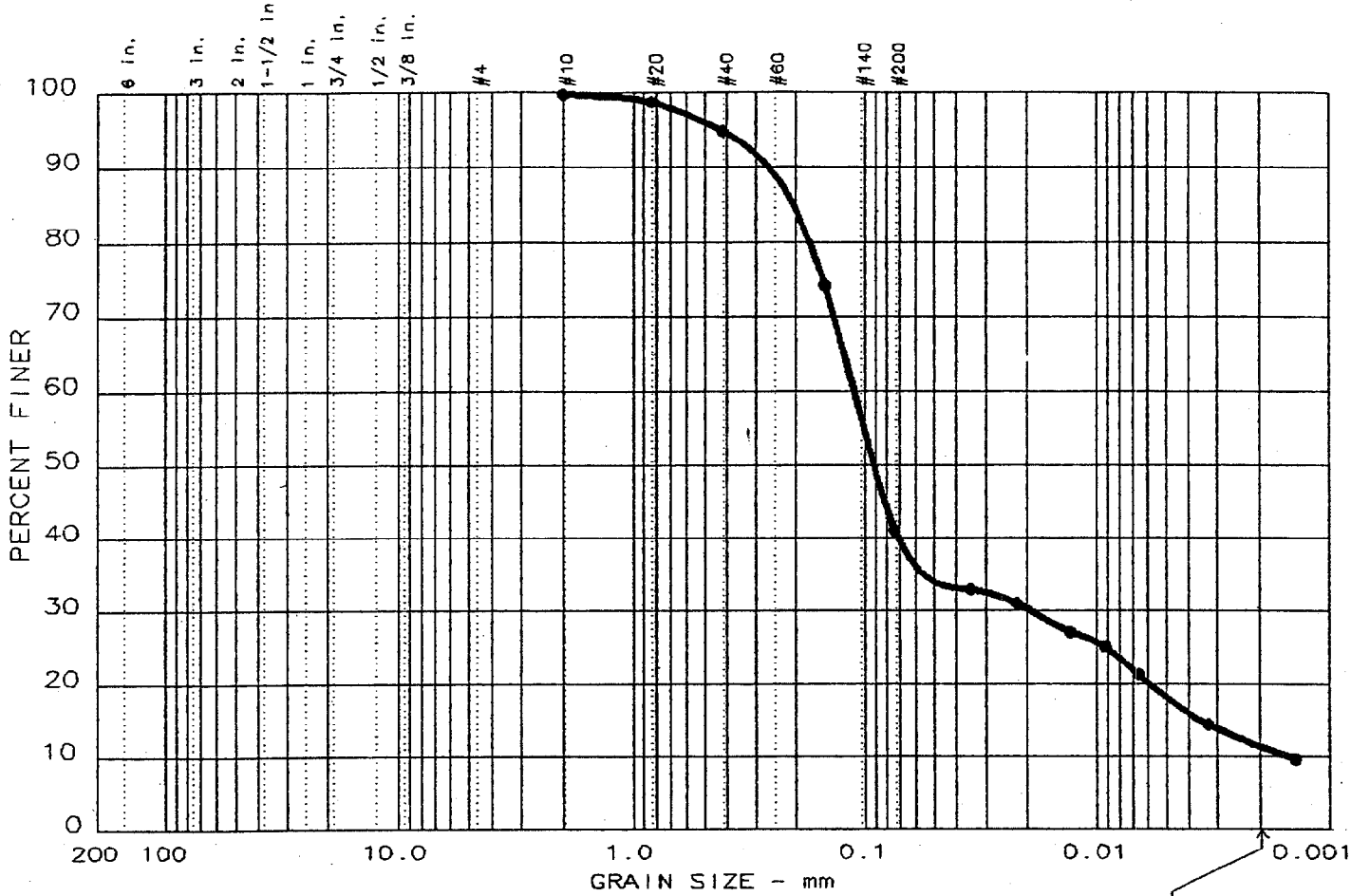
Specific Gravity: 2.66

GRAIN SIZE DISTRIBUTION TEST REPORT

ACKENHEIL ENGINEERS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	1	0.0	0.0	59.0	29.6	11.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NA	NA	0.20	0.11	0.09	0.019	0.0035	0.0015	2.24	75.9

MATERIAL DESCRIPTION	USCS	AASHTO
● Group Name: Silty Sand	SM	A-4(0.0)

Project No.: 98749

Project: Indian Head Site 57, Project No. 7129

● Location: S57-SB-0050501

Date: 2-4-99

Remarks:

Moisture Content: 24.1%

Unit Weight: 125.8 PCF

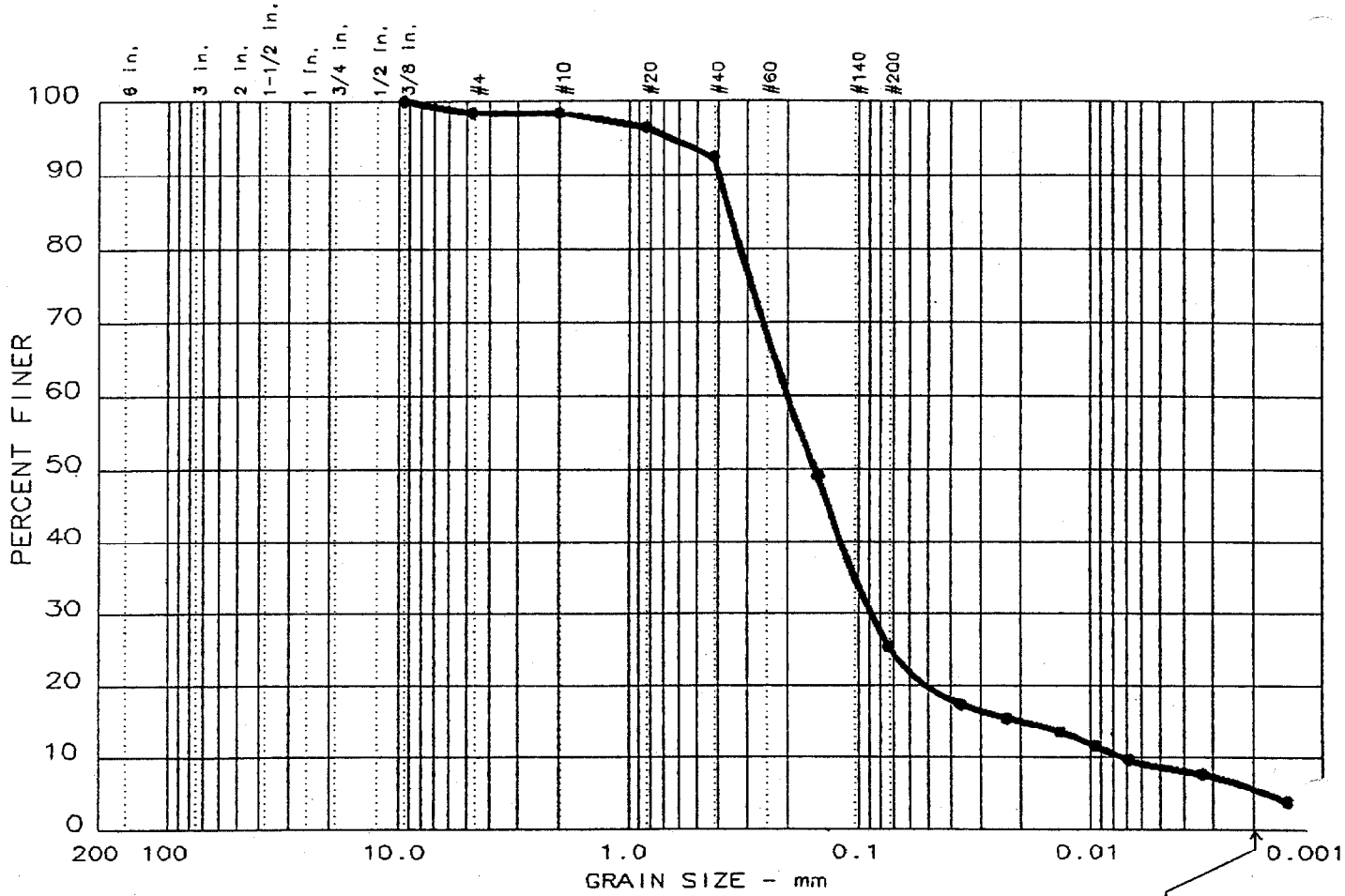
Specific Gravity: 2.65

GRAIN SIZE DISTRIBUTION TEST REPORT

ACKENHEIL ENGINEERS, INC.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	1.7	72.8	19.9	5.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NA	NA	0.36	0.20	0.15	0.089	0.0196	0.0072	5.41	28.0

MATERIAL DESCRIPTION	USCS	AASHTO
● Group Name: Silty Sand	SM	A-2-4(0.0)

Project No.: 98749

Project: Indian Head Site 57, Project No. 7129

● Location: S57-SB-0020501

Date: 2-4-99

Remarks:

Moisture Content: 22.0%

Unit Weight: 124.9 PCF

Specific Gravity: 2.66

GRAIN SIZE DISTRIBUTION TEST REPORT

ACKENHEIL ENGINEERS, INC.

Figure No. _____

APPENDIX O

SAMPLE LOCATION SURVEY DATA
(October 1998 and January 1999 Sampling Events)

COORDINATE REFERENCES

Horizontal control is referenced to NAD 1983 and the Maryland State Plane Coordinate System

Vertical control is referenced to NAVD 1929

APPENDIX 0

SITE 57- FORMER DRUM LOADING AREA
SAMPLE LOCATION SURVEY DATA
OCTOBER 1998 AND JANUARY 1999 SAMPLING EVENTS

SAMPLE NO.	SAMPLE LOCATION	SAMPLE DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	NORTHING	EASTING
S57MW0010101	S57MW001/SB001	1/25/99	35.57	37.09	335394.464	1263650.943
S57MW0020101	S57MW002	1/25/99	35.72	37.58	335397.694	1263649.261
S57MW0030101	S57MW003/SB002	1/25/99	33.83	35.82	335285.641	1263748.262
S57MW0030101-F	S57MW003/SB002	1/25/99	33.83	35.82	335285.641	1263748.262
S57MW0040101	S57MW004	1/25/99	33.91	35.72	335289.358	1263746.882
S57MW0040101-F	S57MW004	1/25/99	33.91	35.72	335289.358	1263746.882
S57MW0050101	S57MW005/SB015	1/27/99	16.18	18.54	334578.380	1264177.596
S57MW0060101	S57MW006	1/27/99	16.57	18.57	334576.701	1264181.972
S57MW0070101	S57MW007/SB004	1/25/99	28.17	30.58	335082.261	1263768.134
S57MW0080101	S57MW008	1/26/99	28.09	30.26	335084.774	1263764.996
S57MW0090101	S57MW009/SB005	1/26/99	23.9	25.75	334897.384	1263862.135
S57MW0090101-F	S57MW009/SB005	1/26/99	23.9	25.75	334897.384	1263862.135
S57MW0100101	S57MW010	1/26/99	23.34	25.82	334894.064	1263861.245
S57MW0100101-F	S57MW010	1/26/99	23.34	25.82	334894.064	1263861.245
S57MW0110101	S57MW011/SB008	1/27/99	31.61	33.49	335222.164	1263751.168
S57MW0110101-D	S57MW011/SB008	1/27/99	31.61	33.49	335222.164	1263751.168
S57MW0120101	S57MW012/SB013	1/25/99	41.74	43.82	335575.450	1263497.421
S57MW0120101-D	S57MW012/SB013	1/25/99	41.74	43.82	335575.450	1263497.421
S57MW0120101-F	S57MW012/SB013	1/25/99	41.74	43.82	335575.450	1263497.421
S57MW0120101-F-D	S57MW012/SB013	1/25/99	41.74	43.82	335575.450	1263497.421
S57MW0130101	S57MW013	1/25/99	41.9	43.98	335577.327	1263500.077
S57MW0130101-F	S57MW013	1/25/99	41.9	43.98	335577.327	1263500.077
S57PW0070101	PW-07	1/25/99				
S57SB0010101	S57MW001/SB001	10/7/98	35.57	37.09	335394.464	1263650.943
S57SB0010201	S57MW001/SB001	10/7/98	35.57	37.09	335394.464	1263650.943
S57SB0020101	S57MW003/SB002	10/8/98	33.83	35.82	335285.641	1263748.262
S57SB0020201	S57MW003/SB002	10/8/98	33.83	35.82	335285.641	1263748.262
S57SB0020301	S57MW003/SB002	1/7/99	33.83	35.82	335285.641	1263748.262
S57SB0020401	S57MW003/SB002	1/7/99	33.83	35.82	335285.641	1263748.262
S57SB0020501	S57MW003/SB002	1/7/99	33.83	35.82	335285.641	1263748.262
S57SB0020601	S57MW003/SB002	1/22/99	33.83	35.82	335285.641	1263748.262
S57SB0020601-D	S57MW003/SB002	1/22/99	33.83	35.82	335285.641	1263748.262
S57SB0030101	S57SB003	10/7/98	31.64		335202.227	1263708.492
S57SB0030101-D	S57SB003	10/7/98	31.64		335202.227	1263708.492
S57SB0030201	S57SB003	10/7/98	31.64		335202.227	1263708.492
S57SB0030201-D	S57SB003	10/7/98	31.64		335202.227	1263708.492
S57SB0040101	S57MW007/SB004	1/10/99	28.17	30.58	335082.261	1263768.134
S57SB0040201	S57MW007/SB004	1/10/99	28.17	30.58	335082.261	1263768.134
S57SB0040301	S57MW007/SB004	1/10/99	28.17	30.58	335082.261	1263768.134
S57SB0040301-D	S57MW007/SB004	1/10/99	28.17	30.58	335082.261	1263768.134
S57SB0050101	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SB0050201	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SB0050201-D	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SB0050301	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SB0050401	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SB0050501	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SB0060101	S57SB006	10/8/98	34.1		335289.177	1263703.782
S57SB0060201	S57SB006	10/8/98	34.1		335289.177	1263703.782
S57SB0070101	S57SB007	10/7/98	33.81		335271.360	1263779.227
S57SB0070201	S57SB007	10/7/98	33.81		335271.360	1263779.227
S57SB0080101	S57MW011/SB008	10/8/98	31.61	33.49	335222.164	1263751.168
S57SB0080101-D	S57MW011/SB008	10/8/98	31.61	33.49	335222.164	1263751.168
S57SB0080201	S57MW011/SB008	10/8/98	31.61	33.49	335222.164	1263751.168
S57SB0090101	S57SB009	10/7/98	32.02		335206.161	1263782.058
S57SB0090201	S57SB009	10/7/98	32.02		335206.161	1263782.058
S57SB0100101	S57SB010	10/7/98	34.07		335290.676	1263647.397
S57SB0100201	S57SB010	10/7/98	34.07		335290.676	1263647.397
S57SB0110101	S57SB011	10/7/98	36.15		335268.144	1263846.462
S57SB0110201	S57SB011	10/7/98	36.15		335268.144	1263846.462
S57SB0120101	S57SB012	10/7/98	32.4		335242.470	1263715.357
S57SB0120201	S57SB012	10/7/98	32.4		335242.470	1263715.357
S57SB0130101	S57MW012/SB013	1/9/99	41.74	43.82	335575.450	1263497.421

APPENDIX 0

SITE 57- FORMER DRUM LOADING AREA
SAMPLE LOCATION SURVEY DATA
OCTOBER 1998 AND JANUARY 1999 SAMPLING EVENTS

SAMPLE NO.	SAMPLE LOCATION	SAMPLE DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	NORTHING	EASTING
S57SB0130201	S57MW012/SB013	1/12/99	41.74	43.82	335575.450	1263497.421
S57SB0140101	S57SB014	10/7/98	32.35		335190.797	1263827.62
S57SB0140201	S57SB014	10/7/98	32.35		335190.797	1263827.62
S57SB0150101	S57MW005/SB015	1/11/99	16.18	18.54	334578.380	1264177.596
S57SB0150201	S57MW005/SB015	1/11/99	16.18	18.54	334578.380	1264177.596
S57SD0050101	S57SW009/SD005	1/20/99	-0.32		333872.602	1264908.531
S57SD0060101	S57SW010/SD006	1/20/99	1.02		333832.627	1264838.335
S57SD0070101	S57SW011/SD007	1/9/99	31.85		335245.235	1263652.45
S57SD0080101	S57SW012/SD008	1/9/99	29.52		335169.840	1263702.925
S57SD0090101	S57SW013/SD009	1/27/99	30.81		334836.099	1263710.909
S57SD0100101	S57SW014/SD010	1/7/99	18.13		334795.561	1263789.369
S57SD0110101	S57SW015/SD011	1/7/99	8.31		334464.949	1264199.997
S57SD0120101	S57SW016/SD012	1/20/99	0.87		333948.116	1264673.22
S57SD0120101-D	S57SW016/SD012	1/20/99	0.87		333948.116	1264673.22
S57SS0010101	S57MW001/SB001	10/7/98	35.57	37.09	335394.464	1263650.943
S57SS0020101	S57MW003/SB002	10/8/98	33.83	35.82	335285.641	1263748.262
S57SS0040101	S57MW007/SB004	1/10/99	28.17	30.58	335082.261	1263768.134
S57SS0050101	S57MW009/SB005	1/12/99	23.9	25.75	334897.384	1263862.135
S57SS0070101	S57SB007	10/7/98	33.81		335271.360	1263779.227
S57SS0080101	S57MW011/SB008	10/8/98	31.61	33.49	335222.164	1263751.168
S57SS0080101-D	S57MW011/SB008	10/8/98	31.61	33.49	335222.164	1263751.168
S57SS0090101	S57SB009	1/22/99	32.02		335206.161	1263782.058
S57SS0090101-D	S57SB009	1/22/99	32.02		335206.161	1263782.058
S57SS0110101	S57SB011	10/7/98	36.15		335268.144	1263846.462
S57SS0130101	S57MW012/SB013	1/9/99	41.74	43.82	335575.450	1263497.421
S57SS0150101	S57MW005/SB015	1/11/99	16.18	18.54	334578.380	1264177.596
S57SW0010101	MH-427	1/27/99	35.05		335375.088	1263653.846
S57SW0020101	MH-429	1/27/99	34.23		335326.696	1263689.213
S57SW0020101-F	MH-429	1/27/99	34.23		335326.696	1263689.213
S57SW0030101	MH-01 (MH-430)	1/22/99	32.41		335237.819	1263750.307
S57SW0030101-D	MH-01 (MH-430)	1/22/99	32.41		335237.819	1263750.307
S57SW0030101-F	MH-01 (MH-430)	1/22/99	32.41		335237.819	1263750.307
S57SW0030201	MH-01 (MH-430)	1/22/99	32.41		335237.819	1263750.307
S57SW0040101	MH-02 (MH-431)	1/22/99	18.53		335170.801	1263794.052
S57SW0040101-F	MH-02 (MH-431)	1/22/99	18.53		335170.801	1263794.052
S57SW0060101	MH-487	1/21/99	18.49		334585.716	1263988.131
S57SW0060101-D	MH-487	1/21/99	18.49		334585.716	1263988.131
S57SW0060201	MH-487	1/21/99	18.49		334585.716	1263988.131
S57SW0070101	IW-80 (MH-489)	1/21/99	11.65		334435.794	1264418.776
S57SW0070101-F	IW-80 (MH-489)	1/27/99	11.65		334435.794	1264418.776
S57SW0070201	IW-80 (MH-489)	1/21/99	11.65		334435.794	1264418.776
S57SW0080101	MH-497	1/21/99	7.63		334316.197	1264756.928
S57SW0080201	MH-497	1/21/99	7.63		334316.197	1264756.928
S57SW0080301	MH-497	1/21/99	7.63		334316.197	1264756.928
S57SW0090101	S57SW009/SD005	1/20/99	-0.32		333872.602	1264908.531
S57SW0090101-F	S57SW009/SD005	1/20/99	-0.32		333872.602	1264908.531
S57SW0100101	S57SW010/SD006	1/20/99	1.02		333832.627	1264838.335
S57SW0110101	S57SW011/SD007	1/9/99	31.85		335245.235	1263652.45
S57SW0120101	S57SW012/SD008	1/9/99	29.52		335169.840	1263702.925
S57SW0130101	S57SW013/SD009	1/25/99	30.81		334836.099	1263710.909
S57SW0140101	S57SW014/SD010	1/7/99	18.13		334795.561	1263789.369
S57SW0140101-F	S57SW014/SD010	1/7/99	18.13		334795.561	1263789.369
S57SW0150101	S57SW015/SD011	1/7/99	8.31		334464.949	1264199.997
S57SW0160101	S57SW016/SD012	1/20/99	0.87		333948.116	1264673.22
S57SW0160101-D	S57SW016/SD012	1/20/99	0.87		333948.116	1264673.22
S57SW0160101-F	S57SW016/SD012	1/20/99	0.87		333948.116	1264673.22
S57SW0160101-F-D	S57SW016/SD012	1/20/99	0.87		333948.116	1264673.22
S57TW0010101	S57TW001	1/22/99	22.77	24.78	334862.807	1263841.346
S57TW0020101	S57TW002	1/21/99	10.09	11.94	334440.192	1264429.702
S57TW0030101	S57TW003	1/21/99	6.63	7.12	334055.197	1264862.798

APPENDIX P

SITE 57 – FORMER DRUM LOADING AREA
ROUND 2 STORM SEWER SAMPLING
(September 1999 Sampling Event)

APPENDIX P
ROUND 2 STORM SEWER SAMPLING
SITE 57– FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

P.1 INTRODUCTION

This discussion of the Round 2 storm sewer sampling conducted at Site 57, Former Drum Loading Area, is prepared as Appendix P to the remedial investigation (RI) report for Site 57 at the Indian Head Division, Naval Surface Warfare Center (IHDIV-NSWC), Indian Head, Maryland.

P.2 BACKGROUND

Site 57 was initially identified as an Installation Restoration (IR) Program site following the detection of trichloroethene (TCE) during sampling of industrial waste discharge IW-80 (also known as manhole MH-489) (Figure P-1). As described in RI Section 4.2, facility personnel sensed the odor of possible organic contaminants during routine sampling of IW-80 in 1994, and as a result, collected a sample from IW-80 to be analyzed for volatile organic compounds. TCE was detected at a concentration of 53 µg/L. Later samplings of IW-80 (in May and July 1994) resulted in TCE detections of 60.2 µg/L and 40.7 µg/L at IW-80. Subsequently, a RI was initiated for the site. Field investigations were conducted at Site 57 in October 1998 and January 1999 to collect data in support of the RI report of which this appendix is a part.

Between the two RI field-sampling events, the storm sewer running through the site (Figure P-1) was rehabilitated by relining the sewer pipe between manholes MH-427 and MH-487. As described in RI Section 4.2, TCE had previously been detected in Site 57 groundwater (B&R Environmental, 1998). Because groundwater infiltration was thought to be the major source of TCE in the storm sewer, the sewer was relined to reduce or eliminate the presence of TCE at IW-80.

P.3 REMEDIAL INVESTIGATION SAMPLING AND RESULTS

Samples were collected from the storm sewer during the January 1999 RI field effort. Samples were collected from manholes MH-427, MH-429, MH-430, MH-431, MH-487, MH- 489, MH-497, and at the point of discharge to Mattawoman Creek (known here as S57SW009). The analytical results from the January 1999 sampling are shown in Table P-1. As can be seen in the table, TCE was detected in the storm sewer at concentrations as high as 21.3 µg/L (in MH-489), and the analytical results indicate the continued presence of TCE in the storm sewer.

P.4 BACKGROUND FOR ROUND 2 STORM SEWER SAMPLING

Subsequent to collecting and analyzing the RI storm sewer samples, it was determined that cooling water from the power plant located up gradient from Site 57 periodically discharged cooling water into the storm sewer several time each day. During the RI field investigation, storm sewer samples had been collected during January 1999 on four different days at different times of the day without regard to the then unknown cooling water discharges. The day and time for collecting any one sample had been determined by the workflow during the field investigation.

Based on monthly records of the periodic sampling of IW-80 dating from as early as May 1990 to as late as August 1997, flow in the storm sewer varies from a low recorded flow rate of approximately 0.078 MGD (million gallons per day) to a high of approximately 3.5 MGD. It is not apparent from the available records how much of the measured flow is due to dry-weather flow, wet-weather flow or cooling water discharges. The potential for varying flow conditions over the duration of the RI storm sewer sampling effort, led to the decision to resample the storm sewer to verify the results from the RI sampling.

P.5 ROUND 2 STORM SEWER SAMPLING AND RESULTS

The Round 2 storm sewer sampling occurred on September 27, 1999. In preparation for the Round 2 storm sewer sampling, facility personnel coordinated with the power plant to determine the part of the sampling day when cooling water would not be discharged. The samples were collected over a single 3.5-hour period from the same manholes sampled during the RI field investigation. During the sampling, facility personnel determined that the flow rate was 0.212 MGD. The day was without precipitation.

TCE was again detected in the storm sewer, this time at concentrations as high as 37 µg/L. The analytical results appear in Table P-2.

P.6 CONCLUSION

Figure P-2 is a bar chart comparing the analytical results from RI sampling and the Round 2 sampling. Recognizing the variability inherent in environmental sampling, combined with those inherent in analytical methods, the results compare favorably. Although neither set of analytical results is consistently higher or lower in concentration than the other set, the pattern of TCE concentrations from manhole to manhole is similar. The original RI analytical results were retained in the RI data set for the purpose of developing human health and environmental risk assessments.

Based on available data, the effect of the storm sewer rehabilitation was to reduce the concentration of TCE discharged at IW-80 by approximately half (see Figure P-2).

It should also be noted that the State of Maryland approved a revised NPDES (National Pollution Discharge Elimination System) permit for the facility subsequent to the rehabilitation of the storm sewer. The newly revised permit included a maximum discharge concentration of 100 µg/L TCE at IW-80. Based on the RI analytical data, the TCE concentration being discharged at IW-80 is within the permitted limit.

REFERENCES

B&R Environmental, 1998. Engineering Evaluation/Cost Analysis (EE/CA) for IR Site 57, Former Drum Loading Area, Building 292, Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland, February.

TABLE P-1
ANALYTICAL RESULTS - STORM SEWER ROUND 1[1]
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010101	S57SW0020101	S57SW0030101	S57SW0030101-D	S57SW0030201	S57SW0040101	S57SW0060101	S57SW0060101-D
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-01 (MH-430)	MH-01 (MH-430)	MH-02 (MH-431)	MH-487	MH-487
SAMPLE DATE:	1/27/99	1/27/99	1/22/99	1/22/99	1/22/99	1/22/99	1/21/99	1/21/99
ASSOCIATED DUPLICATE:			S57SW0030101-D	S57SW0030101			S57SW0060101-D	S57SW0060101
VOLATILES (µg/L)								
1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J	0.1 J
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,1-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,1-DICHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J	0.2 J
1,2,4-TRICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,2-DIBROMOETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,2-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,3-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
1,4-DICHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
2-BUTANONE	17 L	21 L	17.1 J	16.8 J	5 UR	18 J	17.8 L	17 L
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5.0 UJ	5.0 UJ
4-METHYL-2-PENTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	5.0 UJ	5.0 UJ
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR	741.1 J	725.1 J
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
BROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J	0.1 J
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U	0.6 J	0.6 J
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U	0.3 B	0.3 B
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
CHLOROETHANE	1 UR	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
CHLOROMETHANE	1 U	1 UR	1 U	1 U	1 U	1 U	1.0 U	1.0 U
CIS-1,2-DICHLOROETHENE	1 U	15 J	4.3	4.6	7.1	6.7	8.8	8.9
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U	0.4 J	0.4 J
ETHYL ETHER	145 J	197 L	147 J	147.3 J	18.5 J	140.8 J	98.7 J	96.4 J
ETHYLBENZENE	1 U	4 J	0.8 J	0.9 J	1 U	0.9 J	1.0 J	0.9 J
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U	0.8 B	0.8 B
STYRENE	1 U	4 J	1 U	1 U	1 U	0.6 J	1.5	1.7
TETRACHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	0.1 J
TRANS-1,2-DICHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U
TRICHLOROETHENE	1 U	9 J	5.9	6.5	6.9	10.1	20.6	20.6
VINYL CHLORIDE	1 U	2 J	1 U	1 U	1 U	1 U	0.5 J	0.5 J
XYLENES, TOTAL	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	0.2 J

(1) Round 1 storm sewer samples were analyzed for a more complete list of analytes than appears here. The complete list appears in Appendix H as surface water samples.

TABLE P-1
ANALYTICAL RESULTS - STORM SEWER ROUND 1[1]
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010101	S57SW0020101	S57SW0030101	S57SW0030101-D	S57SW0030201	S57SW0040101	S57SW0060101	S57SW0060101-D
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-01 (MH-430)	MH-01 (MH-430)	MH-02 (MH-431)	MH-487	MH-487
SAMPLE DATE:	1/27/99	1/27/99	1/22/99	1/22/99	1/22/99	1/22/99	1/21/99	1/21/99
ASSOCIATED DUPLICATE:			S57SW0030101-D	S57SW0030101			S57SW0060101-D	S57SW0060101
EXPLOSIVES (µg/L)								
1,3,5-TRINITROBENZENE		1.2 U	1.2 U			1.2 U		
1,3-DINITROBENZENE		1.2 U	1.2 U			1.2 U		
2,4,6-TRINITROTOLUENE		1.2 U	1.2 U			1.2 U		
2,4-DINITROTOLUENE		1.2 U	1.2 U			1.2 U		
2,6-DINITROTOLUENE		1.2 U	1.2 U			1.2 U		
2-AMINO-4,6-DINITROTOLUENE		1.2 U	1.2 U			1.2 U		
2-NITROTOLUENE		2.6 U	2.6 U			2.6 U		
3-NITROTOLUENE		2.6 U	2.6 U			2.6 U		
4-AMINO-2,6-DINITROTOLUENE		1.2 U	1.2 U			1.2 U		
4-NITROTOLUENE		2.6 U	2.6 U			2.6 U		
HMX		2.6 U	2.6 U			2.6 U		
NITROBENZENE		1.2 U	1.2 U			1.2 U		
NITROCELLULOSE		144 L	1120 L			1230 L		
NITROGLYCERIN		13.0 U	13 U			13 U		
NITROGUANIDINE		5.0 U	5 U			5 U		
RDX		2.6 U	2.6 U			2.6 U		
TETRYL		2.6 UJ	2.6 U			2.6 U		

(1) Rou orm sewer samples were analyzed for a more complete list of analytes than appears here. omplete list appears in Appendix H as surface water samples.

TABLE P-1
ANALYTICAL RESULTS - STORM SEWER ROUND 1[1]
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0060201	S57SW0070101	S57SW0070201	S57SW0080101	S57SW0080201	S57SW0080301	S57SW0090101
LOCATION:	MH-487	IW-80 (MH-489)	IW-80 (MH-489)	MH-497	MH-497	MH-497	S57SW009/SD005
SAMPLE DATE:	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/20/99
ASSOCIATED DUPLICATE:							
VOLATILES (µg/L)							
1,1,1-TRICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,1,2,2-TETRACHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,1,2-TRICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,1-DICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,1-DICHLOROETHENE	1.0 U	0.1 J	0.1 J	1.0 U	1.0 U	1.0 U	1 U
1,2,4-TRICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,2-DIBROMOETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,2-DICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,2-DICHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,2-DICHLOROPROPANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,3-DICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
1,4-DICHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
2-BUTANONE	14.9 L	17.3 L	17.0 L	13.3 L	16.7 L	5.0 UR	10.7 J
2-HEXANONE	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5 UR
4-METHYL-2-PENTANONE	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5 UR
ACETONE	84.4 B	272.6 J	478.5 J	37.1 B	255.3 J	5.0 UR	5 UR
BENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
BROMOCHLOROMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
BROMODICHLOROMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
BROMOFORM	0.3 J	0.6 J	0.7 J	0.6 J	0.4 J	1.0 U	1 U
BROMOMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
CARBON DISULFIDE	0.1 B	0.1 B	0.3 B	0.4 B	0.2 B	1.8 B	1 U
CARBON TETRACHLORIDE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
CHLOROBENZENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
CHLOROETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
CHLOROFORM	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
CHLOROMETHANE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
CIS-1,2-DICHLOROETHENE	4.7	9.4	11.3	6.0	6.0	0.3 J	10.8
CIS-1,3-DICHLOROPROPENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
DIBROMOCHLOROMETHANE	0.2 J	0.4 J	0.4 J	0.4 J	0.2 J	1.0 U	1 U
ETHYL ETHER	47.3 J	98.9 J	103.1 J	74.2 J	70.3 J	1.9	70.2
ETHYLBENZENE	0.5 J	0.9 J	1.0 J	0.5 J	0.5 J	1.0 U	1 U
METHYLENE CHLORIDE	0.8 B	0.7 B	0.7 B	0.7 B	0.7 B	0.7 B	2 U
STYRENE	1.1	1.6	0.6 J	0.3 J	0.2 J	1.0 U	0.8 J
TETRACHLOROETHENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
TOLUENE	0.1 J	0.1 J	0.1 J	1.0 U	1.0 U	1.0 U	1 U
TRANS-1,2-DICHLOROETHENE	1.0 U	0.1 J	0.1 J	1.0 U	0.1 J	1.0 U	1 U
TRANS-1,3-DICHLOROPROPENE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U
TRICHLOROETHENE	11.5	19.9	21.3	14.9	14.7	0.4 J	16.1
VINYL CHLORIDE	0.2 J	0.4 J	0.4 J	0.3 J	0.2 J	1.0 U	1.1
XYLENES, TOTAL	0.1 J	0.6 J	0.5 J	0.3 J	0.2 J	1.0 U	1 U

(1) Round 1 storm sewer samples were analyzed for a more complete list of analytes than appears here. The complete list appears in Appendix H as surface water samples.

TABLE P-1
ANALYTICAL RESULTS - STORM SEWER ROUND 1[1]
JANUARY 1999
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0060201	S57SW0070101	S57SW0070201	S57SW0080101	S57SW0080201	S57SW0080301	S57SW0090101
LOCATION:	MH-487	IW-80 (MH-489)	IW-80 (MH-489)	MH-497	MH-497	MH-497	S57SW009/SD005
SAMPLE DATE:	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/21/99	1/20/99
ASSOCIATED DUPLICATE:							
EXPLOSIVES (µg/L)							
1,3,5-TRINITROBENZENE		1.2 U					1.2 U
1,3-DINITROBENZENE		1.2 U					1.2 U
2,4,6-TRINITROTOLUENE		1.2 U					1.2 U
2,4-DINITROTOLUENE		1.2 U					1.2 U
2,6-DINITROTOLUENE		1.2 U					1.2 U
2-AMINO-4,6-DINITROTOLUENE		1.2 U					1.2 U
2-NITROTOLUENE		2.6 U					2.6 U
3-NITROTOLUENE		2.6 U					2.6 U
4-AMINO-2,6-DINITROTOLUENE		1.2 U					1.2 U
4-NITROTOLUENE		2.6 U					2.6 U
HMX		2.6 U					2.6 U
NITROBENZENE		1.2 U					1.2 U
NITROCELLULOSE		136 UR					135 UR
NITROGLYCERIN		13.0 U					13 U
NITROGUANIDINE		5.0 U					5 U
RDX		2.6 U					2.6 U
TETRYL		2.6 U					2.6 U

(1) Rou .orm sewer samples were analyzed for a more complete list of analytes than appears here. omplete list appears in Appendix H as surface water samples.

TABLE P-2
ANALYTICAL RESULTS - STORM SEWER ROUND 2
SEPTEMBER 1999
SITE 57 - FORMER DRUM LOADING AREA

IHDIV-NSWC, INDIAN HEAD, MARYLAND

SAMPLE I.D.:	S57SW0010102	S57SW0020102	S57SW0030102	S57SW0040302	S57SW0060102	S57SW0070102	S57SW0080102	S57SW0090102	S57SW0090102-D
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-02 (MH-431)	MH-487	IW-80 (MH-489)	MH-497	S57SW009/SD005	S57SW009/SD005
SAMPLE DATE:	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99
DEPTH INTERVAL (FEET):									
ASSOCIATED DUPLICATE:								S57SW0090102-D	S57SW0090102
VOLATILES (µg/L)									
1,1,1-TRICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	0.18 J	0.18 J	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2,4-TRICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1 UR	1 UR	2 UR	2 UR	1 UR	1 UR	1 UR	1 UR	1 UR
1,2-DIBROMOETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,3-DICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,4-DICHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U
ACETONE	1.5 B	1.1 B	10 U	10 U	1.2 B	1.1 B	1.4 B	1.1 B	1.3 B
BENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
BROMOCHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	2 U	2 U	1 U	1 U	1 U	0.3 J	1 U
BROMOMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 UJ	1 UJ	2 UJ	2 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
CHLOROFORM	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	1 U	0.28 J	3	20	17	11	6.3	10	9.1
CIS-1,3-DICHLOROPROPENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
ETHYL ETHER	71	69	40	49	18	9.5	8.4	4.6	4.1
ETHYLBENZENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	4 U	4 U	2 U	2 U	2 U	2 U	2 U
STYRENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TOLUENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U	2 U	2 U	0.13 J	0.22 J	0.47 J	1 U	0.12 J
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	0.34 J	0.31 J	2.3	21	37	24	16	12	11
VINYL CHLORIDE	1 U	1 U	0.37 J	1.4 J	1.1	0.49 J	0.25 J	1.3	1.2
XYLENES, TOTAL	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U

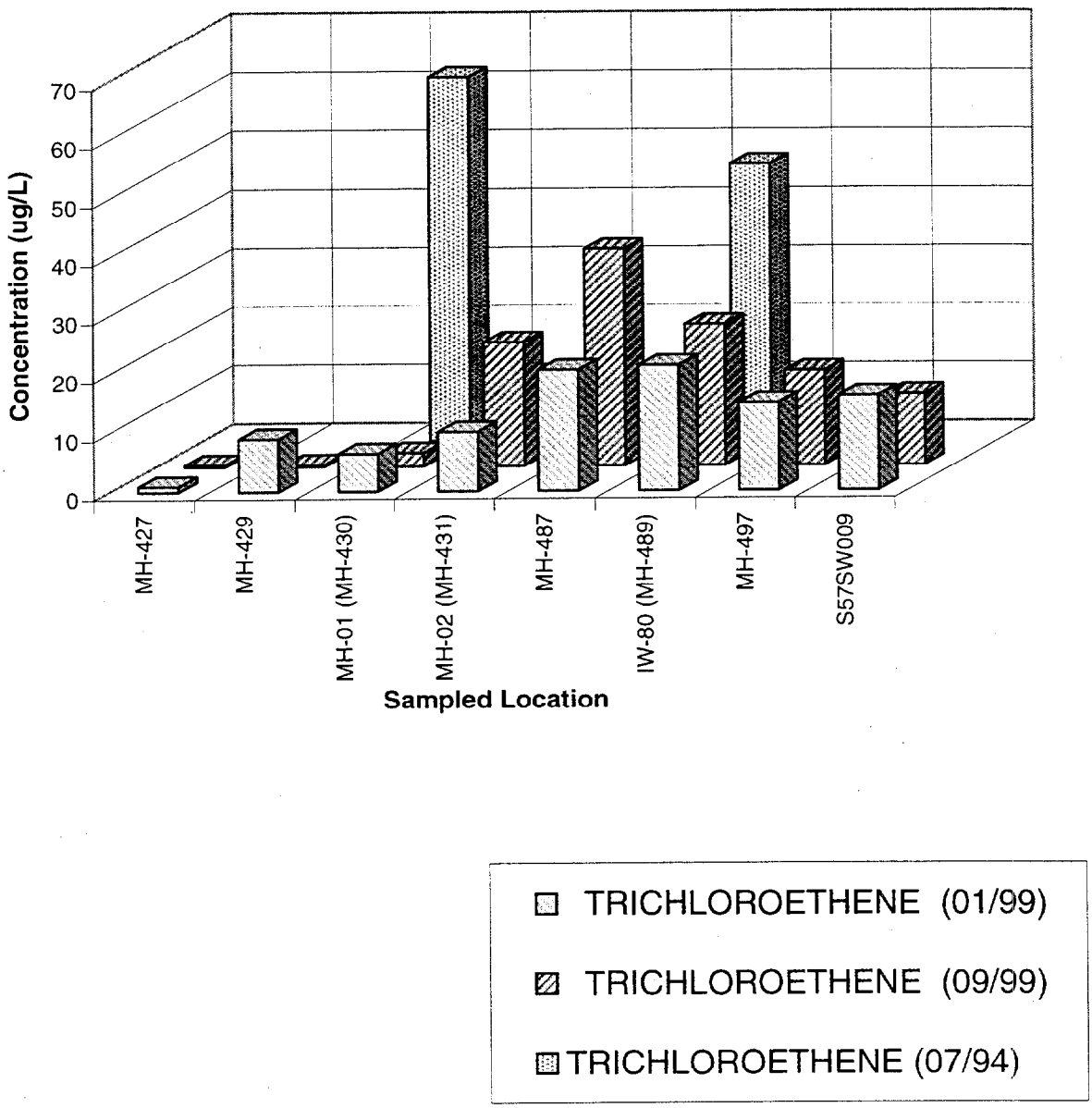
TABLE P-2
ANALYTICAL RESULTS - STORM SEWER ROUND 2
SEPTEMBER 1999
SITE 57 - FORMER DRUM LOADING AREA

IHDIV-NSWC, INDIAN HEAD, MARYLAND

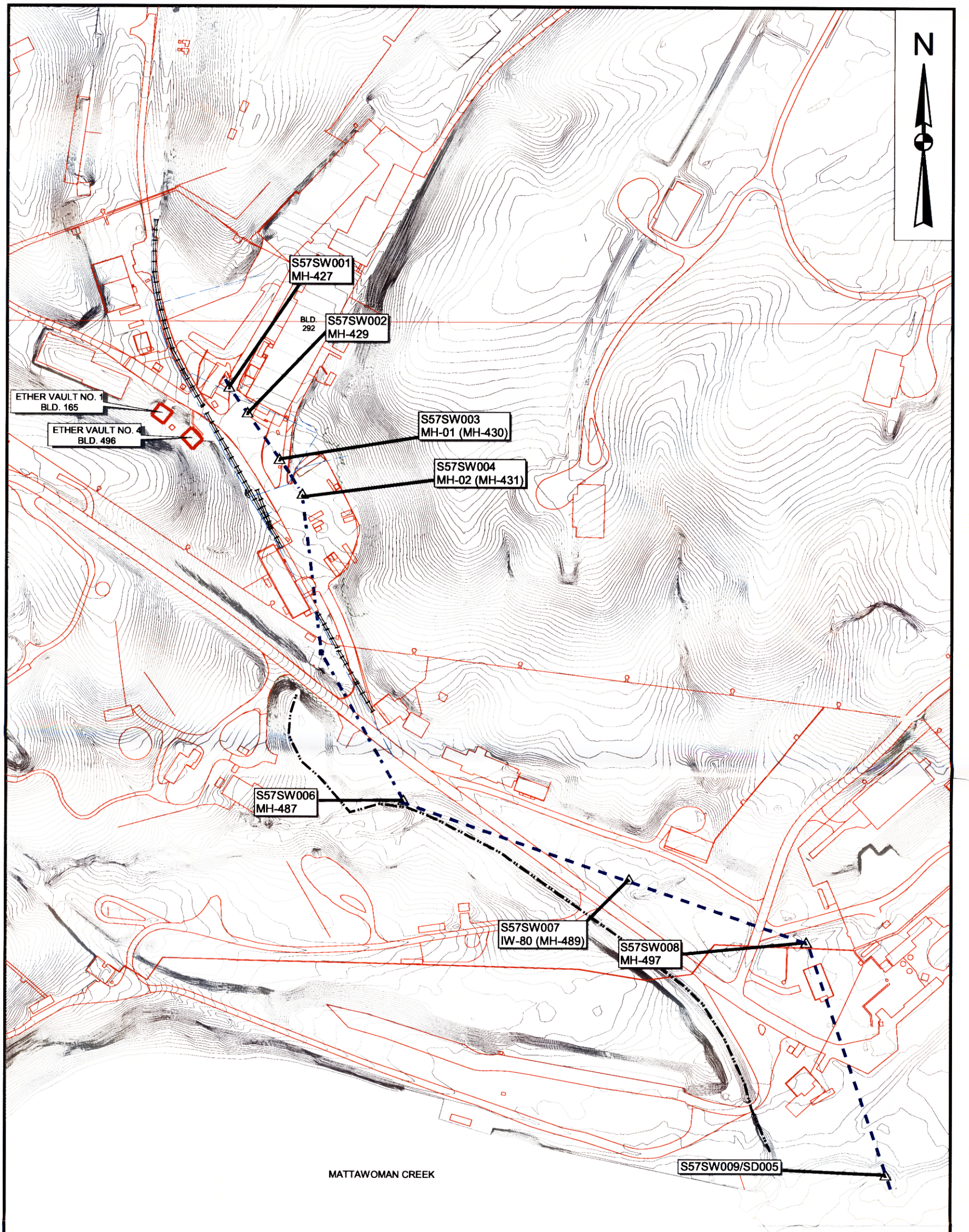
SAMPLE I.D.:	S57SW0010102	S57SW0020102	S57SW0030102	S57SW0040302	S57SW0060102	S57SW0070102	S57SW0080102	S57SW0090102	S57SW0090102-D
LOCATION:	MH-427	MH-429	MH-01 (MH-430)	MH-02 (MH-431)	MH-487	IW-80 (MH-489)	MH-497	S57SW009/SD005	S57SW009/SD005
SAMPLE DATE:	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99
DEPTH INTERVAL (FEET):									
ASSOCIATED DUPLICATE:								S57SW0090102-D	S57SW0090102
EXPLOSIVES (µg/L)									
1,3,5-TRINITROBENZENE		0.3 U	0.3 U	0.3 U		0.3 U		0.3 U	0.3 U
1,3-DINITROBENZENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2,4,6-TRINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2,4-DINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2,6-DINITROTOLUENE		0.3 U	0.3 U	0.3 U		0.3 U		0.3 U	0.3 U
2-AMINO-4,6-DINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
2-NITROTOLUENE		1 U	1 U	1 U		1 U		1 U	1 U
3-NITROTOLUENE		1 U	1 U	1 U		1 U		1 U	1 U
4-AMINO-2,6-DINITROTOLUENE		0.1 U	0.1 U	0.1 U		0.1 U		0.1 U	0.1 U
4-NITROTOLUENE		1 U	1 U	1 U		1 U		1 U	1 U
HMX		1 U	1 U	1 U		1 U		1 U	1 U
NITROBENZENE		1 U	1 U	1 U		1 U		1 U	1 U
NITROCELLULOSE		500 U	500 U	500 U		500 U		620	500
NITROGLYCERIN		0.65 UJ	0.65 UJ	0.65 UJ		0.65 UJ		0.65 UJ	0.65 UJ
NITROGUANIDINE		20 U	20 U	20 U		20 U		20 U	20 U
RDX		0.8 U	0.8 U	0.8 U		0.8 U		0.8 U	0.8 U
TETRYL		1 U	1 U	1 U		1 U		1 U	1 U

Figure P-2

Storm Sewer Data Comparison
TETRACHLOROETHENE (TCE)



P:\GIS\NSWC_INDIAN_HEAD\7129_SITE57.APR\STORM SEWER SAMPLING MAP JCB 2/3/00



LEGEND

- Surface Water/Sediment
- Buildings/Roads/Docks
- Water Pipeline
- Intermittent Stream
- Railroad
- Site 57 Storm Sewer

200 0 200 Feet

DRAWN BY J. BELLONE	DATE 2/1/00	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7129 / OWNER NUMBER —
CHECKED BY G. Latulippe	DATE 2/2/00	STORM SEWER SAMPLING SITE 57 - FORMER DRUM LOADING AREA NSWC INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY G. Latulippe / DATE 2/2/00
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE P-1 / REV 0