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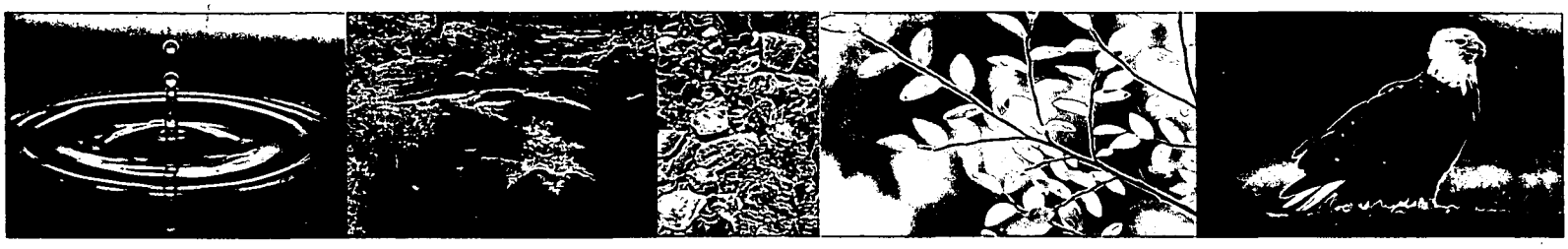

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Monitored Natural Attenuation Report
for
Crane Cast High Explosives Fill/Building 146 (SWMU 16)

Round 7

Naval Surface Warfare Center Crane
Crane, Indiana

Contract Task Order 0377

August 2006

NAVFAC
Naval Facilities Engineering Command

Southeast
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

REVISION 0
AUGUST 2006

MONITORED NATURAL ATTENUATION REPORT
FOR
CAST HIGH EXPLOSIVES FILL/BUILDING 146 (SWMU 16)
ROUND 7

NAVAL SURFACE WARFARE CENTER, CRANE
CRANE, INDIANA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command
Southeast
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

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PREPARED UNDER THE SUPERVISION OF:

RALPH R. BASINSKI, QEP
TASK ORDER MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMITTAL BY:

DEBRA M. HUMBERT
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

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LIST OF ACRONYMS

asml	above mean sea level
B146	Building 146
CMS	Corrective Measures Study
DNX	hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
DO	Dissolved Oxygen
mL	milliliters
MNA	Monitored natural attenuation
MNX	hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
NSWC	Naval Surface Warfare Center
ORP	Oxidation-reduction potential
Plz	Lower Pennsylvanian Water Bearing Zone
Pmz	Middle Pennsylvanian Water Bearing Zone
Puz	Upper Pennsylvanian Water Bearing Zone
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA Facility Investigation
SOPs	Standard operating procedures
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit
TCE	trichloroethylene
TNX	hexahydro-1,3,5-trinitroso-1,3,5-triazine
TtNUS	Tetra Tech NUS
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile organic compound

1.0 INTRODUCTION

A Phase III Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) has been conducted at the Naval Surface Warfare Center (NSWC) Crane Cast High Explosives Fill/Building 146 (B-146) Incinerator, also known as solid waste management unit (SWMU) 16. The purpose of the RFI was to determine whether explosives in the groundwater, surface water, and sediment present unacceptable risk or if any residual explosives in soil present unacceptable levels of risk to human health or the environment. The RFI was conducted at SWMU 16 in accordance with applicable RCRA corrective action requirements and provides data on the nature and extent of select explosive, metal, volatile organic compound (VOC), semivolatile organic compound (SVOC), and other miscellaneous parameter concentrations in surface soils, subsurface soils, sediment, surface water and groundwater. The RFI showed there was excess risk as a result of explosives and volatile organic compounds (VOCs) in the groundwater.

SWMU 16 originally consisted of Building 146 (B146) and three oil-fired, rotary kiln incinerators with fuel storage tanks. B146 is still in existence; it was previously used as an explosive fill and pressure washout facility. The incinerators and fuel storage tanks have been removed. During operation, incinerator ash was stored in waste piles adjacent to the incinerator. These ash piles have also been removed. In previous investigations, exterior sumps receiving roof drain waters and process waters were found to contain trichloroethylene (TCE). These sumps discharged into nearby ditches. After this discovery, a remedial action was conducted during the period 1996 to 1998 in which an air stripper was used to remove VOCs from liquids within the sumps and the roof drain waters were rerouted to a separate line discharging into a ditch. After TCE concentrations in the sump were reduced to acceptable levels, the sump drains were rerouted to the sanitary sewer system.

A corrective measures study (CMS) will be conducted at SWMU 16. Among the remedial alternatives expected to be evaluated will be the potential for natural attenuation to reduce the concentrations of explosives and VOCs in the groundwater in a reasonable time frame. The United States Environmental Protection Agency (U.S. EPA) Region 5 has established a framework entitled "Region 5 Framework for Monitored Natural Attenuation Decisions for Groundwater" (U.S. EPA, 2000). This framework provides technical direction for the collection of adequate monitoring data to support evaluations of the effectiveness of monitored natural attenuation (MNA) decisions. The guidance recommends collection of at least two years of quarterly sampling data. In order to determine whether residual explosives are naturally degrading at SWMU 16, a long-term groundwater monitoring plan for explosives, explosives degradation products, and VOCs is being conducted. Recently, 7 rounds of sampling and analyses were

completed at SWMU 16. Rounds 1 through 3 included groundwater, soils, sediments, and surface water sampling, whereas Rounds 4 through 7 included only groundwater and surface water sampling. Information regarding the results of Rounds 1 through 3 is presented in the SWMU 16 RFI (Tetra Tech NUS [TtNUS], Inc., 2005a). The results show the presence of explosives, primarily RDX, and VOCs above risk-based concentrations in groundwater and surface water. The results for Round 4 and Rounds 5 and 6 were provided in separate reports (TtNUS, 2005b and TtNUS, 2006).

The purpose of this report is to present the results of groundwater and surface water monitoring activities at SWMU 16 in Round 7, including field documentation, and to provide the framework for evaluation of data after all nine rounds of sampling have been completed. Field documentation associated with Round 7 is provided in Appendices A, B, and C of this report. Analytical results for Round 7are presented in Appendix D. The final monitoring report (after Round 9) will contain an evaluation as to whether residual explosives may be naturally degrading and whether MNA is a viable remedial option for contaminated groundwater and surface water at SWMU 16. Information obtained from the long term monitoring program will be used in the CMS to evaluate the effectiveness of MNA. The MNA program being conducted at SWMU 16 meets the U.S. EPA Region 5 MNA requirements.

2.0 FIELD INVESTIGATION

This section presents sampling activities, procedures, and documentation utilized during Round 7 field operations performed in 2006 for NSWC Crane SWMU 16.

2.1 OVERVIEW

Field activities were conducted in January 2006 and all work performed was conducted in accordance with the procedures and methodologies described in the U.S. EPA-approved Quality Assurance Project Plan (QAPP) Addendum No. 2 to the approved QAPP (TtNUS, 2004). Standard operating procedures (SOPs) that governed the field work are included in Appendix C of Addendum No. 2 to the approved QAPP.

All field activities were electronically recorded and copies of all field forms, records, daily activities, and health and safety documentation associated with the field investigation for Round 7 are provided in Appendices A through C of this document.

2.2 SAMPLING OPERATIONS

This section describes the methodology for groundwater and surface water sampling activities performed at SWMU 16 during Round 7. Table 2-1 contains well construction information and water level/elevation data for Rounds 1 through 7. A listing of all SWMU 16 sample analytical fractions conducted for groundwater and surface water samples in Round 7 is provided in Table 2-2. Further discussion of the specific target analytes for each fraction is discussed in Section 3 of the QAPP Addendum No. 2. Instruments used in the field were calibrated daily prior to use according to manufacturer's requirements and in accordance with all applicable standard operating procedures (SOPs).

No nonconformances or suspected deficiencies occurred during sampling in Round 7.

2.2.1 Groundwater and Surface Water Measurements

A complete synoptic round of water levels for all SMWU 16 groundwater wells was taken prior to sampling activities in Round 7. The synoptic water level measurements were obtained within a 24 to 48 hour time period. Measurements were taken with an electrical water level indicator (M-scope), using the top of the riser pipe as the reference point to determine water depth for monitoring wells and using a surveyed mark for staff gauge measurements. All measurements were taken in accordance with the specific SOP contained in Addendum No. 2 to the approved QAPP. A mark was placed at the top of the riser pipe to

ensure that measurements were taken from a consistent reference point. Water level measurements and staff gauge measurements were recorded to the nearest 0.01 foot on groundwater level measurement forms, which are provided in Appendix A.4 of this document. Table 2-1 contains water level/elevation data.

2.2.2 Groundwater Purging and Sampling

During Round 7 the majority of groundwater wells were sampled using dedicated bladder pumps. In monitoring well 16MWT11, the initial water level was below the dedicated pump intake and therefore the pump was pulled and the well was purged and sampled via a dedicated Teflon bailer Groundwater quality parameters including pH, specific conductance, temperature, dissolved oxygen (DO), and oxidation reduction potential (ORP) were measured during purging at 5- to 10-minute intervals using a multi-parameter water quality meter and flow-through cell. Longer intervals were used for slower pumping wells. Water levels and pumping rates were also measured during purging at 5- to 10-minute intervals. Purging continued until a minimum of one well volume was removed and the above parameters stabilized, or until the well had been purged for 4 hours, in accordance with SOP CTO 166-15 and SOP CTO 166-16. To the extent possible, the pumping rates were adjusted to prevent drawdown from exceeding 0.3 foot during purging. Immediately following the purging process and before sampling, the temperature, pH, specific conductance, DO, ORP, and turbidity were measured and recorded on the groundwater sample log sheets.

Sample containers were filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. All pertinent field data, including sampling methods, purge information, pump intake depths, and locations were recorded electronically on low-flow purge data forms and groundwater sample log sheets (see Appendix A.1). See Figure 2-1 for all groundwater sampling locations.

All 12 proposed groundwater samples were collected at SWMU 16 during Round 7 (See Table 2-2). As noted above, monitoring well 16MWT11 had an initial water level below the dedicated pump intake. The dedicated pump was temporarily removed and the well was purged with a Teflon bailer and then sampled the following day. Monitoring well 16MWT15 was purged for 4 hours and recharged at a very slow rate. The well was purged on one day and sampled the next.

2.2.3 Surface Water Sampling

In Round 7, surface water samples were collected from intermittent streams, drainage ditches, and surface runoff locations throughout SWMU 16. All samples were collected at previously sampled locations which had been marked with a labeled, wooden survey stake. Fluorescent flagging had been tied to the stake and to a nearby tree (if available) to facilitate relocation of the sample location for future sampling. Surface water samples were collected in accordance with Addendum No. 2 to the approved QAPP. All pertinent field data, including water quality parameters, sampling methods, and locations were recorded on a surface water sample log sheet (see Appendix A.2). See Figure 2-2 for all surface water sampling locations.

All 4 proposed surface water samples were collected at SWMU 16 during Round 7 (See Table 2-2).

2.3 QUALITY CONTROL SAMPLES

Quality assurance (QA)/quality control (QC) samples were generated and collected during sampling activities to monitor both field and laboratory procedures. These procedures are detailed in the approved QAPP addendum. QA/QC samples included field duplicates, MS/MSD, equipment rinsate blanks, trip blanks, source water blanks, and temperature blanks. Field duplicate results are presented in Appendix D of this report.

TABLE 2-1

MONITORING WELL CONSTRUCTION INFORMATION AND WATER LEVEL MEASUREMENTS
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA

Well Number	Installation Date	Northing (NAD83)	Easting (NAD83)	Ground Elevation	Top of Riser Elevation	Total Depth[1]	Screened Interval				Water-Bearing Zone	May 5, 2003		May 30, 2003		January 24, 2004		February 4, 2005		May 6, 2005		August 10, 2005		January 5, 2006	
							Top	Bottom	Top	Bottom		Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation
		(feet)	(feet)	(feet amsl)	(feet amsl)	(feet bgs)	(feet bgs)	(feet bgs)	(feet amsl)	(feet amsl)		(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)
16MWT01	4/8/2003	1321193.49	3032881.29	762.02	764.50	24.00	14.00	24.00	748.02	738.02	Puz	25.19	739.31	22.70	741.80	19.12	745.38	15.88	748.62	15.55	748.95	14.49	750.01	15.83	748.67
16MWT02	4/11/2003	1321146.42	3032559.16	757.60	760.36	18.00	8.00	18.00	749.60	739.60	Puz	6.55	753.81	12.18	748.18	10.94	749.42	12.61	747.75	11.68	748.68	13.1	747.26	8.15	752.21
16MWT03	4/10/2003	1320946.97	3032644.29	761.95	764.41	35.00	25.00	35.00	736.95	726.95	Pmz	27.20	737.21	28.07	736.34	28.34	736.07	28.88	735.53	27.85	736.56	30.08	734.33	29.03	735.38
16MWT04	4/9/2003	1321003.28	3032946.47	763.88	766.14	25.00	15.00	25.00	748.88	738.88	Puz	8.05	758.09	13.14	753.00	13.11	753.03	14.29	751.85	13.13	753.01	14.49	751.65	10.58	755.56
16MWT05	4/9/2003	1320741.79	3032812.77	764.50	766.88	40.00	29.00	39.00	735.50	725.50	Pmz	29.77	737.11	30.39	736.49	31.44	735.44	32.11	734.77	31.10	735.78	33.06	733.82	32.63	734.25
16MWT06	4/24/2003	1321199.52	3032883.37	761.77	764.44	25.00	15.00	25.00	746.77	736.77	Puz	22.33	742.11	15.92	748.52	17.41	747.03	17.79	746.65	16.69	747.75	17.93	746.51	19.40	745.04
16MWT07	11/11/2003	1321176.93	3033001.57	760.54	762.87	25.50	15.00	25.00	745.54	735.54	Puz	NA	NA	NA	NA	Dry	NA	Dry	NA	Dry	NA	Dry	NA	Dry	NA
16MWT08	11/9/2003	1321179.45	3033009.24	759.57	761.56	99.00	85.00	95.00	674.57	664.57	Plz	NA	NA	NA	NA	97.03	664.53	96.60	664.96	96.16	665.40	95.81	665.75	95.33	666.23
16MWT09	11/8/2003	1321068.49	3033041.44	762.43	764.28	25.00	15.00	25.00	747.43	737.43	Puz	NA	NA	NA	NA	13.88	750.40	15.25	749.03	13.82	750.46	15.49	748.79	13.52	750.76
16MWT10	11/9/2003	1320936.05	3033074.74	761.93	764.43	25.00	14.00	24.00	747.93	737.93	Puz	NA	NA	NA	NA	22.05	742.38	22.30	742.13	21.07	743.36	23.4	741.03	21.49	742.94
16MWT11	11/11/2003	1320934.64	3033062.79	763.23	765.24	98.00	86.00	96.00	677.23	667.23	Plz	NA	NA	NA	NA	96.30	668.94	96.41	668.83	96.10	669.14	95.92	669.32	Water level below pump	NA
16MWT12	11/7/2003	1320729.14	3033074.92	753.23	755.45	26.50	16.00	26.00	737.23	727.23	Pmz	NA	NA	NA	NA	20.13	735.32	20.94	734.51	19.85	735.60	21.86	733.59	13.52	741.93
16MWT13	11/11/2003	1321125.78	3032562.41	757.62	759.57	19.00	8.00	18.00	749.62	739.62	Puz	NA	NA	NA	NA	10.25	749.32	11.36	748.21	10.42	749.15	12.08	747.49	21.49	738.08
16MWT14	11/7/2003	abd.	abd.	764.98	abd.	25.00	15.00	25.00	749.98	739.98	Puz	NA	NA	NA	NA	Dry, abd.	NA	abd.	NA	abd.	NA	abd.	NA	abd.	NA
16MWT15	11/9/2003	1321120.81	3032563.53	757.73	759.69	92.00	81.00	91.00	676.73	666.73	Plz	NA	NA	NA	NA	53.23	706.46	54.99	704.70	56.57	703.12	58.95	700.74	59.43	700.26
16MWT16	11/9/2003	1321059.41	3032814.52	764.98	764.74	40.00	26.00	36.00	738.98	728.98	Pmz	NA	NA	NA	NA	32.93	731.81	34.40	730.34	33.47	731.27	33.33	731.41	33.32	731.42
16MWT17	11/8/2003	1321235.88	3032675.07	764.79	766.53	24.00	14.00	24.00	750.79	740.79	Puz	NA	NA	NA	NA	15.35	751.18	15.78	750.75	15.38	751.15	15.79	750.74	15.52	751.01
16MWT18	1/18/2004	1321068.96	3032807.84	764.99	764.44	105.00	94.00	104.00	670.99	660.99	Plz	NA	NA	NA	NA	96.65	667.79	95.75	668.69	95.68	668.76	95.48	668.96	95.39	669.05
16MWT19	7/28/2004	1320172.28	3033846.62	606.73	609.31	16.00	5.00	15.00	601.73	591.73	Valley deposits	NA	NA	NA	NA	NA	NA	3.25	606.06	3.36	605.95	8.18	601.13	3.11	606.20
16MWT20	7/28/2004	1320532.68	3034030.68	607.43	609.93	16.00	5.00	15.00	602.43	592.43	Valley deposits	NA	NA	NA	NA	NA	NA	3.66	606.27	3.81	606.12	7.76	602.17	3.58	606.35
16MWT21	9/9/2004	1320581.35	3032960.08	760.78	763.05	96.00	80.00	95.00	680.78	665.78	Plz	NA	NA	NA	NA	NA	NA	65.46	697.59	64.90	698.15	65.92	697.13	66.07	696.98
WES-14-01-83	1983	1320638.35	3032713.38	763.87	766.67	50.70	35.80	45.30	728.07	718.57	Pmz	31.00	735.67	31.00	735.67	31.94	734.73	32.33	734.34	31.62	735.05	33.07	733.60	33.25	733.42
WES-14-02-83	1983	1321319.90	3032647.27	763.69	766.54	25.80	11.35	20.39	752.34	743.30	Puz	14.23	752.31	14.56	751.98	15.36	751.18	15.94	750.60	15.40	751.14	15.76	750.78	15.50	751.04
WES-14-03-83	1983	1320816.00	3033018.50	761.51	763.93	35.40	20.88	29.99	740.63	731.52	Puz	18.80	745.13	19.83	744.10	20.00	743.93	20.45	743.48	19.44	744.49	20.69	743.24	19.22	744.71
WES-14-04-83	1983	1320572.35	3032960.96	760.42	762.99	46.00	31.38	40.47	729.04	719.95	Pmz	26.80	736.19	27.27	735.72	28.39	734.60	28.70	734.29	27.67	735.32	29.61	733.38	29.27	733.72
WES-14-05-83	1983	1320584.05	3032850.32	766.60	769.40	50.70	35.80	45.25	730.80	721.35	Pmz	32.59	736.81	33.05	736.35	34.18	735.22	34.88	734.52	33.80	735.60	35.72	733.68	35.41	733.99

TABLE 2-1

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ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA

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							Top	Bottom	Top	Bottom		Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation
		(feet)	(feet)	(feet amsl)	(feet amsl)	(feet bgs)	(feet bgs)	(feet bgs)	(feet amsl)	(feet amsl)		(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)	(feet btor)	(feet amsl)
STAFF GAUGES																									
16SG01	10/16/04	1321342.91	3032498.83	750.58	NA	NA	NA	NA	NA	NA	Puz	NA	NA	NA	NA	NM	NM	Dry	NA	Dry	NA	Dry	NA	Dry	NA
16SG02	10/16/04	1321121.91	3032465.01	734.32	NA	NA	NA	NA	NA	NA	Puz	NA	NA	NA	NA	NM	NM	5.29	729.03	Dry	NA	Dry	NA	4.90	729.42
16SG03	10/16/04	1320712.52	3032705.12	761.79	NA	NA	NA	NA	NA	NA	Puz	NA	NA	NA	NA	NM	NM	5.03	756.76	Dry	NA	Dry	NA	4.96	756.83
16SG04	10/16/04	1320748.57	3033005.16	762.44	NA	NA	NA	NA	NA	NA	Puz	NA	NA	NA	NA	NM	NM	2.15	760.29	Dry	NA	Dry	NA	2.11	760.33
16SG05	10/16/04	1320889.16	3032979.28	763.21	NA	NA	NA	NA	NA	NA	Puz	NA	NA	NA	NA	NM	NM	Dry	NA	Dry	NA	Dry	NA	1.45	761.76
16SG06	10/16/04	1320930.80	3034364.52	603.53	NA	NA	NA	NA	NA	NA	Plz	NA	NA	NA	NA	NM	NM	3.51	600.02	3.67	599.86	Dry	NA	3.21	600.32
16SG07	10/16/04	1320765.76	3034582.61	601.53	NA	NA	NA	NA	NA	NA	Plz	NA	NA	NA	NA	NM	NM	5.99	595.54	**Staff washed away	NA	**Staff washed away	NA	6.39	595.14
16SG08	10/16/04	1318992.38	3033277.47	590.00	NA	NA	NA	NA	NA	NA	Plz	NA	NA	NA	NA	NM	NM	4.16	585.84	4.22	585.78	Dry	NA	4.11	585.89
16SG09	10/16/04	1318679.54	3033368.61	583.26	NA	NA	NA	NA	NA	NA	Plz	NA	NA	NA	NA	NM	NM	6.34	576.92	Dry	NA	Dry	NA	5.93	577.33

Notes:

1 = Total depth of boring; total depth of well may be less.

amsl = Above mean sea level (NAVD88).
abd. = well was grouted shut and abandoned
bgs = Below ground surface.
NA = not applicable
NM = not measured
NAD83 = North American Datum of 1983
Puz = Upper Pennsylvanian water-bearing zone
Pmz = Middle Pennsylvanian water-bearing zone
Plz = Lower Pennsylvanian water-bearing zone

TABLE 2-2

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSES
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
ROUND 7
NSWC CRANE
CRANE, INDIANA

Sample Number	Analytical Fraction		Reasoning Why Sample Was Not Collected
	Volatiles	Explosives	
	SW-846 8260B	Nitroaromatics and Nitramines SW-846 8330	
Groundwater (Round 7)			
16GW0207	X	X	
16GW0307	X	X	
16GW0407	X	X	
16GWT0407	X	X	
16GWT0608	X	X	
16GWT0906	X	X	
16GWT1006	X	X	
16GWT1106	X	X	
16GWT1206	X	X	
16GWT1306	X	X	
16GWT1506	X	X	
16GWT1706	X	X	
GW TOTALS	**12**	**12**	
Surface Water (Round 7)			
16SW1004	X	X	
16SW1205	X	X	
16SW1305	X	X	
16SW3004	X	X	
SW TOTALS	**4**	**4**	

X - indicates the sample was collected as proposed.
O - indicates a sample was not collected as proposed.

3.0 DATA PRESENTATION

This section presents the analytical results for groundwater and surface water sampling conducted in Round 7 at SMWU 16 (see Tables 3-1 through 3-8). In addition, analytical results for Rounds 1 through 6 are also provided in this section to support data interpretation, which is discussed in Section 4.0 of this report.

The SWMU 16 RFI identified RDX and trichloroethene (TCE) to be the primary explosive and VOC contaminants, respectively, in soil and groundwater. Over time, natural attenuation will reduce the mass or concentration of these contaminants in soil and groundwater and the parent compounds will decompose in stages to other well-defined intermediate products. In the case of RDX, it will degrade to give nitroso derivatives hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine (MNX), hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine (DNX) and hexahydro-1,3,5-trinitroso-1,3,5-triazine (TNX). In the case of TCE, the degradation route is expected to produce cis-1,2-dichloroethene, vinyl chloride, ethene, and ethane. As a result, the presentation and interpretation of analytical results in Sections 3 and 4 for SWMU 16 monitoring will focus on these primary contaminants and degradation products for RDX and TCE and miscellaneous field parameters.

3.1 GROUNDWATER DATA

Groundwater analytical results for Rounds 1 through 7 at SWMU 16 are presented in Tables 3-1, 3-3, and 3-5 for select monitoring well locations in the Upper, Middle, and Lower Pennsylvanian Water Bearing Zones, respectively. These tables show summary listings of groundwater concentrations for select explosives, explosive degradation products, VOCs, VOC degradation products, field, and miscellaneous parameters for each aquifer. Concentrations are presented in micrograms per liter (µg/L), unless otherwise noted, along with data validation qualifiers, as applicable. Due to the staggered nature of the groundwater sampling, not all wells were sampled in each of the seven rounds of sampling. RDX degradation products were not target analytes in Round 7. Descriptive statistics for each water bearing zone in Rounds 5 and 6 are shown in Tables 3-2, 3-4, and 3-6.

3.1.1 Explosives

3.1.1.1 Upper Pennsylvanian Water Bearing Zone (Puz)

Monitoring results for Round 7 are presented in Table 3-1. Tables 3-2 presents descriptive statistics for all wells sampled in Round 7. There were no detections of explosives at the upgradient well (16MWT02)

and the source area well 16MWT17 in Round 7. However, explosives were detected in all other Puz wells. The most frequently detected explosive was RDX with concentrations ranging from 0.42 µg/L at 16MWT13 to 120 µg/L at 16MWT04. HMX was the second most frequently detected explosive in 5 out of 8 Puz MNA wells with concentrations ranging from 1.0 µg/L at 16MWT06 to 12 µg/L at 16MWT09. Several other explosives were also detected in Round 7 but only at 16MWT06. The other detected explosives at 16MWT06 included 1,3,5-trinitrobenzene (2.3 µg/L), 2,4,6-trinitrotoluene (6.1 µg/L), 2,4-dinitrotoluene (1.1 µg/L), 2-amino-4,6-dinitrotolunene (38 µg/L), and 4-amino-2,6-dinitrotoluene (15 µg/L).

3.1.1.2 Middle Pennsylvanian Water Bearing Zone (Pmz)

Analytical results for Round 7 sampling at Pmz monitoring locations 16MW04 and 16MWT12 are presented in Table 3-3. The descriptive statistics for Round 7 results are presented in Table 3-4. RDX was the only explosive detected in Round 7 in the Pmz at location 16MW04 (0.85 µg/L).

3.1.1.3 Lower Pennsylvanian Water Bearing Zone (Plz)

Table 3-5 presents the analytical results for Round 7 sampling at Plz MNA wells 16MW11 and 16MWT15. The descriptive statistics for Round 7 results are presented in Table 3-6. In Round 7, there were no detections of explosives in Plz monitoring wells.

3.1.2 Volatile Organic Compounds

3.1.2.1 Upper Pennsylvanian Water Bearing Zone

VOC monitoring results for Round 7 sampling in the Puz wells are presented in Table 3-1. Table 3-2 presents descriptive statistics for upgradient and downgradient Puz wells, respectively. In Round 7, there were no VOC detections in the upgradient well (16MW02). VOCs were detected in all downgradient wells in Round 7. TCE was the most frequently detected VOC. TCE downgradient concentrations ranged from 2 µg/L at well 16MWT10 to 370,000 µg/L at 16MWT06. The compound cis-1,2-dichloroethene was only detected at wells 16MWT06 (4,800 µg/L), 16MWT13 (20 µg/L), and 16MWT17(340 µg/L). Vinyl chloride was only detected at well 16MWT06 (450 µg/L). Ethene and ethane were not target analytes in Round 7.

3.1.2.2 Middle Pennsylvanian Water Bearing Zone

VOC monitoring results for Round75 at the Pmz wells are presented in Table 3-3. Summary descriptive statistics for these locations are shown in Table 3-4. In Round 7, there were no detections of TCE.

3.1.2.3 Lower Pennsylvanian Water Bearing Zone

Analytical results for VOC detections in Round 7 at the Plz wells are presented in Table 3-5. Summary descriptive statistics for Round 7 are given in Table 3-6. In Round 7, there were no detections of VOCs.

3.2 SURFACE WATER

Surface water sampling was conducted at 4 locations in Round 7. The analytical results for Round 7 are presented in Table 3-7. Summary descriptive statistics for Round 7 are presented in Table 3-8.

3.2.1 Explosives

In Round 7, there were detections of four explosives only at locations 16SW30 and 16SW10. RDX (19 µg/L), HMX (4.6 µg/L), 4-amino-2,6-dichlorotoluene (0.55 µg/L), and 2-amino-4,6-dinitrotoluene (0.28 µg/L) were all detected at 16WSW30. Only RDX (0.77 µg/L) was detected at 16SW10. RDX degradation products were not target analytes in Round 7.

3.2.2 Volatile Organic Compounds

The only VOC detected in surface water in Round 7 was TCE at location 16SW12. The measured concentration was 11 µg/L.

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

		16MW02							16MW03							16MWT04						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	04/24/03	10/26/03	08/25/04	02/04/05	05/06/05	08/14/05	01/08/06	05/11/03	11/08/03	08/24/04	02/05/05	05/06/05	08/13/05	01/07/06	04/22/03	11/08/03	08/15/04	02/05/05	05/07/05	08/13/05	01/21/06
EXPLOSIVES																						
1,3,5-TRINITROBENZENE	UG/L	0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
1,3-DINITROBENZENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 U	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 U	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE			0.48 U							0.5 U							0.51 U					
2,4,6-TRINITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
2,4-DIAMINO-6-NITROTOLUENE			0.24 U		0.278 U		0.26 U			0.25 U		0.258 U		0.25 U			0.255 U		0.25 U		0.28 U	
2,4-DINITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
2,6-DIAMINO-4-NITROTOLUENE			0.24 U		0.278 U		0.26 U			0.25 U		0.258 U		0.25 U			0.255 U		0.25 U		0.28 U	
2,6-DINITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
2-AMINO-4,6-DINITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.48 J	0.62 J	0.89	0.52 J	0.45 J	0.41 J	0.52 J	0.55 U	0.47 J	0.27 U	0.3 J	0.269 U	0.34 J	0.26 U
2-NITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
3,5-DINITROANILINE			0.24 U		0.278 U		0.26 U			0.25 U		0.258 U		0.25 U			0.255 U		0.25 U		0.28 U	
3-NITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
4,4'-TN-AZOXY					0.555 U		0.52 U					0.515 U		0.5 U					0.5 U		0.55 U	
4-AMINO-2,6-DINITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.86 J	1.1	1 J	0.91	0.76	0.72	0.94	0.55 U	1 J	0.56	0.75	0.44 J	0.75	0.38 J
4-NITROTOLUENE		0.21 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	0.45 U	0.25 UJ	0.242 U	0.258 U	0.271 U	0.25 U	0.27 U	0.55 U	0.255 UJ	0.27 U	0.25 U	0.269 U	0.28 U	0.26 U
RDX		0.195 U	0.24 U	0.27 U	0.278 U	0.26 U	0.26 U	0.27 U	52	71	50	55	51	51	57	77	200	70	68	59	130	120
DNX			0.24 U		0.278 U		0.26 U			0.25 U		0.258 U		0.25 U			0.63 J		0.25 U		0.28 U	
MNX			0.24 U		0.278 U		0.26 U			0.82		0.36 J		0.32 J			4.1		1.2		2.5	
TNX			0.24 U		0.278 U		0.26 U			0.25 U		0.258 U		0.25 U			0.255 U		0.25 U		0.28 U	
VOLATILES																						
TRICHLOROETHENE	UG/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U		1 U	5.6	5	4.3	5	4.5	4.8	5.2	2.2	3.9	2.1	5	2.4	3.7	1.8
CIS-1,2-DICHLOROETHENE		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U		1 U	0.4 J	0.5 J	0.6 J	0.3 U	0.3 U	0.3 U	1 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
VINYL CHLORIDE		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U		1 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
ETHANE			0.062		0.078		0.093					0.005 U		0.016 J			0.013		0.0088 J		0.004 J	
ETHENE			0.018		0.005 U		0.007 J					0.026		0.052			0.027		0.014 J		0.016 J	
FIELD PARAMETERS																						
TEMPERATURE	C	11.8	15.27	17.24	13.04	15.84	16.63	11.53	14.17	13.62	18.66	14.69	14.85	17.14	9.76	12.41	15.73	19.45	15.09	15.93	19.6	13.34
ALKALINITY	MG/L		300							10 U							75					
CARBON DIOXIDE			105							130							19					
DISSOLVED OXYGEN			0.2	0.12	4.68			1.47		1	0.1	13.83			1.21		2	1.81	7.25			4.32
DISSOLVED OXYGEN - METER		0.64	6.3			1.53	0.95		1.63	0.74			0.81	1.5		5.41	0.89			0.39	2.02	
HYDROGEN SULFIDE (H2S)			0							0							0					
IRON(+2)			3.3 >							0.54							5.19					
MANGANESE(+2)			1.5							2.1							1					
NITRITE-N			0.003							0.007							0.004					
SULFIDE			0							0.01							0					
SPECIFIC CONDUCTANCE	MS/CM	0.568	1.75	0.502	0.479	0.446	402	0.707	0.483	0.355	0.43	0.323	0.359	339	0.472	0.225	0.582	0.232	0.18	0.16	0.168	0.209
OXIDATION REDUCTION POTENTIAL	MV	7.1	-0.8	124	28.2	641	527.4	3	154.2	350	438.1	266	-335.8	566.9	322	79.7	152	54	231	286.3	168	175
TURBIDITY	NTU	2.2	0.8	0	1.1	0.2	0	8	2.8	1.06	15.5	7.9	8.7	8.4	4.1	9.2	2.2	5.13	2.3	7.8	0.7	2.9
PH	S.U.	6.65	6.54	5.75	6.59	5.2	5.91	6.82	5.84	4.82	5.28	5	5.13	5	5	6.28	5.84	5.6	5.5	6.32	6.1	6.57
MISCELLANEOUS PARAMETERS																						
AMMONIA-N	MG/L	0.04							0.02							0.03						
CHLORIDE			14		25 J		22			5		5 J		4			10		11 J		7	
NITRITE/NITRATE-N		0.02 U	0.05 U		0.45		0.025 U		0.54	0.7		0.75		0.36		0.6	0.49		0.88		0.025 U	
SULFATE			270		8700		59			170		150		200			70		32		24	
TOTAL ORGANIC CARBON			1.7				1.1							1.2			1.4				2.6	

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

		16MWT06							16MWT09							16MWT10						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	04/28/03	11/08/03	08/24/04	02/05/05	05/07/05	08/12/05	01/08/06	No Sample	11/22/03	08/17/04	02/06/05	05/07/05	08/14/05	01/07/06	No Sample	11/21/03	08/17/04	02/06/05	05/07/05	08/13/05	01/09/06
EXPLOSIVES																						
1,3,5-TRINITROBENZENE	UG/L	0.34 U	0.25 UJ	1.8	2	3.4	1.9	2.3		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
1,3-DINITROBENZENE		0.34 U	0.25 U	0.25 U	0.24 U	0.264 UJ	0.28 U	0.25 U		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE			0.5 U							0.543 U							0.575 U					
2,4,6-TRINITROTOLUENE		0.34 U	0.25 UJ	4.8	6.2	12	4.1	6.1		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
2,4-DIAMINO-6-NITROTOLUENE			0.27 J		0.31 J		1.3			0.272 U		0.24 U		0.26 U			0.287 U		0.255 U		0.27 U	
2,4-DINITROTOLUENE		0.34 U	0.25 UJ	0.8	1.2	1 J	0.68	1.1		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
2,6-DIAMINO-4-NITROTOLUENE			0.25 U		0.24 U		0.28 U			0.272 U		0.24 U		0.26 U			0.287 U		0.255 U		0.27 U	
2,6-DINITROTOLUENE		0.34 U	0.25 UJ	0.25 U	0.92 J	1.3 J	0.52 J	0.25 U		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
2-AMINO-4,6-DINITROTOLUENE		0.34 U	4.2 J	29 J	34	60 J	28 J	38		0.31 J	0.27 U	0.26 J	0.269 U	0.27 J	0.25 J		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
2-NITROTOLUENE		0.34 U	0.25 UJ	0.25 U	0.24 U	0.264 UJ	0.28 U	0.25 U		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
3,5-DINITROANILINE			0.25 U		0.24 U		0.28 U			0.272 UJ		0.24 U		0.26 U			0.287 U		0.255 U		0.27 U	
3-NITROTOLUENE		0.34 U	0.25 UJ	0.25 U	0.24 U	0.264 UJ	0.28 U	0.47 J		0.272 U	1.5 J	1.8 J	0.269 U	1.1 J	1.5 J		0.287 U	2.1 J	1.8 J	0.248 U	0.34 J	0.24 U
4,4'-TN-AZOXY					0.48 U		0.56 U					0.48 U		0.52 U					0.51 U		0.54 U	
4-AMINO-2,6-DINITROTOLUENE		0.34 U	1.5	14	18	31	13	15		0.69 J	0.27 U	0.61 J	0.269 U	0.68	0.63		0.287 U	0.27 U	0.42 J	0.248 U	0.47 J	0.5 J
4-NITROTOLUENE		0.34 U	0.25 UJ	0.25 U	0.24 U	0.264 UJ	0.28 U	0.25 U		0.272 U	0.27 U	0.24 U	0.269 U	0.26 U	0.25 U		0.287 U	0.27 U	0.255 U	0.248 U	0.27 U	0.24 U
RDX		4	1.8	8.8	7.3	11	13	4.6		110	79	92	98	100	110		55	55	50	51	58	52
DNX			0.25 U		0.24 U		0.28 U			0.272 U		0.24 U		0.26 U			0.287 U		0.255 U		0.27 U	
MNX			0.25 U		0.24 U		0.33 J			1.1		0.43 J		0.46 J			0.5 J		0.3 J		0.27 U	
TNX			0.25 U		0.24 U		0.28 U			0.272 U		0.24 U		0.26 U			0.287 U		0.255 U		0.27 U	
VOLATILES																						
TRICHLOROETHENE	UG/L	35000	250000	330000	440000	510000	480000	370000		7.6	7.1	10	6.9	9.1	8.7		1.9	1.9	2.4	1.6	1.4	2
CIS-1,2-DICHLOROETHENE		600	4200	4100	5200	5600	4600	4800		0.2 J	0.3 U	0.3 U	0.3 U	0.3 U	1 U		0.2 J	0.3 U	0.3 U	0.3 U	0.3 U	1 U
VINYL CHLORIDE		65 J	340 J	390 J	660	610	350 J	450		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U
ETHANE			7.7		2.3		1.5					0.074		0.044			0.33		0.082		0.054	
ETHENE			65		29		22					0.081		0.079			0.16		0.03		0.036	
FIELD PARAMETERS																						
TEMPERATURE	C	15	14.55	18.77	15.57	17.46	20.27	14.26		16.56	19.68	12.18	14.1	17.77	12.4		14.77	16.75	14.1	15.88	17.85	12.8
ALKALINITY	MG/L		200														10 U					
CARBON DIOXIDE			40														280					
DISSOLVED OXYGEN			1.5	0.39	2.64			1.33			0.37	1.41			1.31		0.35	0.14	7.14			1.83
DISSOLVED OXYGEN - METER		0.48	1.67			2.69	3.06			2.33			1.51	1.09			1.28			1.1	220	
HYDROGEN SULFIDE (H2S)			0														0					
IRON(+2)			0.03														3.3 >					
MANGANESE(+2)			3.8														22 >					
NITRITE-N			0.016														0.002					
SULFIDE			0.07														0.02					
SPECIFIC CONDUCTANCE	MS/CM	0.516	1.216	1.219	0.889	0.762	862	1.6		0.502	0.937	0.456	0.432	522	0.655		1.178	1.284	1.168	0.867	854	1.63
OXIDATION REDUCTION POTENTIAL	MV	-106	188.6	402	14.5	497	729	151		329.8	199.7	169.4	525	664.8	232		328.9	501.2	315.2	337	890.5	315
TURBIDITY	NTU	8.8	1.99	29	17.9	15	5.2	29		4.82	2.32	0	1	0	0.95		5.56	6.31	4.3	7.4	6.9	6.5
PH	S.U.	7.7	6.49	4.69	5.96	6	6	6.26		4.1	4.7	4.82	5	4.11	4.61		3.72	3.21	3.31	3.59	3	3.57
MISCELLANEOUS PARAMETERS																						
AMMONIA-N	MG/L	0.57																				
CHLORIDE			47		54 J		58			14 U		13 J		12			8 J		9 J		7	
NITRITE/NITRATE-N		0.5	0.025 U		0.025 U		0.025 U			0.05 U		0.56		0.025 U			0.27 J		0.72		0.27	
SULFATE			520		480		490			210 U		290		240			980 J		1100		880	
TOTAL ORGANIC CARBON							4.1							1							1.7	

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

		16MWT13							16MWT17						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	No Sample	11/22/03	08/18/04	02/05/05	05/08/05	08/14/05	01/22/06	No Sample	12/05/03	08/25/04	02/05/05	05/07/05	08/14/05	01/22/06
EXPLOSIVES															
1,3,5-TRINITROBENZENE	UG/L		0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
1,3-DINITROBENZENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE			0.549 U							0.538 U					
2,4,6-TRINITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
2,4-DIAMINO-6-NITROTOLUENE			0.275 U		0.264 U		0.29 U			0.269 U		0.24 U		0.27 U	
2,4-DINITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
2,6-DIAMINO-4-NITROTOLUENE			0.275 U		0.264 U		0.29 U			0.269 U		0.24 U		0.27 U	
2,6-DINITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
2-AMINO-4,6-DINITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
2-NITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
3,5-DINITROANILINE			0.275 U		0.264 U		0.29 U			0.269 U		0.24 U		0.27 U	
3-NITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
4,4'-TN-AZOXY					0.528 U		0.59 U					0.48 U		0.53 U	
4-AMINO-2,6-DINITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
4-NITROTOLUENE			0.275 U	0.271 U	0.264 U	0.298 U	0.29 U	0.25 U		0.269 U	0.27 U	0.24 U	0.281 U	0.27 U	0.26 U
RDX			6.7	1.1	0.264 U	0.298 U	0.29 U	0.42 J		4.3	5.2	4.9	4.9	4.5	4.5
DNX			0.275 U		0.264 U		0.29 U			0.269 U		0.24 U		0.27 U	
MNX			0.275 U		0.264 U		0.29 U			0.269 U		0.24 U		0.27 U	
TNX			0.275 U		0.264 U		0.29 U			0.269 U		0.24 U		0.27 U	
VOLATILES															
TRICHLOROETHENE	UG/L		62000	28000	1900	2200	130	5100		11000	19000	18000	19000	19000	22000
CIS-1,2-DICHLOROETHENE			280	140	8.2	12	1.5	20		210	290	310	260	290	340
VINYL CHLORIDE			30 U	0.8 J	0.3 U	0.3 U	0.3 U	0.6 U		2.1	60 U	3.8	6 U	3 U	3 U
ETHANE			0.45		0.065		0.03					0.6		0.74	
ETHENE			0.67		0.035		0.1					0.17		0.2	
FIELD PARAMETERS															
TEMPERATURE	C		21.88	18.44	13.12	16.23	21.63	12.04		11.63	18.56	13.97	13.78	18.29	11.48
ALKALINITY	MG/L		10 U												
CARBON DIOXIDE			140												
DISSOLVED OXYGEN			6	0.08	3.22			0.52			0.18	0.89			0.66
DISSOLVED OXYGEN - METER			7.27			0	0.41			0.63			-17.04	20.43	
HYDROGEN SULFIDE (H2S)			0												
IRON(+2)			3.3 >												
MANGANESE(+2)			4.1												
NITRITE-N			0.008												
SULFIDE			0.02												
SPECIFIC CONDUCTANCE	MS/CM		0.433	0.42	0.299	0.232	0.234	0.326		0.649	0.786	0.595	0.474	0.658	1.24
OXIDATION REDUCTION POTENTIAL	MV		264.8	541	12	100.1	108.3	110		111.5	274.3	100.9	173.2	92.3	108
TURBIDITY	NTU		8.67	105	380	30	5.8	0		5.92	9.1	3.27	4.6	2.5	7.4
PH	S.U.		4.72	5.42	5.99	5.18	6.82	5.82		5.58	4.59	5.17	5.4	6.31	5.24
MISCELLANEOUS PARAMETERS															
AMMONIA-N	MG/L														
CHLORIDE			17 U		21 J		23			120		110 J		120	
NITRITE/NITRATE-N			0.19 J		0.025 U		0.025 U			0.05 UJ		0.025 U		0.025 U	
SULFATE			180 U		50		37			150		190		260	
TOTAL ORGANIC CARBON							1.3							1.7	

A blank cell indicates that no sample was collected or analysis was conducted for the parameter.

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

UJ – Indicates that the chemical was not detected; however, the detection limit (sample-specific detection limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.

J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

> - Indicates that the true value is probably greater than the reported value. This "qualifier flag" is used to identify reported values that exceed the calibration range of field measurements but could not be re-analyzed for various reasons.

TABLE 3-2

DESCRIPTIVE STATISTICS FOR
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146) ROUND 7 GROUNDWATER IN THE PENNSYLVANIAN UPPER WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Volatile Organic Compounds (ug/L)							
1,1,2,2-Tetrachloroethane	1/8	1.6	1.6	0.3 - 3	0.694	1.60	16GWT0608
1,1,2-Trichloroethane	3/8	4.9	200	0.3 - 1	31.3	82.6	16GWT0608
1,1-Dichloroethene	2/8	7.7 J	150	0.3 - 1	20.1	79.0	16GWT0608
1,2-Dichloroethane	1/8	2.4	2.4	0.3 - 3	0.794	2.40	16GWT0608
4-Methyl-2-Pentanone	1/8	25	25	0.5 - 5	4.78	25.0	16GWT0608
Acetone	1/8	16 J	16 J	0.5 - 5	3.66	16.0	16GWT0608
Carbon Disulfide	1/8	4	4	0.3 - 3	0.994	4.00	16GWT0608
Carbon Tetrachloride	1/8	14	14	0.3 - 3	2.24	14.0	16GW0307
Chloroform	3/8	2.4	14	0.3 - 3	2.92	6.80	16GWT0608
cis-1,2-Dichloroethene	3/8	20	4800	0.3 - 1	645	1720	16GWT0608
Ethylbenzene	1/8	4.2	4.2	0.3 - 3	1.02	4.20	16GWT0608
Tetrachloroethene	1/8	180	180	0.3 - 3	23.0	180	16GWT0608
Toluene	1/8	270	270	0.3 - 3	34.2	270	16GWT0608
Total Xylenes	1/8	6.6	6.6	0.3 - 3	1.32	6.60	16GWT0608
trans-1,2-Dichloroethene	2/8	5.3 J	19	0.3 - 1	3.37	12.3	16GWT0608
Trichloroethene	7/8	1.8	370000	1 - 1	49640	56731	16GWT0608
Vinyl Chloride	1/8	450	450	0.3 - 3	56.7	450	16GWT0608
Explosives (ug/L)							
1,3,5-Trinitrobenzene	1/8	2.3	2.3	0.24 - 0.27	0.400	2.30	16GWT0608
2,4,6-Trinitrotoluene	1/8	6.1	6.1	0.24 - 0.27	0.875	6.10	16GWT0608
2,4-Dinitrotoluene	1/8	1.1	1.1	0.24 - 0.27	0.250	1.10	16GWT0608
2-Amino-4,6-Dinitrotoluene	3/8	0.25 J	38	0.24 - 0.27	4.93	12.9	16GWT0608
3-Nitrotoluene	2/8	0.47 J	1.5 J	0.24 - 0.27	0.343	0.985	16GWT0906
4-Amino-2,6-Dinitrotoluene	5/8	0.38 J	15	0.25 - 0.27	2.23	3.49	16GWT0608
HMX	5/8	1 J	12 J	0.25 - 0.27	4.00	6.32	16GWT0906
RDX	7/8	0.42 J	120	0.27 - 0.27	43.6	49.8	16GWT0407
Field Parameters							
Dissolved Oxygen (mg/L)	8/8	0.52	4.32	- - -	1.58	1.58	16GWT0407
Oxidation Reduction Potential (MV)	8/8	3	322	- - -	177	177	16GW0307
pH	8/8	3.57	6.82	- - -	5.49	5.49	16GW0208
Specific Conductance (ms/cm)	8/8	0.209	1.63	- - -	0.855	0.855	16GWT1006
Temperature (C)	8/8	9.76	14.26	- - -	12.2	12.2	16GWT0608
Turbidity (NTU)	7/7	0.95	29	- - -	8.41	8.41	16GWT0608

Associated Samples
16GW0208
16GW0307
16GWT0407
16GWT0608
16GWT0906
16GWT1006
16GWT1306
16GWT1706
16GWT1706-D

TABLE 3-3

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
MIDDLE PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

		16MW04							16MWT12						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	04/23/03	10/26/03	08/25/04	02/06/05	05/06/05	08/13/05	01/07/06	No Sample	11/21/03	08/24/04	02/06/05	05/07/05	08/13/05	01/07/06
EXPLOSIVES															
1,3,5-TRINITROBENZENE	UG/L	0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
1,3-DINITROBENZENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE			0.5 U							0.538 U					
2,4,6-TRINITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
2,4-DIAMINO-6-NITROTOLUENE			0.25 U		0.264 U		0.25 U			0.269 U		0.26 U		0.26 U	
2,4-DINITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
2,6-DIAMINO-4-NITROTOLUENE			0.25 U		0.264 U		0.25 U			0.269 U		0.26 U		0.26 U	
2,6-DINITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
2-NITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
3,5-DINITROANILINE			0.25 U		0.264 U		0.25 U			0.269 U		0.26 U		0.26 U	
3-NITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
4,4'-TN-AZOXY					0.528 U		0.5 U					0.52 U		0.51 U	
4-AMINO-2,6-DINITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
4-NITROTOLUENE		0.165 U	0.25 U	0.264 U	0.264 U	0.269 U	0.25 U	0.24 U		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
RDX		1.7	1.9	0.66	0.58	0.59	0.64	0.85		0.269 U	0.264 U	0.26 U	0.266 U	0.26 U	0.25 U
DNX			0.25 U		0.264 U		0.25 U			0.269 U		0.26 U		0.26 U	
MNX			0.25 U		0.264 U		0.25 U			0.269 U		0.26 U		0.26 U	
TNX			0.25 U		0.264 U		0.25 U			0.269 U		0.26 U		0.26 U	
VOLATILES															
TRICHLOROETHENE	UG/L	0.5 J	0.3 U	0.7 J	1.4	0.7 J	0.9 J	1 U		0.3 U	0.3 U	0.5 J	0.3 U	0.3 U	1 U
CIS-1,2-DICHLOROETHENE		0.3 J	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U
VINYL CHLORIDE		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1 U
ETHANE					0.005 U		0.01 J			0.37 J		0.17		0.13	
ETHENE					0.005 U		0.018 J			0.031 J		0.12		0.028	
FIELD PARAMETERS															
TEMPERATURE	C	13.31	13.21	15.03	12.87	14.13	15.79	11.82		16.04	17.81	12.28	16.46	16.75	12.41
ALKALINITY	MG/L									10 U					
CARBON DIOXIDE										260					
DISSOLVED OXYGEN					5.79			0.55		0.1	3.66	4.22			0.59
DISSOLVED OXYGEN - METER		0.29	0.54			1.57	2.01			0.64			-1.57	0.36	
HYDROGEN SULFIDE (H2S)										0					
IRON(+2)										3.3 >					
MANGANESE(+2)										9.4					
NITRITE-N										0					
SULFIDE										0.01					
SPECIFIC CONDUCTANCE	MS/CM	0.72	0.735	0.838	0.672	0.738	0.703	1.29		0.795	2.785	1.898	2.014	1.165	1.81
OXIDATION REDUCTION POTENTIAL	MV	207.4	328.7	124	319	274.3	340	277		306.8	220.7	134.6	230.2	155.9	191
TURBIDITY	NTU	0.5	0.13	8.9	0.05	0.49	0.5	0.4		4.11	7.63	1.7	1.7	0	2.2
PH	S.U.	3.68	3.65	4.1	4.5	4.06	3.33	3.92		4.27	4.64	4.89	4.65	6.68	4.88
MISCELLANEOUS PARAMETERS															
AMMONIA-N	MG/L	0.08													
CHLORIDE			12		15 J		14			15 U		15 J		13	
NITRITE/NITRATE-N		0.02 U	0.05 U		0.025 U		0.025 U			0.025 U		0.025 U		0.025 U	
SULFATE			430		660		650			260 J		1300		980	
TOTAL ORGANIC CARBON							1							1	

TABLE 3-3

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
MIDDLE PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

A blank cell indicates that no sample was collected or analysis was conducted for the parameter.
U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.
J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.
> - Indicates that the true value is probably greater than the reported value. This "qualifier flag" is used to identify reported values that exceed the calibration range of field measurements but could not be re-analyzed for various reasons.

TABLE 3-4

DESCRIPTIVE STATISTICS FOR
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146) ROUND 7 GROUNDWATER IN THE PENNSYLVANIAN MIDDLE WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Explosives (ug/L)							
RDX	1/2	0.85	0.85	0.25 - 0.25	0.488	0.850	16GW0407
Field Parameters							
Dissolved Oxygen (mg/L)	2/2	0.55	0.59	- - -	0.570	0.570	16GWT1206
Oxidation Reduction Potential (MV)	2/2	191	277	- - -	234	234	16GW0407
pH	2/2	3.92	4.88	- - -	4.40	4.40	16GWT1206
Specific Conductance (ms/cm)	2/2	1.29	1.81	- - -	1.55	1.55	16GWT1206
Temperature (C)	2/2	11.82	12.41	- - -	12.1	12.1	16GWT1206
Turbidity (NTU)	2/2	0.4	2.2	- - -	1.30	1.30	16GWT1206

Associated Samples
16GW0407
16GWT1206

TABLE 3-5

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
LOWER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

		16MWT11							16MWT15						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	No Sample	12/06/03	08/25/04	02/04/05	05/06/05	08/12/05	01/22/06	No Sample	12/06/03	08/17/04	02/05/05	05/07/05	08/14/05	01/21/06
EXPLOSIVES															
1,3,5-TRINITROBENZENE	UG/L		0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
1,3-DINITROBENZENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE			0.495 UJ							0.495 U					
2,4,6-TRINITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
2,4-DIAMINO-6-NITROTOLUENE			0.248 UJ		0.316 U		0.29 U			0.248 U		0.266 U		0.26 U	
2,4-DINITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
2,6-DIAMINO-4-NITROTOLUENE			0.248 UJ		0.316 U		0.29 U			0.248 U		0.266 U		0.26 U	
2,6-DINITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
2-NITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
3,5-DINITROANILINE			0.248 UJ		0.316 U		0.29 U			0.248 U		0.266 U		0.26 U	
3-NITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
4,4'-TN-AZOXY					0.632 U		0.59 U					0.532 U		0.52 U	
4-AMINO-2,6-DINITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
4-NITROTOLUENE			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
RDX			0.248 UJ	0.242 U	0.316 U	0.266 U	0.29 U	0.26 U		0.248 U	0.26 U	0.266 U	0.271 U	0.26 U	0.25 U
DNX			0.248 UJ		0.316 U		0.29 U			0.248 U		0.266 U		0.26 U	
MNX			0.248 UJ		0.316 U		0.29 U			0.248 U		0.266 U		0.26 U	
TNX			0.248 UJ		0.316 U		0.29 U			0.248 U		0.266 U		0.26 U	
VOLATILES															
TRICHLOROETHENE	UG/L		0.3 U	0.3 U	0.3 U	52 U	0.3 U	0.3 U		0.3 U	0.3 U	0.6 J	0.3 U	0.3 U	0.3 U
CIS-1,2-DICHLOROETHENE			0.3 U	0.3 U	0.3 U	30 U	0.3 U	0.3 U		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
VINYL CHLORIDE			0.3 U	0.3 U	0.3 U	30 U	0.3 U	0.3 U		0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
ETHANE					0.34		0.44			1		2.5		0.99	
ETHENE					0.075		0.074			0.22		0.26		0.41	
FIELD PARAMETERS															
TEMPERATURE	C		7.29	24.93	11.82					12.78	15.85	13.89	16.87	19.23	13.73
ALKALINITY	MG/L									250					
CARBON DIOXIDE										10 U					
DISSOLVED OXYGEN				0.87	9.72					3.5	1.77	1.36			0.6
DISSOLVED OXYGEN - METER			4.51							2.57			-0.04	1.09	
HYDROGEN SULFIDE (H2S)										0					
IRON(+2)										0					
MANGANESE(+2)										0.3					
NITRITE-N										0.007					
SULFIDE										0.01					
SPECIFIC CONDUCTANCE	MS/CM		0.256	1.004	0.756					0.392	0.411	0.354	0.301	0.326	0.439
OXIDATION REDUCTION POTENTIAL	MV		188	95	-43.9					174.1	143.1	-21.7	238.4	61	103
TURBIDITY	NTU		650	4.7	2.8					22.5	2	0.6	0	0.65	4.6
PH	S.U.		7.35	5.47	6.98					7.99	6.15	7.43	7.06	6.95	7.52
MISCELLANEOUS PARAMETERS															
CHLORIDE	MG/L				5		5			4		3 J		2	
NITRITE/NITRATE-N					0.025 U		0.025 U			0.05 UJ		0.025 U		0.025 U	
SULFATE					4		4			8		0.5 U		0.5 U	
TOTAL ORGANIC CARBON							1 U			2.6				1 U	

TABLE 3-5

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 7
LOWER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

A blank cell indicates that no sample was collected or analysis was conducted for the parameter.
U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.
UJ – Indicates that the chemical was not detected; however, the detection limit (sample-specific detection limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.
J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

TABLE 3-6

DESCRIPTIVE STATISTICS FOR
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146) ROUND 7 GROUNDWATER IN THE PENNSYLVANIAN LOWER WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Volatile Organic Compounds (ug/L)							
Acetone	1/2	1.3 J	1.3 J	0.5 - 0.5	0.775	1.30	16GWT1106
Field Parameters							
Dissolved Oxygen (mg/L)	1/1	0.6	0.6	- - -	0.6	0.6	16GWT1506
Oxidation Reduction Potential (MV)	1/1	103	103	- - -	103	103	16GWT1506
pH	1/1	7.52	7.52	- - -	7.52	7.52	16GWT1506
Specific Conductance (ms/cm)	1/1	0.439	0.439	- - -	0.439	0.439	16GWT1506
Temperature (C)	1/1	13.73	13.73	- - -	13.73	13.73	16GWT1506
Turbidity (NTU)	1/1	4.6	4.6	- - -	4.6	4.6	16GWT1506

Associated Samples
16GWT1106
16GWT1506

TABLE 3-7

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 SURFACE WATER
ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA

		16SW/SD10							16SW/SD12						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	No Sample	No Sample	No Sample	02/03/05	05/08/05	08/27/05	01/05/06	No Sample	10/25/03	11/02/04	02/03/05	05/08/05	08/27/05	01/05/06
EXPLOSIVES															
1,3,5-TRINITROBENZENE	µg/L				0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
1,3-DINITROBENZENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE										0.5 U					
2,4,6-TRINITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
2,4-DIAMINO-6-NITROTOLUENE										0.25 U					
2,4-DINITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
2,6-DIAMINO-4-NITROTOLUENE										0.25 U					
2,6-DINITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
2-AMINO-4,6-DINITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
2-NITROTOLUENE					0.242 U	0.6		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
3,5-DINITROANILINE										0.25 U					
3-NITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
4-AMINO-2,6-DINITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
4-NITROTOLUENE					0.242 U	0.25 U		0.24 U		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
RDX					0.242 U	0.25 U		0.77		0.25 U	0.255 U	0.24 U	0.25 U		0.248 U
DNX										0.25 U					
MNX										0.25 U					
TNX										0.25 U					
VOLATILES															
TRICHLOROETHENE	µg/L				0.3 U	0.3 U		0.3 U		15	5.6	20	6.7		11
CIS-1,2-DICHLOROETHENE					0.3 U	0.3 U		0.3 U		1.4	0.3 U	1.3	0.3 U		0.3 U
VINYL CHLORIDE					0.3 U	0.3 U		0.3 U		0.3 U	0.3 U	0.3 U	0.3 U		0.3 U
FIELD PARAMETERS															
TEMPERATURE	C			10.74	5.44	13.71		5.93		13.24	16.24	5.95	13.92		6.05
DISSOLVED OXYGEN	MG/L			6.02	8.95			8.78			9.38	10.07			9.65
DISSOLVED OXYGEN - METER						10.04				6			10.49		
SPECIFIC CONDUCTANCE	MS/CM			0.066	0.126	0.135		0.182		0.204	0.1	0.164	0.164		0.239
OXIDATION REDUCTION POTENTIAL	MV			120	218	213		180		195.4	51.4	218	211		182
TURBIDITY	NTU			46.7	6.9	1.5		11		4.06	38.4	3	3.5		2.2
PH				7.26	3.65	6.96		7.28		7.21	7.16	3.75	6.76		7.29
MISCELLANEOUS PARAMETERS															
NITRITE/NITRATE-N	MG/L									0.11	0.43				

TABLE 3-7

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 SURFACE WATER
ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA

		16SW/SD13							16SW/SD30						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
PARAMETER	UNITS	No Sample	10/25/03	11/02/04	02/03/05	05/08/05	08/27/05	01/05/06	No Sample	10/25/03	10/26/04	02/03/05	05/08/05	08/27/05	01/05/06
EXPLOSIVES															
1,3,5-TRINITROBENZENE	UG/L		0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
1,3-DINITROBENZENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
2,2',6,6'-TETRANITRO-4,4'-AZOXYTOLUENE			0.5 U												
2,4,6-TRINITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
2,4-DIAMINO-6-NITROTOLUENE			0.25 U												
2,4-DINITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
2,6-DIAMINO-4-NITROTOLUENE			0.25 U												
2,6-DINITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
2-AMINO-4,6-DINITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.29 J	0.245 U	0.39 J		0.28 J
2-NITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
3,5-DINITROANILINE			0.25 U												
3-NITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
4-AMINO-2,6-DINITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.63	0.44 J	0.76		0.55
4-NITROTOLUENE			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			0.24 U	0.245 U	0.25 U		0.266 U
RDX			0.25 U	0.25 U	0.24 U	0.245 U		0.242 U			24	14	13		19
DNX			0.25 U												
MNX			0.25 U												
TNX			0.25 U												
VOLATILES															
TRICHLOROETHENE			0.3 U	0.3 U	0.3 U	0.3 U		0.3 U			0.3 U	0.3 U	0.3 U		0.3 U
CIS-1,2-DICHLOROETHENE			0.3 U	0.3 U	0.3 U	0.3 U		0.3 U			0.3 U	0.3 U	0.3 U		0.3 U
VINYL CHLORIDE			0.3 U	0.3 U	0.3 U	0.3 U		0.3 U			0.3 U	0.3 U	0.3 U		0.3 U
FIELD PARAMETERS															
TEMPERATURE	C		13.68	16.03	5.25	12.66		5.46			13.28	3.12	14.56		5.45
DISSOLVED OXYGEN	MG/L			9.18	10.93			9.67			8.9	11.15			9.92
DISSOLVED OXYGEN - METER			2.94			8.45							10.44		
SPECIFIC CONDUCTANCE	MS/CM		0.168	0.84	0.175	0.166		0.247			0.159	0.14	0.133		0.22
OXIDATION REDUCTION POTENTIAL	MV		68.3	49.4	203	203		175			53.6	188	207		162
TURBIDITY	NTU		15.9	22.8	2.2	3.3		4.8			9.49	3.1	9		8.4
PH			6.4	7.64	3.83	6.48		7.45			7.37	4.16	7.07		7.44
MISCELLANEOUS PARAMETERS															
NITRITE/NITRATE-N	MG/L		0.27	0.55											

A blank cell indicates that no sample was collected or analysis was conducted for the parameter.

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

TABLE 3-8

DESCRIPTIVE STATISTICS FOR
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146) ROUND 7 SURFACE WATER
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Volatile Organic Compounds (ug/L)							
Trichloroethene	1/4	11	11	0.3 - 0.3	2.86	11.0	16SW1205
Explosives (ug/L)							
2-Amino-4,6-Dinitrotoluene	1/4	0.28 J	0.29 J	0.24 - 0.248	0.161	0.280	16SW3004-D
4-Amino-2,6-Dinitrotoluene	1/4	0.55	0.55	0.24 - 0.248	0.229	0.550	16SW3004, 16SW3004-D
HMX	1/4	4.4 J	4.6 J	0.24 - 0.248	1.24	4.60	16SW3004
RDX	2/4	0.77	19	0.242 - 0.248	5.00	9.89	16SW3004, 16SW3004-D
Field Parameters							
Dissolved Oxygen - Meter (mg/L)	4/4	8.78	9.92	- - -	9.51	9.51	16SW3004
Oxidation Reduction Potential (mV)	4/4	162	182	- - -	175	175	16SW1205
pH	4/4	7.28	7.45	- - -	7.37	7.37	16SW1305
Specific Conductance (MS/CM)	4/4	0.182	0.247	- - -	0.222	0.222	16SW1305
Temperature (C)	4/4	5.45	6.05	- - -	5.72	5.72	16SW1205
Turbidity (NTU)	4/4	2.2	11	- - -	6.60	6.60	16SW1004

Associated Samples
16SW1004
16SW1205
16SW1305
16SW3004
16SW3004-D

4.0 DATA EVALUATION

Section 4 presents groundwater and surface monitoring data for Rounds 1 through 7. The information presented includes potentiometric surface contours and temporal plots for each groundwater and surface sampling location included in the SWMU 16 long term monitoring program. The objective of the long term monitoring program at SWMU 16 is to collect enough monitoring data (up to nine rounds) to determine whether residual explosives are naturally degrading and to provide data for making remedy decisions for residual explosives and VOC contamination to complete the CMS.

The information being provided in this monitoring program fulfills the requirements established by the U.S. EPA Region 5 as described in the document entitled "Region 5 Framework for Monitored Natural Attenuation Decisions for Groundwater" (U.S. EPA 2000). The framework summarizes the current state-of-the-science and U.S. EPA policy on the use of MNA. The framework also provides technical direction for the collection of specific primary and secondary monitoring information to demonstrate a net loss of contaminants and processes responsible for the loss.

The primary MNA monitoring information requirements are identified below in bold type along with supporting information being provided by the SWMU 16 long term monitoring program:

- **Monitoring data should include analytical results for the contaminants of concern and their degradation products from nine or more rounds of samples collected under non-pumping conditions over a period of three to five years.** The SWMU 16 long term monitoring program is providing analytical results for select explosives and VOCs. RDX is considered to be the principal explosive chemical of concern because it is a site-related contaminant and it has been detected more frequently and at higher concentrations that any other explosive at SWMU 16.. Degradation products of RDX are DNX, MNX, and TNX. For reasons similar to RDX, TCE is considered to be the primary VOC of concern and has the degradation products cis-1,2-dichloroethene, vinyl chloride, ethene, ethane, and methane. The long-term monitoring program is scheduled to include nine rounds of sampling, under non-pumping conditions, to provide information on trends in groundwater concentrations of explosives and explosives degradation productions. To date, 7 rounds of groundwater sampling has been conducted: Round 1 (February through May 2003); Round 2 (October 2003 through January 2004); Round 3 (July through November 2004), Round 4 (February 2005), Round 5 (May 2005), Round 6 (August 2005), and Round 7 (January 2006). The remaining two rounds of sampling will be completed in 2006, which covers a monitoring period of approximately three years.

- **There should be at least two years of quarterly sampling to evaluate seasonal effects on the contaminant concentrations.** At the completion of the ninth round of sampling at SWMU 16 in 2006, quarterly monitoring will have been conducted for approximately 3 years.

- **The data should be collected from appropriately located sampling points, including within the source area, within the center of the plume and at the leading edges of the plume.** The SWMU 16 long term monitoring program includes 12 wells. The location of each well relative to the contamination plume is discussed in Section 4.1 below.

- **Samples should be collected from points located vertically (above and below) and horizontally (upgradient and downgradient) outside the area of groundwater contamination.** The long term monitoring program includes monitoring wells located in three (Puz, Pmz, and Plz) water bearing zones to evaluate if contamination is migrating from the upper aquifer to the lower aquifer. In addition, the monitoring program includes monitoring wells positioned upgradient and downgradient of the source area, within the source plume and along the outside area of the groundwater contamination. Explosives contamination has been detected in the Puz and Pmz water bearing zones, but not in the Plz water bearing zone. VOCs have been detected in the all three water bearing zones.

- **The most recent analytical data on groundwater should be no more than two years old at the time of evaluation.** The ninth round of sampling is expected to be completed in August 2006. A final report evaluating the MNA program through nine rounds of sampling is expected to be issued in the fall of 2006. As a result, the most recent analytical data will be no more than two years old.

- **Demonstration of a trend of decreasing contamination concentration must be clear and meaningful and be based on statistical tests which indicate a high degree of confidence in the apparent trend line.** The SWMU 16 MNA report for nine rounds of sampling will include temporal plots of RDX and TCE, and their associated degradation by-product concentrations. A statistical summary of analytical data will be included for each round of sampling and in the final report.

- **Additional rounds of samples, beyond nine rounds, may be required to demonstrate the decreasing trend.** SWMU 16 MNA monitoring data will be evaluated after nine rounds and a decision will be made if additional data is needed.

The secondary MNA monitoring information requirements are identified below in bold type along with supporting information being provided by the SWMU 16 long term monitoring program:

- **The monitoring data should be collected from appropriate locations that are distributed both vertically and horizontally throughout the plume.** The long term monitoring program includes monitoring wells located in the Puz, Pmz, and Plz water bearing zones to evaluate if contamination is migrating downward to lower aquifers.. In addition, the monitoring program includes monitoring wells positioned upgradient and downgradient of the source area, within the source plume and along the outside area of the groundwater contamination. As stated previously, explosives contamination has been detected in the Puz and Pmz zones, but not in the Plz aquifer. VOCs have been detected in all 3 water bearing zones.

- **Sample locations should consider heterogeneities in geologic structures and in the spatial distribution of contaminants. Groundwater flow paths and rates should be fully and accurately defined.** Groundwater elevations are being measured during each sampling round to develop potentiometric analyses of groundwater direction and flow rates and the results will be presented in the final MNA report.

- **Locations should be sampled under non-pumping conditions and should include the following information:**

  - **Contaminants of concern and potential degradation by-products.** All sampling is being conducted under non-pumping conditions. The SWMU 16 monitoring program is providing analytical results for RDX and TCE, which are the primary chemicals of concern, and their associated degradation products which are identified in Section 3.

  - **Routine and Other Indicator Parameters.** The monitoring data includes the routine indicator parameters dissolved oxygen (DO), oxidation reduction potential (ORP), pH, specific conductance, temperature, turbidity, and nitrite/nitrate concentrations. Other parameters measured in the MNA monitoring that can be used to support decision making include alkalinity, chloride, nitrite, nitrate, dissolved methane, iron (II) and iron (III), sulfate, sulfide, and total organic carbon (TOC).

  - **Vertical and horizontal characterization of the distribution of hydraulic conductivity and its affect on contaminant concentrations.** Information collected in nine rounds of sampling will be evaluated and used to characterize vertical and horizontal hydraulic conductivity.

- **Water levels should be measured to determine groundwater flow direction.** Groundwater elevations are being measured at each well during each of the nine sampling rounds and the results will be presented in the final MNA report in the form of potentiometric surface figures.

- **Seasonal variations and trends should be evaluated by obtaining data from different times of the year to determine if changes in contaminant concentrations, indicator parameters or water types are caused by natural attenuation or may be attributed to seasonal variability.** The SWMU 16 monitoring program includes quarterly monitoring which will measure RDX, TCE, degradation by-product concentrations, and routine indicator parameters. The final MNA report will include the presentation of temporal plots to discern seasonal trends of RDX, TCE and degradation by-product concentrations, as well as routine indicator parameters.

4.1 GROUNDWATER MONITORING PROGRAM

The MNA groundwater monitoring program is being conducted at 12 select well locations across SWMU 16 (see Figure 2-1). These wells have been established in accordance with U.S. EPA Region 5 MNA guidance (U.S. EPA 2000). The monitoring wells have a specific role in the monitoring program and represent locations within the plume and source area, leading edges of the plume, and from points located vertically (above and below) and horizontally (upgradient and downgradient) outside the area of groundwater contamination. In Rounds 4 through 9, these locations are being analyzed for explosives and VOCs. The selected wells are distributed as follows in the Puz, Pmz, and Plz Water Bearing Zones:

- One clean, laterally upgradient well (16MW02) in the Puz
- Three source area wells (16MWT06, 16MWT13, 16MWT17) in the Puz
- Four wells within the RDX and TCE plumes (16MW03, 16MWT04, 16MWT09, and 16MWT10) in the Puz.
- One well at the leading edge of the plume (16MW04) in the Puz
- One laterally downgradient well that is clean (16MWT12) in the Pmz
- Two clean, deep wells below the plumes (16MWT11, 16MWT15) in the Plz

4.2 SURFACE WATER MONITORING PROGRAM

In support of the MNA demonstration, surface water samples are also being collected at four select locations (see Figure 2-2). These locations include 16SW10, 16SW12, 16SW13, and 16SW30. In Rounds 4 through 9, these locations are being analyzed for explosives and VOCs.

4.3 ROUND 7 POTENTIOMETRIC SURFACES

Figures 4-1 through 4-3 show potentiometric surface elevation maps for the Puz, Pmz, and Plz water bearing zones at SWMU 16 in Round 7. The groundwater elevations for Round 7 in all three zones were compared to groundwater elevations reported in the Round 6 MNA report (TtNUS, 2006). The groundwater elevations for Round 6 are presented in Appendix E. Further discussion of the potentiometric surface elevations for Round 7 is presented below.

In Round 7, groundwater elevations in the Puz monitoring wells ranged from 735.38 feet above mean sea level (amsl) at well 16MWT03 to 755.56 feet amsl at well 16MWT04. Most wells in the Puz experienced a slight increase in water elevation from Round 6 to Round 7 with the exception of wells 16MWT01, 16MWT06, and 16MWT13 which were lower. Monitoring well 16MWT02 reported the largest increase in elevation (+4.95 feet), while well 16MWT13 had the largest decrease in elevation (-9.41 feet) since Round 6. Groundwater flow directions in the Puz remained essentially the same in Round 7 in comparison to Round 6. As reported in Round 6, groundwater to the west of the SWMU 16 centerline flows to the west and southwest, ultimately discharging into gullies that drain surface water and groundwater westward towards a tributary of Turkey Creek. Shallow groundwater east of the SWMU 16 centerline flows to the east towards gullies on the eastern side of the site. Shallow groundwater is also present in the east-central portion of the site and flows in a southeasterly direction towards gullies on the southeastern side of the site that convey water eastward and southeastward towards Turkey Creek.

Groundwater elevations in the Pmz in Round 7 ranged from 733.42 feet amsl at well 16MW01 to 741.93 feet amsl at well 16MWT12. With the exception of well 16MWT12, all Pmz well elevations reported groundwater elevations that were similar to elevations reported in Round 6. In Round 7, monitoring well 16MWT12 had an increase in elevation of 8.34 feet as compared to Round 6. Monitoring well 16MWT16 was not used in developing the potentiometric surface map for the Pmz in Round 7 because the potentiometric surface elevation for 16MWT16 was approximately 4 feet lower than the average water level for other monitoring wells screened in the Pmz. Groundwater is flowing toward the southwestern, southern, and southeastern hillsides.

Plz groundwater elevations in Round 5 ranged from 666.230 feet asml at well 16MWT08 to 700.26 feet amsl at well 16MWT15. Monitoring well 16MWT15 was not used in developing the potentiometric surface map for the Plz because the potentiometric elevation for 16MWT15 was approximately 33 feet higher than the average water level measured in the other two wells screened in the Plz. This may indicate that the well is in an area of increased vertical fracturing and enhanced leakage from the overlying

intermediate flow zone. The groundwater flow direction on the eastern side of the site in the Plz is towards the northeast. There is insufficient data to determine the direction of groundwater flow on the southern and western portions of SWMU 16.

4.4 GROUNDWATER TEMPORAL TREND PLOTS AND DATA EVALUATION

4.4.1 Upper Pennsylvanian Water Bearing Zone (Puz)

Figures 4-4 and 4-5, respectively, show temporal plots of RDX and TCE, and their associated degradation by-product concentrations for Rounds 1 through 7. The temporal plots are arranged in columns by monitoring well location showing concentration trends for RDX and TCE followed by the trend for each degradation by-product. The analytical results for each round are shown as a data point on each plot with the data validation qualifier as applicable and correspond to data presented in Table 3-1 for the Puz.

Through Round 7, RDX has been detected at all Puz monitoring locations with the exception of 16MW02, which is the upgradient well (see Figure 4-4). This pattern of concentrations, among other evidence, links RDX to SWMU 16 as a site-related contaminant in groundwater. DNX and more notably MNX have been detected in 6 wells (16MWT03, 16MWT04, 16MWT06, 16MWT09, and 16MWT10. This alone, is an indication that degradation of RDX is occurring because the only source of these degradation compounds is RDX.

TCE has been detected at all Puz well locations with the exception of 16MW02, which is upgradient (see Figure 4-5). TCE degradation-by-products have been detected at all Puz wells, including 16MW02. Similar to RDX, this links TCE to SWMU 16 as a site-related contaminant. Also, detections of TCE degradation-by-products at all Puz wells provide evidence that TCE is degrading in the environment. A summary evaluation of monitoring results through Round 7 for each Puz well location is presented below.

- Upgradient well:
  - 16MW02 – There have been no detections of RDX or degradation-by-products through Round 7. Also there have been no detections of TCE; however ethene and ethane have been detected in most rounds. Results for Rounds 2, 4, and 6 show a possible upward trend in ethane concentrations.
- Three source area wells:

- 16MWT06 – RDX has been detected in all 7 rounds of sampling. RDX concentrations demonstrated an upward trend in concentrations through Round 6, however decreased somewhat in Round 7. Only one degradation product (MNX) has been detected in well 16MWT06 and only in Round 6. TCE and associated degradation-by-products have been detected in all rounds of sampling. TCE demonstrated a steady increased in concentrations through Round 5; but has trended lower in Rounds 6 and 7. Cis-1,2-dichloroethene and vinyl chloride appear to show a potential upward trend in concentrations through Round 7. Concentrations of ethene and ethane, based on only three sampling events, show a downward trend in concentrations.

- 16MWT13 – RDX has only been detected in Rounds 2, 3, and 7. There have been no detections of RDX degradation products. TCE and cis-1,2-dichloroethene have been detected in all rounds; however, concentrations have decreased significantly since Round 2 and are presently showing no trend since Round 4. There is insufficient data for vinyl chloride, ethane, and ethene to discern any trend in concentrations through Round 7.

- 16MWT17 – RDX has been detected in all rounds; however, this no clear trend in concentrations. There have been no detections of RDX degradation by-products through Round 7. TCE and cis-1,2-dichloroethene have been detected in Rounds 2 through 7 with concentrations of both contaminants generally trending upward. There are no apparent trends in concentrations for the other TCE degradation-by-products.

- Four wells within the RDX and TCE plumes:

  - 16MW03 – RDX has been detected in all rounds with concentrations exhibiting no distinct trend. MNX has been the only detected degradation by-product with concentrations appearing to trend lower based on 3 samples. TCE has also been detected in all rounds; however there is no trend in concentrations. Cis-1,2-dichloroethene was detected in Rounds 1 through 3 but not in subsequent rounds. There have been no detections of vinyl chloride. Ethane and ethene were target analytes only in Rounds 4 and 6. As a result, there too few data points for ethane and ethene to identify a trend in concentrations.

  - 16MWT04 – RDX has been positively detected in all rounds. Concentrations have ranged between 59 and 200 µg/L in all rounds with no apparent trend. DNX and MNX are the only degradation by-products detected; however they do not show a trend in concentrations. TCE has

been detected in all rounds and there is no apparent trend in concentrations. Cis-1,2-dichloroethene and vinyl chloride have not been detected through Round 7. However, the degradation by-products ethane and ethene have been detected in Rounds 2, 4, and 6 but show no trend in concentrations.

- 16MWT09 – RDX has been detected in all rounds. Based on these results, concentrations have been in the range of 79 to 110 µg/L and show no indications of a potential upward trend since Round 3. MNX has been the only detected degradation-by-product and concentrations exhibit no obvious trend based on only 3 samples. TCE has been detected in all rounds of sampling with no trend in concentrations. Cis-1,2-dichloroethene has only been detected in Round 1. Ethane and ethene have been detected in Rounds 4 and 6; however, there is insufficient data to indicate a trend for either compound.

- 16MWT10 – RDX has been positively detected in all rounds and shows no indications of a trend in concentrations. MNX has been the only degradation-by-product detected through Round 7 and concentrations have trended downward since the first sample in Round 2. TCE has been positively detected in all rounds and there is no trend in concentrations. Ethene and ethane were detected in Round 2, 4, and 6 and have generally decreased since Round 2.

4.4.2 Middle Pennsylvanian Water Bearing Zone (Pmz)

The Figures 4-6 and 4-7, respectively, show temporal plots of RDX, TCE, and their associated degradation-by-product concentrations for Rounds 1 through for wells 16MW04 and 16MWT127. The data points and validation qualifiers posted on each trend plot correspond to data presented in Table 3-3. RDX has been detected only in well 16MW04. DNX, MNX, and TNX have not been detected in either Pmz well. TCE has been detected most frequently at well 16MW04. A summary evaluation of monitoring results for each Pmz well location is presented below:

- Well at the leading edge of the plume:

  - 16MW04 – RDX has been positively detected in all rounds except Round 2 and show no indication of a trend in concentrations. RDX degradation-by-products were target analytes in Rounds 2, 4, and 6 but were not detected. TCE has been detected in all Rounds except 2 and 7, and show no indications of a trend in concentrations. There has only been one detection each for cis-1,2-dichloroethene in Round 1, and ethane and ethene in Round 6. There have been no detections of cis-1,2-dichloroethene or vinyl chloride at this location.

- Downgradient well:

  - 16MWT12 – There have been no detections of RDX or degradation-by-products through Round 7. TCE has only been detected once in Round 4. Ethene and ethane have been the only detected degradation products. Ethane concentrations show a potential downward trend since Round 2. However, ethene concentrations are exhibiting no trend.

4.4.3 Lower Pennsylvanian Water Bearing Zone (Plz)

Figure 4-8 shows temporal plots of RDX and degradation by-product concentrations. Figure 4-19 shows temporal plots of TCE and degradation-by-product concentrations. All positive hits are shown as a data point on each plot and correspond to data presented in Table 3-9. A summary evaluation of monitoring results for each Plz well location is presented below:

- Deep wells below the plumes:

  - 16MWT11 – There have been no detections of RDX, TCE, or RDX degradation-by-products. Ethane and ethene were detected in Round 4 and 6 at low concentrations. However, there is insufficient data to show a trend in concentrations.

  - 16MWT15 – There have been no detections of RDX or degradation-by-products. TCE was only detected in Round 4. Ethene and ethane have been the only detected degradation by-products in Rounds 2, 4, and 6. Insufficient data is available to discern a trend for these compounds.

4.4 SURFACE WATER TEMPORAL TREND PLOTS AND DATA EVALUATION

Figures 4-10 and 4-11, respectively, show temporal plots of RDX and TCE and associated degradation by-product concentrations in surface water through Round 7. It is important to note that surface water samples were not collected in Round 6 due to dry conditions. All analytical results are shown as a data point on each plot and correspond to data presented in Table 3-7. Through Round 7, RDX has only been detected at locations 16SW/SD10 and 16SW/SD30, with most detections occurring at 16SW/SD30. There has been very limited sampling for RDX degradation by-products. As a result, data trend information is not available. Only TCE and cis-1,2-dichloroethene have been detected at 16SW/SD12. A summary evaluation of monitoring results for each surface water location is presented below:

- 16SW/SD10 – No detections of RDX, TCE, or their associated degradation products..

- 16SW/SD12 - No detections of RDX or degradation products. TCE has been detected in 5 rounds of sampling with no distinct trend in concentrations. Cis-1,2-dichloroethene has only been detected in Rounds 2 and 4. .

- 16SW/SD13 - No detections of RDX, TCE, or their associated degradation products.

- 16SW/SD30 – RDX has been detected in Rounds 3, 4, 5, and 7 and does not show a trend in concentrations. No analyses have been conducted for RDX degradation products at this location. There have been no detections of TCE or degradation products.

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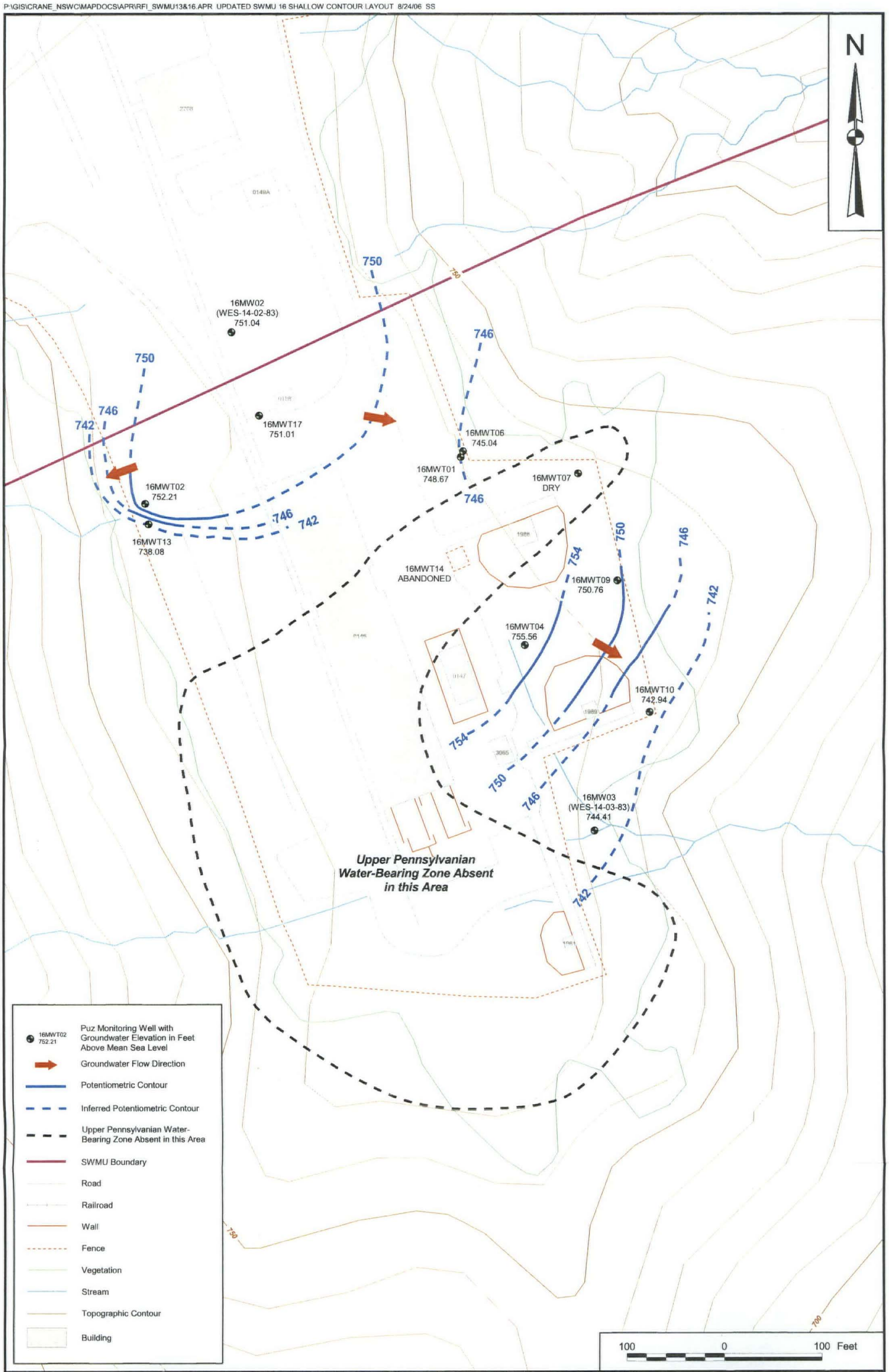

DRAWN BY	DATE
S. STROZ	8/21/06
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J. LUCAS	8/24/06
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
UPPER PENNSYLVANIAN WATER-BEARING ZONE - JANUARY 5, 2006
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
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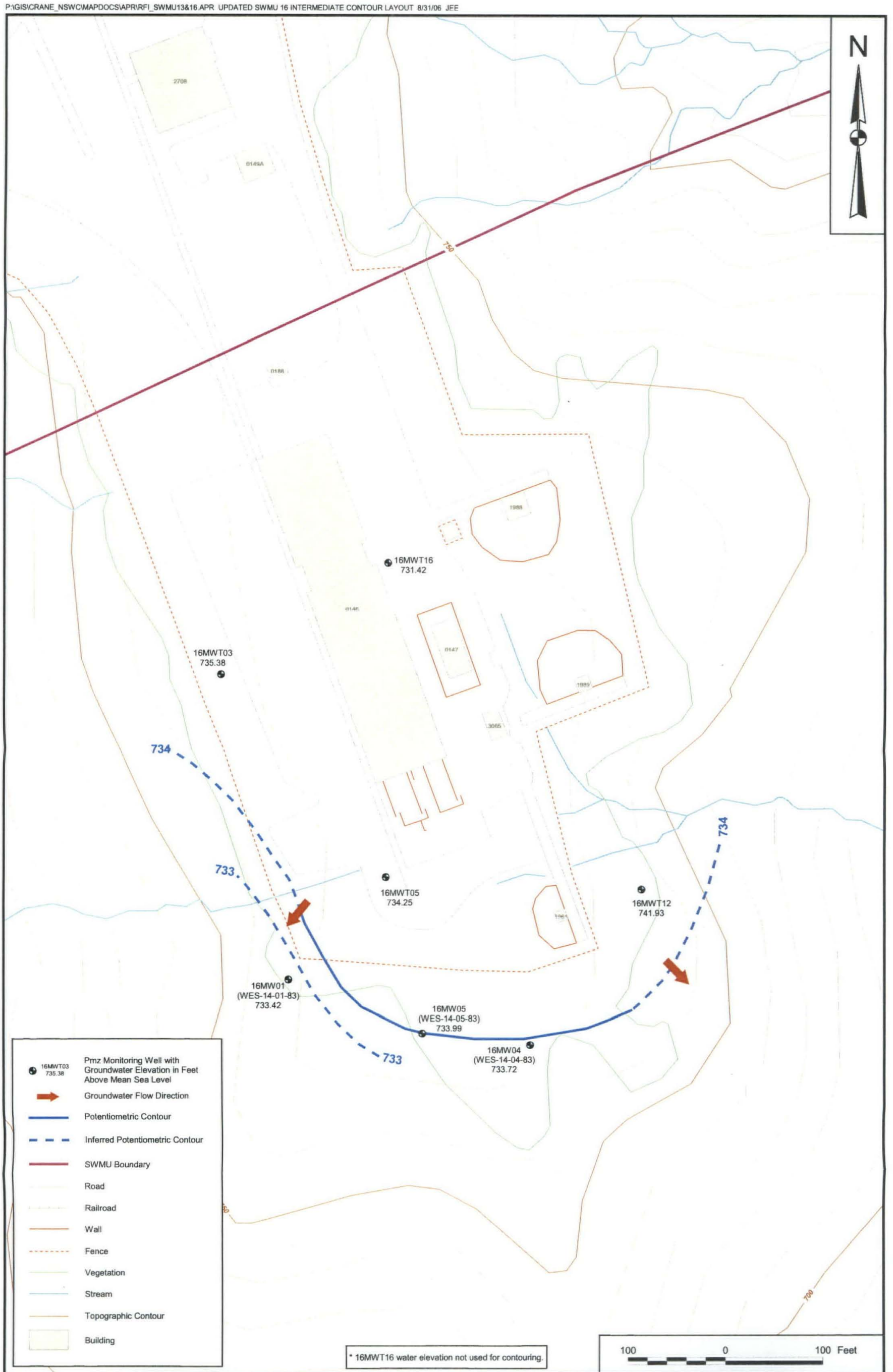

DRAWN BY S. STROZ	DATE 8/18/06	POTENTIOMETRIC SURFACE MAP FOR MIDDLE PENNSYLVANIAN WATER-BEARING ZONE - JANUARY 25, 2006 SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0377
CHECKED BY J. LUCAS	DATE 8/31/06		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 4 - 2 REV 0

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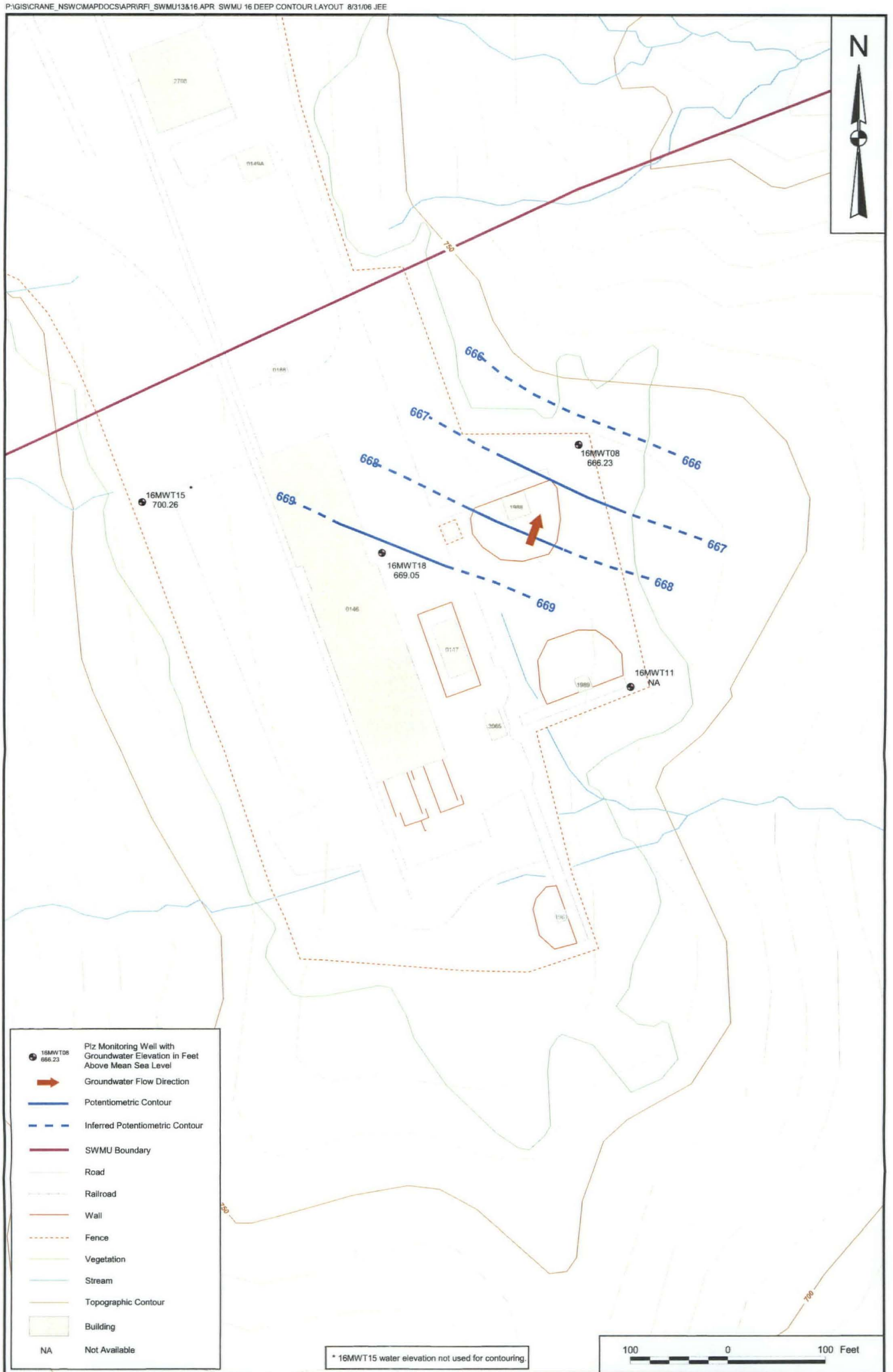

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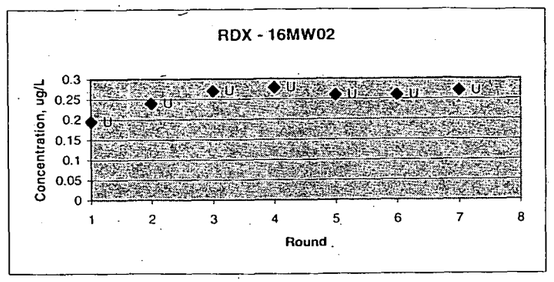
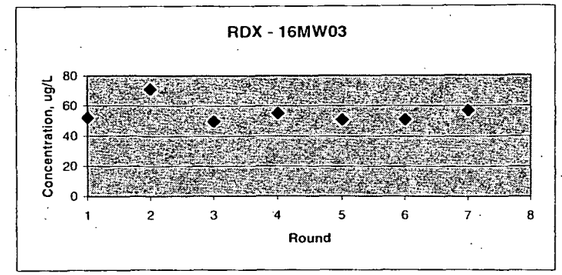
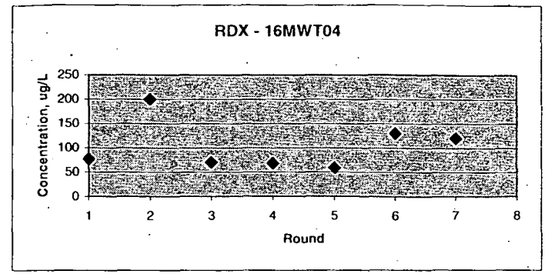
CHECKED BY J. LUCAS	DATE 8/31/06		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 4 - 3 REV 0

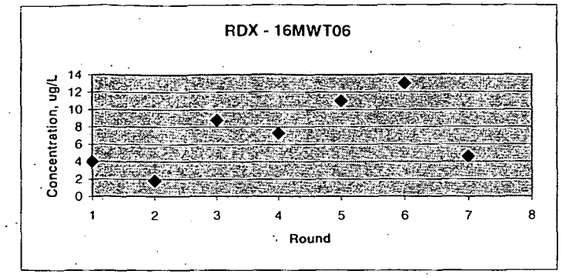
FIGURE 4-4

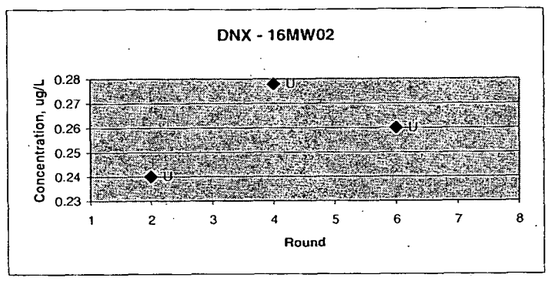
TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA
PAGE 1 OF 2

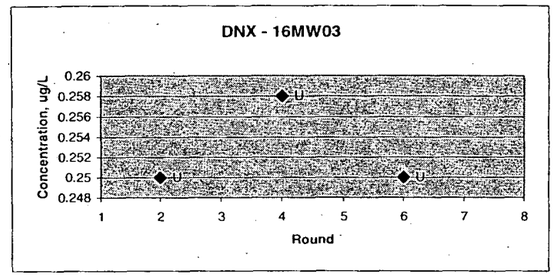


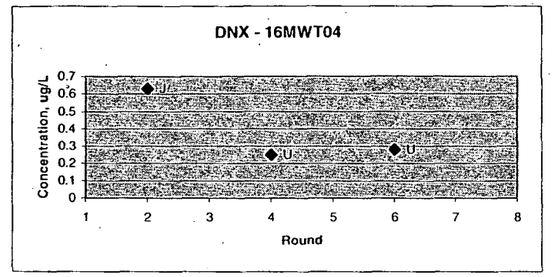


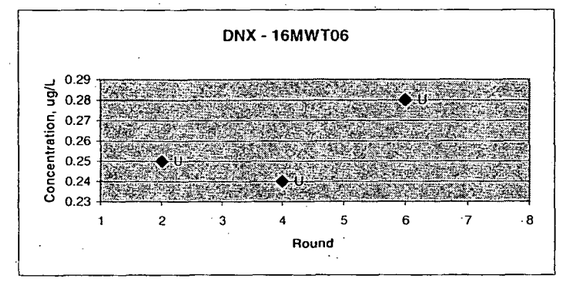


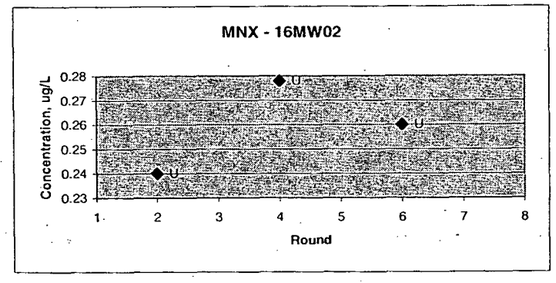


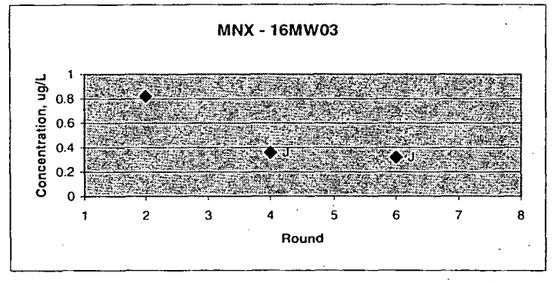


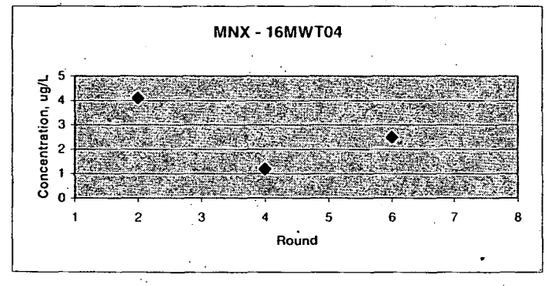


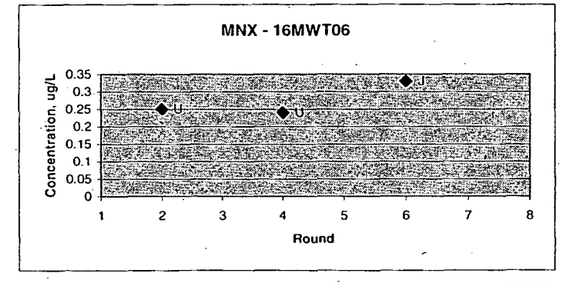


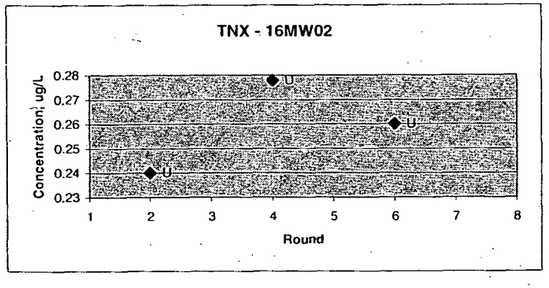


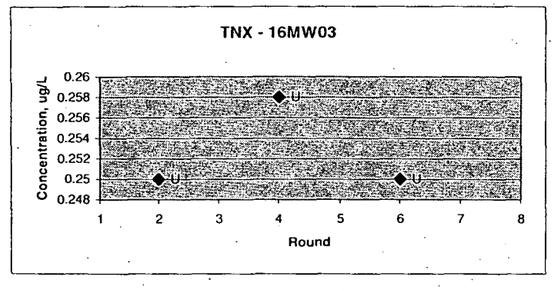


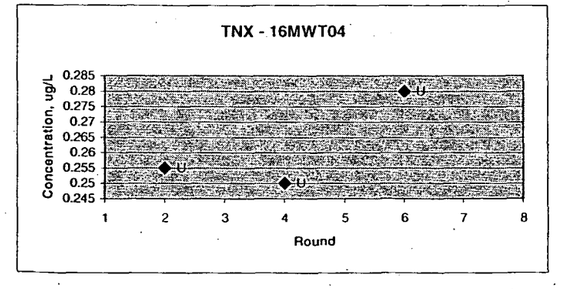












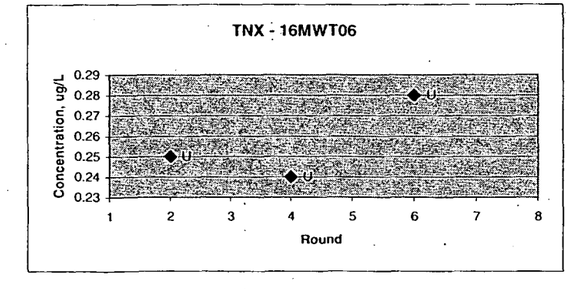
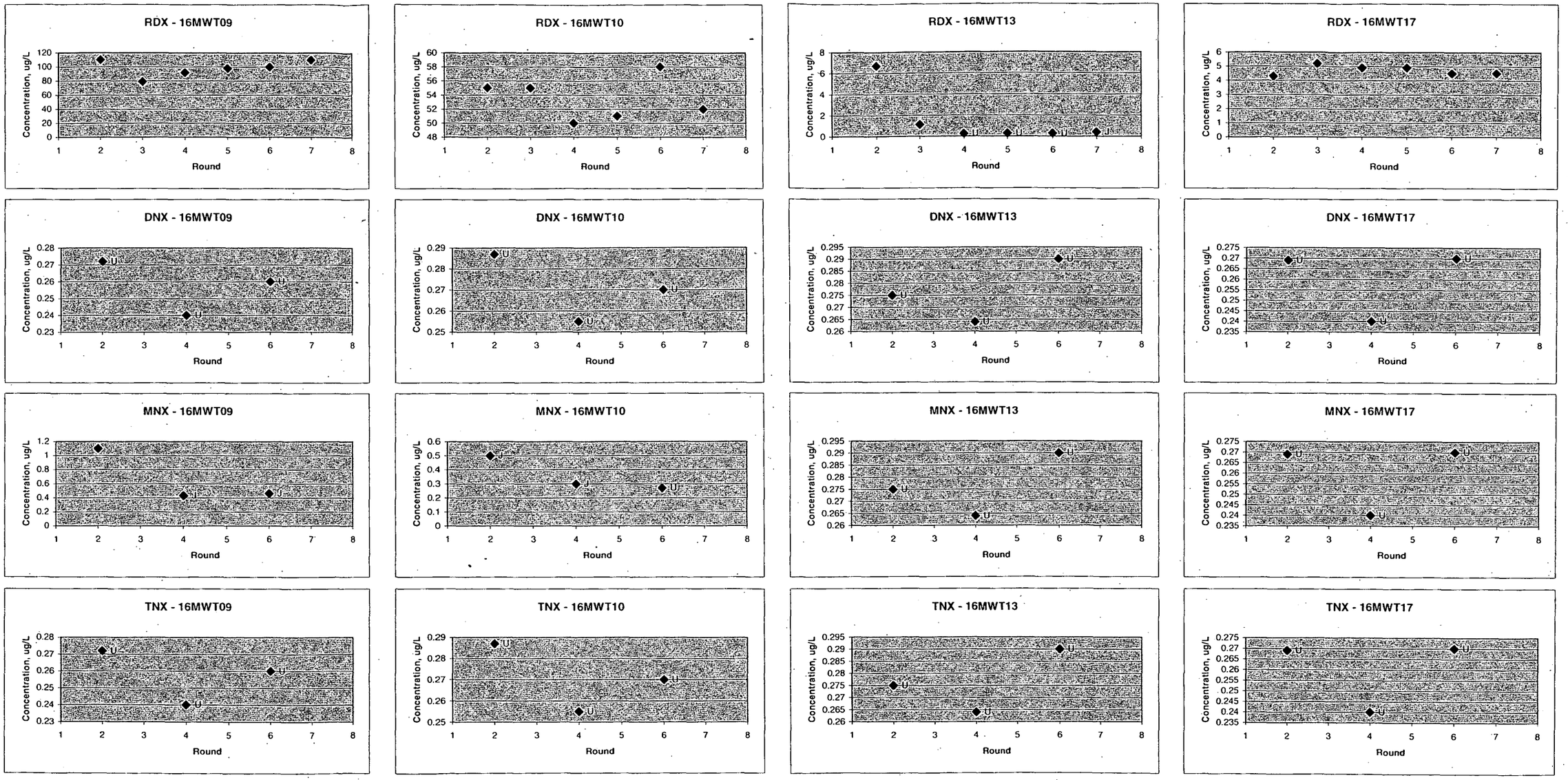


FIGURE 4-4

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA
PAGE 2 OF 2



A blank cell indicates that no sample was collected or analysis was conducted for the parameter.
U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.
J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

FIGURE 4-5

TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA
PAGE 1 OF 2

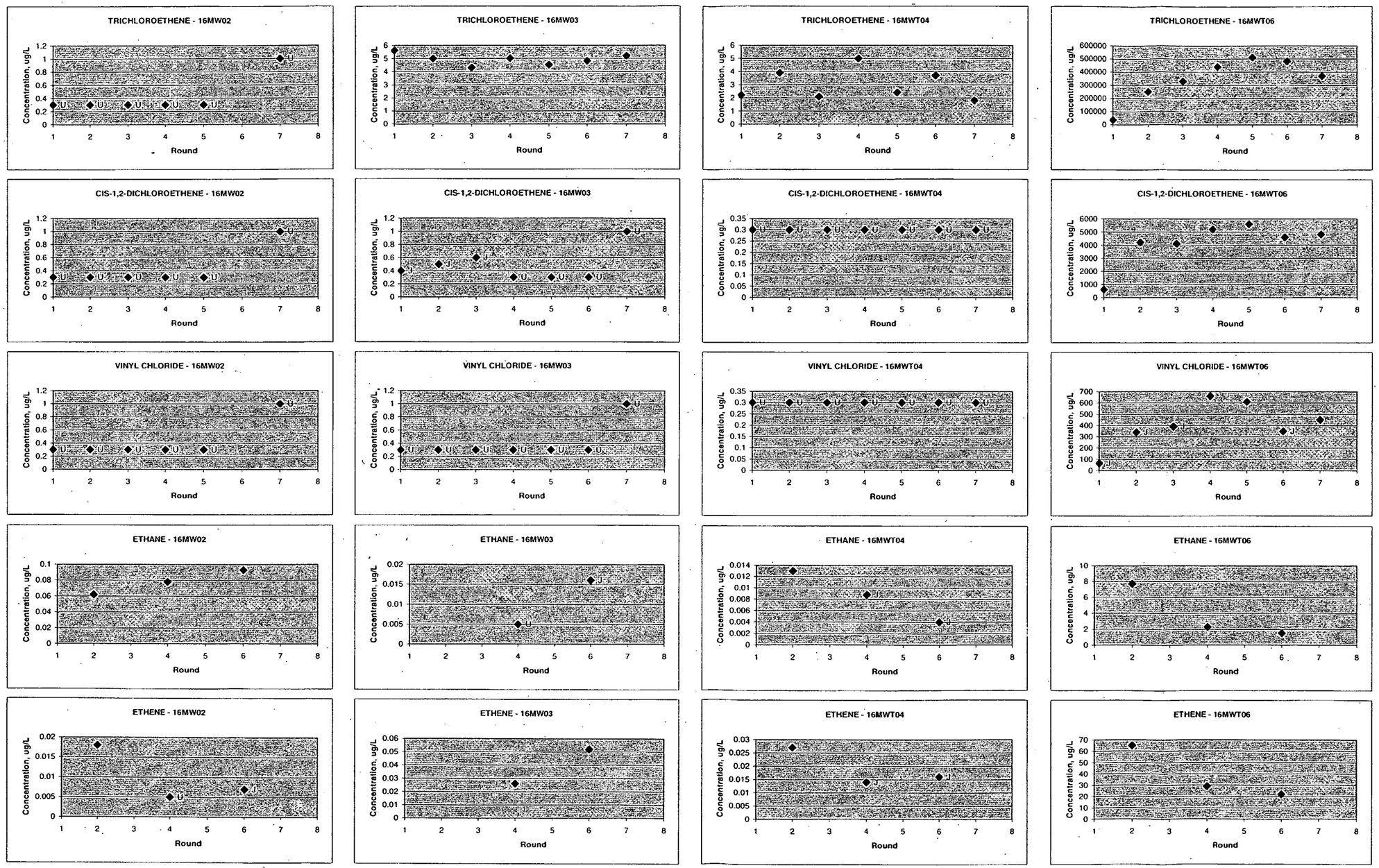
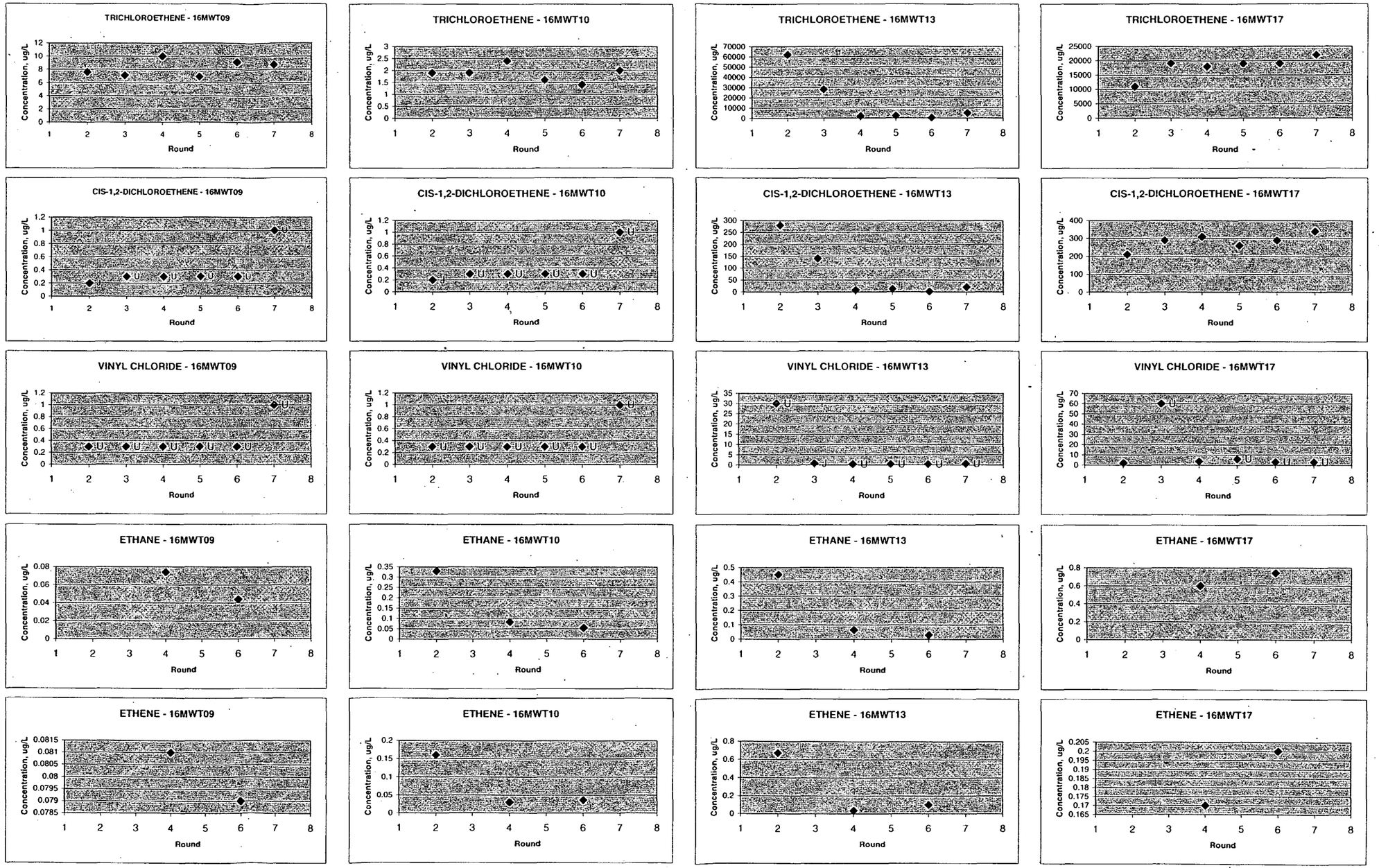


FIGURE 4-5

TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA
PAGE 2 OF 2



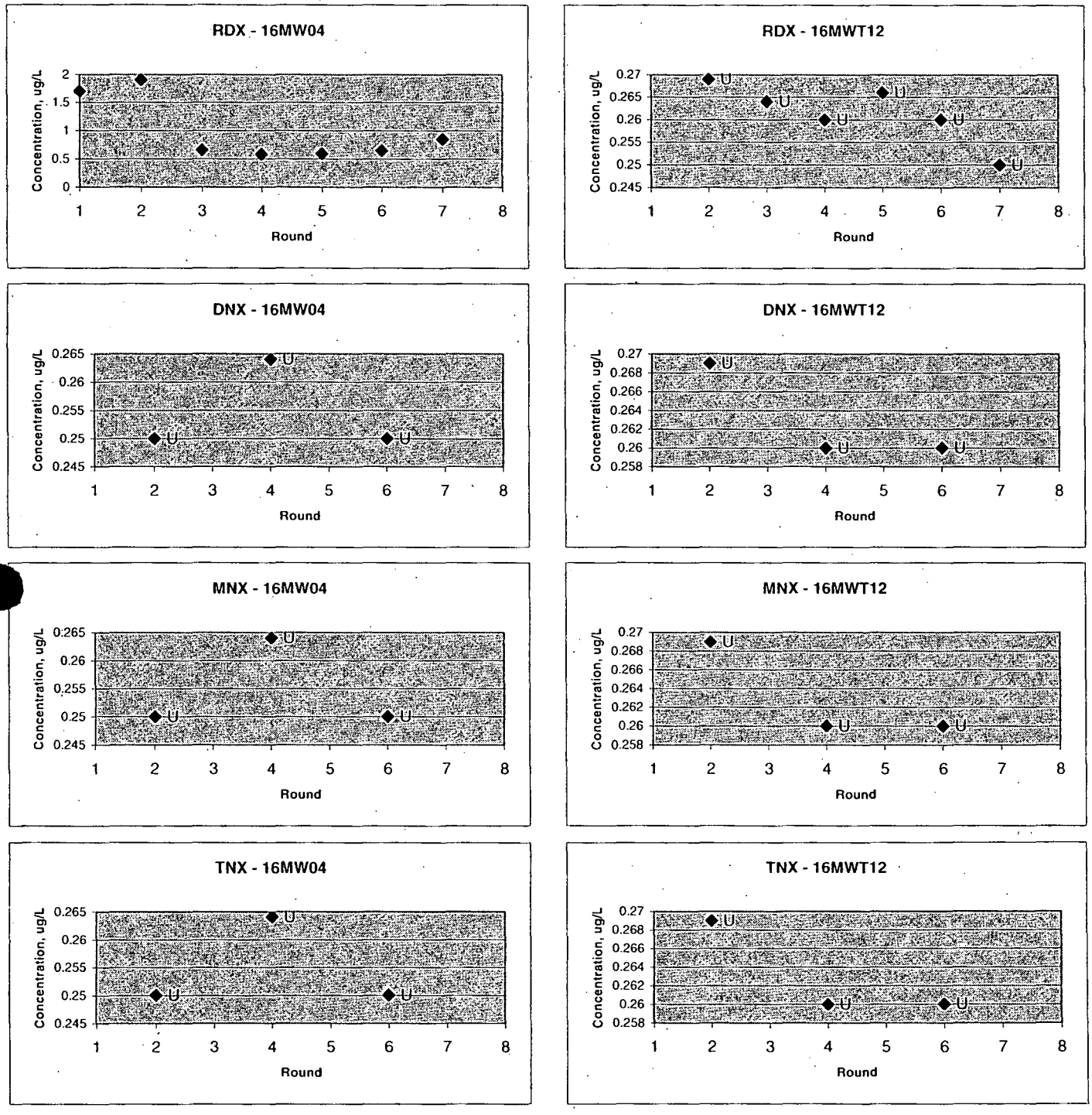
A blank cell indicates that no sample was collected or analysis was conducted for the parameter.

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

FIGURE 4-6

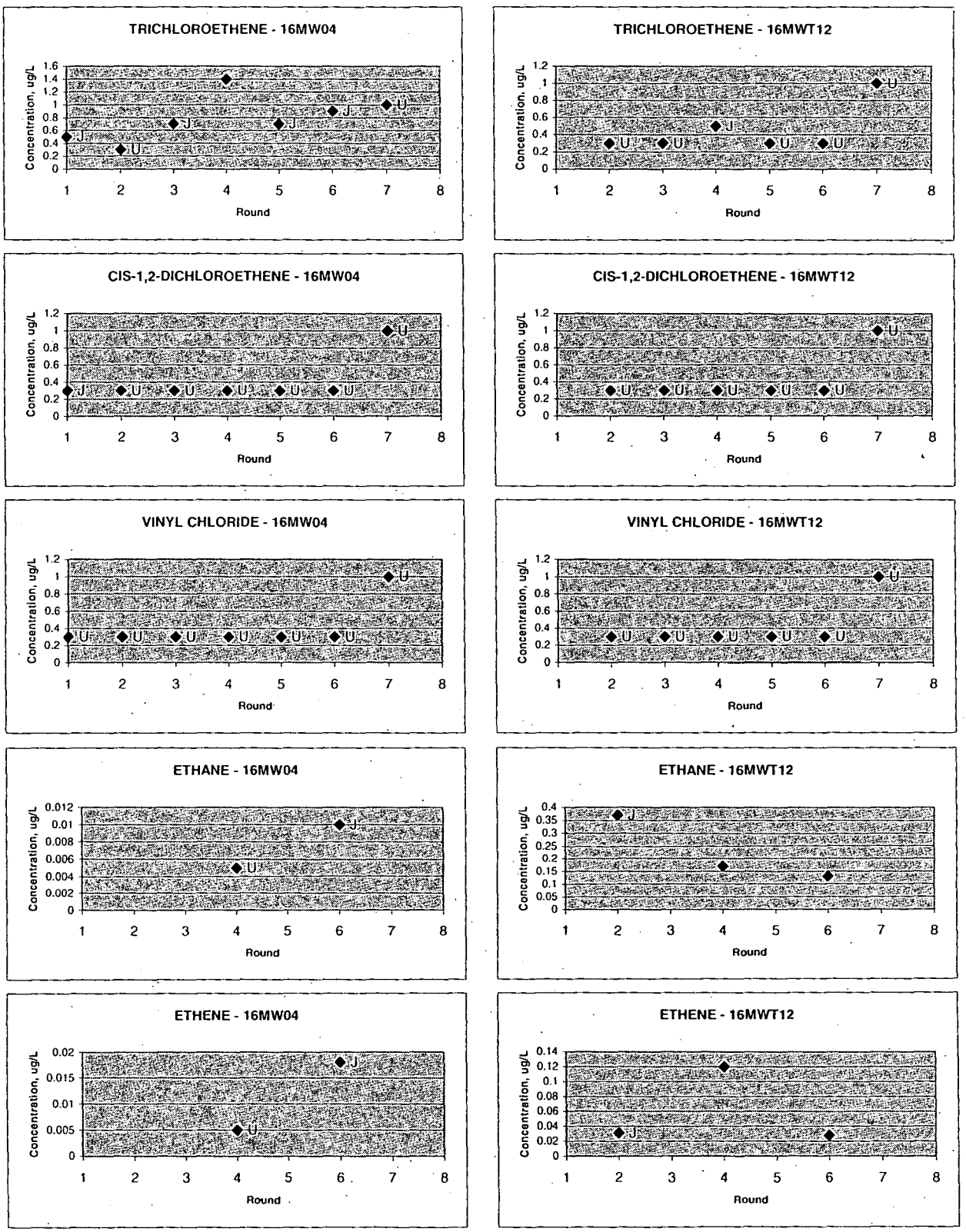
RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE MIDDLE PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
IN ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

FIGURE 4-7

TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS IN THE MIDDLE PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA



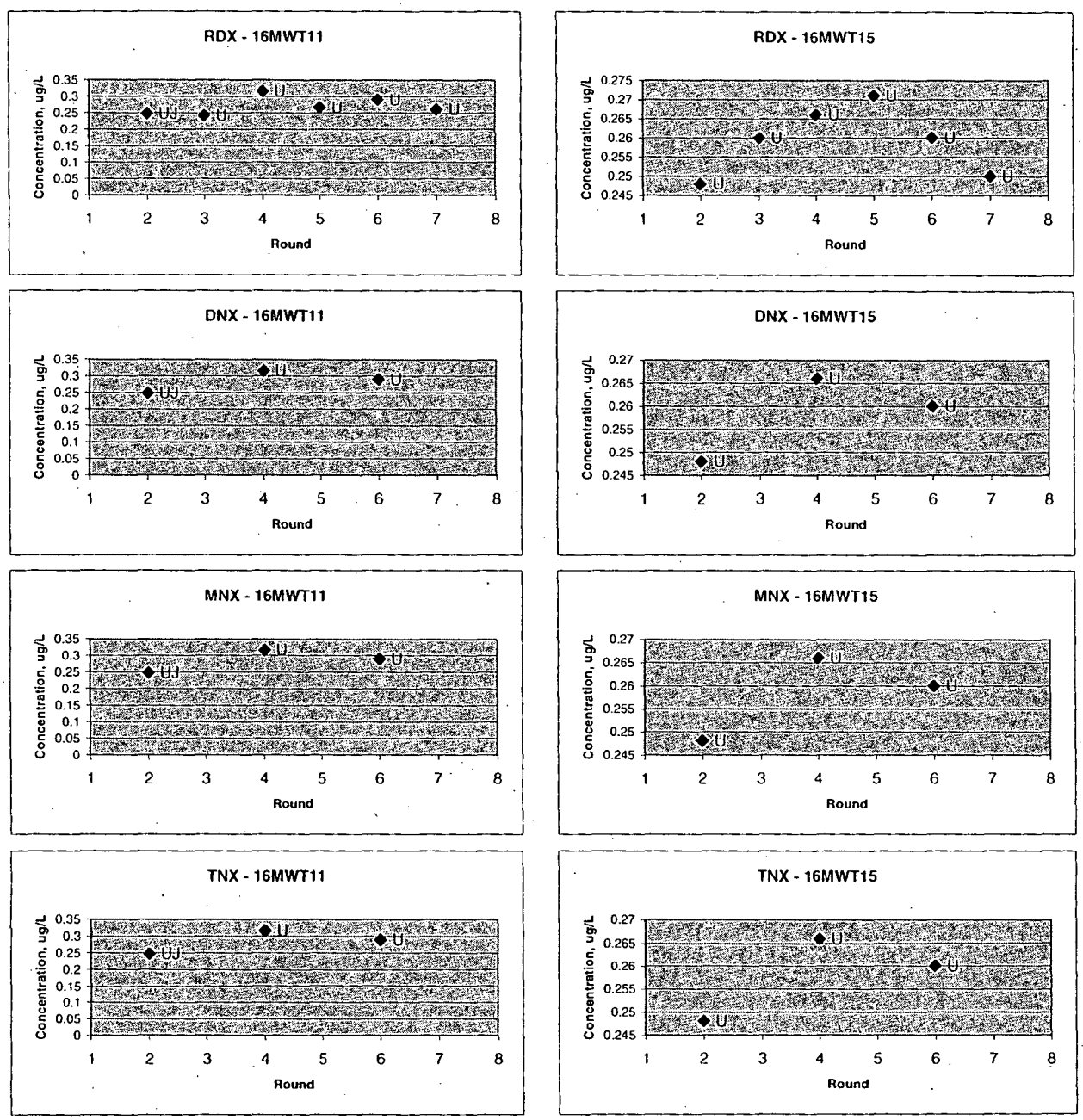
A blank cell indicates that no sample was collected or analysis was conducted for the parameter.

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

FIGURE 4-8

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE LOWER PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA



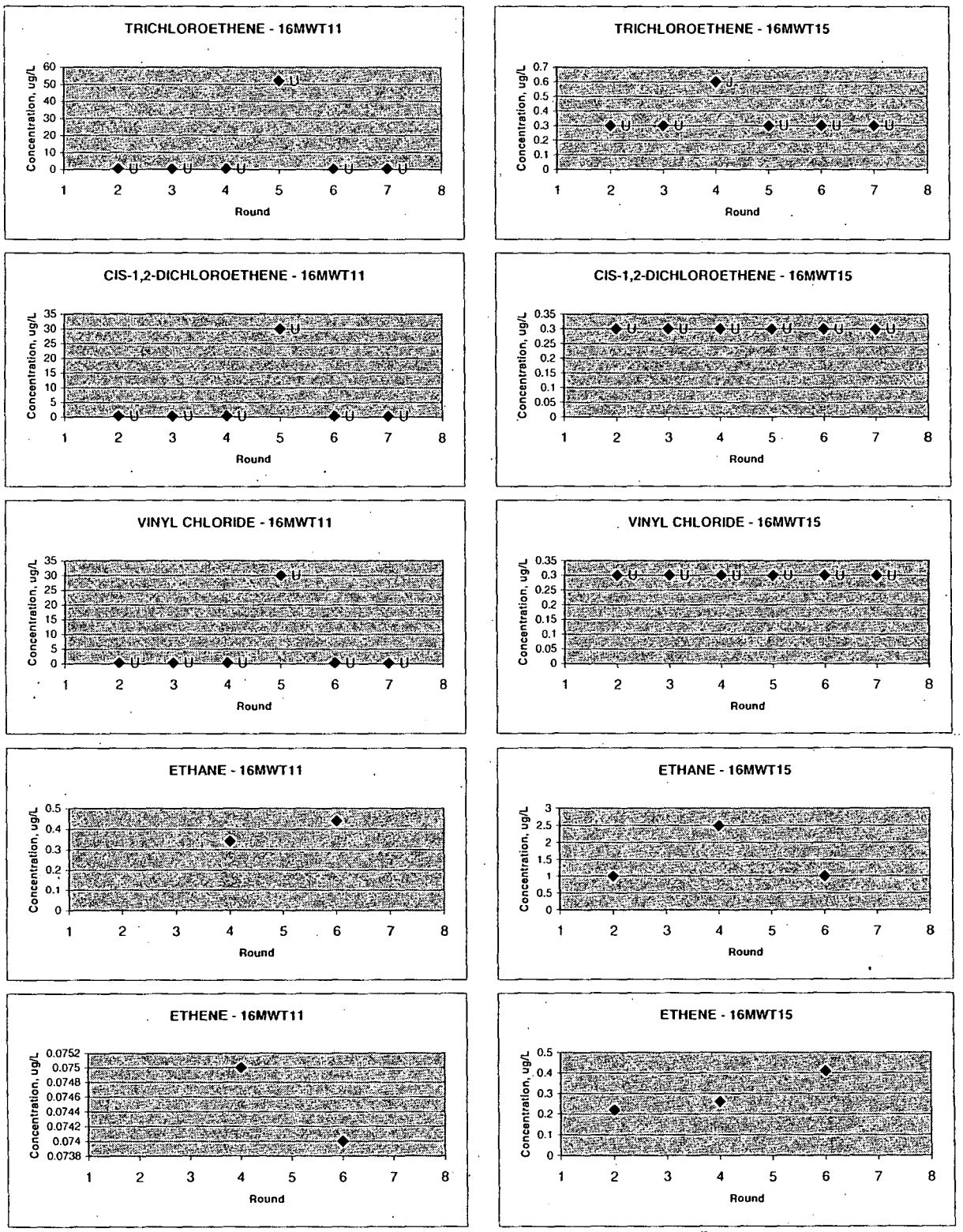
A blank cell indicates that no sample was collected or analysis was conducted for the parameter.

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

UJ – Indicates that the chemical was not detected; however, the detection limit (sample-specific detection limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.

FIGURE 4-9

TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE LOWER PENNSYLVANIAN WATER BEARING ZONE AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE\
CRANE, INDIANA



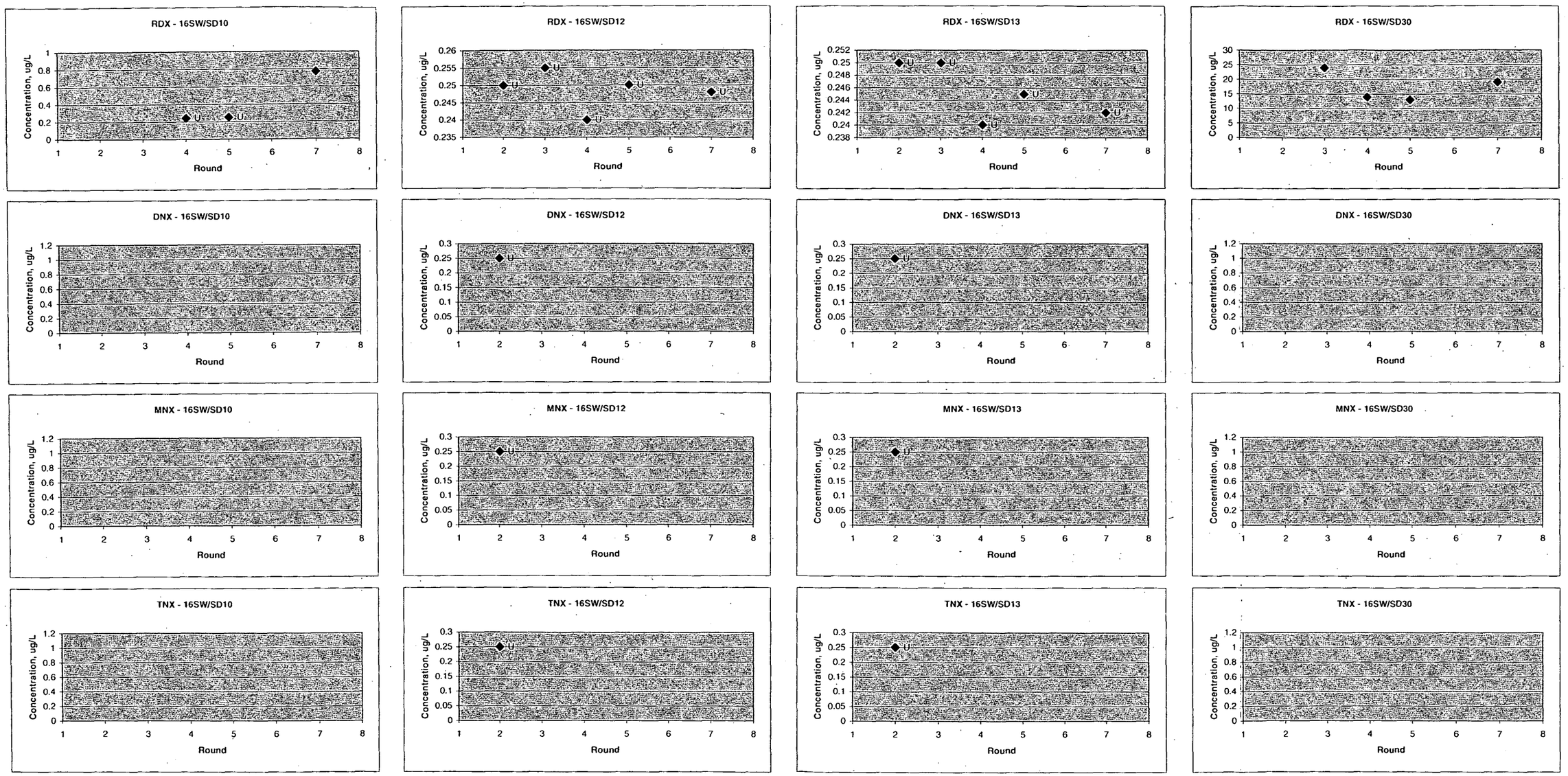
A blank cell indicates that no sample was collected or analysis was conducted for the parameter.

U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

FIGURE 4-10

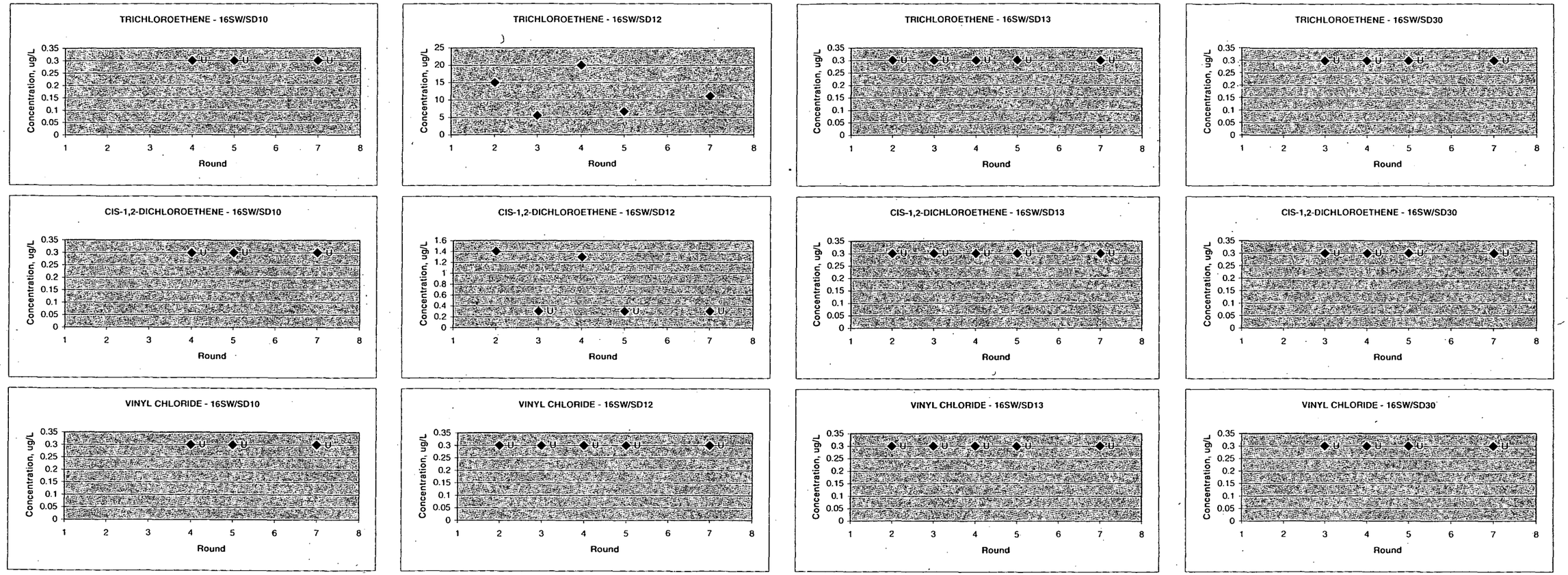
TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 16 FOR ROUNDS 1 THROUGH 6
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

FIGURE 4-11

TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 16
FOR ROUNDS 1 THROUGH 7
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.

REFERENCES

Tetra Tech NUS, Inc. (TtNUS), 2004. QAPP Addendum No. 2 for Mine Fill A (SWMU 12), Mine Fill B (SWMU 13), Cast High Explosives Fill/B146 Incinerator (SWMU 16), and Pyrotechnic Test Area (SWMU 19) RCRA Facility Investigation, Tetra Tech NUS, Inc., June.

TtNUS, 2005a. Cast High Explosives Fill/B146 Incinerator (SWMU 16) Resource Conservations and Recovery Act Facility Investigation Report, NSWC Crane, Crane, Indiana, June.

TtNUS, 2005b. Monitored Natural Attenuation Report for Cast High Explosives Fill/B146 Incinerator (SWMU 16), Round No. 4, NSWC Crane, Crane, Indiana, November.

TtNUS, 2006. Monitored Natural Attenuation Report for Cast High Explosives Fill/B146 Incinerator (SWMU 16), Rounds No. 5 and 6, NSWC Crane, Crane, Indiana, April.

United States Environmental Protection Agency (U.S. EPA), 2000. Region 5 Framework for Monitored Natural Attenuation Decisions for Groundwater, U.S. EPA Region 5, September.

APPENDIX A

SWMU 16

SAMPLE LOG SHEETS AND OTHER FIELD FORMS

ROUND 7

A.1

SWMU 16

SURFACE WATER SAMPLE LOG SHEETS

ROUND 7

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLING LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	James Goerdt
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Sample ID Number	16SW1004			**Printed By**	James Goerdt
Sample Location ID	16SWSD10			**Printed Date**	8/3/06

Sample Collection Records

Date	1/5/06	**Color**	Clear	**Temp (C)**	5.93
Time	15:49	**pH (S.U.)**	7.28	**ORP (mV)**	180
Depth (ft.)	0.4	**S.C. (mS/cm)**	.182	**Salinity (%)**	
Method	Direct Bottle	**DO (mg/L)**	8.78		
MS/MSD Collected	N	**Turbidity (NTUs)**	11		
Duplicate Collected	N				
Duplicate ID					

Laboratory Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Count	Type	Requirements	Preservative	Comments	Chain of Custody #
✓	1/5/06	15:49	Explosives Nitroaromatics and Nitramines	SW-846-8330	2	Glass	1L Amber	4°C		112G00041-162006-1
✓	1/5/06	15:49	Volatile Organic Compounds	SW-846 8260B	3	Glass	40ml vials	4° C/HCL		112G00041-162006-1

General Observations and Notes

2'X 2.5' pool

- End of Report -

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLING LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	James Goerdt
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Sample ID Number	16SW1205			**Printed By**	James Goerdt
Sample Location ID	16SWSD12			**Printed Date**	8/3/06

Sample Collection Records

Date	1/5/06	**Color**	clear	**Temp (C)**	6.05
Time	14:44	**pH (S.U.)**	7.29	**ORP (mV)**	182
Depth (ft.)	. 04	**S.C. (mS/cm)**	0.239	**Salinity (%)**	
Method	Direct Bottle	**DO (mg/L)**	9.65		
MS/MSD Collected	N	**Turbidity (NTUs)**	2.2		
Duplicate Collected	N				
Duplicate ID					

Laboratory Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Count	Type	Requirements	Preservative	Comments	Chain of Custody #
✓	1/5/06	14:44	Volatile Organic Compounds	SW-846 8260B	3	Glass	40ml vials	4° C/HCL		112G00041-162006-1
✓	1/5/06	14:44	Explosives Nitroaromatics and Nitramines	SW-846-8330	2	Glass	1L Amber	4°C		112G00041-162006-1

General Observations and Notes

1.0 ft/sec

- End of Report -

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLING LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	James Goerdt
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Sample ID Number	16SW1305			**Printed By**	James Goerdt
Sample Location ID	16SWSD13			**Printed Date**	8/3/06

Sample Collection Records

Date	1/5/06	**Color**	clear	**Temp (C)**	5.46
Time	14:31	**pH (S.U.)**	7.45	**ORP (mV)**	175
Depth (ft.)	.07	**S.C. (mS/cm)**	0.247	**Salinity (%)**	
Method	Direct Bottle	**DO (mg/L)**	9.67		
MS/MSD Collected	N	**Turbidity (NTUs)**	4.8		
Duplicate Collected	N				
Duplicate ID					

Laboratory Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Count	Type	Requirements	Preservative	Comments	Chain of Custody #
✓	1/5/06	14:31	Volatile Organic Compounds	SW-846 8260B	3	Glass	40ml vials	4° C/HCL		112G00041-162006-1
✓	1/5/06	14:31	Explosives Nitroaromatics and Nitramines	SW-846-8330	2	Glass	1L Amber	4°C		112G00041-162006-1

General Observations and Notes

1.5' wide

- End of Report -

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLING LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	James Goerdt
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Sample ID Number	16SW3004			**Printed By**	James Goerdt
Sample Location ID	16SWSD30			**Printed Date**	8/3/06

Sample Collection Records

Date	1/5/06	**Color**	clear	**Temp (C)**	5.45
Time	12:56	**pH (S.U.)**	7.44	**ORP (mV)**	162
Depth (ft.)	.05	**S.C. (mS/cm)**	0.220	**Salinity (%)**	
Method	Direct Bottle	**DO (mg/L)**	9.92		
MS/MSD Collected	Y	**Turbidity (NTUs)**	8.4		
Duplicate Collected	Y				
Duplicate ID					

Laboratory Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Count	Type	Requirements	Preservative	Comments	Chain of Custody #
✓	1/5/06	12:56	Explosives Nitroaromatics and Nitramines	SW-846-8330	4	Glass	1L Amber	4°C	DO MS/MSD	112G00041-162006-1
✓	1/5/06	12:56	Volatile Organic Compounds	SW-846 8260B	9	Glass	40ml vials	4° C/HCL	DO MS/MSD	112G00041-162006-1

General Observations and Notes

0.55 w

- End of Report -

A.2

SWMU 16

GROUNDWATER SAMPLE LOG SHEETS

ROUND 7

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	James Goerdt	**Modified By**	John Wright	**Printed By**	James Goerdt
Created Date	1/8/06	**Modified Date**	2/9/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GW0207
TtNUS Project #	112G00041	**Well ID**	16MW02
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	James Goerdt
		Concentration	Low Concentration

Well and Sample Data

Date	1/8/06	**Static Water Level (ft.)**	15.19	**Water Quality Meter**	4143006
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	25.80	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	4073-1103
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/8/06	08:35	15.19	80	Clear	NA	NA	NA	NA	NA	NA	NA	NA	0
1/8/06	08:45	15.33	80	Clear	6.67	1.10	3.06	7.9	9.92	-36	NA	NA	800
1/8/06	08:55	15.35	80	Clear	6.76	1.02	2.73	4.1	10.43	-34	NA	NA	800
1/8/06	09:05	15.38	80	Clear	6.80	0.92	2.58	2.1	10.67	-27	NA	NA	1600
1/8/06	09:15	15.35	80	Clear	6.79	.79	2.19	1.4	11.28	-17	NA	NA	2400
1/8/06	09:25	15.34	80	Clear	6.80	.756	2.07	2.2	11.30	-9	NA	NA	3200
1/8/06	09:35	15.33	80	Clear	6.81	.743	1.90	1.9	11.29	-7	NA	NA	4000
1/8/06	09:45	15.33	80	Clear	6.81	.726	1.76	0.8	11.43	-3	NA	NA	4800

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/8/06	09:55	15.34	80	Clear	6.81	.7171	1.67	0.8	11.41	2	NA	NA	5600
1/8/06	10:05	15.33	80	Clear	6.81	.708	1.53	0.4	11.15	4	NA	NA	6400
1/8/06	10:15	15.33	80	Clear	6.81	.707	1.48	0.7	11.47	3	NA	NA	7200
1/8/06	10:25	15.34	80	Clear	6.82	.707	1,47	08	11.53	3	NA	NA	8000

Final Purge / Sample Data

One Casing Volume	6.55	**Method**		**Dissolved Oxygen (mg/L)**	1,47
Total Vo. Purge (L)	29607.2	**Waterlevel (ft.)**	15.34	**Turbidity (NTUs)**	08
Start Purge (hrs.)	1/8/06	**Flowrate (mL/min)**	80	**Temp (C)**	11.53
End Purge (hrs.)	1/8/06	**Color**	Clear	**ORP (mV)**	3
Total Purge Time (min.)	0	**pH (S.U.)**	6.82	**Salinity**	NA
		Conductivity (mS/cm)	.707	**Other**	NA

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/8/06	10:30	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-192006-2
✓	1/8/06	10:30	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2

General Observations and Notes

No Notes

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	James Goerdt	**Modified By**	John Wright	**Printed By**	James Goerdt
Created Date	1/7/06	**Modified Date**	2/9/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GW0307
TtNUS Project #	112G00041	**Well ID**	16MW03
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	James Goerdt
		Concentration	Low Concentration

Well and Sample Data

Date	1/7/06	**Static Water Level (ft.)**	19.25	**Water Quality Meter**	4143006
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	35.40	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	4073-1103
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	08:55	19.25	100	Clear	NA	NA	NA	NA	NA	NA	NA	NA	0
1/7/06	09:05	20.49	100	Clear	5.16	.450	9.53	110	10.61	282	NA	NA	1000
1/7/06	09:15	21.29	100	Clear	4.31	.001	10.14	210	10.98	284	NA	NA	1000
1/7/06	09:25	22.01	10	Clear				25					200
1/7/06	09:35	22.19	90	Clear	5.09	.002	10.41	22	8.54	291	NA	NA	2700
1/7/06	09:45	22.11	90	Clear	5.06	.468	2.79	22	8.05	295	NA	NA	900
1/7/06	09:55	21.98	90	Clear	5.05	.473	2.08	16	8.199	299	NA	NA	1800
1/7/06	10:05	21.95	90	Clear	5.03	.475	1.70	12	8.61	306	NA	NA	2700

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	10:15	21.53	90	Clear	5.01	.478	1.63	10	8.76	311	NA	NA	3600
1/7/06	10:25	21.47	90	Clear	5.02	.480	1.30	9.5	8.80	315	NA	NA	4500
1/7/06	10:35	21.48	90	Clear	5.02	.480	1.28	8.4	8.77	314	NA	NA	5400
1/7/06	10:45	21.48	90	Clear	5.01	.476	1.28	4.7	9.29	318	NA	NA	6300
1/7/06	10:55	21.47	90	Clear	5.00	.472	1.21	4.1	9.76	322	NA	NA	7200

Final Purge / Sample Data

One Casing Volume	9.98	**Method**		**Dissolved Oxygen (mg/L)**	1.21
Total Vo. Purge (L)	18405.4	**Waterlevel (ft.)**	21.47	**Turbidity (NTUs)**	4.1
Start Purge (hrs.)	1/7/06	**Flowrate (mL/min)**	90	**Temp (C)**	9.76
End Purge (hrs.)	1/7/06	**Color**	Clear	**ORP (mV)**	322
Total Purge Time (min.)	0	**pH (S.U.)**	5.00	**Salinity**	NA
		Conductivity (mS/cm)	.472	**Other**	NA

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/7/06	11:00	SW-846 8260B	Volatile Organic Compounds	4° ,C/HCL	3	Glass	40ml vials		112G00041-192006-2
✓	1/7/06	11:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2

General Observations and Notes

Some of the initial water quality meter readings are not accurate due to battery failure. New battery installed in meter beginning with 09:35 reading.

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/7/06	**Modified Date**	1/30/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GW0407
TtNUS Project #	112G00041	**Well ID**	16MW04
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/7/06	**Static Water Level (ft.)**	29.10	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	49.16	**Pump Control Box**	MP10-1578
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	09:25	29.10	0	Clear	NA	NA	NA	NA	NA	NA			0
1/7/06	09:35	29.15	160	Clear	3.96	1.30	1.02	20	10.98	325			1600
1/7/06	09:45	29.15	120	Clear	3.94	1.31	0.80	12	11.09	320			1200
1/7/06	09:55	29.15	120	Clear	3.94	1.30	0.77	13	11.35	315			1200
1/7/06	10:05	29.15	130	Clear	3.93	1.30	0.71	5.9	11.57	309			1300
1/7/06	10:15	29.15	130	Clear	3.94	1.30	0.66	2.5	11.90	301			-520
1/7/06	10:25	29.15	130	Clear	3.93	1.30	0.92	1.0	11.72	292			1300
1/7/06	10:35	29.15	130	Clear	3.93	1.30	0.65	0.60	11.89	285			1300

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	10:45	29.15	130	Clear	3.93	1.29	0.57	0.95	11.85	280			1300
1/7/06	10:55	29.15	130	Clear	3.92	1.29	0.58	0.55	11.81	278			1300
1/7/06	11:05	29.15	130	Clear	3.92	1.29	0.55	0.40	11.82	277			1300

Final Purge / Sample Data

One Casing Volume	12.4	**Method**		**Dissolved Oxygen (mg/L)**	0.55
Total Vo. Purge (L)	1601.2	**Waterlevel (ft.)**	29.15	**Turbidity (NTUs)**	0.40
Start Purge (hrs.)	1/7/06	**Flowrate (mL/min)**	130	**Temp (C)**	11.82
End Purge (hrs.)	1/7/06	**Color**	Clear	**ORP (mV)**	277
Total Purge Time (min.)	0	**pH (S.U.)**	3.92	**Salinity**	
		Conductivity (mS/cm)	1.29	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/7/06	11:10	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-192006-2
✓	1/7/06	11:10	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2

General Observations and Notes

Measured TD was 47.70

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/21/06	**Modified Date**	1/23/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT0407
TtNUS Project #	112G00041	**Well ID**	16MWT04
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/21/06	**Static Water Level (ft.)**	10.29	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	49.16	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	Y	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/21/06	15:25	10.29	0	Clear	NA	NA	NA	NA	NA	NA			0
1/21/06	15:35	10.81	140	Clear	6.19	0.252	3.45	24	14.26	136			1400
1/21/06	15:45	11.20	200	Clear	6.29	0.237	3.07	10	14.29	134			2000
1/21/06	15:55	11.24	200	Clear	6.32	0.227	3.09	9.7	14.32	134			2000
1/21/06	16:05	11.20	200	Clear	6.40	0.220	3.36	12	14.18	136			2000
1/21/06	16:15	11.20	200	Clear	6.47	0.214	3.72	9.6	14.12	140			2000
1/21/06	16:25	11.20	200	Clear	6.50	0.211	3.97	8.0	13.94	145			2000
1/21/06	16:35	11.20	200	Clear	6.53	0.208	4.12	7.0	13.72	153			2000

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/21/06	16:45	11.20	200	Clear	6.53	0.209	4.16	6.1	13.46	158			2000
1/21/06	16:55	11.20	200	Clear	6.55	0.209	4.20	5.4	13.33	165			2000
1/21/06	17:05	11.20	200	Clear	6.56	0.209	4.29	4.9	13.41	167			2000
1/21/06	17:15	11.20	200	Clear	6.57	0.209	4.27	4.0	13.34	171			2000
1/21/06	17:25	11.20	200	Clear	6.57	0.209	4.33	3.1	13.32	174			2000
1/21/06	17:30	11.20	200	Clear	6.57	0.209	4.32	2.9	13.34	175			1000

Final Purge / Sample Data

One Casing Volume	24	**Method**		**Dissolved Oxygen (mg/L)**	4.32
Total Vo. Purge (L)	21402	**Waterlevel (ft.)**	11.20	**Turbidity (NTUs)**	2.9
Start Purge (hrs.)	1/21/06	**Flowrate (mL/min)**	200	**Temp (C)**	13.34
End Purge (hrs.)	1/21/06	**Color**	Clear	**ORP (mV)**	175
Total Purge Time (min.)	0	**pH (S.U.)**	6.57	**Salinity**	
		Conductivity (mS/cm)	0.209	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/21/06	17:35	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	9	Glass	40ml vials		112G00041-1232006-5
✓	1/21/06	17:35	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	4	Glass	1L Amber		112G00041-1232006-5

General Observations and Notes

Do MS/MSD

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/8/06	**Modified Date**	1/8/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT0608
TtNUS Project #	112G00041	**Well ID**	16MWT06
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/8/06	**Static Water Level (ft.)**	19.42	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	28.30	**Pump Control Box**	MP10-1578
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/8/06	09:30	19.42	0	Clear	NA	NA	NA	NA	NA	NA			0
1/8/06	09:40	19.78	150	Clear	6.15	1.58	2.75	25	12.14	271			1500
1/8/06	09:50	19.95	100	Clear	6.29	1.55	3.75	11	12.06	267			1000
1/8/06	10:00	20.15	70	Clear	6.37	1.50	4.62	27	12.19	262			700
1/8/06	10:10	20.33	70	Clear	6.39	1.49	4.75	34	12.29	258			700
1/8/06	10:20	20.49	70	Clear	6.39	1.49	4.64	40	12.81	253			700
1/8/06	10:30	20.67	70	Clear	6.40	1.50	4.42	39	12.88	245			700
1/8/06	10:40	20.90	70	Clear	6.34	1.51	4.23	40	20.93	239			700

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/8/06	10:50	21.11	70	Clear	6.36	1.51	4.06	60	12.90	234			700
1/8/06	11:00	21.26	70	Clear	6.33	1.51	3.99	55	13.09	227			700
1/8/06	11:10	21.41	70	Clear	6.32	1.51	3.86	60	12.90	225			700
1/8/06	11:20	21.56	70	Slightly Turbid	6.32	1.52	3.65	65	13.12	220			700
1/8/06	11:30	21.75	70	Slightly Turbid	6.32	1.53	3.41	65	13.50	214			700
1/8/06	11:40	21.87	70	Slightly Turbid	6.31	1.54	3.15	75	13.39	209			700
1/8/06	11:50	22.04	70	Slightly Turbid	6.29	1.56	2.70	75	13.36	203			700
1/8/06	12:00	22.16	50	Clear	6.29	1.57	2.39	60	13.15	198			0
1/8/06	12:10	22.25	50	Clear	6.28	1.57	2.09	50	13.49	191			500
1/8/06	12:20	22.36	50	Clear	6.29	1.58	2.04	45	13.65	183			500
1/8/06	12:30	22.46	50	Clear	6.28	1.58	1.93	45	13.60	178			500
1/8/06	12:40	22.61	50	Clear	6.28	1.58	1.81	45	13.98	173			500
1/8/06	12:50	22.68	50	Clear	6.27	1.58	1.73	37	14.10	167			500
1/8/06	13:00	22.77	50	Clear	6.27	1.58	1.63	34	14.24	162			500
1/8/06	13:10	22.87	50	Clear	6.26	1.58	1.50	30	14.29	158			500
1/8/06	13:20	22.96	50	Clear	6.26	1.60	1.42	27	14.37	154			500
1/8/06	13:30	23.05	50	Clear	6.26	1.60	1.33	29	14.26	151			500

Final Purge / Sample Data

One Casing Volume	5.5	**Method**		**Dissolved Oxygen (mg/L)**	1.33
Total Vo. Purge (L)	10200.7	**Waterlevel (ft.)**	23.05	**Turbidity (NTUs)**	29
Start Purge (hrs.)	1/8/06	**Flowrate (mL/min)**	50	**Temp (C)**	14.26
End Purge (hrs.)	1/8/06	**Color**	Clear	**ORP (mV)**	151
Total Purge Time (min.)	0	**pH (S.U.)**	6.26	**Salinity**	
		Conductivity (mS/cm)	1.60	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/8/06	13:35	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-192006-2
✓	1/8/06	13:35	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2

General Observations and Notes

Sample pH (paper) = ~6.1

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/7/06	**Modified Date**	1/7/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT0906
TtNUS Project #	112G00041	**Well ID**	16MWT09
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/7/06	**Static Water Level (ft.)**	13.35	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	27.70	**Pump Control Box**	MP10-1578
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	14:20	13.35	0	Clear	NA	NA	NA	NA	NA	NA			0
1/7/06	14:30	14.10	1700	Clear	5.18	1.32	1.35	36	13.04	194			17000
1/7/06	14:40	13.95	100	Clear	4.97	1.15	1.13	17	12.75	195			200
1/7/06	14:50	13.95	100	Clear	4.90	1.10	1.19	8.7	12.61	197			1000
1/7/06	15:00	13.98	100	Clear	4.78	1.04	1.29	5.4	12.55	203			1000
1/7/06	15:10	13.98	100	Clear	4.63	0.99	1.44	4.4	12.71	216			1000
1/7/06	15:20	13.98	100	Clear	4.55	0.96	1.49	3.4	12.53	223			1000
1/7/06	15:30	13.98	100	Clear	4.49	0.94	1.48	3.3	12.51	232			1000

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	15:40	13.98	100	Clear	4.50	0.91	1.45	2.3	12.40	236			1000
1/7/06	15:50	14.02	100	Clear	4.52	0.700	1.40	2.0	12.36	238			1000
1/7/06	16:00	14.05	100	Clear	4.56	0.671	1.35	1.4	12.47	236			1000
1/7/06	16:10	14.05	100	Clear	4.58	0.667	1.32	1.2	12.31	234			1000
1/7/06	16:20	14.05	100	Clear	4.61	0.655	1.31	0.95	12.40	232			1000

Final Purge / Sample Data

One Casing Volume	8.9	**Method**		**Dissolved Oxygen (mg/L)**	1.31
Total Vo. Purge (L)	17	**Waterlevel (ft.)**	14.05	**Turbidity (NTUs)**	0.95
Start Purge (hrs.)	1/7/06	**Flowrate (mL/min)**	100	**Temp (C)**	12.40
End Purge (hrs.)	1/7/06	**Color**	Clear	**ORP (mV)**	232
Total Purge Time (min.)	0	**pH (S.U.)**	4.61	**Salinity**	
		Conductivity (mS/cm)	0.655	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/7/06	16:25	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-192006-2
✓	1/7/06	16:25	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2

General Observations and Notes

Measured TD 27.55.

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/9/06	**Modified Date**	1/9/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT1006
TtNUS Project #	112G00041	**Well ID**	16MWT10
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/9/06	**Static Water Level (ft.)**	21.72	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	27.15	**Pump Control Box**	MP10-1578
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/9/06	09:25	21.72	0	Clear	NA	NA	NA	NA	NA	NA			0
1/9/06	09:35	21.85	120	Slightly Turbid	3.33	2.01	1.67	75	12.68	394			1200
1/9/06	09:45	21.88	100	Clear	3.41	1.93	1.36	35	12.92	364			1000
1/9/06	09:55	21.90	110	Clear	3.48	1.79	1.42	25	12.83	340			1100
1/9/06	10:05	21.91	110	Clear	3.54	1.74	1.35	19	12.95	323			1100
1/9/06	10:15	21.92	110	Clear	3.53	1.70	1.64	11	12.95	321			1100
1/9/06	10:25	21.92	110	Clear	3.54	1.68	1.85	10	12.71	321			1100
1/9/06	10:35	21.93	110	Clear	3.55	1.66	1.88	7.5	12.78	320			0

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/9/06	10:45	21.92	110	Clear	3.57	1.63	1.83	6.5	12.80	315			1100

Final Purge / Sample Data

One Casing Volume	3.35	**Method**		**Dissolved Oxygen (mg/L)**	1.83
Total Vo. Purge (L)	4401.1	**Waterlevel (ft.)**	21.92	**Turbidity (NTUs)**	6.5
Start Purge (hrs.)	1/9/06	**Flowrate (mL/min)**	110	**Temp (C)**	12.80
End Purge (hrs.)	1/9/06	**Color**	Clear	**ORP (mV)**	315
Total Purge Time (min.)	0	**pH (S.U.)**	3.57	**Salinity**	
		Conductivity (mS/cm)	1.63	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/9/06	10:50	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2
✓	1/9/06	10:50	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-192006-2

General Observations and Notes

Sample pH (paper) = 3.5 SUs

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/21/06	**Modified Date**	1/22/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT1106
TtNUS Project #	112G00041	**Well ID**	16MWT11
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/21/06	**Static Water Level (ft.)**	96.60	**Water Quality Meter**	4103008
Purge Method	Bailer	**Total Well Depth (ft.)**	98.70	**Pump Control Box**	No Data Dedicated Teflon Bailer
Sampling Method	Bailer	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/22/06	09:30	96.60	0	Cloudy	6.89	1.21	6.60	160	9.50	234			0

Final Purge / Sample Data

One Casing Volume	1.3	**Method**		**Dissolved Oxygen (mg/L)**	
Total Vo. Purge (L)		**Waterlevel (ft.)**		**Turbidity (NTUs)**	
Start Purge (hrs.)	1/22/06	**Flowrate (mL/min)**		**Temp (C)**	
End Purge (hrs.)	1/22/06	**Color**	error	**ORP (mV)**	
Total Purge Time (min.)	0	**pH (S.U.)**		**Salinity**	
		Conductivity (mS/cm)		**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/22/06	09:30	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-1232006-5
✓	1/22/06	09:30	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-1232006-5

General Observations and Notes

On 1/21/2006 = Water level below the top of the pump - pulled pump and purged well w/ dedicated teflon bailer - saved purge water for sample - well historically has a very slow recharge rate - purged 2Ls prior to drying out well.

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	James Goerdt	**Modified By**	James Goerdt	**Printed By**	James Goerdt
Created Date	1/7/06	**Modified Date**	1/7/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT1206
TtNUS Project #	112G00041	**Well ID**	16MWT12
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	James Goerdt
		Concentration	Low Concentration

Well and Sample Data

Date	1/7/06	**Static Water Level (ft.)**	21.33	**Water Quality Meter**	4143006
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	28.45	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2"	**Turbidity Meter**	4073-1103
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	13:15	21.33	100	Clear	NA	NA	NA	NA	NA	NA	NA	NA	0
1/7/06	13:25	21.60	100	Clear	4.99	2.55	1.76	14	12.50	171	NA	NA	1000
1/7/06	13:35	21.69	100	Clear	4.95	2.59	1.16	7.5	12.43	183	NA	NA	1000
1/7/06	13:45	21.81	100	Clear	4.96	2.58	0.99	4.7	12.33	183	NA	NA	1000
1/7/06	13:55	21.88	100	Clear	4.93	2.55	0.89	3.7	12.56	192	NA	NA	1000
1/7/06	14:05	21.93	100	Clear	4.89	2.47	0.82	4.2	12.23	202	NA	NA	1000
1/7/06	14:15	21.96	100	Clear	4.81	2.34	0.74	4.2	12.50	NA	NA	NA	1000
1/7/06	14:25	22.06	100	Clear	4.83	2.26	0.72	3.8	12.25	213	NA	NA	1000

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/7/06	14:35	22.08	100	Clear	4.86	2.09	0.68	4.9	12.22	206	NA	NA	1000
1/7/06	14:45	22.11	100	Clear	4.87	1.95	0.64	4.2	12.50	200	NA	NA	1000
1/7/06	14:55	22.11	100	Clear	4.88	1.87	0.60	3.1	12.22	197	NA	NA	1300
1/7/06	15:05	22.10	100	Clear	4.88	1.82	0.58	2.6	12.36	193	NA	NA	1000
1/7/06	15:15	22.09	100	Clear	4.88	1.81	0.59	2.2	12.41	191	NA	NA	1000

Final Purge / Sample Data

One Casing Volume	4.3	**Method**		**Dissolved Oxygen (mg/L)**	0.59
Total Vo. Purge (L)	8001	**Waterlevel (ft.)**	22.09	**Turbidity (NTUs)**	2.2
Start Purge (hrs.)	1/7/06	**Flowrate (mL/min)**	100	**Temp (C)**	12.41
End Purge (hrs.)	1/7/06	**Color**	Clear	**ORP (mV)**	191
Total Purge Time (min.)	0	**pH (S.U.)**	4.88	**Salinity**	NA
		Conductivity (mS/cm)	1.81	**Other**	NA

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/7/06	15:20	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-192006-2
✓	1/7/06	15:20	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-192006-2

General Observations and Notes

No Notes

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/21/06	**Modified Date**	1/22/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT1306
TtNUS Project #	112G00041	**Well ID**	16MWT13
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/21/06	**Static Water Level (ft.)**	9.58	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	20.32	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/21/06	09:45	9.58	0	Clear	NA	NA	NA	NA	NA	NA			0
1/21/06	09:55	10.60	100	Clear	5.71	0.324	2.45	39	9.95	178			1000
1/21/06	10:05	10.95	80	Clear	5.69	0.320	2.24	30	9.75	175			0
1/21/06	10:15	11.25	80	Clear	5.69	0.317	2.28	21	9.70	173			800
1/21/06	10:25	11.45	70	Clear	5.69	0.317	2.28	20	9.70	171			700
1/21/06	10:35	11.70	80	Clear	5.69	0.315	2.21	17	10.25	169			800
1/21/06	10:45	11.95	70	Clear	5.68	0.314	2.08	17	10.03	168			700
1/21/06	10:55	12.30	95	Clear	5.71	0.312	1.80	18	10.82	156			950

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/21/06	11:05	12.60	90	Clear	5.78	0.316	1.56	24	10.88	138			900
1/21/06	11:15	12.90	90	Clear	5.83	0.321	1.36	19	10.97	120			900
1/21/06	11:25	13.15	90	Clear	5.89	0.327	1.16	20	11.21	99			900
1/21/06	11:35	13.45	90	Clear	5.92	0.332	1.01	22	11.01	88			900
1/21/06	11:45	13.65	90	Clear	5.93	0.335	0.91	23	10.96	81			900
1/21/06	11:55	13.90	90	Clear	5.91	0.334	0.83	25	10.87	75			900
1/21/06	12:05	14.15	90	Clear	5.92	0.335	0.77	27	10.97	71			900
1/21/06	12:15	14.35	90	Clear	5.93	0.337	0.69	25	11.08	94			900
1/21/06	12:25	14.58	90	Clear	5.94	0.339	0.65	25	9.97	98			900
1/21/06	12:35	14.85	90	Clear	5.96	0.343	0.60	31	11.27	98			0
1/21/06	12:45	15.15	90	Clear	5.98	0.347	0.59	45	11.10	97			900
1/21/06	12:55	15.33	80	Clear	5.98	0.347	0.59	55	11.08	98			800
1/21/06	13:05	15.58	80	Clear	5.95	0.342	0.62	55	11.21	100			800
1/21/06	13:15	*	80	Clear	5.90	0.334	0.61	70	11.04	104			800
1/21/06	13:25	*	70	Clear	5.88	0.330	0.58	60	11.18	106			700
1/21/06	13:35	*	70	Clear	5.85	0.328	0.58	70	11.87	107			700
1/21/06	13:43	DRY	70	Clear	5.82	0.326	0.52	DRY	12.04	110			560

Final Purge / Sample Data

One Casing Volume	6.6	**Method**		**Dissolved Oxygen (mg/L)**	0.52
Total Vo. Purge (L)	1	**Waterlevel (ft.)**	DRY	**Turbidity (NTUs)**	DRY
Start Purge (hrs.)	1/21/06	**Flowrate (mL/min)**	70	**Temp (C)**	12.04
End Purge (hrs.)	1/21/06	**Color**	Clear	**ORP (mV)**	110
Total Purge Time (min.)	0	**pH (S.U.)**	5.82	**Salinity**	
		Conductivity (mS/cm)	0.326	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/22/06	08:50	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-1232006-5
✓	1/22/06	08:50	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-1232006-5

General Observations and Notes

Sample water level = 13.75'

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	Terry Rojahn	**Printed By**	James Goerdt
Created Date	1/20/06	**Modified Date**	1/21/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT1506
TtNUS Project #	112G00041	**Well ID**	16MWT15
Task/Contract #	CTO 0377	**Well Type**	Monitoring Well
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/20/06	**Static Water Level (ft.)**	59.18	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	94.70	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**	2	**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**			
Duplicate Sample Collected?	N	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/20/06	09:40	59.18	0	Clear	NA.	NA	NA	NA	NA	NA			0
1/20/06	09:50	60.75	100	Clear	7.00	0.474	1.04	4.2	13.17	106			1000
1/20/06	10:00	62.46	110	Clear	7.22	0.454	0.77	4.3	13.11	92			1100
1/20/06	10:10	63.50	90	Clear	7.33	0.447	0.77	4.2	13.13	101			900
1/20/06	10:20	64.61	90	Clear	7.41	0.445	0.73	3.8	13.17	110			900
1/20/06	10:30	65.65	90	Clear	7.45	0.445	0.68	4.1	13.17	115			900
1/20/06	10:40	66.56	90	Clear	7.47	0.445	0.69	3.6	13.18	115			900
1/20/06	10:50	67.40	80	Clear	7.48	0.445	0.67	4.6	13.25	113			800

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/20/06	11:00	68.20	80	Clear	7.49	0.444	0.64	4.1	13.26	112			800
1/20/06	11:10	69.20	100	Clear	7.50	0.443	0.60	3.8	13.39	112			1000
1/20/06	11:20	70.10	90	Clear	7.51	0.443	0.58	4.0	13.50	110			900
1/20/06	11:30	70.93	90	Clear	7.52	0.442	0.60	3.6	13.59	112			900
1/20/06	11:40	71.75	90	Clear	7.52	0.442	0.61	3.7	13.71	115			900
1/20/06	11:50	72.45	90	Clear	7.53	0.443	0.60	3.2	13.65	118			900
1/20/06	12:00	73.18	90	Clear	7.53	0.442	0.60	3.7	13.80	119			900
1/20/06	12:10	73.88	90	Clear	7.54	0.442	0.63	3.4	13.93	119			900
1/20/06	12:20	74.39	90	Clear	7.54	0.442	0.63	3.4	13.74	119			900
1/20/06	12:30	75.10	100	Clear	7.52	0.441	0.62	4.6	13.58	118			1000
1/20/06	12:40	75.81	90	Clear	7.52	0.441	0.63	3.3	13.50	115			900
1/20/06	12:50	76.40	90	Clear	7.51	0.440	0.64	3.3	13.58	112			900
1/20/06	13:00	77.00	90	Clear	7.52	0.441	0.66	3.7	13.59	110			900
1/20/06	13:10	77.60	90	Clear	7.52	0.440	0.62	3.4	13.69	108			900
1/20/06	13:20	78.20	90	Clear	7.52	0.440	0.63	4.7	13.78	106			900
1/20/06	13:30	78.85	90	Clear	7.52	0.440	0.64	3.4	13.83	105			900
1/20/06	13:40	79.43	100	Clear	7.52	0.439	0.60	4.6	13.73	103			1000

Final Purge / Sample Data

One Casing Volume	22.0	**Method**		**Dissolved Oxygen (mg/L)**	0.60
Total Vo. Purge (L)	20100.9	**Waterlevel (ft.)**	79.43	**Turbidity (NTUs)**	4.6
Start Purge (hrs.)	1/20/06	**Flowrate (mL/min)**	100	**Temp (C)**	13.73
End Purge (hrs.)	1/20/06	**Color**	Clear	**ORP (mV)**	103
Total Purge Time (min.)	0	**pH (S.U.)**	7.52	**Salinity**	
		Conductivity (mS/cm)	0.439	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/21/06	09:05	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-1232006-5
✓	1/21/06	09:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-1232006-5

General Observations and Notes

End purge after 4 Hrs. - will allow the well time to recover and sample tomorrow.

- End of Report -

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

Created By	Terry Rojahn	**Modified By**	James Goerdt	**Printed By**	James Goerdt
Created Date	1/22/06	**Modified Date**	6/5/06	**Printed Date**	7/11/06

Project Information

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Facility Name	CRANE NSWC	**Sample ID #**	16GWT1706
TtNUS Project #	112G00041	**Well ID**	16MWT17
Task/Contract #	CTO 0377	**Well Type**	CRA
WBS Code #	0000	**Sampled By**	Terry Rojahn
		Concentration	Low Concentration

Well and Sample Data

Date	1/22/06	**Static Water Level (ft.)**	15.40	**Water Quality Meter**	4103008
Purge Method	Low flow - Bladder	**Total Well Depth (ft.)**	24.00	**Pump Control Box**	MP10-1334
Sampling Method	Low flow - Bladder	**Well Riser Diameter (in.)**		**Turbidity Meter**	0359-4197
MS/MSD Collected?	N	**Well Volumes Req.**	1		
Duplicate Sample Collected?	Y	**Monitor Reading (ppm)**	NA		
Corresponding Duplicate Sample ID					

Purge Entries

Date	Time	Water Level (ft.)	Flow Rate (mL/min)	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTUs)	Temp °C	ORP (mV)	Salinity (%)	Other	Incremental Volume (mL)
1/22/06	10:50	15.40	0	Clear	NA	NA	NA	NA	NA	na			0
1/22/06	11:00	15.73	130	Clear	5.09	1.38	1.04	45	11.92	121			1300
1/22/06	11:10	15.60	50	Clear	5.22	1.42	0.96	27	10.59	114			500
1/22/06	11:20	15.75	110	Clear	5.14	1.33	0.75	15	12.20	113			1100
1/22/06	11:30	15.73	100	Clear	5.18	1.24	0.65	12	12.26	113			1000
1/22/06	11:40	15.75	110	Clear	5.19	1.21	0.67	10	12.14	112			1100
1/22/06	11:50	15.70	90	Clear	5.22	1.24	0.64	8.5	11.49	110			900
1/22/06	12:00	15.70	90	Clear	5.24	1.24	0.66	7.4	11.48	108			900

Final Purge / Sample Data

One Casing Volume	6.6	**Method**	Low flow - Bladder	**Dissolved Oxygen (mg/L)**	0.66
Total Vo. Purge (L)	6.8	**Waterlevel (ft.)**	15.70	**Turbidity (NTUs)**	7.4
		Flowrate (mL/min)	90	**Temp (C)**	11.48
Start Purge (hrs.)	10:50:00 AM	**Color**	Clear	**ORP (mV)**	108
End Purge (hrs.)	12:00:00 PM	**pH (S.U.)**	5.24	**Salinity**	
Total Purge Time (min.)	70	**Conductivity (mS/cm)**	1.24	**Other**	

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Analysis Records

Collected	Date	Time	Analysis / Method	Description of Analysis	Preservative	Count	Type	Requirements	Comments	Chain#
✓	1/22/06	12:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	4°C	2	Glass	1L Amber		112G00041-1232006-5
✓	1/22/06	12:05	SW-846 8260B	Volatile Organic Compounds	4° C/HCL	3	Glass	40ml vials		112G00041-1232006-5

General Observations and Notes

Sample pH (paper) = ~5.0 SUs

- End of Report -

A.3

SWMU 16

CHAIN OF CUSTODY RECORDS

ROUND 7

Tetra Tech NUS, Inc.

CHAIN OF CUSTODY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	Terry Rojahn
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/6/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Chain of Custody ID	112G00041-162006-1	**Carrier**	Federal Express	**Printed By**	James Goerdt
		Carrier/Waybill No.	8244 4672 4260	**Printed Date**	7/11/06

Chain of Custody Information

Chain of Custody #	**112G00041-162006-1**	**Lab Name**	Laucks Testing Laboratories	**Relenquished By**	Terry Rojahn
Carrier	Federal Express	**Address**	940 South Harney Street	**Date**	1/6/06
Carrier/Waybill No.	8244 4672 4260	**City, State, Zip**	Seattle, WA 98108	**Time**	
		Lab Contact	Hugh Prentice/Elaine Walker	**Received By:**	Federal Express
		Lab Telephone	206-767-5060 x1028	**Date**	1/6/06
				Time	

Sample Records

Date	Sample ID#	Time	Analysis	Description	Loc ID	Matrix	Preservative	No.	Type	Requirements	Comments
1/5/06	13SW1104	10:25	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD11	SW	4°C	2	Glass	1L Amber	

1/5/06	13SW1406	08:44	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD14	SW	4°C	4	Glass	1L Amber	Do MS/MSD
1/5/06	13SW1506	09:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD15	SW	4°C	2	Glass	1L Amber	
1/5/06	13SW1606	09:22	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD16	SW	4°C	2	Glass	1L Amber	
1/5/06	13SW1905	11:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD19	SW	4°C	2	Glass	1L Amber	
1/5/06	13SW2005	10:44	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD20	SW	4°C	2	Glass	1L Amber	
1/5/06	13SW2205	10:11	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD22	SW	4°C	2	Glass	1L Amber	
1/5/06	13SW3006	00:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	QC	SW	4°C	2	Glass	1L Amber	

Tetra Tech NUS, Inc.

CHAIN OF CUSTODY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Sample Records

Date	Sample ID#	Time	Analysis	Description	Loc ID	Matrix	Preservative	No.	Type	Requirements	Comments
1/5/06	13SW3006	09:37	SW-846-8330	Explosives Nitroaromatics and Nitramines	13SWSD30	SW	4°C	2	Glass	1L Amber	
1/5/06	16SW1004	15:49	SW-846-8330	Explosives Nitroaromatics and Nitramines	16SWSD10	SW	4°C	2	Glass	1L Amber	
1/5/06	16SW1004	15:49	SW-846 8260B	Volatile Organic Compounds	16SWSD10	SW	4°C/HCL	3	Glass	40ml vials	
1/5/06	16SW1205	14:44	SW-846 8260B	Volatile Organic Compounds	16SWSD12	SW	4°C/HCL	3	Glass	40ml vials	
1/5/06	16SW1205	14:44	SW-846-8330	Explosives Nitroaromatics and Nitramines	16SWSD12	SW	4°C	2	Glass	1L Amber	
1/5/06	16SW1305	14:31	SW-846 8260B	Volatile Organic Compounds	16SWSD13	SW	4°C/HCL	3	Glass	40ml vials	
1/5/06	16SW1305	14:31	SW-846-8330	Explosives Nitroaromatics and Nitramines	16SWSD13	SW	4°C	2	Glass	1L Amber	
1/5/06	16SW3004	00:00	SW-846 8260B	Volatile Organic Compounds	QC	SW	4°C/HCL	3	Glass	40ml vials	
1/5/06	16SW3004	00:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	QC	SW	4°C	2	Glass	1L Amber	
1/5/06	16SW3004	12:56	SW-846-8330	Explosives Nitroaromatics and Nitramines	16SWSD30	SW	4°C	4	Glass	1L Amber	DO MS/MSD
1/5/06	16SW3004	12:56	SW-846 8260B	Volatile Organic Compounds	16SWSD30	SW	4°C/HCL	9	Glass	40ml vials	DO MS/MSD
1/5/06	TB01050601	07:30	SW-846 8260B	Volatile Organic Compounds	QC	AQ	4°C/HCL	2	Glass	40ml vials	Trip Blank
1/6/06	13GWT4006	10:08	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT40	GW	4°C	2	Glass	1L Amber	
1/6/06	13GWT4706	11:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT47	GW	4°C	4	Glass	1L Amber	Do MS/MSD

General Observations and Notes

No Notes

- End of Report -

Tetra Tech NUS, Inc.

CHAIN OF CUSTODY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	Terry Rojahn
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/9/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Chain of Custody ID	112G00041-192006-2	**Carrier**	Federal Express	**Printed By**	James Goerdt
		Carrier/Waybill No.	8244 4672 4281	**Printed Date**	7/11/06

Chain of Custody Information

Chain of Custody #	**112G00041-192006-2**	**Lab Name**	Laucks Testing Laboratories	**Relenquished By**	Terry Rojahn
Carrier	Federal Express	**Address**	940 South Harney Street	**Date**	1/9/06
Carrier/Waybill No.	8244 4672 4281	**City, State, Zip**	Seattle, WA 98108	**Time**	
		Lab Contact	Hugh Prentice/Elaine Walker	**Received By:**	Federal Express
		Lab Telephone	206-767-5060 x1028	**Date**	1/9/06
				Time	

Sample Records

Date	Sample ID#	Time	Analysis	Description	Loc ID	Matrix	Preservative	No.	Type	Requirements	Comments
1/6/06	13GWT3706	16:45	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT37	GW	4°C	2	Glass	1L Amber	
1/6/06	13GWT4606	14:20	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT46	GW	4°C	2	Glass	1L Amber	
1/7/06	16GW0307	11:00	SW-846 8260B	Volatile Organic Compounds	16MW03	GW	4°C/HCL	3	Glass	40ml vials	

1/7/06	16GW0307	11:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MW03	GW	4°C	2	Glass	1L Amber	
1/7/06	16GW0407	11:10	SW-846 8260B	Volatile Organic Compounds	16MW04	GW	4°C/HCL	3	Glass	40ml vials	
1/7/06	16GW0407	11:10	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MW04	GW	4°C	2	Glass	1L Amber	
1/7/06	16GWT0906	16:25	SW-846 8260B	Volatile Organic Compounds	16MWT09	GW	4°C/HCL	3	Glass	40ml vials	
1/7/06	16GWT0906	16:25	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT09	GW	4°C	2	Glass	1L Amber	

Tetra Tech NUS, Inc.

CHAIN OF CUSTODY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Sample Records

Date	Sample ID#	Time	Analysis	Description	Loc ID	Matrix	Preservative	No.	Type	Requirements	Comments
1/7/06	16GWT1206	15:20	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT12	GW	4°C	2	Glass	1L Amber	
1/7/06	16GWT1206	15:20	SW-846 8260B	Volatile Organic Compounds	16MWT12	GW	4°C/HCL	3	Glass	40ml vials	
1/7/06	TB01070601	07:00	SW-846 8260B	Volatile Organic Compounds	QC	AQ	4°C/HCL	2	Glass	40ml vials	Trip Blank
1/8/06	13GWT1307	13:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT13	GW	4°C	2	Glass	1L Amber	
1/8/06	16GW0207	10:30	SW-846 8260B	Volatile Organic Compounds	16MW02	GW	4°C/HCL	3	Glass	40ml vials	
1/8/06	16GW0207	10:30	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MW02	GW	4°C	2	Glass	1L Amber	
1/8/06	16GWT0608	13:35	SW-846 8260B	Volatile Organic Compounds	16MWT06	GW	4°C/HCL	3	Glass	40ml vials	Hot sample in past!
1/8/06	16GWT0608	13:35	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT06	GW	4°C	2	Glass	1L Amber	
1/9/06	13GWT0908	00:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	QC	GW	4°C	2	Glass	1L Amber	Field Dup
1/9/06	13GWT0908	10:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT09	GW	4°C	2	Glass	1L Amber	
1/9/06	16GWT1006	10:50	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT10	GW	4°C	2	Glass	1L Amber	
1/9/06	16GWT1006	10:50	SW-846 8260B	Volatile Organic Compounds	16MWT10	GW	4°C/HCL	3	Glass	40ml vials	

General Observations and Notes

No Notes

- End of Report -

Tetra Tech NUS, Inc.

CHAIN OF CUSTODY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	Terry Rojahn
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/23/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Chain of Custody ID	112G00041-1232006-5	**Carrier**	Federal Express	**Printed By**	James Goerdt
		Carrier/Waybill No.	8494 1921 7746	**Printed Date**	7/11/06

Chain of Custody Information

Chain of Custody #	**112G00041-1232006-5**	**Lab Name**	Laucks Testing Laboratories	**Relenquished By**	Terry Rojahn
Carrier	Federal Express	**Address**	940 South Harney Street	**Date**	1/23/06
Carrier/Waybill No.	8494 1921 7746	**City, State, Zip**	Seattle, WA 98108	**Time**	
		Lab Contact	Hugh Prentice/Elaine Walker	**Received By:**	Federal Express
		Lab Telephone	206-767-5060 x1028	**Date**	1/23/06
				Time	

Sample Records

Date	Sample ID#	Time	Analysis	Description	Loc ID	Matrix	Preservative	No.	Type	Requirements	Comments
1/20/06	13GWT5105	16:55	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT51	GW	4°C	2	Glass	1L Amber	
1/21/06	16GWT0407	17:35	SW-846 8260B	Volatile Organic Compounds	16MWT04	GW	4°C/HCL	9	Glass	40ml vials	Do MS/MSD
1/21/06	16GWT0407	17:35	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT04	GW	4°C	4	Glass	1L Amber	Do MS/MSD

1/21/06	16GWT1506	09:05	SW-846 8260B	Volatile Organic Compounds	16MWT15	GW	4°C/HCL	3	Glass	40ml vials	
1/21/06	16GWT1506	09:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT15	GW	4°C	2	Glass	1L Amber	
1/21/06	TB01210601	07:10	SW-846 8260B	Volatile Organic Compounds	QC	AQ	4°C/HCL	2	Glass	40ml vials	Trip Blank
1/22/06	16GWT1106	09:30	SW-846 8260B	Volatile Organic Compounds	16MWT11	GW	4°C/HCL	3	Glass	40ml vials	
1/22/06	16GWT1106	09:30	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT11	GW	4°C	2	Glass	1L Amber	

Tetra Tech NUS, Inc.

CHAIN OF CUSTODY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Sample Records

Date	Sample ID#	Time	Analysis	Description	Loc ID	Matrix	Preservative	No.	Type	Requirements	Comments
1/22/06	16GWT1306	08:50	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT13	GW	4°C	2	Glass	1L Amber	
1/22/06	16GWT1306	08:50	SW-846 8260B	Volatile Organic Compounds	16MWT13	GW	4°C/HCL	3	Glass	40ml vials	Hot in past!
1/22/06	16GWT1706	00:00	SW-846 8260B	Volatile Organic Compounds	QC	GW	4°C/HCL	3	Glass	40ml vials	DUP - Hot in past!
1/22/06	16GWT1706	00:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	QC	GW	4°C	2	Glass	1L Amber	DUP
1/22/06	16GWT1706	12:05	SW-846 8260B	Volatile Organic Compounds	16MWT17	GW	4°C/HCL	3	Glass	40ml vials	Hot in past!
1/22/06	16GWT1706	12:05	SW-846-8330	Explosives Nitroaromatics and Nitramines	16MWT17	GW	4°C	2	Glass	1L Amber	
1/23/06	13GWT0107	11:00	SW-846-8330	Explosives Nitroaromatics and Nitramines	13MWT01	GW	4°C	2	Glass	1L Amber	

General Observations and Notes

No Notes

- End of Report -

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SWMU 16

WATER LEVEL MEASUREMENTS

ROUND 7

Tetra Tech NUS, Inc.

GROUNDWATER MEASUREMENT LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Sample ID #**		**Created By**	James Goerdt
TtNUS Project #	112G00041	**Well ID**		**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Sampled By**	James Goerdt	**Modified By**	
WBS Code #	0000	**Concentration**		**Modified Date**	
Well Type				**Printed By**	James Goerdt
QA Sample Type				**Printed Date**	7/11/06

Groundwater Measurements

Well ID	Date	Time	Water Level Indicator Reading (ft)	Total Well Depth (ft)	Free Product Thickness (ft)	PID/FID (ppm)	Reference Elevation (ft)	Groundwater Elevation	Tidally Influenced
16MW01	1/5/06	14:58	33.25	53.55	NA	NA		e	N
16MW02	1/5/06	16:58	15.5	*	NA	NA		e	N
16MW03	1/5/06	15:39	19.22	38.20	NA	NA		e	N
16MW04	1/5/06	15:22	29.27	47.70	NA	NA		e	N
16MW05	1/5/06	15:18	35.41	53.06	NA	NA		calc	N
16MWT01	1/5/06	16:50	15.83	*	NA	NA		e	N
16MWT02	1/5/06	16:21	8.15	21.05	NA	NA		e	N
16MWT03	1/5/06	16:12	29.03	37.95	NA	NA		e	N

Tetra Tech NUS, Inc.

GROUNDWATER MEASUREMENT LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Groundwater Measurements

Well ID	Date	Time	Water Level Indicator Reading (ft)	Total Well Depth (ft)	Free Product Thickness (ft)	PID/FID (ppm)	Reference Elevation (ft)	Groundwater Elevation	Tidally Influenced
16MWT04	1/5/06	16:47	10.58	27.55	NA	NA		e	N
16MWT05	1/5/06	16:04	32.63	41.79	NA	NA		e	N
16MWT06	1/5/06	16:51	19.4	*	NA	NA		e	N
16MWT07	1/5/06	16:42	DRY	27.3	NA	NA		e	N
16MWT08	1/5/06	16:44	95.33	*	NA	NA		e	N
16MWT09	1/5/06	16:37	13.52	27.55	NA	NA		e	N
16MWT10	1/5/06	16:32	21.49	26.90	NA	NA		e	N
16MWT11	1/5/06	16:29	DRY	*	NA	NA		e	N
16MWT12	1/5/06	15:35	21.54	28.45	NA	NA		e	N
16MWT13	1/5/06	16:17	10.03	20.25	NA	NA		e	N
16MWT14	1/5/06		abdandoned	*	NA	NA		e	N
16MWT15	1/5/06	16:22	59.43	*	NA	NA		e	N
16MWT16	1/5/06	17:32	33.32	35.22	NA	NA		e	N
16MWT17	1/5/06	16:54	15.52	*	NA	NA		e	N
16MWT18	1/5/06	17:28	95.39	104.45	NA	NA		e	N
16MWT19	1/5/06	13:50	3.11	18.00	NA	NA		e	N
16MWT20	1/5/06	17:56	3.58	18.05	NA	NA		e	N
16MWT21	1/5/06	15:21	66.07	97.75	NA	NA		e	N
16MWT22	1/5/06	13:46	3.52	18.10	NA	NA		e	N

General Observations and Notes

Water levels and total well depths measured. Dedicated bladder pump depths also measured where applicable.

- End of Report -

Tetra Tech NUS, Inc.

SURFACE WATER MEASUREMENT LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Project Manager (PM)**	Ralph Basinski	**Created By**	James Goerdt
TtNUS Project #	112G00041	**PM Telephone**	412-921-8308	**Created Date**	1/5/06
Task/Contract #	CTO 0377	**Field Op Leader (FOL)**	Terry Rojahn	**Modified By**	
WBS Code #	0000	**FOL Phone**	412-921-8857	**Modified Date**	
Chain of Custody ID		**Carrier**		**Printed By**	James Goerdt
		Carrier/Waybill No.		**Printed Date**	7/11/06

Surface Water Measurements

Location ID	Date	Time	Flow Rate (est.)	Type	Measurement	Flow Width	Flow Depth	Flow Velocity
16SG01	1/5/06	16:25		Dry				
16SG02	1/5/06	15:08		Stagnant	4.90			
16SG03	1/5/06	16:06		Stagnant	4.96			
16SG04	1/5/06	15:57		Stagnant	2.11			
16SG05	1/5/06	15:55		Stagnant	1.45			
16SG06	1/5/06	13:27		Estimated	3.21	2.0	0.11	1
16SG07	1/5/06	13:35		Estimated	6.39	2.90	0.24	2.5
16SG08	1/5/06	13:55		Estimated	4.11	1.10	0.25	1

Tetra Tech NUS, Inc.

SURFACE WATER MEASUREMENT LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Surface Water Measurements

Location ID	Date	Time	Flow Rate (est.)	Type	Measurement	Flow Width	Flow Depth	Flow Velocity
16SG09	1/5/06	14:01		Estimated	5.93	1.10	0.25	1

General Observations and Notes

No Notes

- End of Report -

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SWMU 16

EQUIPMENT CALIBRATION FORMS

ROUND 7

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Instrument**	Turbidity Meter	**Created By**	James Goerdt
TtNUS Project #	112G00041	**Manufacturer**	LaMotte 2020	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Serial Number**	0359-4197	**Modified By**	John Wright
WBS Code #	0000			**Modified Date**	8/18/06
Client				**Printed By**	John Wright
				Printed Date	8/29/06

Calibration Records

Date	Calibrator	Turbidity - 0 NTU	Turbidity - 10 NTU	Comments
1/2/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 9.95 Post: 10.00 Std: Exp:	
1/4/06	James Goerdt	Pre: 0.0 Post: 0.0 Std: Exp:	Pre: 10 Post: 10 Std: Exp:	
1/7/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 9.9 Post: 9.9 Std: Exp:	
1/8/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 10 Post: 10 Std: Exp:	
1/9/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 10 Post: 10 Std: Exp:	
1/18/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 10.25 Post: 10.00 Std: Exp:	
1/19/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 9.95 Post: 10.0 Std: Exp:	
1/20/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 9.90 Post: 10.00 Std: Exp:	
1/21/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 9.88 Post: 10.00 Std: Exp:	

1/22/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 9.9 Post: 10.00 Std: Exp:	
1/23/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 9.95 Post: 10.00 Std: Exp:	
1/24/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 10.05 Post: 10.00 Std: Exp:	

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Instrument**	Turbidity Meter	**Created By**	James Goerdt
TtNUS Project #	112G00041	**Manufacturer**	LaMotte 2020	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Serial Number**	4073-1103	**Modified By**	John Wright
WBS Code #	0000			**Modified Date**	8/18/06
Client				**Printed By**	John Wright
				Printed Date	8/29/06

Calibration Records

Date	Calibrator	Turbidity - 0 NTU	Turbidity - 10 NTU	Comments
1/4/06	James Goerdt	Pre: 0.0 Post: 0.0 Std: Exp:	Pre: 9.9 Post: 10 Std: Exp:	
1/6/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 10 Post: 10 Std: Exp:	
1/7/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 9.7 Post: 10.0 Std: Exp:	
1/8/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 10 Post: 10 Std: Exp:	
1/9/06	James Goerdt	Pre: 0 Post: 0 Std: Exp:	Pre: 10 Post: 10 Std: Exp:	
1/10/06	T. Rojahn	Pre: 0.00 Post: 0.00 Std: Exp:	Pre: 10.06 Post: 10.00 Std: Exp:	

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Instrument**	Water Quality Meter U22	**Created By**	James Goerdt
TtNUS Project #	112G00041	**Manufacturer**	Horiba	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Serial Number**	4103008	**Modified By**	John Wright
WBS Code #	0000			**Modified Date**	8/29/06
Client				**Printed By**	John Wright
				Printed Date	8/29/06

Calibration Records

Date	Calibrator	pH	Conductivity	DO	ORP	Turbidity	Comments
1/6/06	James Goerdt	Pre: 3.86 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.65 Post: 4.49 Std: 4920 Exp: 5/10/07	Pre: 11.45 Post: 10.09 Std: Exp:	Pre: 380 Post: 376 Std: Exp: ORP: 16.80	Pre: 2 Post: 0 Std: 4920 Exp: 5/10/07	
1/7/06	James Goerdt	Pre: 4.02 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.38 Post: 4.48 Std: 4920 Exp: 5/10/07	Pre: 8.97 Post: 9.09 Std: Exp:	Pre: 316 Post: 313 Std: Exp: ORP: 18.44	Pre: 0 Post: 0 Std: 4920 Exp: 5/10/07	
1/8/06	James Goerdt	Pre: 3.97 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.54 Post: 4.48 Std: 4920 Exp: 5/10/07	Pre: 8.93 Post: 9.01 Std: Exp:	Pre: 380 Post: 371 Std: Exp: ORP: 19.21	Pre: 9 Post: 0 Std: 4920 Exp: 5/10/07	
1/9/06	James Goerdt	Pre: 4.06 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.45 Post: 4.49 Std: 4920 Exp: 5/10/07	Pre: 8.99 Post: 8.90 Std: Exp:	Pre: 344 Post: 339 Std: Exp: ORP: 20.37	Pre: 13 Post: 0 Std: 4920 Exp: 5/10/07	
1/18/06	T. Rojahn	Pre: 3.97 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.47 Post: 4.49 Std: 4920 Exp: 5/10/07	Pre: 8.18 Post: 8.55 Std: 4920 Exp: 5/10/07	Pre: 312 Post: 309 Std: 4920 Exp: 5/10/07 ORP: 20.76	Pre: NA Post: NA Std: Exp:	
1/19/06	T. Rojahn	Pre: 3.98 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.33 Post: 4.50 Std: 4920 Exp: 5/10/07	Pre: 9.12 Post: 9.20 Std: 4920 Exp: 5/10/07	Pre: 308 Post: 300 Std: 4920 Exp: 5/10/07 ORP: 19.02	Pre: NA Post: NA Std: Exp:	
1/20/06	T. Rojahn	Pre: 4.03 Post: 4.00 Std: 4920 Exp:	Pre: 4.75 Post: 4.49 Std: 4920 Exp:	Pre: 9.05 Post: 9.11 Std: 4920 Exp:	Pre: 423 Post: 417 Std: 4920 Exp:	Pre: NA Post: NA Std:	

		5/10/07	5/10/07	5/10/07	5/10/07 ORP: 19.85	Exp:	
1/21/06	T. Rojahn	Pre: 4.02 Post: 4.00 Std: 4920 Exp: 05/10/07	Pre: 4.39 Post: 4.49 Std: 4920 Exp: 05/10/07	Pre: 9.32 Post: 9.25 Std: 4920 Exp: 05/10/07	Pre: 174 Post: 172 Std: 4920 Exp: 05/10/07 ORP: 19.41	Pre: NA Post: NA Std: Exp:	Checked ORP with Zobell Solution (should read ~238) reading = 201mV
1/22/06	T. Rojahn	Pre: 4.00 Post: 4.00 Std: 4920 Exp: 05/10/07	Pre: 4.52 Post: 4.49 Std: 4920 Exp: 05/10/07	Pre: 9.32 Post: 9.38 Std: 4920 Exp: 05/10/07	Pre: 299 Post: 298 Std: 4920 Exp: 05/10/07 ORP: 18.78	Pre: NA Post: NA Std: Exp:	
1/23/06	T. Rojahn	Pre: 4.02 Post: 4.00 Std: 4920 Exp: 05-10-2007	Pre: 4.47 Post: 4.49 Std: 4920 Exp: 05-10-2007	Pre: 9.44 Post: 9.45 Std: 4920 Exp: 05-10-2007	Pre: 299 Post: 300 Std: 4920 Exp: 05-10-2007 ORP: 18.83	Pre: NA Post: NA Std: Exp:	
1/24/06	T. Rojahn	Pre: 4.00 Post: 4.00 Std: 4920 Exp: 05/10/2007	Pre: 4.40 Post: 4.49 Std: 4920 Exp: 05/10/2007	Pre: 9.27 Post: 9.49 Std: 4920 Exp: 05/10/2007	Pre: 334 Post: 330 Std: 4920 Exp: 05/10/2007 ORP: 18.66	Pre: NA Post: NA Std: Exp:	

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Facility Name	CRANE NSWC	**Instrument**	Water Quality Meter U22	**Created By**	James Goerdt
TtNUS Project #	112G00041	**Manufacturer**	Horiba	**Created Date**	1/4/06
Task/Contract #	CTO 0377	**Serial Number**	4143006	**Modified By**	John Wright
WBS Code #	0000			**Modified Date**	8/18/06
Client				**Printed By**	John Wright
				Printed Date	8/29/06

Calibration Records

Date	Calibrator	pH	Conductivity	DO	ORP	Turbidity	Comments
1/5/06	James Goerdt	Pre: 3.98 Post: 3.99 Std: 4920 Exp: 5/10/07	Pre: 4.50 Post: 4.50 Std: 4920 Exp: 5/10/07	Pre: 8.19 Post: 8.46 Std: Exp:	Pre: 285 Post: 294 Std: Exp: ORP: 19.05	Pre: 0 Post: Std: 4920 Exp: 5/10/07	
1/6/06	James Goerdt	Pre: 3.96 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.61 Post: 4.49 Std: 4920 Exp: 5/10/07	Pre: 6.63 Post: 8.05 Std: Exp:	Pre: 303 Post: 303 Std: Exp: ORP: 16.68	Pre: 4 Post: 0 Std: 4920 Exp: 5/10/07	
1/7/06	James Goerdt	Pre: 3.98 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.28 Post: 4.48 Std: 4920 Exp: 5/10/07	Pre: 10.62 Post: 9.36 Std: Exp:	Pre: 296 Post: 294 Std: Exp: ORP: 18.08	Pre: 1 Post: 1 Std: 4920 Exp: 5/10/07	
1/8/06	James Goerdt	Pre: 4.04 Post: 3.99 Std: 4920 Exp: 5/10/07	Pre: 4.46 Post: 4.48 Std: 4920 Exp: 5/10/07	Pre: 9.30 Post: 9.25 Std: Exp:	Pre: 289 Post: 289 Std: Exp: ORP: 18.67	Pre: 1 Post: 1 Std: 4920 Exp: 5/10/07	
1/9/06	James Goerdt	Pre: 3.98 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.51 Post: 4.49 Std: 4920 Exp: 5/10/07	Pre: 8.76 Post: 9.03 Std: Exp:	Pre: 276 Post: 275 Std: Exp: ORP: 19.55	Pre: 1 Post: 0 Std: 4920 Exp: 5/10/07	
1/10/06	T. Rojahn	Pre: 4.01 Post: 4.00 Std: 4920 Exp: 5/10/07	Pre: 4.66 Post: 4.49 Std: 4920 Exp: 5/10/07	Pre: 8.52 Post: 8.70 Std: Exp:	Pre: 344 Post: 342 Std: Exp: ORP: 19.64	Pre: 6 Post: 0 Std: 4920 Exp: 5/10/07	

APPENDIX B

SMWU 16

MISCELLANEOUS FIELD DOCUMENTATION

ROUND 7

B.1

SWMU 16

DAILY ACTIVITIES RECORD

ROUND 7

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/03/2006	**Weather/Temp**		**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;T. Rojahn	**Created Date**	1/4/06
TtNUS Project #	112G00041			**Modified By**	Terry Rojahn
Task/Contract #	0000	**Subcontractor Personnel**		**Modified Date**	3/9/06
WBS Code #	0000	**Visitors**		**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/3/06	07:35	Terry Rojahn	Due to the cancellation of TR's 0835 Hr flight in Pittsburgh and a 1700 Hr arrival into Indy airport - this date was all travel. JG arrived in Bloomington in time to pick up equipment shipments at Fed. Ex. Station in Bloomington (JG's flight out of Pittsburgh was delayed).
1/3/06	07:40	Terry Rojahn	TR arrived in Bloomington at 18:40 Hrs and JG arrived at 1700 Hrs on 1/3/2006.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/04/2006	**Weather/Temp**	Mostly sunny & High 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;T. Rojahn	**Created Date**	1/4/06
TtNUS Project #	112G00041			**Modified By**	Terry Rojahn
Task/Contract #	0000	**Subcontractor Personnel**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV	**Visitors**		**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/4/06	06:45	Terry Rojahn	Arrive at Bloomington gate for NSWC Crane pass.
1/4/06	07:00	Terry Rojahn	Arrive at B-3245:
1/4/06	09:18	Terry Rojahn	Check in w/Mr. Roach - no production this shift at SWMUs 13 &16
1/4/06	09:30	Terry Rojahn	Install well tag on monitoring well 12MWT14.
1/4/06	09:39	Terry Rojahn	Begin synoptic water levels at SWMU 13.
1/4/06	11:55	Terry Rojahn	Break for lunch after completing ground water and surface water levels inside the fence at SWMU 13. Measurements taken for both the monitoring wells (WL, TD & bladder pump intake) and staff gauges(surface water level and flow).
1/4/06	12:20	Terry Rojahn	Return to B-3245:
1/4/06	12:49	Terry Rojahn	Leave B-3245 for SWMU13 to continue synoptic water level measurements.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/4/06	15:25	Terry Rojahn	Complete synoptic water levels for monitoring wells and staff gauges at SWMU 13.
1/4/06	15:30	Terry Rojahn	Return to B-3245:
1/4/06	16:30	Terry Rojahn	Leave B-3245 for Bloomington.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/05/2006	**Weather/Temp**	Overcast & 30's	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;T. Rojahn	**Created Date**	1/5/06
TtNUS Project #	112G00041			**Modified By**	Terry Rojahn
Task/Contract #	0000	**Subcontractor Personnel**		**Modified Date**	3/9/06
WBS Code #	0000	**Visitors**		**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/5/06	06:50	Terry Rojahn	Arrive at B-3245:
1/5/06	07:30	Terry Rojahn	Collect Trip Blank 16TB01050601.
1/5/06	08:30	Terry Rojahn	Arrive at SWMU 13 to collect surface water samples.
1/5/06	11:20	Terry Rojahn	Return to B-3245 after collecting all Round 7 surface water samples (13SW1104, 1406, 1506, 1606, 1905, 2005, 2205 & 3006) at SWMU 13.
1/5/06	11:50	Terry Rojahn	Leave B-3245 for lunch at cafe.
1/5/06	12:20	Terry Rojahn	Finish lunch
1/5/06	12:34	Terry Rojahn	Arrive at SWMU 16 after a quick stop at B-3245 to collect surface water samples and measure monitoring well and staff gauge water levels.
1/5/06	17:00	Terry Rojahn	Arrive at B-3245 after collecting all Round 7 surface water samples (16SW1004, 1205, 1305 and 3004) at SWMU 16. Also, completed the round of synoptic water levels and staff gauge measurements at SWMU 16.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/5/06	18:20	Terry Rojahn	Leave B-3245 for Bloomington.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/06/2006	**Weather/Temp**	Overcast & 30s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;T.Rojahn	**Created Date**	1/6/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/6/06	07:00	Terry Rojahn	Arrive at B-3245:
1/6/06	08:55	Terry Rojahn	Arrive at SWMU 13
1/6/06	09:25	Terry Rojahn	Begin purge at 13MWT47.
1/6/06	10:55	Terry Rojahn	End purge at 13MWT47.
1/6/06	11:00	Terry Rojahn	Begin collecting ground water sample 13GWT4706.
1/6/06	11:55	Terry Rojahn	Finish sampling and clean up at 13MWT47.
1/6/06	12:00	Terry Rojahn	Arrive at cafe - lunch.
1/6/06	12:30	Terry Rojahn	Return to B-3245:

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/6/06	16:25	Terry Rojahn	Prep to leave B-3245 for Fed Ex.
1/6/06	17:00	Terry Rojahn	Drop off samples at Fed Ex.
1/6/06	17:32	Terry Rojahn	Picked up supplies at Lowe's.
1/6/06	17:45	Terry Rojahn	SAMPLE SUMMARY FOR THIS DATE:

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/07/2006	**Weather/Temp**	Partly cloudy and 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J.Goerdt;T. Rojahn	**Created Date**	1/7/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/7/06	07:00	Terry Rojahn	Arrive at B-3245:
1/7/06	09:00	Terry Rojahn	Arrive at SWMU 12
1/7/06	09:25	Terry Rojahn	Begin purging monitoring well 16MW04.
1/7/06	11:05	Terry Rojahn	Finish purging monitoring well 16MW04.
1/7/06	11:10	Terry Rojahn	Start collecting ground water sample 16GW0407.
1/7/06	11:45	Terry Rojahn	Finish clean up at monitoring well 16MW04.
1/7/06	12:00	Terry Rojahn	Lunch
1/7/06	12:45	Terry Rojahn	Prep to retake photos of select monitoring wells at SWMUs 8 & 13.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/7/06	12:58	Terry Rojahn	Return to SWMU 16.
1/7/06	14:20	Terry Rojahn	Begin purging monitoring well 16MWT09.
1/7/06	16:20	Terry Rojahn	Finish purging monitoring well 16MWT09.
1/7/06	16:25	Terry Rojahn	Start collecting ground water sample 16GWT0906.
1/7/06	17:00	Terry Rojahn	Finish clean up at monitoring well 16MWT09.
1/7/06	17:05	Terry Rojahn	Arrive at B3245:
1/7/06	17:30	Terry Rojahn	Leave B-3245 for Bloomington.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/08/2006	**Weather/Temp**	Partly Cloudy & 50s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;T. Rojahn	**Created Date**	1/8/06
TtNUS Project #	112G00041			**Modified By**	Terry Rojahn
Task/Contract #	0000	**Subcontractor Personnel**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV	**Visitors**		**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/8/06	07:10	Terry Rojahn	Arrive at B-3245:
1/8/06	09:10	Terry Rojahn	Arrive at SWMU 16.
1/8/06	09:30	Terry Rojahn	Begin purge at 16MWT06.
1/8/06	13:30	Terry Rojahn	End purge at 16MWT06.
1/8/06	13:35	Terry Rojahn	Begin collecting ground water sample 16GWT0608.
1/8/06	14:26	Terry Rojahn	Finish clean up at 16MWT06.
1/8/06	14:30	Terry Rojahn	Arrive at B3245:
1/8/06	15:00	Terry Rojahn	Leave B-3245 for Bloomington.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/09/2006	**Weather/Temp**	Partly cloudy & 30s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;T. Rojahn	**Created Date**	1/9/06
TtNUS Project #	112G00041			**Modified By**	Terry Rojahn
Task/Contract #	0000	**Subcontractor Personnel**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV	**Visitors**		**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/9/06	07:00	Terry Rojahn	Arrive at B-3245:
1/9/06	08:50	Terry Rojahn	Arrive at SWMU 16 - check in with B-146 supervisor (Pam) - OK to work this date.
1/9/06	09:25	Terry Rojahn	Begin purge at 16MWT10.
1/9/06	10:45	Terry Rojahn	End purge at 16MWT10.
1/9/06	10:50	Terry Rojahn	Begin collecting ground water sample 16GWT1006.
1/9/06	11:35	Terry Rojahn	Finish clean up at 16MWT10.
1/9/06	11:45	Terry Rojahn	Lunch
1/9/06	12:15	Terry Rojahn	Install weep hole in monitoring well 13MWT47.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/9/06	12:25	Terry Rojahn	Check on JG at 13MWT28. Got JGs Thoughbook to sync for COC generating.
1/9/06	12:40	Terry Rojahn	Arrive at B-3245:
1/9/06	14:01	Terry Rojahn	Took photo #1340 @ monitoring well 16MWT19.
1/9/06	14:03	Terry Rojahn	Took photo #1341 @ monitoring well 16MWT20.
1/9/06	14:13	Terry Rojahn	Took photo #1342 @ monitoring well 16MWT21.
1/9/06	14:14	Terry Rojahn	Took photo #1343 @ monitoring well 16MW04.
1/9/06	14:20	Terry Rojahn	Return to B-3245:
1/9/06	17:00	Terry Rojahn	Leave B-3245 for Fed. Ex.
1/9/06	17:50	Terry Rojahn	Drop off samples at Bloomington Fed Ex.
1/9/06	17:55	Terry Rojahn	SAMPLE SUMMARY FOR THIS DATE:

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/10/2006	**Weather/Temp**	Rain & 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	R. Basinski;J. Goerdt;T. Rojahn	**Created Date**	1/10/06
TtNUS Project #	112G00041			**Modified By**	Terry Rojahn
Task/Contract #	0000	**Subcontractor Personnel**		**Modified Date**	3/9/06
WBS Code #	0000	**Visitors**	Mr. Tom Brent	**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/10/06	07:00	Terry Rojahn	Arrive @ B-3245
1/10/06	10:00	Terry Rojahn	Lay out soil boring sampling (DPT) locations at SWMU 13.
1/10/06	11:45	Terry Rojahn	Lunch
1/10/06	12:30	Terry Rojahn	Continue laying out DPT boring locations.
1/10/06	17:00	Terry Rojahn	Finish laying out DPT boring locations and return to B-3245.
1/10/06	17:10	Terry Rojahn	Soil borings laid out this date:
1/10/06	17:30	Terry Rojahn	Leave B-3245 for Lowe's
1/10/06	18:15	Terry Rojahn	Purchase wooden grade stakes - need to replace pin flags at SWMU 12 with wooden stakes.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/10/06	18:16	Terry Rojahn	SAMPLE SUMMARY FOR THIS DATE:

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/11/2006	**Weather/Temp**	Partly cloudy & 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	T. Rojahn	**Created Date**	1/11/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/11/06	07:15	Terry Rojahn	Arrive @ B-3245:
1/11/06	12:10	Terry Rojahn	Lunch
1/11/06	12:45	Terry Rojahn	Return to B3245 - receive MFA and MFB maps from Mr. Tom Brent to locate and map soil boring locations.
1/11/06	13:35	Terry Rojahn	Arrive at MFB - located all previously staked out boring locations - mapped and photographed said boring locations (13SB48 through 13SB71).
1/11/06	15:05	Terry Rojahn	Arrive at MFA - located previously staked out boring locations - mapped and photographed boring locations (12SB40 through 13SB55 and 12SB57 through 13SB67).
1/11/06	15:40	Terry Rojahn	Returned to B-3245:
1/11/06	18:05	Terry Rojahn	Leave B-3245 for Fed Ex.
1/11/06	18:40	Terry Rojahn	Drop off samples and equipment on above AB #s.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/12/2006	**Weather/Temp**	Mostly sunny & 50s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	T. Rojahn	**Created Date**	1/12/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/12/06	07:15	Terry Rojahn	Arrive at B-3245:
1/12/06	08:50	Terry Rojahn	Located and photographed soil boring 12SB56, replaced pin flags W/wooden stakes, mapped and photographed 12SB68 - 71.
1/12/06	10:30	Terry Rojahn	Return to B-3245:
1/12/06	10:56	Terry Rojahn	Leave B-3245 for Fed Ex.
1/12/06	11:35	Terry Rojahn	Drop off package at Fed Ex - leave Fed Ex for Indy Airport - remainder of day = Travel.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/18/2006	**Weather/Temp**	Partly sunny & 30s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	T. Rojahn	**Created Date**	1/18/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/18/06	06:30	Terry Rojahn	Arrive at PIT airport:
1/18/06	13:15	Terry Rojahn	Arrive at B-3245:
1/18/06	14:15	Terry Rojahn	Check in with Mr. Mike Roach @ MFA - no production at MFB or in the area of B-146 for the duration of this shift.
1/18/06	14:25	Terry Rojahn	Arrive at SWMU 13
1/18/06	14:50	Terry Rojahn	Begin purge at monitoring well 13MWT45.
1/18/06	16:55	Terry Rojahn	End purge at monitoring well 13MWT45 - dry out well - will sample tomorrow.
1/18/06	17:15	Terry Rojahn	Finish clean up at monitoring well 13MWT45.
1/18/06	17:25	Terry Rojahn	Return to B-3245:

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/18/06	17:35	Terry Rojahn	Leave B-3245 for Bloomington.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/19/2006	**Weather/Temp**	Partly sunny & 50s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	T. Rojahn	**Created Date**	1/19/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/19/06	07:05	Terry Rojahn	Arrive at B-3245:
1/19/06	08:30	Terry Rojahn	Arrive at monitoring well 13MWT21.
1/19/06	08:55	Terry Rojahn	Begin purge at monitoring well 13MWT21.
1/19/06	09:55	Terry Rojahn	End purge at monitoring well 13MWT21.
1/19/06	10:00	Terry Rojahn	Begin collecting ground water sample 13GWT2107.
1/19/06	10:25	Terry Rojahn	Finish clean up at monitoring well 13MWT21.
1/19/06	10:35	Terry Rojahn	Begin collecting ground water sample 13GWT4506 - purged on 1/18/2006.
1/19/06	11:37	Terry Rojahn	Finish clean up at monitoring well 13MWT45.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/19/06	12:05	Terry Rojahn	Begin purge at monitoring well 13MWT15.
1/19/06	13:45	Terry Rojahn	End purge at monitoring well 13MWT15.
1/19/06	13:50	Terry Rojahn	Begin collecting ground water sample 13GWT1507.
1/19/06	14:21	Terry Rojahn	Finish clean up at monitoring well 13MWT15.
1/19/06	14:30	Terry Rojahn	Return to B-3245:
1/19/06	14:45	Terry Rojahn	Sync Toughbook.
1/19/06	16:30	Terry Rojahn	Leave B-3245 for Fed Ex.
1/19/06	17:10	Terry Rojahn	Drop off samples at Bloomington Fed Ex.
1/19/06	17:25	Terry Rojahn	SAMPLE SUMMARY FOR THIS DATE:

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/20/2006	**Weather/Temp**	Overcast & 50s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	Terry Rojahn	**Created Date**	1/20/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/20/06	07:10	Terry Rojahn	Arrive at B-3245:
1/20/06	09:10	Terry Rojahn	Arrive at Break Bldg #2708 - check in with Pam - OK to work in the area of B-146 (today and this weekend).
1/20/06	09:19	Terry Rojahn	Arrive at monitoring well 16MWT15.
1/20/06	09:40	Terry Rojahn	Start purge at monitoring well 16MWT15.
1/20/06	13:40	Terry Rojahn	End purge at monitoring well 16MWT15 after 4 Hrs. - will allow the well time to recover and sample tomorrow..
1/20/06	14:05	Terry Rojahn	Finish clean up at monitoring well 16MWT15.
1/20/06	14:15	Terry Rojahn	Lunch
1/20/06	14:50	Terry Rojahn	Arrive at monitoring well 13MWT51.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/20/06	15:10	Terry Rojahn	Begin purge at monitoring well 13MWT51.
1/20/06	16:50	Terry Rojahn	End purge at monitoring well 13MWT51.
1/20/06	16:55	Terry Rojahn	Begin collecting ground water sample 13GWT5105.
1/20/06	17:30	Terry Rojahn	Finish clean up at monitoring well 13MWT51.
1/20/06	17:38	Terry Rojahn	Return to B-3245:
1/20/06	18:10	Terry Rojahn	Prep to leave B-3245 for Bloomington

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/21/2006	**Weather/Temp**	Overcast & 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	T. Rojahn	**Created Date**	1/21/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/21/06	07:05	Terry Rojahn	Arrive at B-3245:
1/21/06	08:50	Terry Rojahn	Arrive at SWMU 16 (16MWT15)
1/21/06	08:51	Terry Rojahn	Begin collecting ground water sample 16GWT1506 (purged 1/20/06).
1/21/06	09:45	Terry Rojahn	Begin purge at 16MWT13.
1/21/06	13:43	Terry Rojahn	End purge at 16MWT13 - dropped water level below the bottom of pump - will sample tomorrow.
1/21/06	14:00	Terry Rojahn	Lunch - Checked in w/R. Basinski.
1/21/06	14:35	Terry Rojahn	Arrive at monitoring well 16MWT11 - water level below the top of the pump - pulled pump and purged well w/ dedicated teflon bailer - saved purge water for sample - well historically has a very slow recharge rate.
1/21/06	15:05	Terry Rojahn	Arrive at monitoring well 16MWT04.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/21/06	15:25	Terry Rojahn	Start purge at monitoring well 16MWT04.
1/21/06	17:30	Terry Rojahn	End purge at monitoring well 16MWT04.
1/21/06	17:35	Terry Rojahn	Begin collecting ground water sample 16GWT0407 - also, collect MS/MSD.
1/21/06	18:30	Terry Rojahn	Return to B-3245:
1/21/06	18:45	Terry Rojahn	Prep to leave B-3245 for Bloomington

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/22/2006	**Weather/Temp**	Overcast & 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	T. Rojahn	**Created Date**	1/22/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/22/06	07:44	Terry Rojahn	Arrive at B-3245
1/22/06	08:50	Terry Rojahn	Begin collecting ground water sample 16GWT1306 (purged 1/21/06).
1/22/06	09:22	Terry Rojahn	Finish clean up at monitoring well 16MWT13.
1/22/06	09:30	Terry Rojahn	Begin collecting ground water sample 16GWT1106 (purged 1/21/06).
1/22/06	10:40	Terry Rojahn	Finished clean up at 16MWT11 - replaced bladder pump after collecting sample w/dedicated teflon bailer.
1/22/06	10:50	Terry Rojahn	Start purge at monitoring well 16MWT17.
1/22/06	12:00	Terry Rojahn	End purge at monitoring well 16MWT17.
1/22/06	12:00	Terry Rojahn	Begin collecting ground water sample 16GWT1706 - also, collect 16FD01220601.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/22/06	13:10	Terry Rojahn	Finish clean up at 16MWT17.
1/22/06	13:20	Terry Rojahn	Return to B-3245:
1/22/06	14:00	Terry Rojahn	Prep to leave B-3245 for Bloomington

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/23/2006	**Weather/Temp**	Mostly sunny & 40s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	Terry Rojahn	**Created Date**	1/23/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/23/06	07:10	Terry Rojahn	Arrive at B-3245:
1/23/06	08:55	Terry Rojahn	Arrive at monitoring well 13MWT01
1/23/06	09:05	Terry Rojahn	Begin purge at monitoring well 13MWT01.
1/23/06	10:55	Terry Rojahn	End purge at monitoring well 13MWT01.
1/23/06	11:00	Terry Rojahn	Begin collecting ground water sample 13GWT0107.
1/23/06	11:45	Terry Rojahn	Finish clean up at monitoring well 13MWT01.
1/23/06	11:55	Terry Rojahn	Lunch
1/23/06	12:25	Terry Rojahn	Return to B-3245:

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/23/06	15:00	Terry Rojahn	Arrived at Public Works to see if Branda Chen received Digging Permit request - she wasn't in but talked to her on the phone - she had received our request letter/package and requested that we fill out the top portion of the NSWC Crane Digging Permit forms and return them to her desk.
1/23/06	15:15	Terry Rojahn	Returned to B-3245:
1/23/06	15:45	Terry Rojahn	Returned to Public Works - access door to Branda's office was locked - will drop off Digging Permits tomorrow.
1/23/06	16:00	Terry Rojahn	Return to B-3245:
1/23/06	16:15	Terry Rojahn	Drop off sample shipment at Fed Ex.
1/23/06	16:25	Terry Rojahn	Leave B-3245 for Bloomington Fed Ex.

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	01/24/2006	**Weather/Temp**	Mostly sunny & 30s	**Created By**	Terry Rojahn
Facility Name	CRANE NSWC	**TtNUS Personnel**	Terry Rojahn	**Created Date**	1/24/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	Terry Rojahn
Task/Contract #	0000	**Visitors**		**Modified Date**	3/9/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
1/24/06	07:00	Terry Rojahn	Arrive at B-3245:
1/24/06	08:10	Terry Rojahn	Drop off Digging Permits at Public Works B-56.
1/24/06	08:20	Terry Rojahn	Arrive at monitoring well 13MWT11.
1/24/06	08:40	Terry Rojahn	Begin purge at monitoring well 13MWT11.
1/24/06	09:35	Terry Rojahn	End purge at monitoring well 13MWT11.
1/24/06	09:40	Terry Rojahn	Begin collecting ground water sample 13GWT1107.
1/24/06	10:10	Terry Rojahn	Finish clean up at monitoring well 13MWT11.
1/24/06	10:25	Terry Rojahn	Begin purge at monitoring well 13MWT17.

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Daily Activity

Date	Time	Author	Notes
1/24/06	11:45	Terry Rojahn	End purge at monitoring well 13MWT17.
1/24/06	11:50	Terry Rojahn	Begin collecting ground water sample 13GWT1707.
1/24/06	12:25	Terry Rojahn	Finish clean up at monitoring well 13MWT17.
	12:34	Terry Rojahn	Return to B-3245:
1/24/06	12:45	Terry Rojahn	Sync Toughbook.
1/24/06	17:00	Terry Rojahn	Leave B-3245 for Fed Ex.
	17:40	Terry Rojahn	Drop off shipments at Bloomington Fed Ex.
1/24/06	17:45	Terry Rojahn	SAMPLE SUMMARY FOR THIS DATE:

- End of Report -

Tetra Tech NUS, Inc.

DAILY ACTIVITY LOG

SWMU 13 and 16 Round 7 Sampling - CRANE NSWC

Project Information

Activity Date	05/06/2006	**Weather/Temp**	am-sun upper 40's	**Created By**	James Goerdt
Facility Name	CRANE NSWC	**TtNUS Personnel**	J. Goerdt;D.Hickey	**Created Date**	5/6/06
TtNUS Project #	112G00041	**Subcontractor Personnel**		**Modified By**	James Goerdt
Task/Contract #	0000	**Visitors**		**Modified Date**	5/6/06
WBS Code #	0000			**Printed By**	James Goerdt
Client	SOUTHDIV			**Printed Date**	7/11/06

Daily Activity

Date	Time	Author	Notes
5/6/06	07:30	James Goerdt	Arrive at Bldg. 3245 from Martinsville. Sync computers and load vehicles for sampling GW at SWMU 16.
5/6/06	08:20	James Goerdt	Arrived at SWMU 16 to begn GW sampling. Setting up on well 16MWT12.

- End of Report -

APPENDIX C

SWMU 16

HEALTH AND SAFETY DOCUMENTATION

ROUND 7

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Terry R. Rojahn

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

February 25, 2005

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

NUS CORPORATION

Certificate of Training

THIS CERTIFIES THAT

TERRY ROJAHN

has successfully completed a course of instruction on

SUPERFUND TRAINING CLASS

prepared and conducted by the
NUS Corporation, Pittsburgh, Pennsylvania

SEPT. 30 - OCT. 4, 1985
Date of Award

Gary F. Smith, C.S.P.
Director; Health, Safety Training

E. Dennis Escher, P.E.
Vice President

Basinski, Ralph

From: Soltis, Matthew
Sent: Tuesday, August 31, 2004 3:18 PM
To: Basinski, Ralph
Cc: Rojahn, Terry; Diano, Linda
Subject: Training Certificate

Ralph:

As I mentioned earlier, one of the action items from my recent H&S audit at NSWC Crane was to follow up on the matter of an 8-hour training certificate for Management/Supervisor H&S training for our FOL on this field effort (Terry Rojahn). This was the only mandatory training element that I could not find documentation for during my audit.

In checking our corporate training database, I have confirmed that Terry did satisfactorily complete this training with us on March 31, 1988. We do not maintain copies of every training certificate that we issue. Please have Terry use this message as interim confirmation of his satisfying this training requirement. The next time that we prepare training certificates, Linda Diano will prepare a replacement certificate for Terry and provide it to him for his records/use.

If there are any questions, let me know.

Matt

Matthew M. Soltis, CIH, CSP.
Corporate Health and Safety Manager
Tetra Tech NUS, Inc.
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, PA 15220-2745
Telephone: (412) 921-8912
FAX: (412) 921-4040
soltism@ttnus.com
http://www.ttnus.com
http://www.tetratech.com

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WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

EMPLOYEE:	Rojahn, Terry	**COMPANY:**	TT/NUS
SSN:	XXX-XX-8670	**POSITION:**	Environmental Sampling
DATE OF EXAM:	11/05/2004	**LOCATION:**	TT/NUS-Pittsburgh
EXPIRATION DATE:	11/05/2006	**SITE:**	Pittsburgh

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☑	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☑	☐

STATUS

1. ☑ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. ☐ **NOT QUALIFIED**

4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Peter P. Greaney, M.D. Date: 11/10/04

Signature: Peter P Greaney MD

WorkCare
333 S. Anita Drive, Suite 630, Orange, CA 92868
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

October 28, 2005

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

James Goerdt

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER
REFRESHER TRAINING

prepared and instructed by
Tetra Tech NUS, Inc.
Pittsburgh, Pennsylvania

December 29, 2005

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

A LIED EDUCATIONAL SERIES

James D. Goerdt

APPLIED ASSOCIATES INTERNATIONAL INC.

CERTIFICATE

OSHA, 1910.120
Hazardous Waste Operations and Emergency Response 40 Hour Course

ISSUE DATE: December 13, 1991

EXPIRATION: December 13, 1992

CERTIFICATE: HAZ9112001058

STEVEN L. WILLIAMS
President

THOMAS O. MURRAY
Certified Industrial Hygenist

P. O. Box 300068
Fern Park, Florida 32730-0068

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

EMPLOYEE:	Goerdt, James	**COMPANY:**	TT/NUS
SSN:	XXX-XX-2691	**POSITION:**	Environmental Scientist
DATE OF EXAM:	11/22/2005	**LOCATION:**	TT/NUS-Pittsburgh
EXPIRATION DATE:	11/22/2007	**SITE:**	Pittsburgh

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☒	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☒	☐

STATUS

1. ☒ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. ☐ **NOT QUALIFIED**

4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Peter P. Greaney, M.D. Date: 11/29/05

Signature: Pet P Greaney MD

WorkCare
300 S. Harbor Blvd., Suite 600, Anaheim, CA 92805
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

APPENDIX D

ANALYTICAL DATA
SWMU 16
ROUND 7

APPENDIX D.1

GROUNDWATER ANALYTICAL DATA

ROUND 7

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - GROUNDWATER ROUND 7
PENNSYLVANIA UPPER WATER BEARING ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

SITE	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR
AOC	PUZ-UPGRAD	PUZ	PUZ	PUZ	PUZ
SWMU	16	16	16	16	16
PHASE	07	07	07	07	07
LOCATION	16MW02	16MW03	16MWT04	16MWT06	16MWT09
NSAMPLE	16GW0208	16GW0307	16GWT0407	16GWT0608	16GWT0906
MATRIX	GW	GW	GW	GW	GW
SACODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	1/8/2006	1/7/2006	1/21/2006	1/8/2006	1/7/2006
EXPLOSIVES (UG/L)					
1,3,5-TRINITROBENZENE	0.27 U	0.27 U	0.26 U	2.3	0.25 U
1,3-DINITROBENZENE	0.27 U	0.27 U	0.26 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.27 U	0.27 U	0.26 U	6.1	0.25 U
2,4-DINITROTOLUENE	0.27 U	0.27 U	0.26 U	1.1	0.25 U
2,6-DINITROTOLUENE	0.27 U	0.27 U	0.26 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.27 U	0.52 J	0.26 U	38	0.25 J
2-NITROTOLUENE	0.27 U	0.27 U	0.26 U	0.25 U	0.25 U
3-NITROTOLUENE	0.27 U	0.27 U	0.26 U	0.47 J	1.5 J
4-AMINO-2,6-DINITROTOLUENE	0.27 U	0.94	0.38 J	15	0.63
4-NITROTOLUENE	0.27 U	0.27 U	0.26 U	0.25 U	0.25 U
HMX	0.27 U	6.2 J	7.1	1 J	12 J
NITROBENZENE	0.27 U	0.27 U	0.26 U	0.25 U	0.25 U
RDX	0.27 U	57	120	4.6	110
TETRYL	0.27 U	0.27 U	0.26 U	0.25 U	0.25 U
FIELD PARAMETERS					
DISSOLVED OXYGEN (MG/L)	1.47	1.21	4.32	1.33	1.31
OXIDATION REDUCTION POTENTIAL (MV)	3	322	175	151	232
PH (S.U.)	6.82	5	6.57	6.26	4.61
SPECIFIC CONDUCTANCE (MS/CM)	0.707	0.472	0.209	1.60	0.655
TEMPERATURE (C)	11.53	9.76	13.34	14.26	12.40
TURBIDITY (NTU)	8	4.1	2.9	29	0.95
VOLATILE ORGANIC COMPOUNDS					
1,1,1,2-TETRACHLOROETHANE	1 U	1 U	0.3 U	1 U	1 U
1,1,1-TRICHLOROETHANE	1 U	1 U	0.3 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	0.3 U	1.6	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	0.3 U	200	1 U
1,1-DICHLOROETHANE	1 U	1 U	0.3 U	1 U	1 U
1,1-DICHLOROETHENE	1 U	1 U	0.3 U	150	1 U
1,2,3-TRICHLOROPROPANE	1 U	1 U	0.3 U	1 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	1 U	0.3 U	1 U	1 U

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - GROUNDWATER ROUND 7
PENNSYLVANIA UPPER WATER BEARING ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

SITE	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR
AOC	PUZ-UPGRAD	PUZ	PUZ	PUZ	PUZ
SWMU	16	16	16	16	16
PHASE	07	07	07	07	07
LOCATION	16MW02	16MW03	16MWT04	16MWT06	16MWT09
NSAMPLE	16GW0208	16GW0307	16GWT0407	16GWT0608	16GWT0906
MATRIX	GW	GW	GW	GW	GW
SACODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	1/8/2006	1/7/2006	1/21/2006	1/8/2006	1/7/2006
1,2-DIBROMOETHANE	1 U	1 U	0.3 U	1 U	1 U
1,2-DICHLOROETHANE	1 U	1 U	0.3 U	2.4	1 U
1,2-DICHLOROPROPANE	1 U	1 U	0.3 U	1 U	1 U
2-BUTANONE	5 U	5 U	0.5 U	5 U	5 U
2-HEXANONE	5 U	5 U	0.5 U	5 U	5 U
3-CHLOROPROPENE	5 U	5 U	0.5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	0.5 U	25	5 U
ACETONE	5 UJ	5 UJ	0.5 UJ	16 J	5 UJ
ACROLEIN	5 UR	5 UR	0.5 UR	5 UR	5 UR
ACRYLONITRILE	5 U	5 U	0.5 U	5 U	5 U
BENZENE	1 U	1 U	0.3 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	0.3 U	1 U	1 U
BROMOFORM	1 U	1 U	0.3 U	1 U	1 U
BROMOMETHANE	1 U	1 U	0.3 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	0.3 U	4	1 U
CARBON TETRACHLORIDE	1 U	14	0.3 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	0.3 U	1 U	1 U
CHLORODIBROMOMETHANE	1 U	1 U	0.3 U	1 U	1 U
CHLOROETHANE	1 U	1 U	0.5 U	1 U	1 U
CHLOROFORM	1 U	4	0.3 U	14	1 U
CHLOROMETHANE	1 U	1 U	0.3 U	1 U	1 U
CHLOROPRENE	5 U	5 U	0.5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	1 U	1 U	0.3 U	4800	1 U
CIS-1,3-DICHLOROPROPENE	1 U	1 U	0.3 U	1 U	1 U
DIBROMOMETHANE	1 U	1 U	0.3 U	1 U	1 U
DICHLORODIFLUOROMETHANE	1 UJ	1 UJ	0.3 U	1 UJ	1 UJ
ETHYL METHACRYLATE	5 U	5 U	0.5 U	5 U	5 U
ETHYLBENZENE	1 U	1 U	0.3 U	4.2	1 U
METHACRYLONITRILE	50 U	50 U	0.3 U	50 U	50 U
METHYL IODIDE	5 U	5 U	0.5 U	5 U	5 U
METHYL METHACRYLATE	5 U	5 U	0.5 U	5 U	5 U

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - GROUNDWATER ROUND 7
PENNSYLVANIA UPPER WATER BEARING ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

SITE	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR
AOC	PUZ-UPGRAD	PUZ	PUZ	PUZ	PUZ
SWMU	16	16	16	16	16
PHASE	07	07	07	07	07
LOCATION	16MW02	16MW03	16MWT04	16MWT06	16MWT09
NSAMPLE	16GW0208	16GW0307	16GWT0407	16GWT0608	16GWT0906
MATRIX	GW	GW	GW	GW	GW
SACODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	1/8/2006	1/7/2006	1/21/2006	1/8/2006	1/7/2006
METHYL TERT-BUTYL ETHER	1 U	1 U	0.5 U	1 U	1 U
METHYLENE CHLORIDE	2 UJ	2 UJ	0.3 UJ	2 UJ	2 UJ
STYRENE	1 U	1 U	0.3 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	0.3 U	180	1 U
TOLUENE	1 U	1 U	0.3 U	270	1 U
TOTAL XYLENES	1 U	1 U	0.3 U	6.6	1 U
TRANS-1,2-DICHLOROETHENE	1 U	1 U	0.3 U	19	1 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	0.3 U	1 U	1 U
TRANS-1,4-DICHLORO-2-BUTENE	5 U	5 U	0.5 U	5 U	5 U
TRICHLOROETHENE	1 U	5.2	1.8	370000	8.7
TRICHLOROFLUOROMETHANE	1 U	1 U	0.3 U	1 U	1 U
VINYL ACETATE	5 U	5 U	0.5 U	5 U	5 U
VINYL CHLORIDE	1 U	1 U	0.3 U	450	1 U

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - GROUNDWATER ROUND 7
PENNSYLVANIA UPPER WATER BEARING ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

SITE	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR
AOC	PUZ	PUZ	PUZ	PUZ
SWMU	16	16	16	16
PHASE	07	07	07	07
LOCATION	16MWT10	16MWT13	16MWT17	16MWT17
NSAMPLE	16GWT1006	16GWT1306	16GWT1706	16GWT1706-D
MATRIX	GW	GW	GW	GW
SACODE	NORMAL	NORMAL	NORMAL	DUP
SAMPLE DATE	1/9/2006	1/22/2006	1/22/2006	1/22/2006
EXPLOSIVES (UG/L)				
1,3,5-TRINITROBENZENE	0.24 U	0.25 U	0.26 U	0.252 U
1,3-DINITROBENZENE	0.24 U	0.25 U	0.26 U	0.252 U
2,4,6-TRINITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
2,4-DINITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
2,6-DINITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
2-AMINO-4,6-DINITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
2-NITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
3-NITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
4-AMINO-2,6-DINITROTOLUENE	0.5 J	0.25 U	0.26 U	0.252 U
4-NITROTOLUENE	0.24 U	0.25 U	0.26 U	0.252 U
HMX	5.3 J	0.25 U	0.26 U	0.252 U
NITROBENZENE	0.24 U	0.25 U	0.26 U	0.252 U
RDX	52	0.42 J	4.5	4.3
TETRYL	0.24 U	0.25 U	0.26 U	0.252 U
FIELD PARAMETERS				
DISSOLVED OXYGEN (MG/L)	1.83	0.52	0.66	
OXIDATION REDUCTION POTENTIAL (MV)	315	110	108	
PH (S.U.)	3.57	5.82	5.24	
SPECIFIC CONDUCTANCE (MS/CM)	1.63	0.326	1.24	
TEMPERATURE (C)	12.80	12.04	11.48	
TURBIDITY (NTU)	6.5	0	7.4	
VOLATILE ORGANIC COMPOUNDS				
1,1,1,2-TETRACHLOROETHANE	1 U	0.6 U	3 U	3 U
1,1,1-TRICHLOROETHANE	1 U	0.6 U	3 U	3 U
1,1,2,2-TETRACHLOROETHANE	1 U	0.6 U	3 U	3 U
1,1,2-TRICHLOROETHANE	1 U	4.9	43	40
1,1-DICHLOROETHANE	1 U	0.6 U	3 U	3 U
1,1-DICHLOROETHENE	1 U	0.6 U	8 J	7.7 J
1,2,3-TRICHLOROPROPANE	1 U	0.6 U	3 U	3 U
1,2-DIBROMO-3-CHLOROPROPANE	1 U	0.6 U	3 U	3 U

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - GROUNDWATER ROUND 7
PENNSYLVANIA UPPER WATER BEARING ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

SITE	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR
AOC	PUZ	PUZ	PUZ	PUZ
SWMU	16	16	16	16
PHASE	07	07	07	07
LOCATION	16MWT10	16MWT13	16MWT17	16MWT17
NSAMPLE	16GWT1006	16GWT1306	16GWT1706	16GWT1706-D
MATRIX	GW	GW	GW	GW
SACODE	NORMAL	NORMAL	NORMAL	DUP
SAMPLE DATE	1/9/2006	1/22/2006	1/22/2006	1/22/2006
1,2-DIBROMOETHANE	1 U	0.6 U	3 U	3 U
1,2-DICHLOROETHANE	1 U	0.6 U	3 U	3 U
1,2-DICHLOROPROPANE	1 U	0.6 U	3 U	3 U
2-BUTANONE	5 U	1 U	5 U	5 U
2-HEXANONE	5 U	1 U	5 U	5 U
3-CHLOROPROPENE	5 U	1 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	1 U	5 U	5 U
ACETONE	5 UJ	1 UJ	5 UJ	5 UJ
ACROLEIN	5 UR	1 UR	5 UR	5 UR
ACRYLONITRILE	5 U	1 U	5 U	5 U
BENZENE	1 U	0.6 U	3 U	3 U
BROMODICHLOROMETHANE	1 U	0.6 U	3 U	3 U
BROMOFORM	1 U	0.6 U	3 U	3 U
BROMOMETHANE	1 U	0.6 U	3 U	3 U
CARBON DISULFIDE	1 U	0.6 U	3 U	3 U
CARBON TETRACHLORIDE	1 U	0.6 U	3 U	3 U
CHLOROBENZENE	1 U	0.6 U	3 U	3 U
CHLORODIBROMOMETHANE	1 U	0.6 U	3 U	3 U
CHLOROETHANE	1 U	1 U	5 U	5 U
CHLOROFORM	2.4	0.6 U	3 U	3 U
CHLOROMETHANE	1 U	0.6 U	3 U	3 U
CHLOROPRENE	5 U	1 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	1 U	20	340	330
CIS-1,3-DICHLOROPROPENE	1 U	0.6 U	3 U	3 U
DIBROMOMETHANE	1 U	0.6 U	3 U	3 U
DICHLORODIFLUOROMETHANE	1 UJ	0.6 U	3 U	3 U
ETHYL METHACRYLATE	5 U	1 U	5 U	5 U
ETHYLBENZENE	1 U	0.6 U	3 U	3 U
METHACRYLONITRILE	50 U	0.6 U	3 U	3 U
METHYL IODIDE	5 U	1 U	5 U	5 U
METHYL METHACRYLATE	5 U	1 U	5 U	5 U

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - GROUNDWATER ROUND 7
PENNSYLVANIA UPPER WATER BEARING ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

SITE	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR	B146 INCINERATOR
AOC	PUZ	PUZ	PUZ	PUZ
SWMU	16	16	16	16
PHASE	07	07	07	07
LOCATION	16MWT10	16MWT13	16MWT17	16MWT17
NSAMPLE	16GWT1006	16GWT1306	16GWT1706	16GWT1706-D
MATRIX	GW	GW	GW	GW
SACODE	NORMAL	NORMAL	NORMAL	DUP
SAMPLE DATE	1/9/2006	1/22/2006	1/22/2006	1/22/2006
METHYL TERT-BUTYL ETHER	1 U	1 U	5 U	5 U
METHYLENE CHLORIDE	2 UJ	0.6 UJ	3 UJ	3 UJ
STYRENE	1 U	0.6 U	3 U	3 U
TETRACHLOROETHENE	1 U	0.6 U	3 U	3 U
TOLUENE	1 U	0.6 U	3 U	3 U
TOTAL XYLENES	1 U	0.6 U	3 U	3 U
TRANS-1,2-DICHLOROETHENE	1 U	0.6 U	5.5 J	5.3 J
TRANS-1,3-DICHLOROPROPENE	1 U	0.6 U	3 U	3 U
TRANS-1,4-DICHLORO-2-BUTENE	5 U	1 U	5 U	5 U
TRICHLOROETHENE	2	5100	22000	18000
TRICHLOROFLUOROMETHANE	1 U	0.6 U	3 U	3 U
VINYL ACETATE	5 U	1 U	5 U	5 U
VINYL CHLORIDE	1 U	0.6 U	3 U	3 U

APPENDIX D.2

SURFACE WATER ANALTYICAL DATA

ROUND 7

NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - SURFACE WATER ROUND 7
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

LOCATION	16SW/SD10	16SW/SD12	16SW/SD13	16SW/SD30	16SW/SD30
NSAMPLE	16SW1004	16SW1205	16SW1305	16SW3004	16SW3004-D
MATRIX	SW	SW	SW	SW	SW
AOC	GULLY	GULLY	GULLY	GULLY	GULLY
PHASE	06	06	06	06	06
SAMPLE DATE	1/5/2006	1/5/2006	1/5/2006	1/5/2006	1/5/2006
SACODE	NORMAL	NORMAL	NORMAL	NORMAL	DUP
Explosives (ug/L)					
1,3,5-TRINITROBENZENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
1,3-DINITROBENZENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
2,4,6-TRINITROTOLUENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
2,4-DINITROTOLUENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
2,6-DINITROTOLUENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
2-AMINO-4,6-DINITROTOLUENE	0.24 U	0.248 U	0.242 U	0.28 J	0.29 J
2-NITROTOLUENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
3-NITROTOLUENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
4-AMINO-2,6-DINITROTOLUENE	0.24 U	0.248 U	0.242 U	0.55	0.55
4-NITROTOLUENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
HMX	0.24 U	0.248 U	0.242 U	4.6 J	4.4 J
NITROBENZENE	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
RDX	0.77	0.248 U	0.242 U	19	19
TETRYL	0.24 U	0.248 U	0.242 U	0.266 U	0.242 U
Volatile Organic Compounds (ug/L)					
1,1,1,2-TETRACHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,1,1-TRICHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,1,2,2-TETRACHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,1,2-TRICHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,1-DICHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,1-DICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,2,3-TRICHLOROPROPANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,2-DIBROMO-3-CHLOROPROPANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,2-DIBROMOETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,2-DICHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,2-DICHLOROPROPANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
2-BUTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-HEXANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
3-CHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
4-METHYL-2-PENTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
ACROLEIN	0.5 UR	0.5 UR	0.5 UR	0.5 UR	0.5 UR
ACRYLONITRILE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BENZENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
BROMODICHLOROMETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
BROMOFORM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
BROMOMETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CARBON DISULFIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CARBON TETRACHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CHLOROBENZENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CHLORODIBROMOMETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CHLOROMETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CHLOROPRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CIS-1,3-DICHLOROPROPENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
DIBROMOMETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
DICHLORODIFLUOROMETHANE	0.3 UJ	0.3 UJ	0.3 UJ	0.3 UJ	0.3 UJ
ETHYL METHACRYLATE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

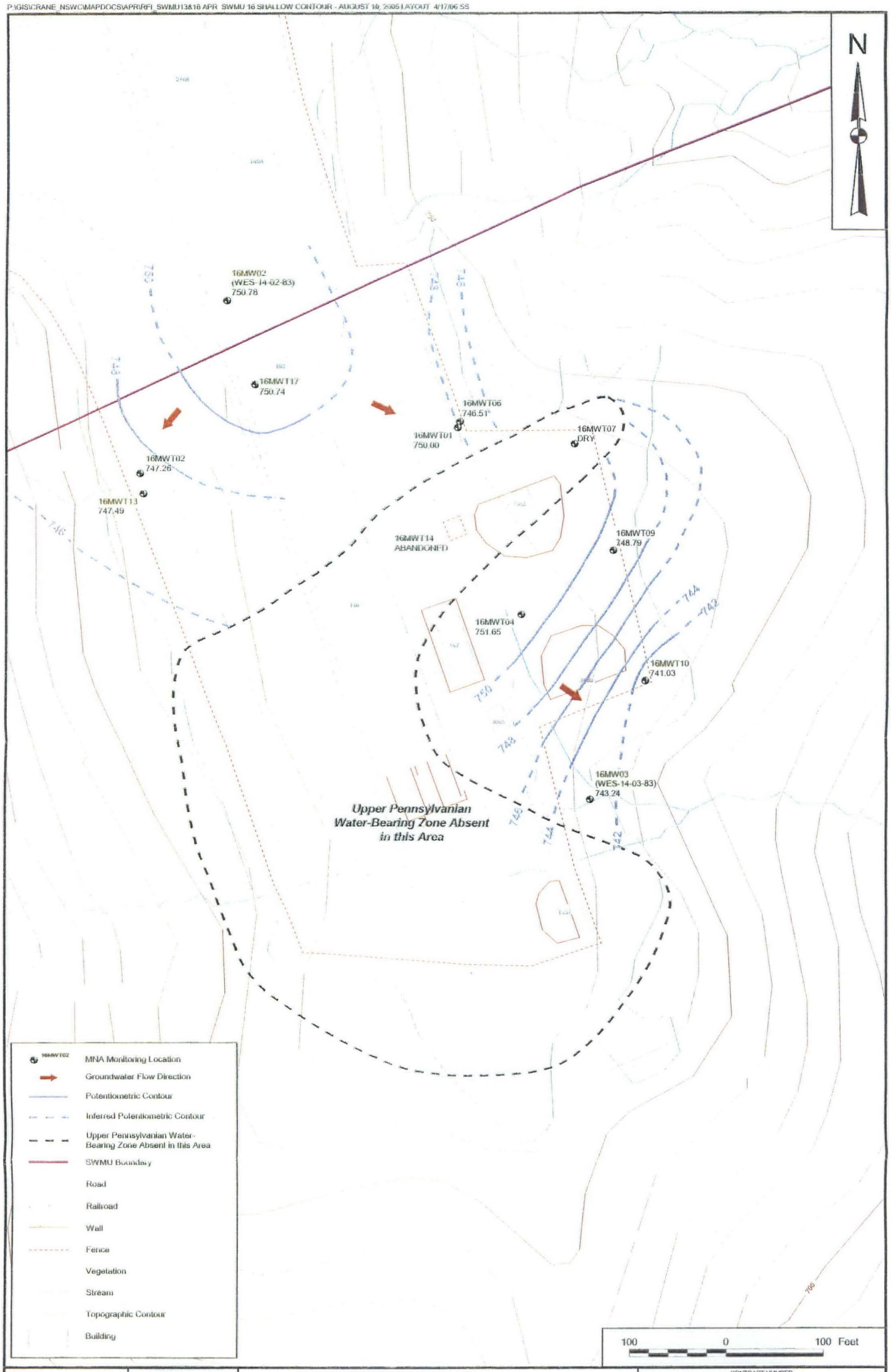
NSWC CRANE
SUMMARY OF ANALYTIC RESULTS - SURFACE WATER ROUND 7
SWMU 16 (CAST HIGH EXPLOSIVES FILL/BUILDING 146)

LOCATION	16SW/SD10	16SW/SD12	16SW/SD13	16SW/SD30	16SW/SD30
NSAMPLE	16SW1004	16SW1205	16SW1305	16SW3004	16SW3004-D
MATRIX	SW	SW	SW	SW	SW
AOC	GULLY	GULLY	GULLY	GULLY	GULLY
PHASE	06	06	06	06	06
SAMPLE DATE	1/5/2006	1/5/2006	1/5/2006	1/5/2006	1/5/2006
SACODE	NORMAL	NORMAL	NORMAL	NORMAL	DUP
ETHYLBENZENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
METHACRYLONITRILE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
METHYL IODIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYL METHACRYLATE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYL TERT-BUTYL ETHER	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	0.3 UJ	0.3 UJ	0.3 UJ	0.3 UJ	0.3 UJ
STYRENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TETRACHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TOLUENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TOTAL XYLENES	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TRANS-1,2-DICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TRANS-1,3-DICHLOROPROPENE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TRANS-1,4-DICHLORO-2-BUTENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.3 U	11	0.3 U	0.3 U	0.3 U
TRICHLOROFLUOROMETHANE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
VINYL ACETATE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
FIELD TESTED PARAMETERS					
DISSOLVED OXYGEN - METER (MG/L)	8.78	9.65	9.67	9.92	
OXIDATION REDUCTION POTENTIAL (MV)	180	182	175	162	
PH (S.U.)	7.28	7.29	7.45	7.44	
SPECIFIC CONDUCTANCE (MS/CM)	0.182	0.239	0.247	0.22	
TEMPERATURE (C)	5.93	6.05	5.46	5.45	
TURBIDITY (NTU)	11	2.2	4.8	8.4	

APPENDIX E

SWMU 16 ROUND 6
POTENTIOMETRIC SURFACE MAPS
AUGUST 10, 2005

P:\GIS\CRANE_NSWC\MAPDOCS\APR\RFI_SWMU13&16 APR SWMU 16 SHALLOW CONTOUR - AUGUST 10, 2005 LAYOUT 4/17/06 SS



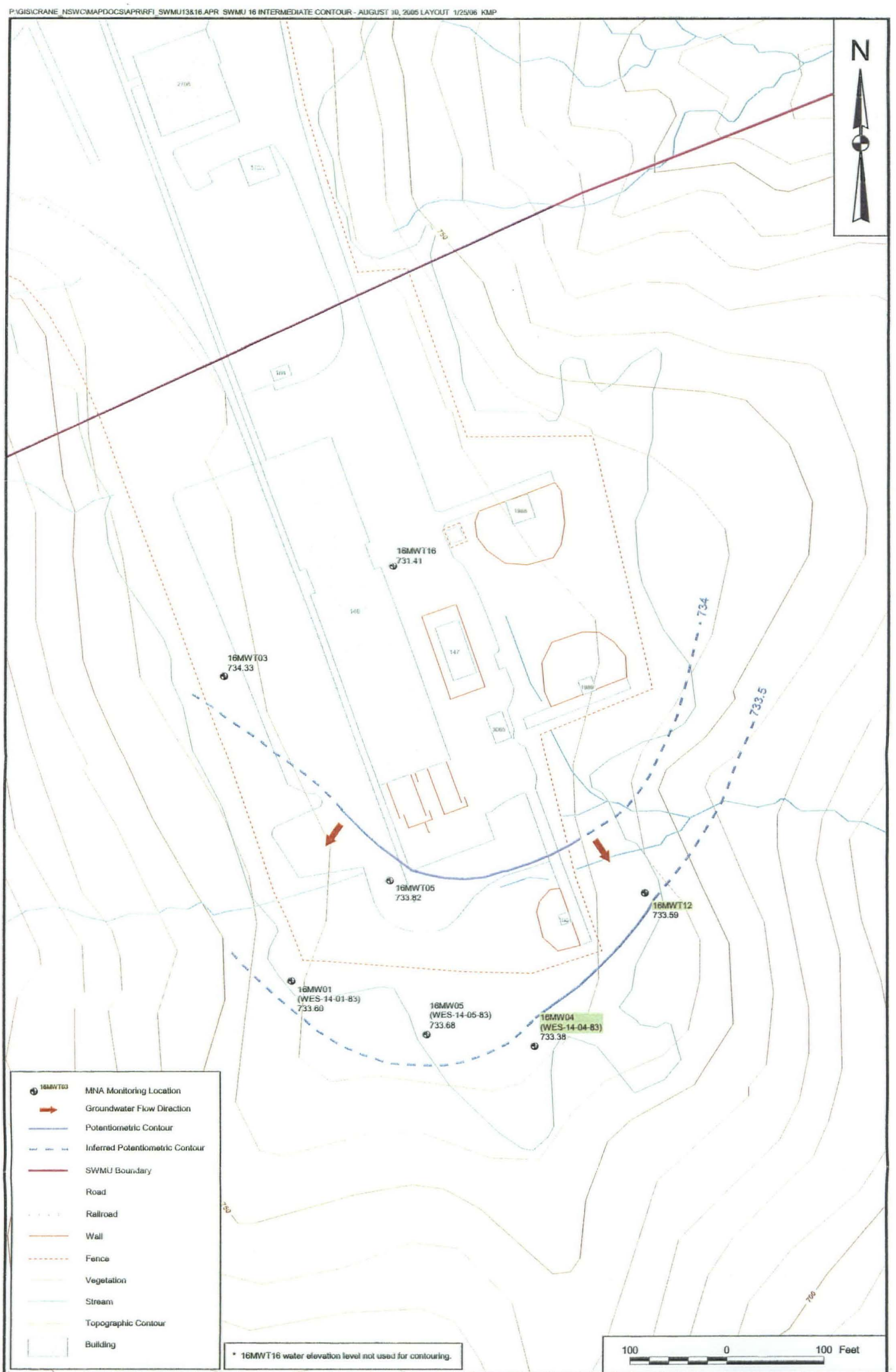
DRAWN BY	DATE
K. PEILA	1/25/06
CHECKED BY	DATE
J. LUCAS	4/17/06
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
UPPER PENNSYLVANIAN WATER-BEARING ZONE - AUGUST 10, 2005 (ROUND 6)
SWMU 16 - CAST HIGH EXPLOSIVES FILL /BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
00041	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO	REV
FIGURE 4 - 4	0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\RFI_SWMU13&16.APR SWMU 16 INTERMEDIATE CONTOUR - AUGUST 10, 2005 LAYOUT 1/25/06 KMP



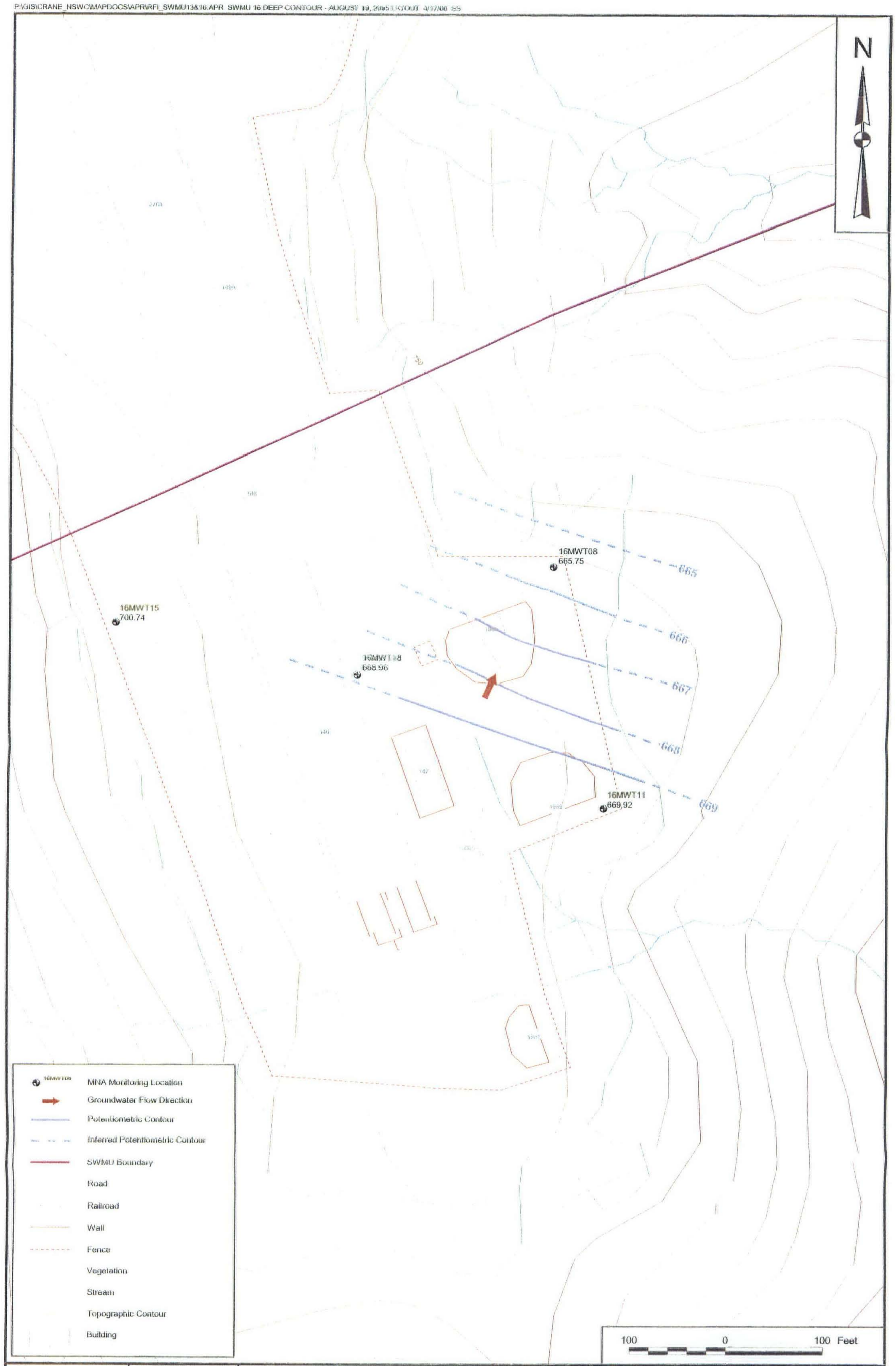
DRAWN BY	DATE
K. PEILA	1/25/06
CHECKED BY	DATE
J. LUCAS	1/25/06
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
MIDDLE PENNSYLVANIAN WATER-BEARING ZONE - AUGUST 10, 2005 (ROUND 6)
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
00041	
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
DRAWING NO.	REV
FIGURE 4 - 5	0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\RFI_SWMU13&16.APR SWMU 16 DEEP CONTOUR - AUGUST 10, 2005 LAYOUT 4/17/06 SS



DRAWN BY	DATE
K. PEILA	1/25/06
CHECKED BY	DATE
J. LUCAS	4/17/06
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
LOWER PENNSYLVANIAN WATER-BEARING ZONE - AUGUST 10, 2005 (ROUND 6)
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
00041	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	REV
FIGURE 4 - 6	0