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

Round No. 4

Naval Surface Warfare Center Crane
Crane, Indiana

Contract Task Order 0343

November 2005

NAVFAC
Naval Facilities Engineering Command
Southern Division
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TABLE OF CONTENTS

SECTION **PAGE NO.**

LIST OF ACRONYMS **3**

1.0 INTRODUCTION **1-1**

2.0 FIELD INVESTIGATION **2-1**
2.1 OVERVIEW 2-1
2.2 ROUND 4 SAMPLING OPERATIONS 2-1
2.2.1 Groundwater and Surface Water Measurements 2-1
2.2.2 Groundwater Purging and Sampling 2-1
2.2.3 Surface Water Sampling 2-2
2.3 QUALITY CONTROL SAMPLES 2-3

3.0 DATA PRESENTATION **3-1**
3.1 GROUNDWATER DATA 3-1
3.1.1 Explosives 3-1
3.1.2 Volatile Organic Compounds 3-2
3.2 SURFACE WATER 3-3
3.2.1 Explosives 3-3
3.2.2 Volatile Organic Compounds 3-4

4.0 DATA EVALUATION **4-1**
4.1 GROUNDWATER MONITORING PROGRAM 4-4
4.2 SURFACE WATER MONITORING PROGRAM 4-4
4.3 ROUND 4 POTENTIOMETRIC SURFACES 4-5
4.4 GROUNDWATER TEMPORAL TREND PLOTS AND DATA EVALUATION 4-6
4.4.1 Upper Pennsylvanian Water Bearing Zone (Puz) 4-6
4.4.2 Middle Pennsylvanian Water Bearing Zone (Pmz) 4-7
4.4.3 Lower Pennsylvanian Water Bearing Zone (Plz) 4-8
4.4 SURFACE WATER TEMPORAL TREND PLOTS AND DATA EVALUATION 4-8

REFERENCES **R-1**

APPENDICES

A SAMPLE LOG SHEETS AND OTHER FIELD FORMS ROUND 4
B MISCELLANEOUS FIELD DOCUMENTATION ROUND 4
C HEALTH AND SAFETY DOCUMENTATION ROUND 4
D ANALYTICAL DATA
E POTENTIOMETRIC SURFACE MAPS - JANUARY 24, 2004

TABLES

NUMBER

2-1 Monitoring Well Construction Information and Water Level Measurements
2-2 Summary of Environmental Samples and Laboratory Analyses
3-1 Summary of Chemicals Detected, Field Parameters, and Miscellaneous Parameters for SWMU 16 Groundwater Rounds 1 Through 4 Upper Pennsylvanian Water Bearing Zone
3-2 Descriptive Statistics for Round 4 Upgradient Groundwater Samples from Upper Pennsylvanian Zone
3-3 Descriptive Statistics for Round 4 Downgradient Groundwater Samples from Upper Pennsylvanian Zone
3-4 Summary of Chemicals Detected, Field Parameters, and Miscellaneous Parameters for SWMU 16 Groundwater Rounds 1 Through 4 Middle Pennsylvanian Water Bearing Zone
3-5 Descriptive Statistics for Round 4 Groundwater Samples from Middle Pennsylvanian Zone
3-6 Summary of Chemicals Detected, Field Parameters, and Miscellaneous Parameters for SWMU 16 Groundwater Rounds 1 Through 4 Lower Pennsylvanian Water Bearing Zone
3-7 Descriptive Statistics for Round 4 Groundwater Samples from Pennsylvanian Lower Zone
3-8 Summary of Chemicals Detected, Field Parameters, and Miscellaneous Parameters for SWMU 16 Surface Water Rounds 1 Through 4
3-9 Descriptive Statistics for Round 4 Surface Water Samples

FIGURES

NUMBER

2-1 Monitoring Well Locations
2-2 Survey Surface Water, Sediment, and Staff Gauge Locations
4-1 Potentiometric Surface Map for Upper Pennsylvania Water Bearing Zone February 4, 2005 (Round 4)
4-2 Potentiometric Surface Map for Middle Pennsylvania Water Bearing Zone February 4, 2005 (Round 4)
4-3 Potentiometric Surface Map for Lower Pennsylvania Water Bearing Zone February 4, 2005 (Round 4)
4-4 Temporal Plots of RDX and Degradation Product Concentrations in the Upper Pennsylvanian Water Bearing Zone at SWMU 16
4-5 Temporal Plots of TCE and Degradation Product Concentrations in the Upper Pennsylvanian Water Bearing Zone at SWMU 16
4-6 Temporal Plots of RDX and Degradation Product Concentrations in the Pennsylvanian Middle Water Bearing Zone at SWMU 16
4-7 Temporal Plots of TCE and Degradation Product Concentrations in the Pennsylvanian Middle Water Bearing Zone at SWMU 16
4-8 Temporal Plots of RDX and Degradation Product Concentrations in the Pennsylvanian Lower Water Bearing Zone at SWMU 16
4-9 Temporal Plots of TCE and Degradation Product Concentrations in the Pennsylvanian Lower Water Bearing Zone at SWMU 16
4-10 Temporal Plots of RDX and Degradation Product Concentrations in Surface Water at SWMU 16
4-11 Temporal Plots of TCE and Degradation Product Concentrations in the Surface Water at SWMU 16

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
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RDX	Royal demolition explosive
RFI	RCRA Facility Investigation
SOPs	Standard operating procedures
SWMU	Solid waste management unit
TCE	trichloroethene
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 B-146 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, 4 rounds of sampling and analyses were

completed at SWMU 16. Rounds 1 through 3 included groundwater, soils, sediments, and surface water sampling, whereas Round 4 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., 2005]. The results show the presence of explosives, primarily RDX, and VOCs above risk-based concentrations in groundwater and surface water.

The purpose of this report is to present the results of groundwater and surface water monitoring activities in Round 4, 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 4 is provided in Appendices A, B, and C of this report. 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 4 field operations performed in 2005 for NSWC Crane SWMU 16.

2.1 OVERVIEW

RFI field activities for Round 4 were conducted in February 2005. 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 (TtNUS, 2004).

2.2 ROUND 4 SAMPLING OPERATIONS

This section describes the methodology for surface water and groundwater sampling activities performed at SWMU 16 during Round 4. QAPP non-conformances or suspected deficiencies in sampling operations did not occur during Round 4. Copies of all field forms, records, field logbooks, and health and safety documentation associated with the Round 4 field investigation are provided in Appendices A through C of this document. Groundwater and surface water sampling locations are shown in Figures 2-1 and 2-2, respectively.

2.2.1 Groundwater and Surface Water Measurements

Water level measurements were obtained from each monitoring well prior to purging and sampling. All measurements were taken in accordance with SOP CTO166-18. 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 surface water staff gauge measurements were recorded to the nearest 0.01 foot. Table 2-1 contains water level/elevation data for Round 4, as well as previous rounds.

2.2.2 Groundwater Purging and Sampling

Groundwater measurements, purging, and stabilization of wells prior to sampling were accomplished using low-flow techniques in accordance with SOP CTO166-15 and SOP CTO166-16. Sampling was accomplished in accordance with SOP CTO166-05. A listing of all SWMU 16 sample analytical fractions is provided in Table 2-2. Further discussion of the target analytes for each fraction in Round 4 sampling is

discussed in Section 3 of the QAPP Addendum No. 2. All 12 proposed groundwater samples were collected at SWMU 16 during Round 4 (See Table 2-2). Monitoring well 16MWT11 dried out while purging the well on February 4, 2005. The well was revisited the following day (February 5, 2005) and a minimum volume of water for explosives analysis (1 liter for each explosive analysis instead of 2) and 900 milliliters (mL) for the Nitrate and Nitrite analysis was collected before the well dried out again. On February 20, 2005 the well was revisited for a third time and the remaining samples for VOC, chloride and sulfate, and methane, ethane, and ethene analyses were collected.

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 YSI Model 600 series multi-parameter water quality meter and flow-through cell. Longer intervals were used for slower pumping wells. Turbidity readings were measured using a LaMotte 2020 turbidity meter. 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 CTO166-15 and SOP CTO166-16. 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. All pertinent field data, including sampling methods, purge information, pump intake depths, and locations were recorded on low-flow purge data sheets and groundwater sample log sheets (see Appendix A.1.1). See Figure 2-1 for all groundwater sampling locations.

2.2.3 Surface Water Sampling

Surface water samples were collected from intermittent streams, drainage ditches, and surface runoff locations throughout SWMU 16. All four proposed surface water samples were collected at previously sampled locations which had been marked with a labeled, wooden survey stake (See Table 2-2). Fluorescent flagging was tied to the stake and to a nearby tree (if available) to facilitate relocation of the sample location for future sampling. All Round 4 surface water samples were collected in accordance with Addendum No. 2 to the approved QAPP (TtNUS, 2004). All pertinent field data, including water quality parameters, sampling methods, and locations were recorded on a surface water sample log sheet (see Appendix A.1.2). See Figure 2-2 for all surface water sampling locations.

2.3 QUALITY CONTROL SAMPLES

Quality assurance (QA)/quality control (QC) samples were generated and collected during sampling activities in Round 4 to monitor both field and laboratory procedures. These procedures are detailed in the approved QAPP Addendum No. 2. QA/QC samples included field duplicates, equipment rinsate blanks, trip blanks, source water blanks, and temperature blanks. Field duplicate results are tabulated in Appendix D (Analytical Data) of this document.

TABLE 2-1

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

Well Number	Installation Date	Northing (NAD83)	Easting (NAD83)	Ground Elevation	Top of Riser Elevation	Total Depth[1]	Screened Interval				Date	May 5, 2003		May 30, 2003		January 24, 2004		February 4, 2005	
							Top	Bottom	Top	Bottom	Round	1		2		3		3	
											Water-Bearing Zone	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)
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
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
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
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
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
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
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	Dry	Dry	Dry
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
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
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
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
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
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
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.	Dry, abd.	abd.	abd.
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
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
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
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
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
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
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
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
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
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
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
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

TABLE 2-1

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NSWC CRANE
CRANE, INDIANA

Well Number	Installation Date	Northing (NAD83)	Easting (NAD83)	Ground Elevation	Top of Riser Elevation	Total Depth[1]	Screened Interval				Date	May 5, 2003		May 30, 2003		January 24, 2004		February 4, 2005	
							Top	Bottom	Top	Bottom	Round	1		2		3		3	
											Water-Bearing Zone	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)
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
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
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
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
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
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
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
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
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

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.
btor = Below top of riser (for monitoring wells).
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.

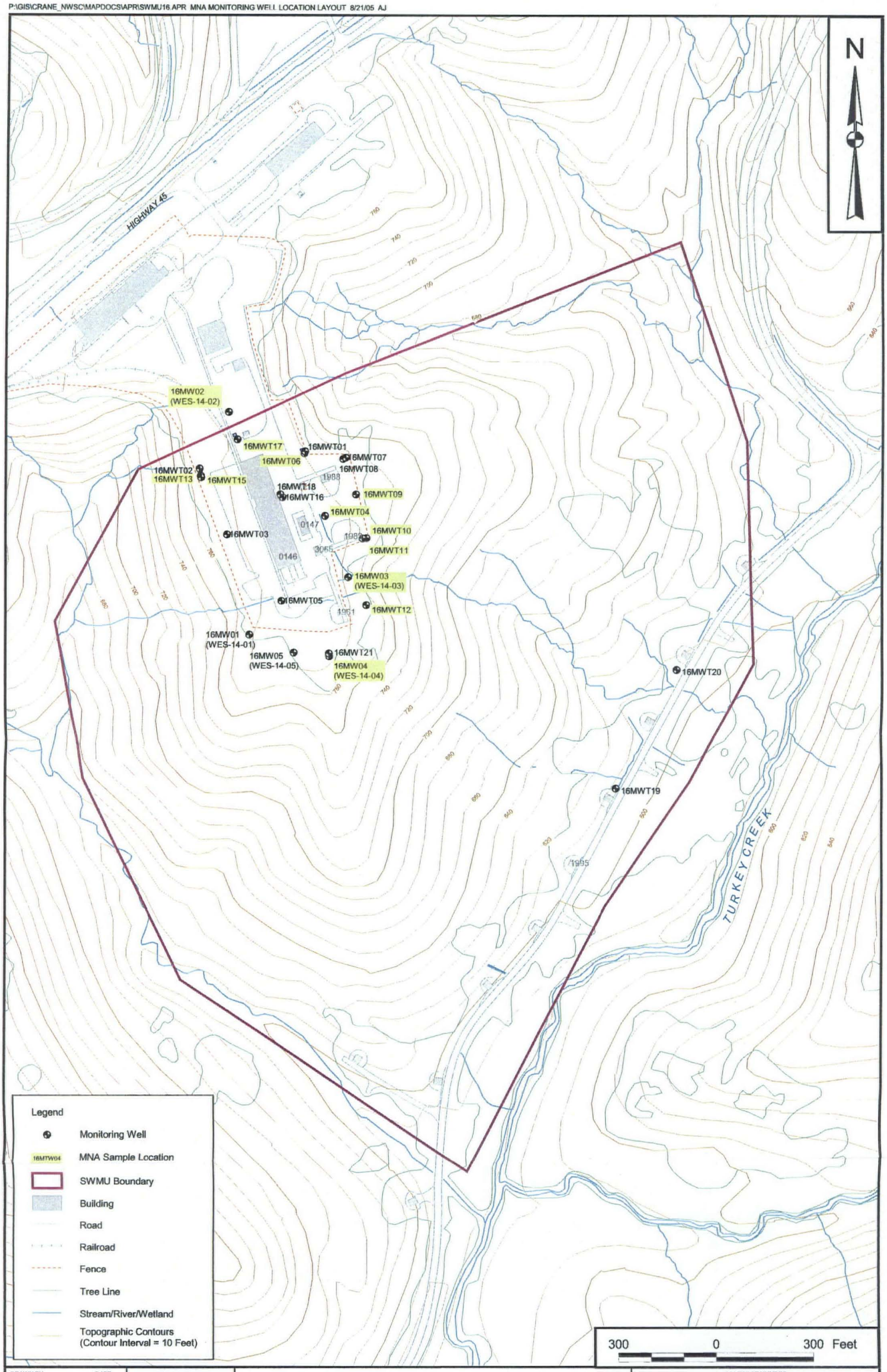
TABLE 2-2

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSES
SWMU 13 - MINE FILL B
ROUND 4
NSWC CRANE
CRANE, INDIANA

Sample Number	Analytical Fraction					
	Volatiles	Explosives		Miscellaneous		
	SW-846 8260B	Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846 8330, Modified	Nitrate + Nitrite (as N) EPA 353.2	Sulfate and Chloride	Methane, Ethane, Ethene
Groundwater (Round 4)						
16GW0204	X	X	X	X	X	X
16GW0304	X	X	X	X	X	X
16GW0404	X	X	X	X	X	X
16GWT0404	X	X	X	X	X	X
16GWT0605	X	X	X	X	X	X
16GWT0903	X	X	X	X	X	X
16GWT1003	X	X	X	X	X	X
16GWT1103	X	X	X	X	X	X
16GWT1203	X	X	X	X	X	X
16GWT1303	X	X	X	X	X	X
16GWT1503	X	X	X	X	X	X
16GWT1703	X	X	X	X	X	X
GW TOTALS	**12**	**12**	**12**	**12**	**12**	**12**
Surface Water (Round 4)						
16SW1002	X	X				
16SW1203	X	X				
16SW1303	X	X				
16SW3002	X	X				
SW TOTALS	**4**	**4**	**0**	**0**	**0**	**0**

X = indicates the sample was collected as proposed.

P:\GIS\CRANE_NWSC\MAPDOCS\APR\SWMU16.APR MNA MONITORING WELL LOCATION LAYOUT 8/21/05 AJ



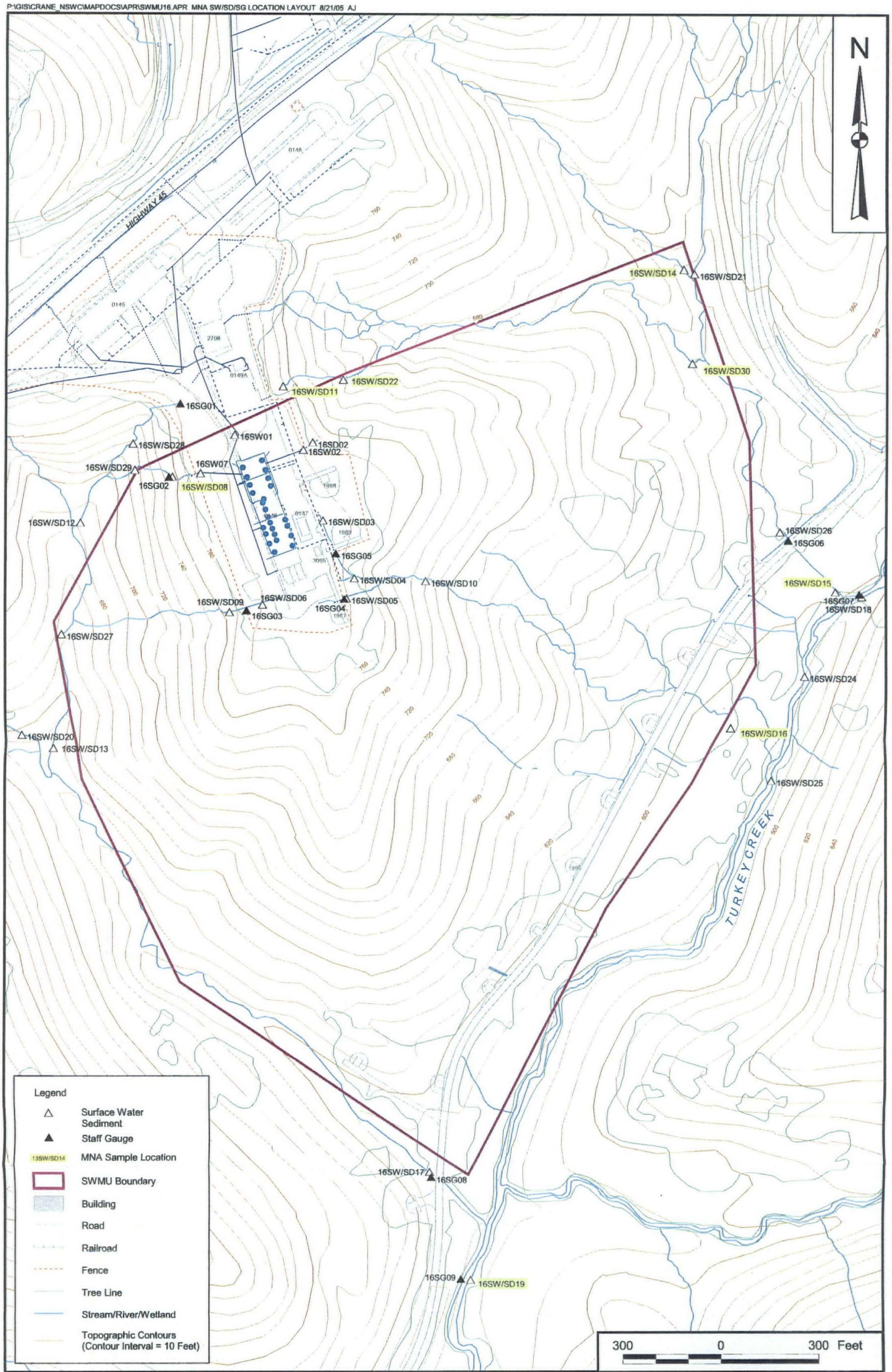
DRAWN BY	DATE
A. JANOCHA	8/21/05
CHECKED BY	DATE
J. LUCAS	8/22/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

MONITORING WELL LOCATIONS
SWMU 16 CAST HIGH EXPLOSIVES FILL/
BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
7448	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	REV
FIGURE 2 - 1	0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SWMU16.APR MNA SW/SD/SG LOCATION LAYOUT 8/21/05 AJ



DRAWN BY	DATE
A. JANOCHA	8/21/05
CHECKED BY	DATE
J. LUCAS	8/22/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

SURVEYED SURFACE WATER,
SEDIMENT, AND STAFF GAUGE LOCATIONS
SWMU 16 CAST HIGH EXPLOSIVES FILL/
BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER 7448	
APPROVED BY —	DATE —
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DRAWING NO. FIGURE 2 - 2	REV 0

3.0 DATA PRESENTATION

This section presents the analytical results for groundwater and surface water sampling conducted in Round 4 at SMWU 16 (see Tables 3-1 through 3-9). In addition, analytical results for Rounds 1 through 3 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 the 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, ethane and methane. As a result, the presentation and interpretation of analytical results in Sections 3 and 4 for SWMU 16 monitoring will focus on these primary and degradation products for RDX and TCE and miscellaneous field parameters.

3.1 GROUNDWATER DATA

Groundwater analytical results for Rounds 1 through 4 at SWMU 16 are presented in Tables 3-1 through 3-6 for select monitoring well locations in the Upper, Middle, and Lower Pennsylvanian Water Bearing Zones. 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, as well as descriptive statistics. 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 four rounds of sampling.

3.1.1 Explosives

3.1.1.1 Upper Pennsylvanian Water Bearing Zone (Puz)

Monitoring results for Round 4 sampling at the Puz monitoring wells is presented in Table 3-1. Tables 3-2 and 3-3 present descriptive statistics for upgradient and downgradient Puz wells, respectively. There were no detections of explosives at the upgradient well (16MWT02) in Round 4. The most frequently detected explosive in the downgradient wells was RDX, which was detected at all Puz wells with the

exception of 16MWT13. In Round 4, RDX concentrations ranged from 4.9 µg/L at 16MWT17 to 92 µg/L at 16MWT09. Other explosive parameters exhibiting a high frequency of detection in Round 4 were HMX, 4-amino-2,6-dinitrotoluene, and 2-amino-4,6-dinitrotoluene. The only RDX degradation product detected in Round 4 in conjunction with RDX was MNX at locations 16MWT03, 16MWT04, 16MWT09, and 16MWT10.

3.1.1.2 Middle Pennsylvanian Water Bearing Zone (Pmz)

Analytical results for Round 4 sampling at Pmz monitoring locations (16MW04 and 16MWT12) are shown in Table 3-4, Descriptive statistics for Pmz sampling in Round 4 is presented in Table 3-5. Only one explosive compound, RDX, was detected in Round 4 at location 16MW04 (0.58 µg/L). There were no detections of RDX degradation products.

3.1.1.3 Lower Pennsylvanian Water Bearing Zone (Plz)

In Round 4, there were no detections of explosives or explosive degradation products at the Plz monitoring wells (16MWT11 and 16MWT15).

3.1.2 Volatile Organic Compounds

3.1.2.1 Upper Pennsylvanian Water Bearing Zone

VOC monitoring results for Round 4 at the Puz wells are presented in Table 3-1. Summary descriptive statistics for upgradient and downgradient wells are shown in Tables 3-2 and 3-3, respectively. In Round 4, the only detected VOC in the upgradient location 16MW02 was ethane at a concentration of 0.078 µg/L. At the downgradient wells, TCE was detected at all locations with concentrations ranging from 2.4 µg/L at 16MWT10 to 440,000 µg/L at 16MWT06. High concentrations of TCE were also reported at 16MWT13 (62,000 µg/L) and 16MWT17 (19,000 µg/L).

In Round 4, TCE was detected in combination with two or more degradation products at all downgradient locations. The degradation products detected in Round 4 included cis-1,2-dichloroethene, ethene, ethane, methane, and vinyl chloride. The most frequently detected degradation compounds included ethane, ethene, and methane at virtually all downgradient locations. Detections of cis-1,2-dichloroethene and vinyl chloride were only reported at about half of the downgradient wells. The monitoring well exhibiting the highest concentrations of TCE and all degradation products in Round 4 was 16MWT06.

Several other VOCs were also detected in the Puz wells but generally on a less frequent basis. These VOCs included tetrachloroethene (PCE), 1,1,2,2-PCA, 1,1,2-TCA, 1,1-dichloroethen, carbon tetrachloride, chloroform, acetone, benzene, and toluene. The most notable aspect of these detections was the fact that the maximum concentrations for these compounds all occurred at location 16MWT06, which also reported the highest concentrations of TCE and all degradation products.

3.1.2.2 Middle Pennsylvanian Water Bearing Zone

VOC monitoring results for Round 4 at the Pmz wells are presented in Table 3-4. Summary descriptive statistics for these locations are shown in Table 3-5. In Round 4, the only VOCs detected included TCE and the degradation products ethane, ethene, and methane. Only TCE and methane were detected at 16MWT04. However, in the case of well 16MWT12, TCE, ethane, ethene, and methane were all detected. TCE concentrations were relatively low in the range of 0.5 to 1.4 µg/L.

3.1.2.3 Lower Pennsylvanian Water Bearing Zone

VOC monitoring results for Round 4 at the Plz wells are presented in Table 3-6. The summary descriptive statistics for these locations are shown in Table 3-7. In Round 4, the only detected VOCs and degradation products included TCE, ethane, ethene, and methane. All four of these VOCs were detected at location 16MWT15. However, only the degradations products ethane, ethene, and methane were detected at the other Plz location 16MWT11. The single detected concentration of TCE at 16SMWT15 was 0.6 µg/L. Of the degradation products detected, the most notable concentrations were for methane at 16MWT11 (540 µg/L) and at 16MWT15 (9,400 µg/L).

3.2 SURFACE WATER

Surface water sampling was conducted at 4 locations in Round 4. The analytical results for Round 4 are presented in Table 3-8. Summary descriptive statistics for these same samples are presented in Table 3-9.

3.2.1 Explosives

In Round 4, the only reported detections of explosives in surface water included RDX, HMX, and 4-amino-2,6-dinitrotoluene at location 16SW/SD30. The respective concentrations for these detections were 14, 3.6, and 0.44 µg/L. There were no detections of RDX degradation products.

3.2.2 Volatile Organic Compounds

The only reported detections of VOCs in Round 4 were TCE (20 µg/L) and the degradation product cis-1,2-dichloroethene (1.3 µg/L) at location 16SW/SD12.

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 4
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

SAMPLING LOCATION	16MW02									16MW03									16MWT04								
SAMPLING ROUND	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
DATE	4/24/2003	10/26/2003	8/25/2004	2/4/2005						5/11/2003	11/8/2003	8/24/2004	2/5/2005						4/22/2003	11/8/2003	8/15/2004	2/5/2005					
PARAMETERS																											
VOLATILES (UG/L)																											
CIS-1,2-DICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U						0.4	0.5	0.6	0.3 U						0.3 U	0.3 U	0.3 U	0.3 U					
ETHANE (UG/L)		0.062		0.078									0.005 U							0.013		0.008					
ETHENE (UG/L)		0.018		0.005 U									0.026							0.027		0.014 J					
TRICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U						5.6	5	4.3	5						2.2	3.9		5					
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	0.3 U	0.3 U	0.3 U					
EXPLOSIVES (UG/L)																											
1,3,5-TRINITROBENZENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
1,3-DINITROBENZENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 U	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
2,2',6,6'-TETRANITRO-4,4'-AZOX		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						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
2,4-DIAMINO-6-NITROTOLUENE		0.24 U		0.278 U							0.25 U		0.258 U							0.255 U		0.25 U					
2,4-DINITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
2,6-DIAMINO-4-NITROTOLUENE		0.24 U		0.278 U							0.25 U		0.258 U							0.255 U		0.25 U					
2,6-DINITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
2-AMINO-4,6-DINITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.48 J	0.62 J	0.89	0.52 J						0.55 U	0.47 J	0.27 U	0.3 J					
2-NITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
3,5-DINITROANILINE		0.24 U		0.278 U							0.25 U		0.258 U							0.255 U		0.25 U					
3-NITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
4,4'-TN-AZOXY				0.555 U									0.515 U									0.5 U					
4-AMINO-2,6-DINITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.86 J	1.1	1 J	0.91						0.55 U	1 J	0.56	0.75					
4-NITROTOLUENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 UJ	0.242 U	0.258 U						0.55 U	0.255 UJ	0.27 U	0.25 U					
DNX		0.24 U		0.278 U							0.25 U		0.258 U							0.63		0.25 U					
HMX	0.21 U	0.24 U	0.27 U	0.278 U						5.7	7.5	6.1	5.7						7.8	21	8.6	8.2					
MNX		0.24 U		0.278 U							0.82		0.36 J							4.1		1.2					
NITROBENZENE	0.21 U	0.24 U	0.27 U	0.278 U						0.45 U	0.25 U	0.242 U	0.258 U						0.55 U	0.255 U	0.27 U	0.25 U					
RDX	0.195 U	0.24 U	0.27 U	0.278 U						52	71	50	55						77	200	70	68					
TETRYL	0.21 U	0.24 U	0.27 UJ	0.278 U						0.45 U	0.25 U	0.242 UJ	0.258 U						0.55 U	0.255 U	0.27 U	0.25 U					
TNX		0.24 U		0.278 U							0.25 U		0.258 U							0.255 U		0.25 U					
MISCELLANEOUS PARAMETERS																											
AMMONIA-N (MG/L)	0.04									0.02									0.03								
CHLORIDE (MG/L)		14		25 J							5		5 J							10		11 J					
NITRITE/NITRATE-N (MG/L)	0.02 U U	0.05 U		0.45						0.54	0.7		0.75						0.6	0.49		0.88					
SULFATE (MG/L)		270		8700							170		150							70		32					
TOTAL ORGANIC CARBON (MG/L)		1.7																		1.4							
FIELD PARAMETERS																											
ALKALINITY (MG/L)		300									10 U									75							
CARBON DIOXIDE (MG/L)		105									130									19							
DISSOLVED OXYGEN (MG/L)		0.2	0.12	4.68							1	0.1	13.83							2	1.81	7.25					
DISSOLVED OXYGEN - METER (MG/L)	0.64	6.3								1.63	0.74								5.41	0.89							
HYDROGEN SULFIDE (H2S) (MG/L)		0									0									0							
IRON(+2) (MG/L)		3.3 >									0.54									5.19							
MANGANESE(+2) (MG/L)		1.5									2.1									1							
NITRITE-N (MG/L)		0.003									0.007									0.004							
OXIDATION REDUCTION POTENTIAL (MV)	7.1	-0.8	124	28.2						154.2	350	438.1	266						79.7	152	54	231					
PH (S.U.)	6.65	6.54	5.75	6.59						5.84	4.82	5.28	5						6.28	5.84	5.6	5.5					
SPECIFIC CONDUCTANCE (MS/CM)	0.568	1.75	0.502	0.479						0.483	0.355	0.43	0.323						0.225	0.582	0.232	0.18					
SULFIDE (MG/L)		0									0.01									0							
TEMPERATURE (C)	11.8	15.27	17.24	13.04						14.17	13.62	18.66	14.69						12.41	15.73	19.45	15.09					
TURBIDITY (NTU)	2.2	0.8	0	1.1						2.8	1.06	15.5	7.9						9.2	2.2	5.13	2.3					

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 4
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

SAMPLING LOCATION	16MWT06									16MWT09									16MWT10								
SAMPLING ROUND	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
DATE	4/28/2003	11/8/2003	8/24/2004	2/5/2005							11/22/2003	8/17/2004	2/6/2005							11/21/2003	8/17/2004	2/6/2005					
PARAMETERS																											
VOLATILES (UG/L)																											
CIS-1,2-DICHLOROETHENE	600	4200	4100	5200							0.2 J	0.3 U	0.3 U							0.2 J	0.3 U	0.3 U					
ETHANE (UG/L)	0	7.7	0	2.3									0.074						0	0.33	0	0.082					
ETHENE (UG/L)		65		29									0.081							0.16		0.03					
TRICHLOROETHENE	35000	250000	330000	440000							7.6	7.1	10							1.9	1.9	2.4					
VINYL CHLORIDE	65 J	340 J	390 J	660							0.3 U	0.3 U	0.3 U							0.3 U	0.3 U	0.3 U					
EXPLOSIVES (UG/L)																											
1,3,5-TRINITROBENZENE	0.34 U	0.25 UJ	1.8	2							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
1,3-DINITROBENZENE	0.34 U	0.25 U	0.25 U	0.24 U							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
2,2',6,6'-TETRANITRO-4,4'-AZOX		0.5 U									0.543 U									0.575 U							
2,4,6-TRINITROTOLUENE	0.34 U	0.25 UJ	4.8	6.2							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
2,4-DIAMINO-6-NITROTOLUENE		0.27 J		0.31 J							0.272 U		0.24 U							0.287 U		0.255 U					
2,4-DINITROTOLUENE	0.34 U	0.25 UJ	0.8	1.2							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
2,6-DIAMINO-4-NITROTOLUENE		0.25 U		0.24 U							0.272 U		0.24 U							0.287 U		0.255 U					
2,6-DINITROTOLUENE	0.34 U	0.25 UJ	0.25 U	0.92 J							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
2-AMINO-4,6-DINITROTOLUENE	0.34 U	4.2 J	29 J	34							0.31 J	0.27 U	0.26 J							0.287 U	0.27 U	0.255 U					
2-NITROTOLUENE	0.34 U	0.25 UJ	0.25 U	0.24 U							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
3,5-DINITROANILINE		0.25 U		0.24 U							0.272 UJ		0.24 U							0.287 U		0.255 U					
3-NITROTOLUENE	0.34 U	0.25 UJ	0.25 U	0.24 U							0.272 U	1.5 J	1.8 J							0.287 U	2.1 J	1.8 J					
4,4'-TN-AZOXY				0.48 U									0.48 U									0.51 U					
4-AMINO-2,6-DINITROTOLUENE	0.34 U	1.5	14	18							0.69 J	0.27 U	0.61 J							0.287 U	0.27 U	0.42 J					
4-NITROTOLUENE	0.34 U	0.25 UJ	0.25 U	0.24 U							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
DNX		0.3 U		0.2 U							0.272 U		0.24 U							0.287 U		0.255 U					
HMX	0.34 U	0.27 J	0.93 J	0.72 J							11	8.1	9.3							6.7	5.2	5.1					
MNX		0.25 U		0.24 U							1.1		0.43 J							0.5 J		0.3 J					
NITROBENZENE	0.34 U	0.25 U	0.25 U	0.24 U							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
RDX	4	1.8	8.8	7.3							110	79	92							55	55	50					
TETRYL	0.34 U	0.25 U	0.25 UJ	0.24 U							0.272 U	0.27 U	0.24 U							0.287 U	0.27 U	0.255 U					
TNX		0.25 U		0.24 U							0.272 U		0.24 U							0.287 U		0.255 U					
MISCELLANEOUS PARAMETERS																											
AMMONIA-N (MG/L)	0.57																										
CHLORIDE (MG/L)		47		54 J							14 U		13 J							8 J		9 J					
NITRITE/NITRATE-N (MG/L)	0.5	0.025 U		0.025 U							0.05 U		0.56							0.27 J		0.72					
SULFATE (MG/L)		520		480							210 U		290							980 J		1100					
TOTAL ORGANIC CARBON (MG/L)																											
FIELD PARAMETERS																											
ALKALINITY (MG/L)		200																		10 U							
CARBON DIOXIDE (MG/L)		40																		280							
DISSOLVED OXYGEN (MG/L)		1.5	0.39	2.64								0.37	1.41							0.35	0.14	7.14					
DISSOLVED OXYGEN - METER (MG/L)	0.48	1.67									2.33									1.28							
HYDROGEN SULFIDE (H2S) (MG/L)		0																		0							
IRON(+2) (MG/L)		0.03																		3.3 >							
MANGANESE(+2) (MG/L)		3.8																		22 >							
NITRITE-N (MG/L)		0.016																		0.002							
OXIDATION REDUCTION POTENTIAL (MV)	-106	188.6	402	14.5							329.8	199.7	169.4							328.9	501.2	315.2					
PH (S.U.)	7.7	6.49	4.69	5.96							4.1	4.7	4.82							3.72	3.21	3.31					
SPECIFIC CONDUCTANCE (MS/CM)	0.516	1.216	1.219	0.889							0.502	0.937	0.456							1.178	1.284	1.168					
SULFIDE (MG/L)		0.07																		0.02							
TEMPERATURE (C)	15	14.55	18.77	15.57							16.56	19.68	12.18							14.77	16.75	14.1					
TURBIDITY (NTU)	8.8	1.99	29	17.9							4.82	2.32	0							5.56	6.31	4.3					

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 4
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

SAMPLING LOCATION	16MWT13									16MWT17								
SAMPLING ROUND	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
DATE		11/22/2003	8/18/2004	2/5/2005							12/5/2003	8/25/2004	2/5/2005					
PARAMETERS																		
VOLATILES (UG/L)																		
CIS-1,2-DICHLOROETHENE		280	140	8.2							210	290	310					
ETHANE (UG/L)		0.45		0.065									0.6					
ETHENE (UG/L)		0.67		0.035									0.17					
TRICHLOROETHENE		62000	28000	1900							11000	19000	18000					
VINYL CHLORIDE		30 U	0.3 U	0.3 U							2.1	60 U	3.8					
EXPLOSIVES (UG/L)																		
1,3,5-TRINITROBENZENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
1,3-DINITROBENZENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
2,2',6,6'-TETRANITRO-4,4'-AZOX		0.549 U									0.538 U							
2,4,6-TRINITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
2,4-DIAMINO-6-NITROTOLUENE		0.275 U		0.264 U							0.269 U		0.24 U					
2,4-DINITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
2,6-DIAMINO-4-NITROTOLUENE		0.275 U		0.264 U							0.269 U		0.24 U					
2,6-DINITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
2-AMINO-4,6-DINITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
2-NITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
3,5-DINITROANILINE		0.275 U		0.264 U							0.269 U		0.24 U					
3-NITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
4,4'-TN-AZOXY				0.528 U									0.48 U					
4-AMINO-2,6-DINITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
4-NITROTOLUENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
DNX		0.275 U		0.264 U							0.269 U		0.24 U					
HMX		0.275 U	0.271 U	0.264 U							0.43 J	0.27 U	0.24 U					
MNX		0.275 U		0.264 U							0.269 U		0.24 U					
NITROBENZENE		0.275 U	0.271 U	0.264 U							0.269 U	0.27 U	0.24 U					
RDX		6.7	1.1	0.264 U							4.3	5.2	4.9					
TETRYL		0.275 U	0.271 U	0.264 U							0.269 U	0.27 UJ	0.24 U					
TNX		0.275 U		0.264 U							0.269 U		0.24 U					
MISCELLANEOUS PARAMETERS																		
AMMONIA-N (MG/L)																		
CHLORIDE (MG/L)		17 U		21 J							120		110 J					
NITRITE/NITRATE-N (MG/L)		0.19 J		0.025 U							0.05 UJ		0.025 U					
SULFATE (MG/L)		180 U		50							150		190					
TOTAL ORGANIC CARBON (MG/L)																		
FIELD PARAMETERS																		
ALKALINITY (MG/L)		10 U																
CARBON DIOXIDE (MG/L)		140																
DISSOLVED OXYGEN (MG/L)		6	0.08	3.22								0.18	0.89					
DISSOLVED OXYGEN - METER (MG/L)		7.27									0.63							
HYDROGEN SULFIDE (H2S) (MG/L)		0																
IRON(+2) (MG/L)		3.3 >																
MANGANESE(+2) (MG/L)		4.1																
NITRITE-N (MG/L)		0.008																
OXIDATION REDUCTION POTENTIAL (MV)		264.8	541	12							111.5	274.3	100.9					
PH (S.U.)		4.72	5.42	5.99							5.58	4.59	5.17					
SPECIFIC CONDUCTANCE (MS/CM)		0.433	0.42	0.299							0.649	0.786	0.595					
SULFIDE (MG/L)		0.02																
TEMPERATURE (C)		21.88	18.44	13.12							11.63	18.56	13.97					
TURBIDITY (NTU)		8.67	105	380							5.92	9.1	3.27					

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.
UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration non-compliances, and extremely low analyte recoveries).
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 3-2

DESCRIPTIVE STATISTICS FOR
ROUND 4 UPGRADIENT GROUNDWATER SAMPLES FROM UPPER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
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 Organics (ug/L)							
ETHANE	1/1	0.078	0.078	---	0.0780	0.0780	16GW0205
METHANE	1/1	72	72	---	72.0	72.0	16GW0205
Field Parameters							
DISSOLVED OXYGEN (mg/L)	1/1	4.68	4.68	---	4.68	4.68	16GW0205
OXIDATION REDUCTION POTENTIAL (MV)	1/1	28.2	28.2	---	28.2	28.2	16GW0205
PH (S.U.)	1/1	6.59	6.59	---	6.59	6.59	16GW0205
SPECIFIC CONDUCTANCE (MS/CM)	1/1	0.479	0.479	---	0.479	0.479	16GW0205
TEMPERATURE (C)	1/1	13.04	13.04	---	13.0	13.0	16GW0205
TURBIDITY (NTU)	1/1	1.1	1.1	---	1.10	1.10	16GW0205
Miscellaneous Parameters (mg/L)							
CHLORIDE	1/1	25 J	25 J	---	25.0	25.0	16GW0205
NITRITE/NITRATE-N	1/1	0.45	0.45	---	0.450	0.450	16GW0205
SULFATE	1/1	8700	8700	---	8700	8700	16GW0205

TABLE 3-3

DESCRIPTIVE STATISTICS FOR
ROUND 4 DOWNGRADIENT GROUNDWATER SAMPLES FROM UPPER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
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 Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	1/7	3.9	3.9	0.3	0.686	3.90	16GWT0605
1,1,2-TRICHLOROETHANE	3/7	2.1	250	0.3	42.4	98.7	16GWT0605
1,1-DICHLOROETHENE	2/7	8.1	140	0.3	21.3	74.1	16GWT0605
2-HEXANONE	1/7	1.8 J	1.8 J	0.5	0.471	1.80	16GWT0605
4-METHYL-2-PENTANONE	1/7	36	36	0.5	5.36	36.0	16GWT0605
ACETONE	2/7	7.6	33	0.5	5.98	20.3	16GWT0605
BENZENE	2/7	1.3	4.6	0.3	0.950	2.95	16GWT0605
CARBON DISULFIDE	1/7	2.5	2.5	0.3	0.486	2.50	16GWT0605
CARBON TETRACHLORIDE	2/7	2.4	17	0.3	2.88	9.70	16GW0304
CHLOROFORM	5/7	0.6 J	20	0.3	4.61	6.40	16GWT0605
CIS-1,2-DICHLOROETHENE	3/7	8.2	5200	0.3	788	1839	16GWT0605
ETHANE	6/7	0.0088 J	2.3	0.005	0.447	0.522	16GWT0605
ETHENE	7/7	0.014 J	29	---	4.19	4.19	16GWT0605
ETHYLBENZENE	1/7	4.4	4.4	0.3	0.757	4.40	16GWT0605
METHANE	7/7	0.87	440	---	87.4	87.4	16GWT0605
TETRACHLOROETHENE	2/7	3.4	190	0.3	27.7	96.7	16GWT0605
TOLUENE	2/7	0.5 J	310	0.3	44.5	155	16GWT0605
TOTAL XYLENES	1/7	6.7	6.7	0.3	1.09	6.70	16GWT0605
TRANS-1,2-DICHLOROETHENE	2/7	5.8	21	0.3	3.94	13.4	16GWT0605
TRICHLOROETHENE	7/7	2.4	440000	---	65703	65703	16GWT0605
VINYL CHLORIDE	2/7	3.8	660	0.3	94.9	332	16GWT0605
Energetics (ug/L)							
1,3,5-TRINITROBENZENE	1/7	2	2	0.24 - 0.264	0.393	2.00	16GWT0605
2,4,6-TRINITROTOLUENE	1/7	6.2	6.2	0.24 - 0.264	0.993	6.20	16GWT0605
2,4-DIAMINO-6-NITROTOLUENE	1/7	0.31 J	0.31 J	0.24 - 0.264	0.152	0.310	16GWT0605
2,4-DINITROTOLUENE	1/7	1.2	1.2	0.24 - 0.264	0.279	1.20	16GWT0605
2,6-DINITROTOLUENE	1/7	0.92 J	0.92 J	0.24 - 0.264	0.239	0.920	16GWT0605
2-AMINO-4,6-DINITROTOLUENE	4/7	0.26 J	34	0.24 - 0.264	5.07	8.77	16GWT0605
3-NITROTOLUENE	2/7	1.8 J	1.8 J	0.24 - 0.264	0.604	1.80	16GWT1003, 16GWT0903
4-AMINO-2,6-DINITROTOLUENE	5/7	0.42 J	18	0.24 - 0.264	2.99	4.14	16GWT0605
HMX	5/7	0.72 J	9.3	0.24 - 0.264	4.18	5.80	16GWT0903
MNX	4/7	0.3 J	1.2	0.24 - 0.264	0.380	0.573	16GWT0404
RDX	6/7	4.9	92	0.264	39.6	46.2	16GWT0903
Field Parameters							
DISSOLVED OXYGEN (mg/L)	7/7	0.89	13.83	---	5.20	5.20	16GW0304
OXIDATION REDUCTION POTENTIAL (MV)	7/7	12	315.2	---	158	158	16GWT1003
PH (S.U.)	7/7	3.31	5.99	---	5.11	5.11	16GWT1303
SPECIFIC CONDUCTANCE (MS/CM)	7/7	0.18	1.168	---	0.559	0.559	16GWT1003
TEMPERATURE (C)	7/7	12.18	15.57	---	14.1	14.1	16GWT0605
TURBIDITY (NTU)	7/7	0	380	---	59.4	59.4	16GWT1303
Miscellaneous Parameters (mg/L)							
CHLORIDE	7/7	5 J	110 J	---	31.9	31.9	16GWT1703
NITRITE/NITRATE-N	4/7	0.56	0.88	0.025	0.421	0.728	16GWT0404
SULFATE	7/7	32	1100	---	327	327	16GWT1003

TABLE 3-4

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER ROUNDS 1 THROUGH 4
MIDDLE PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

SAMPLING LOCATION	16MW04									16MWT12									
SAMPLING ROUND	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
DATE	4/23/03	10/26/03	8/25/04	2/6/05							11/21/03	8/24/2004	2/6/2005					
PARAMETERS																		
VOLATILES (UG/L)																		
CIS-1,2-DICHLOROETHENE	0.3 J	0.3 U	0.3 U	0.3 U							0.3 U	0.3 U	0.3 U					
ETHANE (UG/L)				0.005 U							0.37 J		0.17					
ETHENE (UG/L)				0.005 U							0.031 J		0.12					
TRICHLOROETHENE	0.5 J	0.3 U	0.7 J	1.4							0.3 U	0.3 U	0.5 J					
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U							0.3 U	0.3 U	0.3 U					
MISCELLANEOUS PARAMETERS																		
AMMONIA-N (MG/L)	0.08																	
CHLORIDE (MG/L)		12		15 J							15 U		15 J					
NITRITE/NITRATE-N (MG/L)	0.02 U	0.05 U		0.025 U							0.025 U		0.025 U					
SULFATE (MG/L)		430		660							260 J		1300					
TOTAL ORGANIC CARBON (MG/L)																		
FIELD PARAMETERS																		
ALKALINITY (MG/L)											10 U							
CARBON DIOXIDE (MG/L)											260							
DISSOLVED OXYGEN (MG/L)				5.79							0.1	3.66	4.22					
DISSOLVED OXYGEN - METER (MG/L	0.29	0.54									0.64							
HYDROGEN SULFIDE (H2S) (MG/L)											0							
IRON(+2) (MG/L)											3.3 >							
MANGANESE(+2) (MG/L)											9.4							
NITRITE-N (MG/L)											0							
OXIDATION REDUCTION POTENTIAL	207	329	124	319							306.8	220.7	134.6					
PH (S.U.)	3.68	3.65	4.1	4.5							4.27	4.64	4.89					
SPECIFIC CONDUCTANCE (MS/CM)	0.72	0.74	0.84	0.672							0.795	2.785	1.898					
SULFIDE (MG/L)											0.01							
TEMPERATURE (C)	13.3	13.2	15	12.87							16.04	17.81	12.28					
TURBIDITY (NTU)	0.5	0.13	8.9	0.05							4.11	7.63	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.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration non-compliances, and extremely low analyte recoveries).

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 3-5

DESCRIPTIVE STATISTICS FOR
ROUND 4 GROUNDWATER SAMPLES FROM MIDDLE PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
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 Organics (ug/L)							
ETHANE	1/2	0.17	0.17	0.005	0.0863	0.170	16GWT1203
ETHENE	1/2	0.12	0.12	0.005	0.0613	0.120	16GWT1203
METHANE	2/2	1.1	1.6	---	1.35	1.35	16GWT1203
TRICHLOROETHENE	2/2	0.5 J	1.4	---	0.950	0.950	16GW0404
Energetics (ug/L)							
RDX	1/2	0.58	0.58	0.26	0.355	0.580	16GW0404
Field Parameters							
DISSOLVED OXYGEN (mg/L)	2/2	4.22	5.79	---	5.01	5.01	16GW0404
OXIDATION REDUCTION POTENTIAL (MV)	2/2	134.6	319	---	227	227	16GW0404
PH (S.U.)	2/2	4.5	4.89	---	4.70	4.70	16GWT1203
SPECIFIC CONDUCTANCE (MS/CM)	2/2	0.672	1.898	---	1.29	1.29	16GWT1203
TEMPERATURE (C)	2/2	12.28	12.87	---	12.6	12.6	16GW0404
TURBIDITY (NTU)	2/2	0.05	1.7	---	0.875	0.875	16GWT1203
Miscellaneous Parameters (mg/L)							
CHLORIDE	2/2	15 J	15 J	---	15.0	15.0	16GW0404, 16GWT1203
SULFATE	2/2	660	1300	---	980	980	16GWT1203

TABLE 3-6

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 GROUNDWATER
ROUNDS 1 THROUGH 4
LOWER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

SAMPLING LOCATION	16MWT11									16MWT15								
SAMPLING ROUND	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
DATE		12/6/03	8/25/04	2/4/05							12/6/03	8/17/04	2/5/05					
PARAMETERS																		
VOLATILES (UG/L)																		
Figure 4-7		0.3 U	0.3 U	0.3 U							0.3 U	0.3 U U	0.3 U					
ETHANE (UG/L)				0.34							1		2.5					
ETHENE (UG/L)				0.75							0.22		0.26					
TRICHLOROETHENE		0.3 U	0.3 U	0.3 U							0.3 U	0.3 U	0.6 J					
VINYL CHLORIDE		0.3 U	0.3 U	0.3 U							0.3 U	0.3 U	0.3 U					
MISCELLANEOUS PARAMETERS																		
AMMONIA-N (MG/L)																		
CHLORIDE (MG/L)				5							4		3 J					
NITRITE/NITRATE-N (MG/L)				0.025 U							0.05 UJ		0.025 U					
SULFATE (MG/L)				4							8		0.5 U					
TOTAL ORGANIC CARBON (MG/L)											2.6							
FIELD PARAMETERS																		
ALKALINITY (MG/L)											250							
CARBON DIOXIDE (MG/L)											10 U							
DISSOLVED OXYGEN (MG/L)			0.87	9.72							3.5	1.77	1.36					
DISSOLVED OXYGEN - METER (MG/L)		4.51									2.57							
HYDROGEN SULFIDE (H2S) (MG/L)											0							
IRON(+2) (MG/L)											0							
MANGANESE(+2) (MG/L)											0.3							
NITRITE-N (MG/L)											0.007							
OXIDATION REDUCTION POTENTIAL (MV)		188	95	-43.9							174.1	143.1	-21.7					
PH (S.U.)		7.35	5.47	6.98							7.99	6.15	7.43					
SPECIFIC CONDUCTANCE (MS/CM)		0.256	1.004	0.756							0.392	0.411	0.354					
SULFIDE (MG/L)											0.01							
TEMPERATURE (C)		7.29	24.93	11.82							12.78	15.85	13.89					
TURBIDITY (NTU)		650	4.7	2.8							22.5	2	0.6					

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.
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 3-7

DESCRIPTIVE STATISTICS FOR
ROUND 4 GROUNDWATER SAMPLES FROM PENNSYLVANIAN LOWER ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
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 Organics (ug/L)							
ETHANE	2/2	0.34	2.5	---	1.42	1.42	16GWT1503
ETHENE	2/2	0.075	0.26	---	0.168	0.168	16GWT1503
METHANE	2/2	540	9400	---	4970	4970	16GWT1503
TRICHLOROETHENE	1/2	0.6 J	0.6 J	0.3	0.375	0.600	16GWT1503
Field Parameters							
DISSOLVED OXYGEN (mg/L)	2/2	1.36	9.72	---	5.54	5.54	16GWT1103
OXIDATION REDUCTION POTENTIAL (MV)	2/2	-43.9	-21.7	---	-32.8	-32.8	16GWT1503
PH (S.U.)	2/2	6.98	7.43	---	7.21	7.21	16GWT1503
SPECIFIC CONDUCTANCE (MS/CM)	2/2	0.354	0.756	---	0.555	0.555	16GWT1103
TEMPERATURE (C)	2/2	11.82	13.89	---	12.9	12.9	16GWT1503
TURBIDITY (NTU)	2/2	0.6	2.8	---	1.70	1.70	16GWT1103
Miscellaneous Parameters (mg/L)							
CHLORIDE	2/2	3 J	5	---	4.00	4.00	16GWT1103
SULFATE	1/2	4	4	0.5	2.13	4.00	16GWT1103

TABLE 3-8

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 16 SURFACE WATER
ROUNDS 1 THROUGH 4
NSWC CRANE
CRANE, INDIANA

SAMPLING LOCATION	16SW/SD10				16SW/SD12				16SW/SD13				16SW/SD30				
SAMPLING ROUND	1	2	3	4	1	2	3	4	1	2	3	4	1	2		3	4
DATE			11/11/04	2/3/05		10/25/03	11/2/04	2/3/05		10/25/03	11/2/04	2/3/05				10/26/04	2/3/05
PARAMETER																	
VOLATILES (UG/L)																	
CIS-1,2-DICHLOROETHENE				0.3 U		1.4	0.3 U	1.3		0.3 U	0.3 U	0.3 U				0.3 U	0.3 U
ETHANE (UG/L)																	
ETHENE (UG/L)																	
TRICHLOROETHENE				0.3 U		15	5.6	20		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	0		0.3 U	0.3 U
MISCELLANEOUS PARAMETERS																	
AMMONIA-N (MG/L)																	
CHLORIDE (MG/L)																	
NITRITE/NITRATE-N (MG/L)						0.11	0.43			0.27	0.55						
SULFATE (MG/L)																	
TOTAL ORGANIC CARBON (MG/L)																	
FIELD PARAMETERS																	
ALKALINITY (MG/L)																	
CARBON DIOXIDE (MG/L)																	
DISSOLVED OXYGEN (MG/L)			6.02	8.95			9.38	10.07			9.18	10.93				8.9	11.15
DISSOLVED OXYGEN - METER (MG/L)						6				2.94							
HYDROGEN SULFIDE (H2S) (MG/L)																	
IRON(+2) (MG/L)																	
MANGANESE(+2) (MG/L)																	
NITRITE-N (MG/L)																	
OXIDATION REDUCTION POTENTIAL (MV)			120	218		195.4	51.4	218		68.3	49.4	203				53.6	188
PH (S.U.)			7.26	3.65		7.21	7.16	3.75		6.4	7.64	3.83				7.37	4.16
SPECIFIC CONDUCTANCE (MS/CM)			0.066	0.126		0.204	0.1	0.164		0.168	0.84	0.175				0.159	0.14
SULFIDE (MG/L)																	
TEMPERATURE (C)			10.74	5.44		13.24	16.24	5.95		13.68	16.03	5.25				13.28	3.12
TURBIDITY (NTU)			46.7	6.9		4.06	38.4	3		15.9	22.8	2.2				9.49	3.1

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

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.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration non-compliances, and extremely low analyte recoveries).

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 3-9

DESCRIPTIVE STATISTICS FOR
ROUND 4 SURFACE WATER SAMPLES
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
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 Organics (ug/L)							
CIS-1,2-DICHLOROETHENE	1/4	1.3	1.3	0.3	0.438	1.30	16SW1203
TRICHLOROETHENE	1/4	20	20	0.3	5.11	20.0	16SW1203
Energetics (ug/L)							
4-AMINO-2,6-DINITROTOLUENE	1/4	0.44 J	0.44 J	0.24 - 0.242	0.200	0.440	16SW3002
HMX	1/4	3.6	3.6	0.24 - 0.242	0.990	3.60	16SW3002
RDX	1/4	14	14	0.24 - 0.242	3.59	14.0	16SW3002
Field Parameters							
DISSOLVED OXYGEN (mg/L)	4/4	8.95	11.15		10.3	10.3	16SW3002
OXIDATION REDUCTION POTENTIAL (MV)	4/4	188	218		207	207	16SW1002, 16SW1203
PH (S.U.)	4/4	3.65	4.16		3.85	3.85	16SW3002
SPECIFIC CONDUCTANCE (MS/CM)	4/4	0.126	0.175		0.151	0.151	16SW1303
TEMPERATURE (C)	4/4	3.12	5.95		4.94	4.94	16SW1203
TURBIDITY (NTU)	4/4	2.2	6.9		3.80	3.80	16SW1002

4.0 DATA EVALUATION

Section 4 presents groundwater and surface monitoring data for Rounds 1 through 4. 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, and ethane. 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, four rounds of groundwater sampling events have been conducted: Round 1 (February through May 2003); Round 2 (October 2003 through January 2004); Round 3 (July through November 2004) and Round 4 (February 2005). The remaining five rounds of sampling are expected to be completed in 2005 and 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, quarterly monitoring will have been conducted for approximately 2 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 (Upper, Middle, and Lower Pennsylvania) water bearing zones to evaluate if contamination is migrating from the upper aquifer to the 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. Explosives contamination has been detected in the Upper and Middle Pennsylvania water bearing zones, but not in the Lower Pennsylvania 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.** As stated previously, explosives contamination has been detected in the upper and middle Pennsylvania water bearing zones, but not the lower Pennsylvania aquifer and VOCs have been detected in all 3 water bearing zones. The long term monitoring program includes monitoring wells located in the Upper and Lower Pennsylvania water bearing zones to evaluate if contamination is migrating 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.

- **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.

  - **Routine and Other Indicator Parameters.** The monitoring data includes the routine indicator parameters dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, turbidity, and nitrite/nitrate concentrations. Other parameters that can be used to support decision making includes 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, and 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

MNA groundwater sampling 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 source area, within the center and 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, 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 eight 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 4 POTENTIOMETRIC SURFACES

Figures 4-1, 4-2, and 4-3 show the Round 4 (February 4, 2005) potentiometric surface elevation maps for the Upper, Middle, and Lower Pennsylvanian water bearing zones, respectively. The Round 4 groundwater elevations collected in Round 4 for all three zones were compared to groundwater elevations reported in RFI (see Appendix E). The comparison revealed similar groundwater elevations and flow directions for each zone. Further discussion of the Round 4 results for each zone are presented below.

In Round 4, groundwater elevations in the Puz monitoring wells ranged from 742.13 feet above mean sea level (amsl) at well 16MWT10 to 751.85 feet amsl at well 16MWT04. Monitoring well 16MWT01 was not used to develop the SWMU 16 Puz potentiometric surface map because it is not representative of SWMU 16 groundwater elevations due to differences in water elevation in previous rounds. The highest groundwater elevations in the northern portion of the site were measured in monitoring wells WES-14-02-83 and 16MWT17, which are located near the centerline of the ridge. Groundwater to the west of the 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 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 ranged from 730.34 feet amsl at well 16MWT16 to 735.53 feet amsl at well 16MWT03. Monitoring well 16MWT16 was not used in developing the potentiometric surface map for the Pmz 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 zone. Groundwater elevations for the Pmz are highest near the central portion of this SWMU (near B146), and groundwater is flowing toward the southwestern, southern, and southeastern hillsides.

In Round 4, Plz groundwater elevations ranged from 664.96 at well 16MWT08 to 704.70 feet amsl at well 16MWT15. However, monitoring well 16MWT15 was not used in developing the potentiometric surface map for the Plz because the potentiometric elevation for 16MWT15 was approximately 40 feet higher than the average water level measured in the other 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. Excluding the data for monitoring well 16MWT15, the deep groundwater elevations ranged from 664.96 to 668.3 feet amsl in Round 4. Groundwater flow direction on the eastern side of the site is

towards the northeast. There is insufficient data to determine which direction groundwater in the Plz is flowing 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)

Figure 4-4 shows temporal plots of RDX and degradation by-product concentrations for Rounds 1 through 4 in the Puz. Figure 4-5 shows temporal plots of TCE and degradation-by-product concentrations. 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. All detections 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.

Through Round 4, RDX was detected at all Puz monitoring locations with the exception of 16MW02, which is the upgradient well. This pattern of concentrations, among other evidence, links RDX to SWMU 16 as a site-related contaminant in groundwater. RDX degradation-by-products have been detected at 2 locations (16MWT04 and 16MWT09). This alone, is an indication that degradation of RDX is occurring because the only source of these compounds is RDX. TCE has been detected at all Puz well locations with the exception of 16MW02, which is the upgradient well. TCE degradation-by-products have been detected at all Puz wells. Similar to RDX, this links TCE to SWMU 16 as a site-related contaminant and provides evidence that TCE is degrading in the environment. A summary evaluation of monitoring results through Round 4 for each Puz well location is presented below:

- Upgradient well:
  - 16MW02 – No detection of explosives or degradation-by-products. Three total detections of ethene and ethane. No apparent trend in concentrations.

- Three source area wells:
  - 16MWT06 – Four detections of RDX with no apparent trend in concentrations. TCE and associated degradation-by-products have been detected in all rounds of sampling. TCE and vinyl chloride concentrations have increased since Round 1 and indicate a possible upward trend. Concentrations of ethene and ethane show no apparent trend.

  - 16MWT13 – RDX has been detected in 2 of 3 rounds of sampling with no apparent trend in concentrations. TCE and cis-1,2-dichloroethene have been detected in all rounds of sampling

with concentrations showing a potential downward trend since Round 2 when sampling initiated. Insufficient data is available for ethene and ethane to discern any trend in concentrations.

- 16MWT17 – There have been 3 detections of RDX with no apparent trend in concentrations. TCE and cis-1,2-dichloroethene have been detected in all rounds with no apparent trend in concentrations; vinyl chloride has been detected in 2 of 3 rounds with no trend in concentrations; and ethene and ethane have each been detected once.

- Four wells within the RDX and TCE plumes:
  - 16MW03 – There have been 4 detections of RDX and 2 detections of MNX. There is slight increase in RDX concentrations but no trend in MNX. TCE and cis-1,2-dichloroethene have been detected in all rounds with an apparent decreasing trend in concentrations. Ethene has been detected once.

  - 16MWT04 – There have been 4 detections of RDX with no apparent trend in concentrations. In sufficient data is available for DNX, MNX, and TNX to detect a trend in concentrations. have each been detected once. TCE has been detected in all sampling events. However, there is no apparent trend in concentrations. There have been two detections of ethene and ethane through Round 4 but there is insufficient data to discern a trend in these compounds.

  - 16MWT09 – RDX has been detected in 3 of 4 sampling rounds and there is no apparent trend in concentrations. MNX was the only degradation product detected in 2 rounds. There is insufficient data to discern a trend for this compound.

  - 16MWT10 – RDX has been detected in all sampling events with no apparent trend in concentrations. MNX was the only degradation product detected in 2 rounds. There is insufficient data to discern a trend for this compound.

4.4.2 Middle Pennsylvanian Water Bearing Zone (Pmz)

Figure 4-6 shows temporal plots of RDX and degradation by-product concentrations for Rounds 1 through 4. Figure 4-7 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 3-4. RDX has been detected in one well (16MW04). No RDX degradation-by-products have been detected. TCE and cis-1,2-dichloroethen have been detected in both Pmz wells at least once. Ethene and ethane have been

detected only at well 16MWT12. 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 detected in all four rounds and there is no apparent trend in concentrations. TCE has been detected in 3 of 4 sampling rounds and indicates a possible increasing trend in concentrations. Cis-1,2-dichloroethene has been detected once.

- Downgradient well:
  - 16MWT12 – There have been no detections of explosives or degradation-by-products. TCE was detected only in Round 4; cis-1,2-dichloroethene has been detected in all rounds and there is no apparent trend in concentrations. Ethene and ethane have been detected only twice in two sampling rounds. Insufficient data is available to indicate a possible trend for these compounds.

4.4.3 Lower Pennsylvanian Water Bearing Zone (Plz)

Figure 4-8 shows temporal plots of RDX and degradation by-product concentrations. Figure 4-9 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 3-6. 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 or degradation-by-products. There have been no detections of TCE. Ethene and ethane have only been detected in Round 4.

  - 16MWT15 – There have been no detections of RDX or degradation-by-products. TCE and cis-1,2-dichloroethene have only been detected in Round 4. Ethene and ethane have been detected twice in two rounds of sampling. 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. All positive hits are shown as a data point on each plot and correspond to data presented in Table 3-8. Through Round 4, RDX has been detected twice at location

16SW/SD30. TCE and cis-1,2-dichloroethene have only been detected in one well (16SW/SD12). A summary evaluation of monitoring results for surface water location is presented below:

- 16SW10 – No detections of RDX. No detection of TCE, cis-1,2-dichloroethene, or vinyl chloride.

- 16SW12 - No detections of RDX or degradation products. TCE has been detected in all rounds of sampling with no apparent trend in concentrations and cis-1,2-dichloroethene has been detected in 2 of 3 samples and shows no trend in concentrations.

- 16SW13 - No detections of RDX or degradation products. No detections of TCE or degradation products.

- 16SW30 – RDX has been detected in twice; however, only two rounds of sampling have been conducted at this well. There have been no detections of TCE or degradation products.

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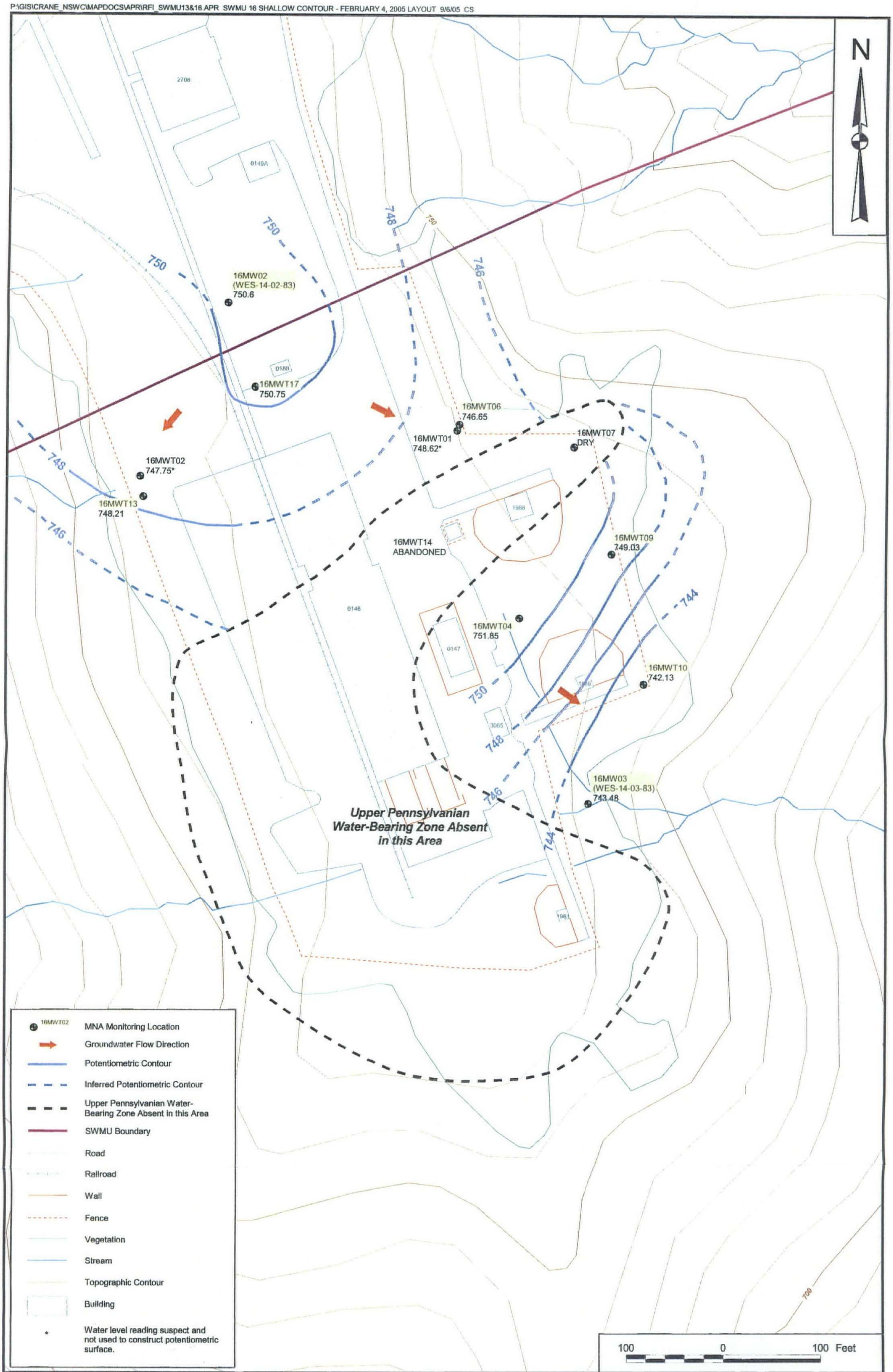

DRAWN BY	DATE
A. JANOCHA	8/21/05
CHECKED BY	DATE
J. LUCAS	8/31/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
UPPER PENNSYLVANIAN WATER-BEARING ZONE - FEBRUARY 4, 2005 (ROUND 4)
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
7448	
APPROVED BY	DATE
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APPROVED BY	DATE
—	—
DRAWING NO.	REV
FIGURE 4 - 1	0

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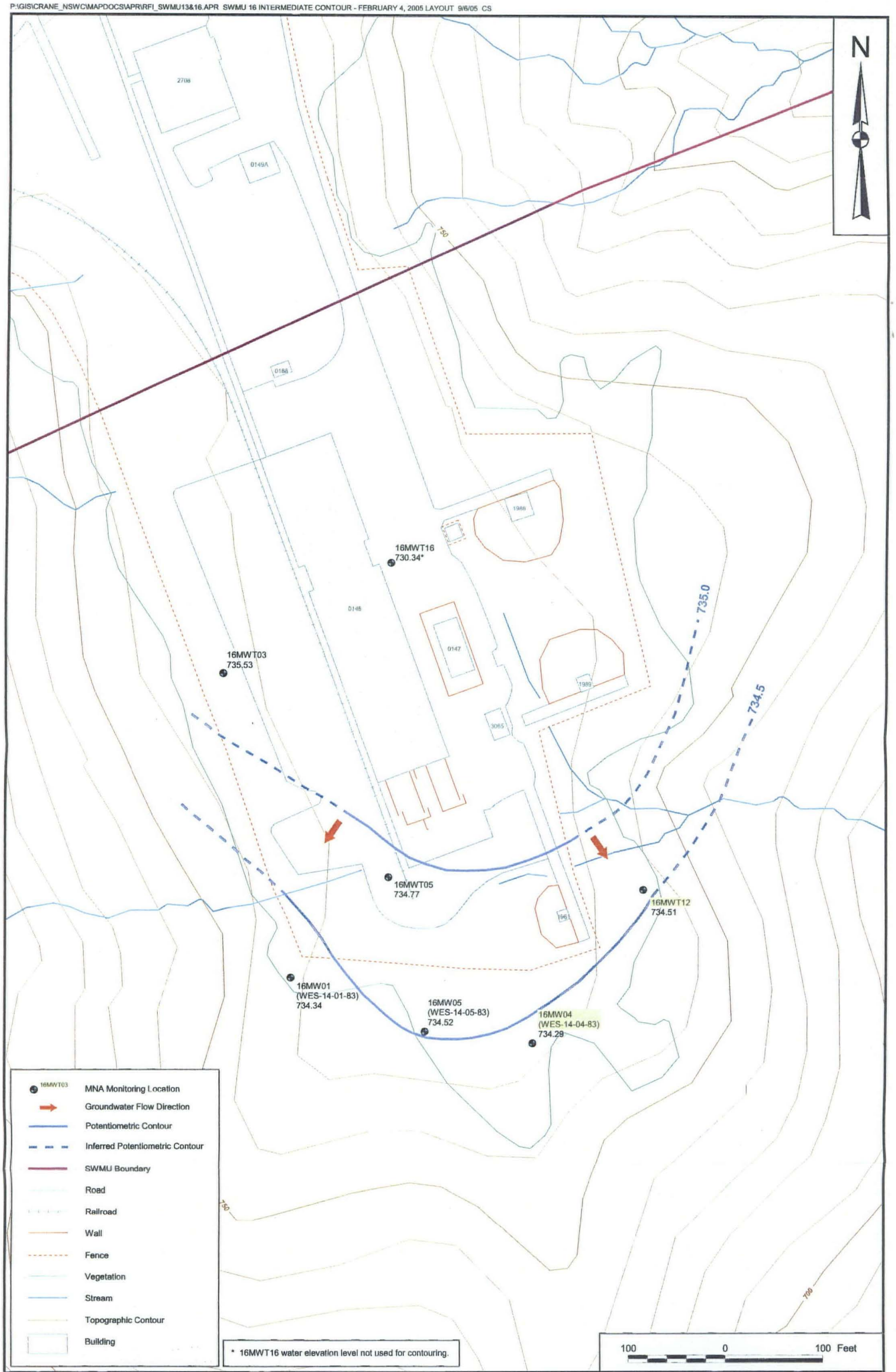

DRAWN BY	DATE
A. JANOCHA	8/21/05
CHECKED BY	DATE
J. LUCAS	8/31/05
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
MIDDLE PENNSYLVANIAN WATER-BEARING ZONE - FEBRUARY 4, 2005 (ROUND 4)
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER 7448	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 4 - 2	REV 0

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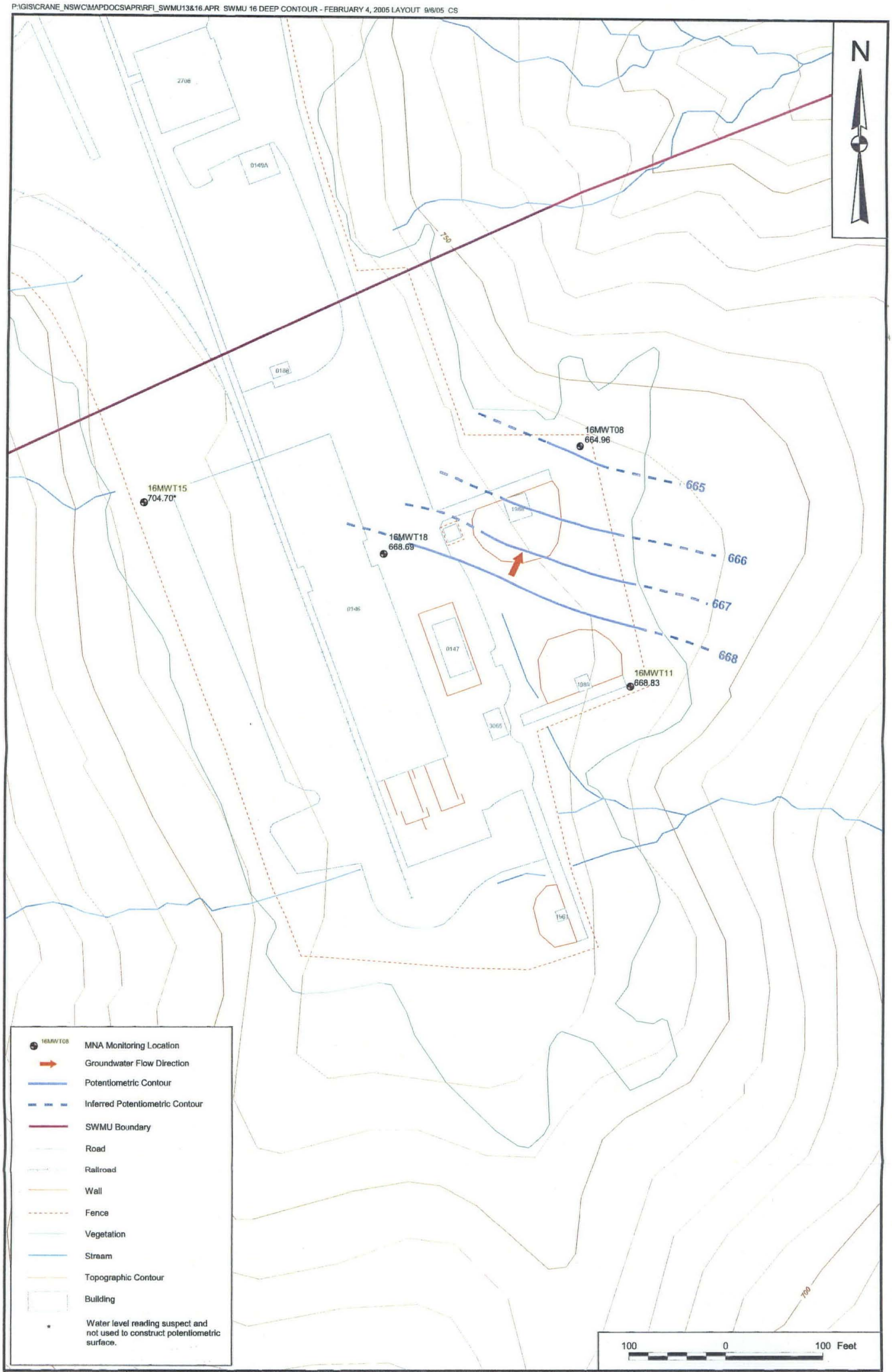

DRAWN BY	DATE
A. JANOCHA	8/21/05
CHECKED BY	DATE
J. LUCAS	8/31/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR
LOWER PENNSYLVANIAN WATER-BEARING UNIT - FEBRUARY 4, 2005 (ROUND 4)
SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
7448	
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DRAWING NO.	REV
FIGURE 4 - 3	0

FIGURE 4-4
TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

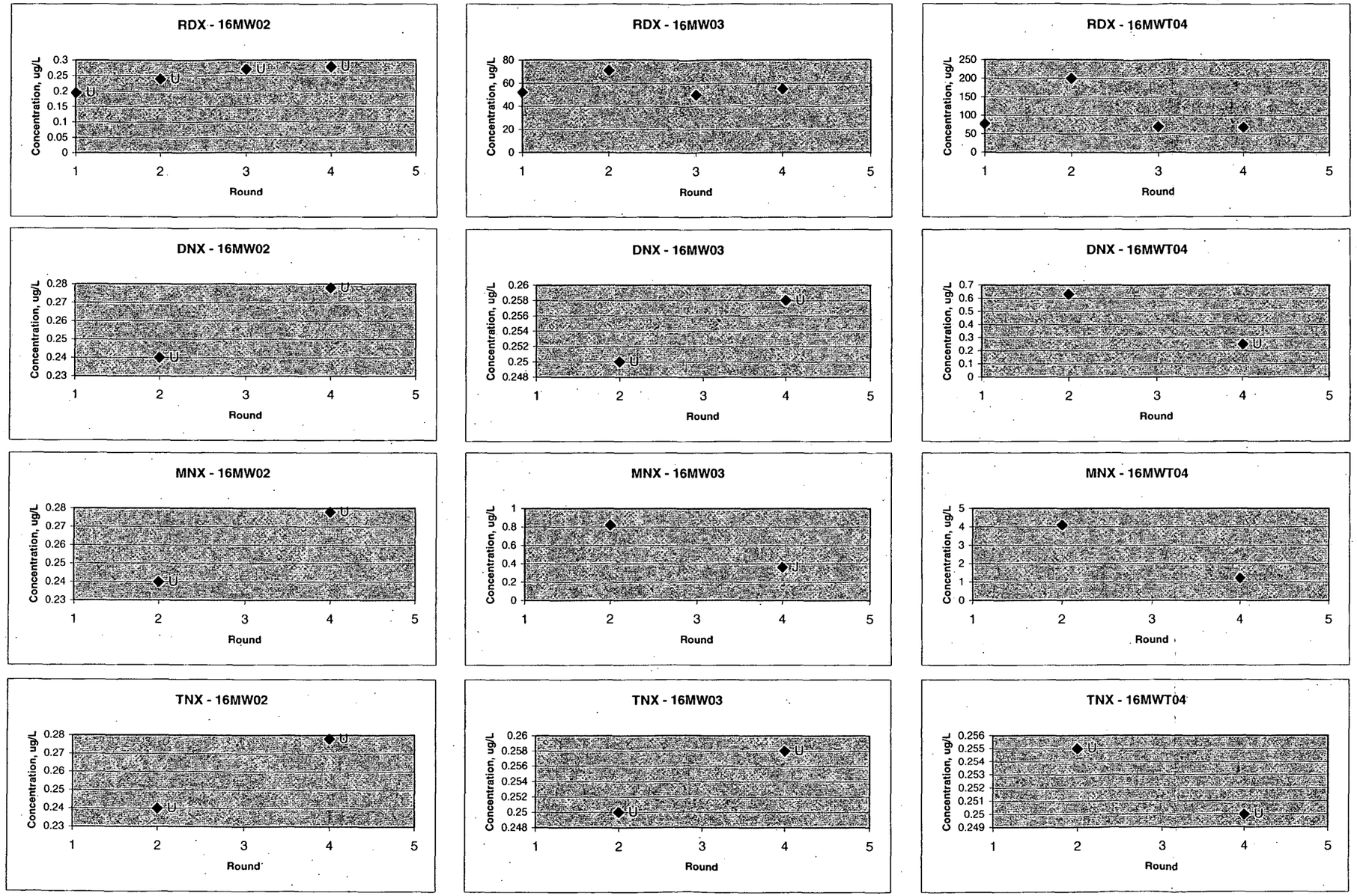


FIGURE 4-4
TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

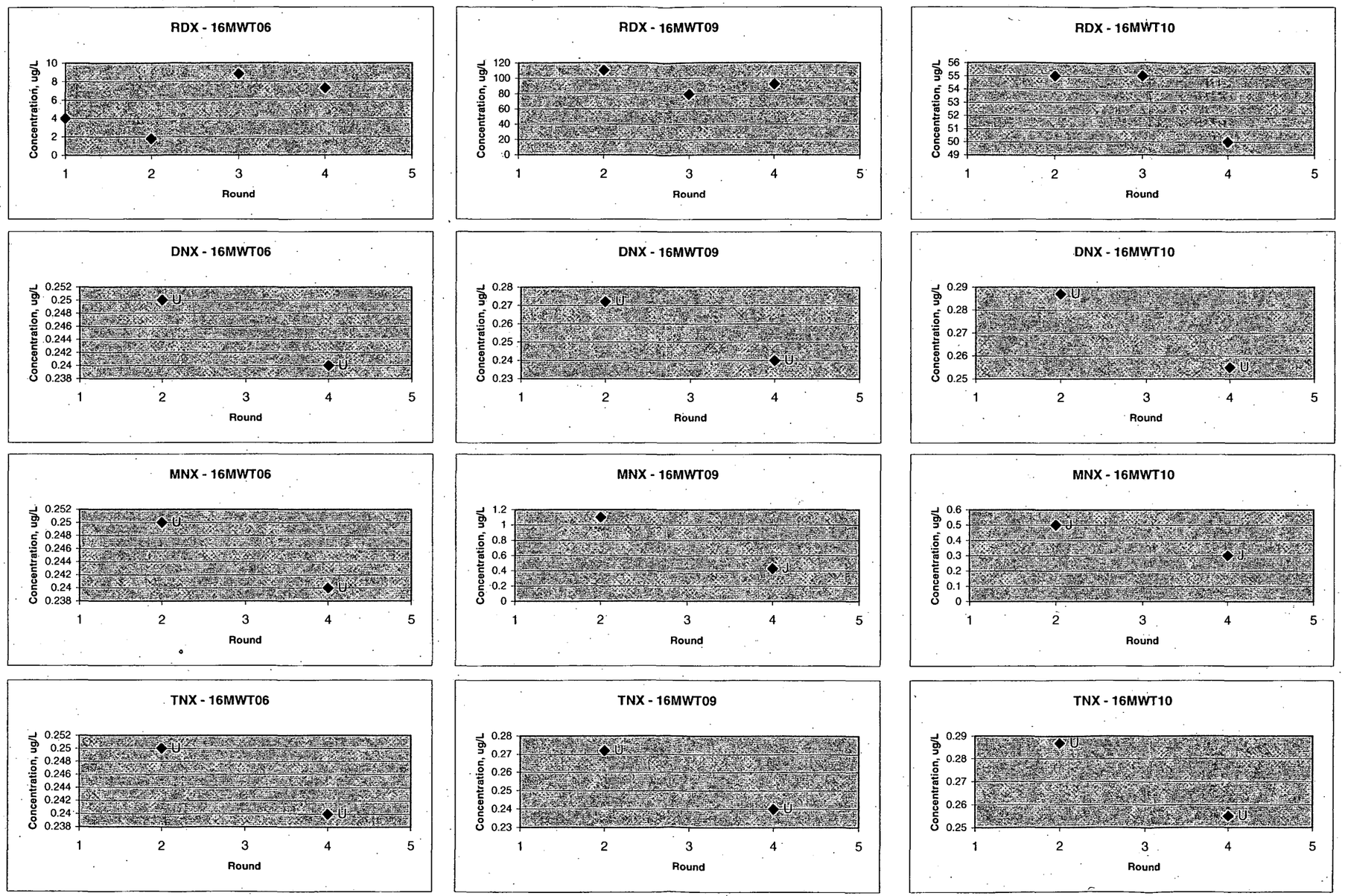
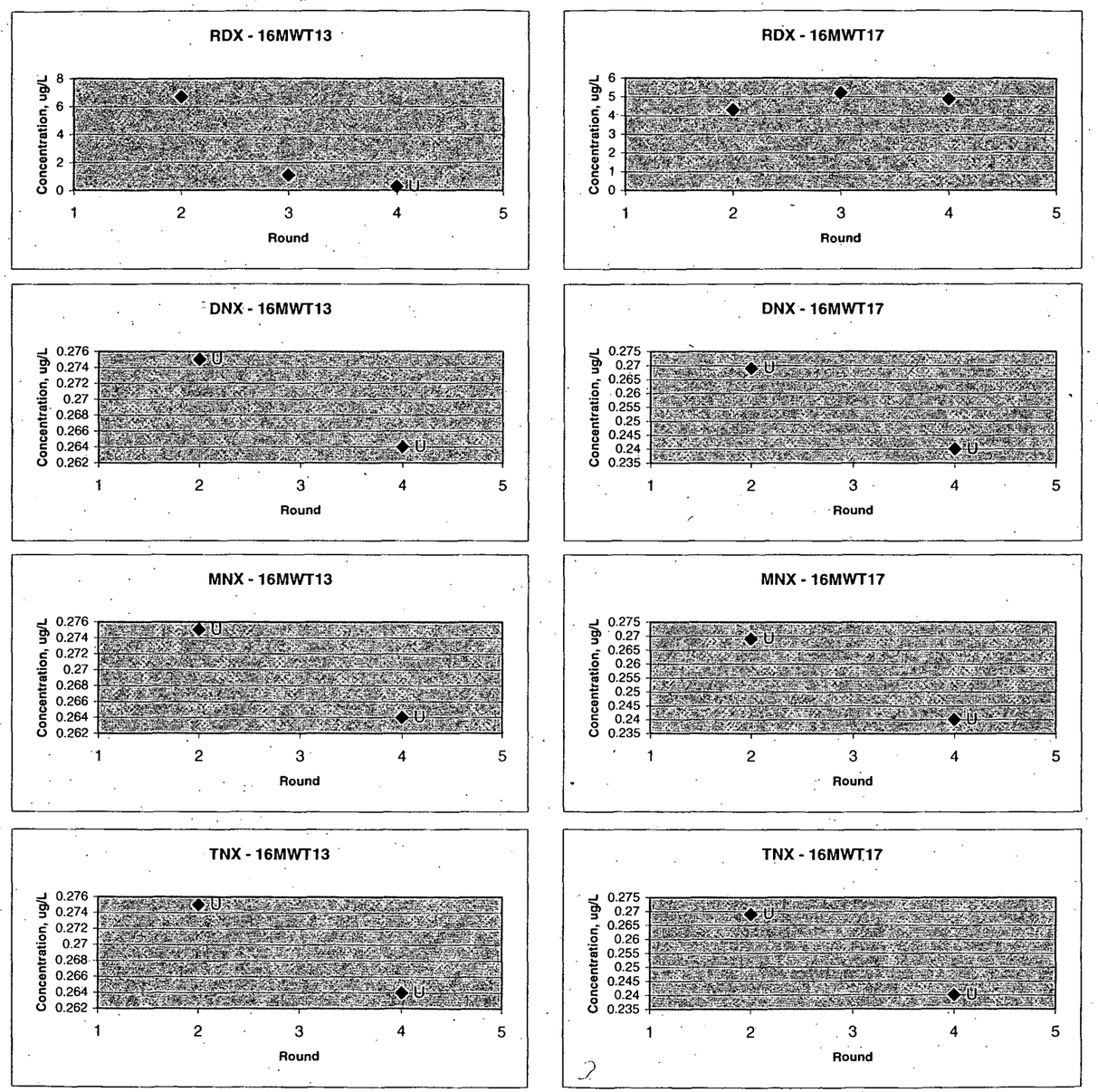
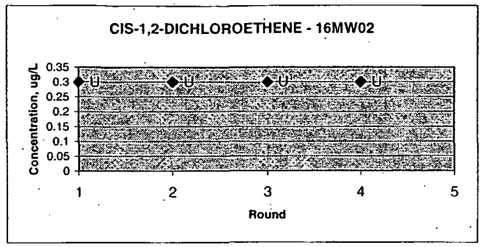


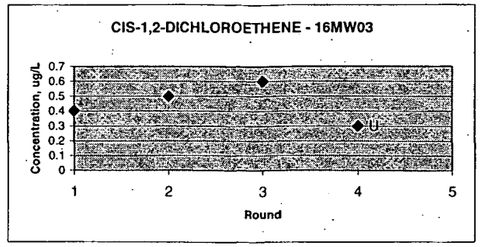
FIGURE 4-4
TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

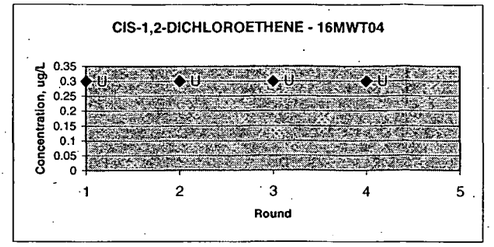


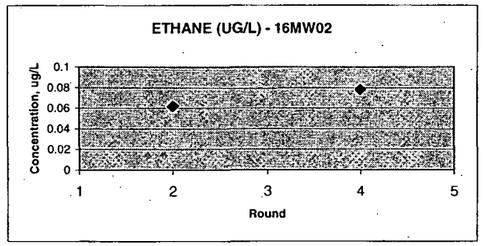
U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner. This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration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

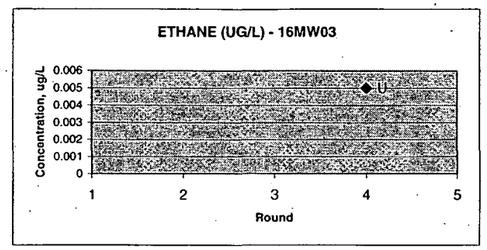
TABLE 4-5
TEMPORAL PLOTS FOR TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN PENNSYVANIAN WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA

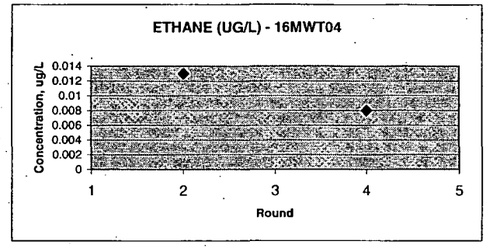


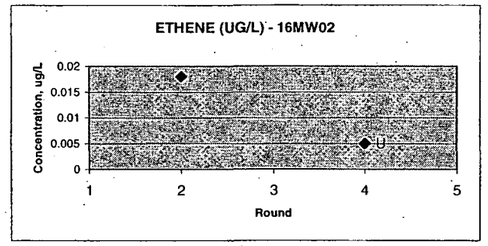


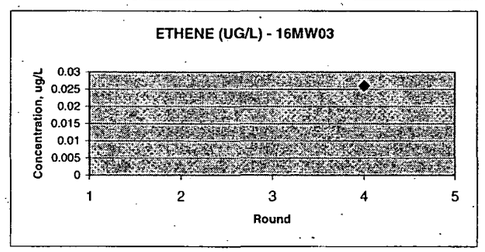


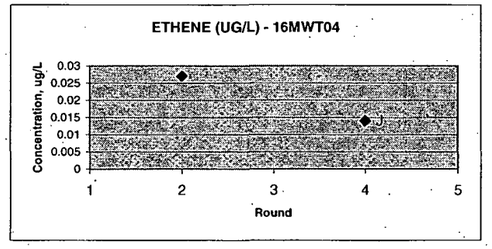


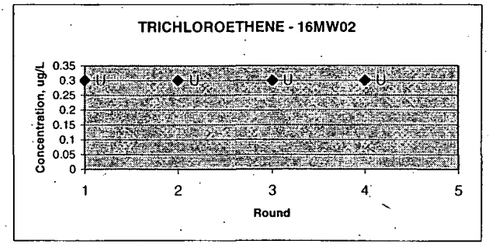


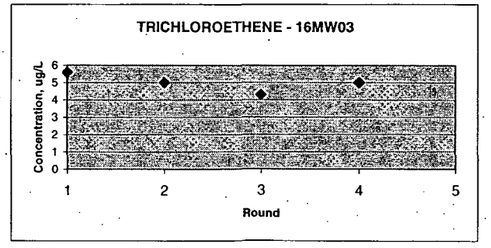


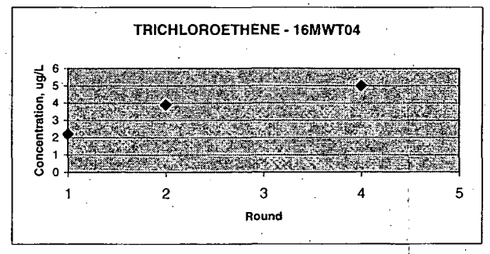


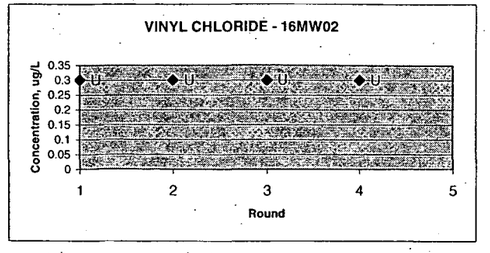


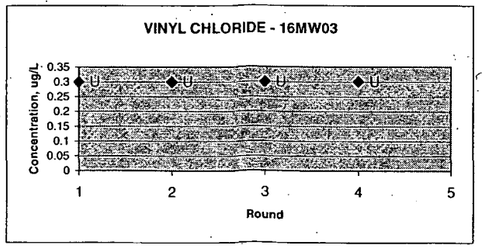












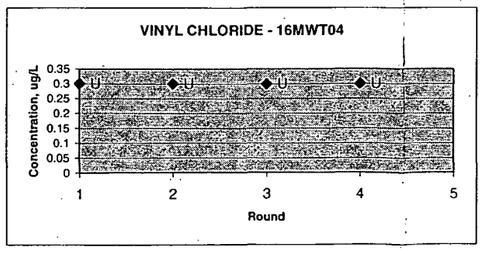
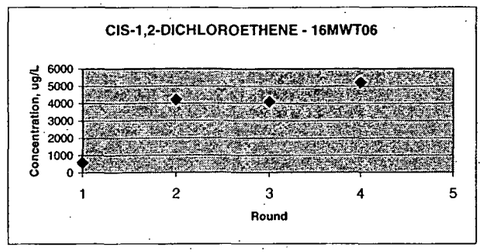
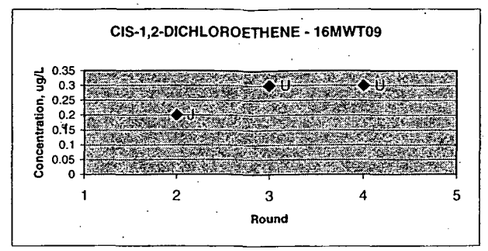
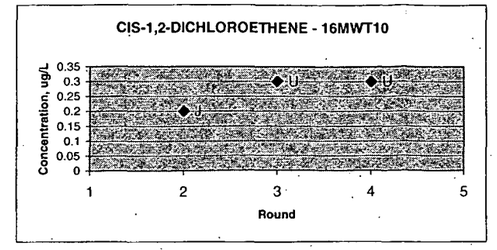
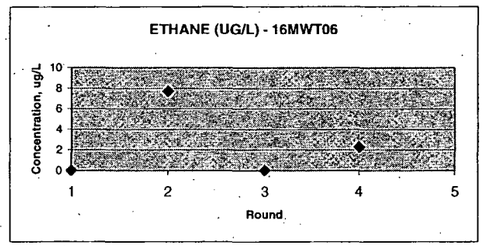


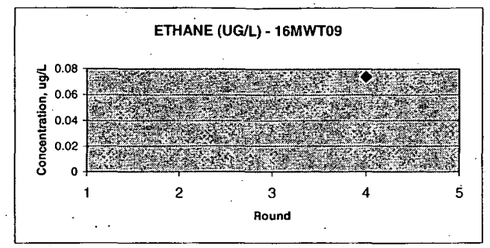
TABLE 4-5
TEMPORAL PLOTS FOR TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN PENNSYVANIAN WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA

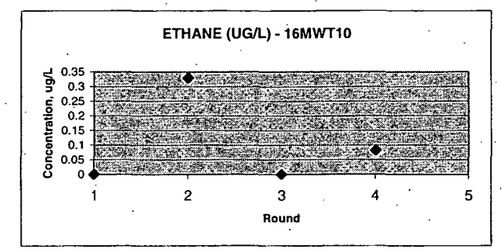


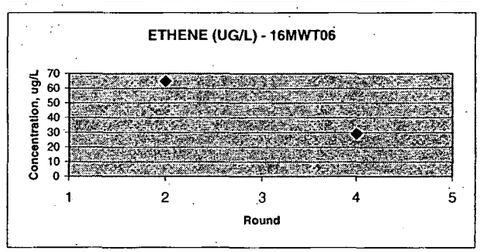


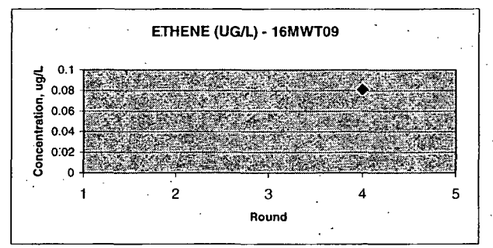


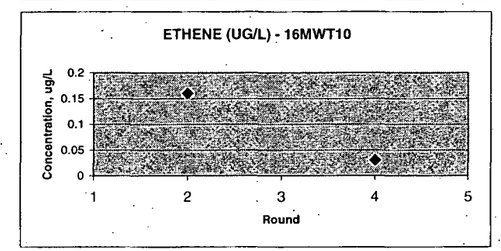


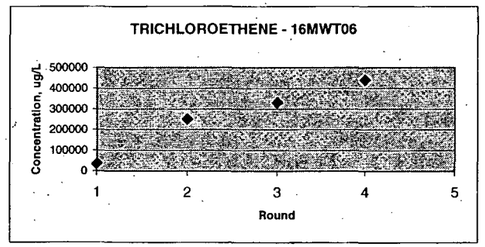


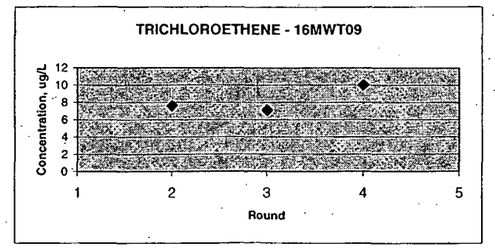


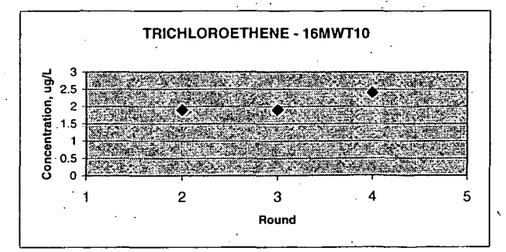


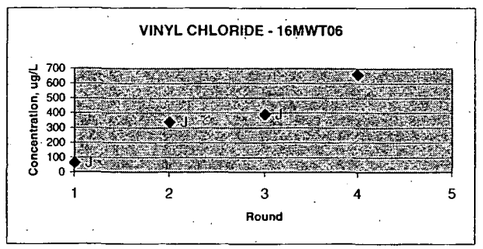


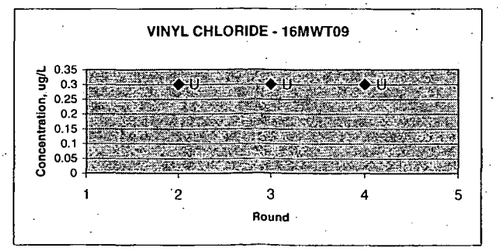












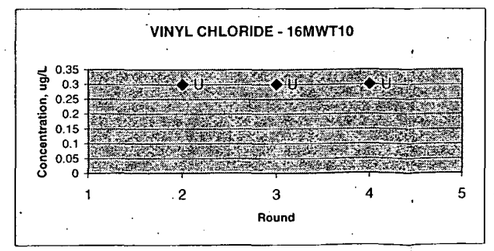
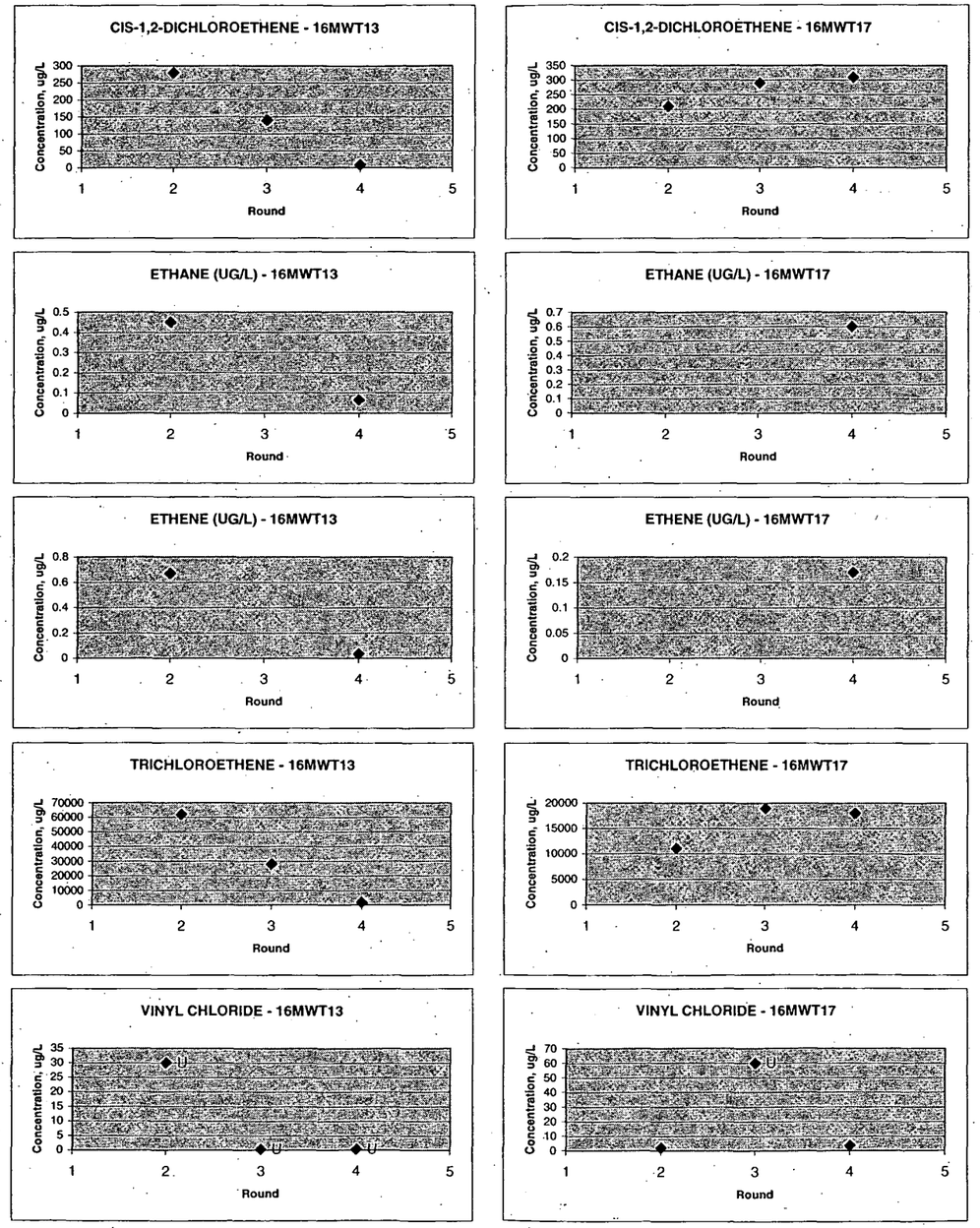


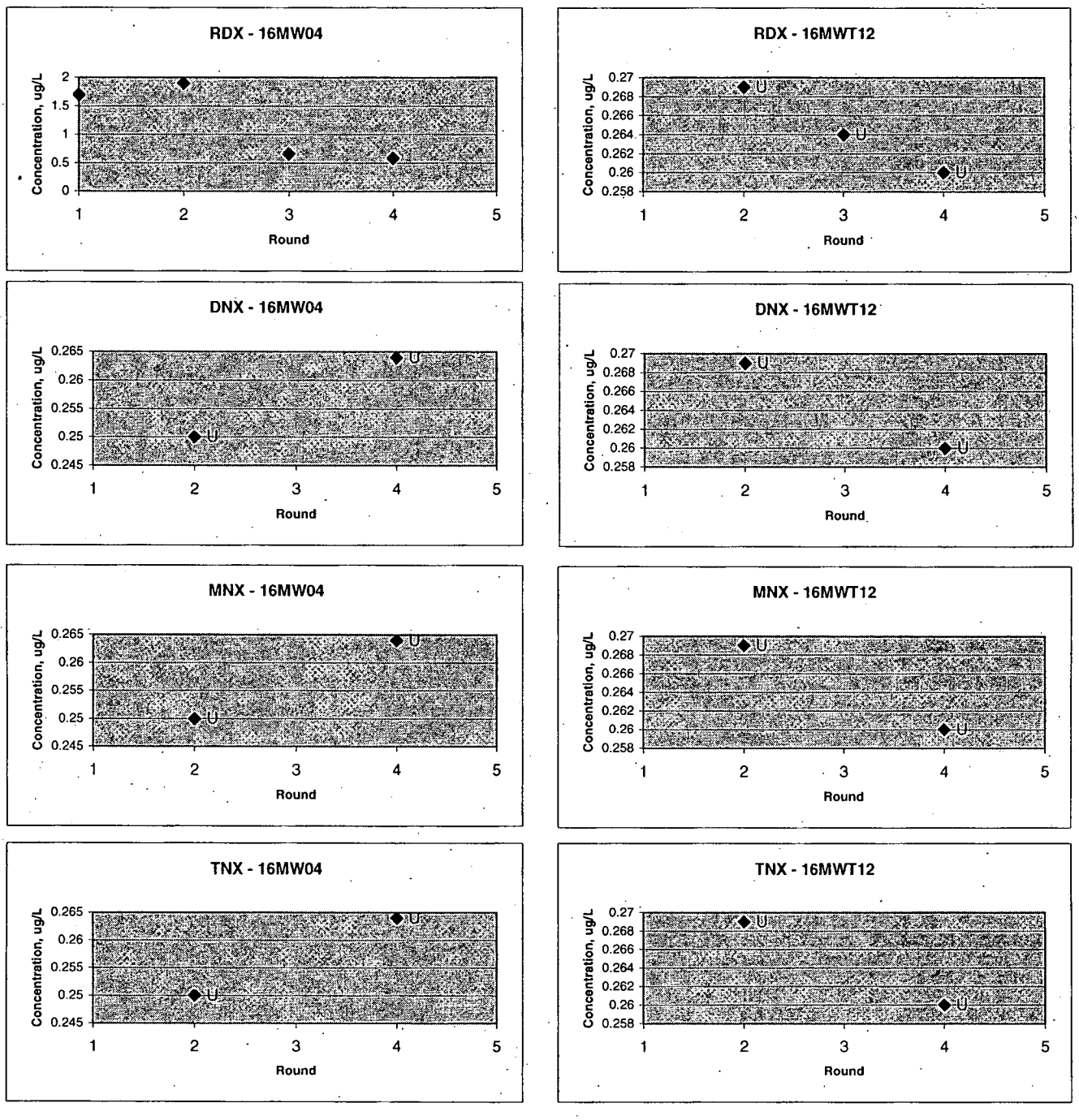
TABLE 4-5
TEMPORAL PLOTS FOR TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN PENNSYVANIAN WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA



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.

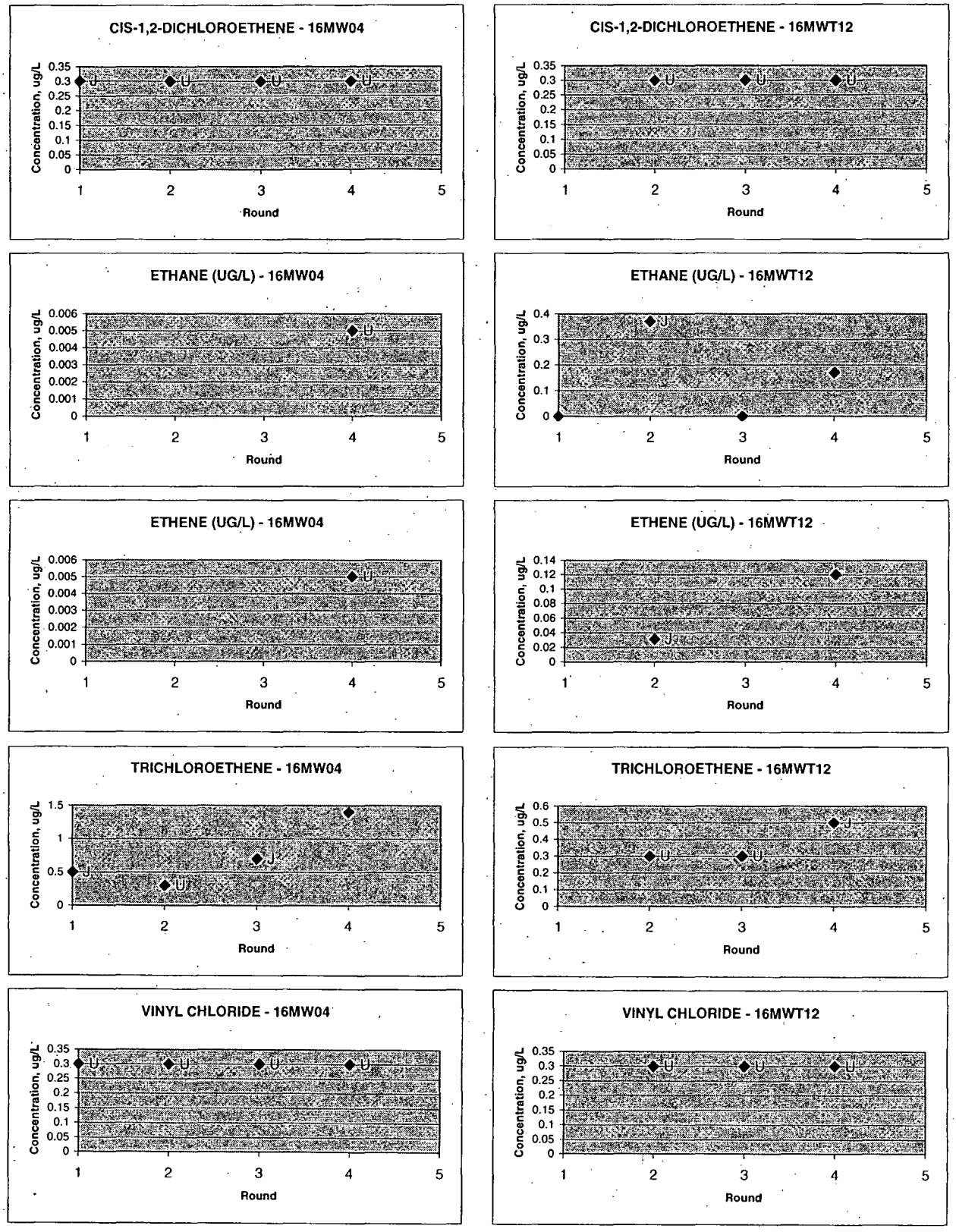
J – Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

FIGURE 4-6
TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS IN THE PENNSYLVANIAN MIDDLE WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA



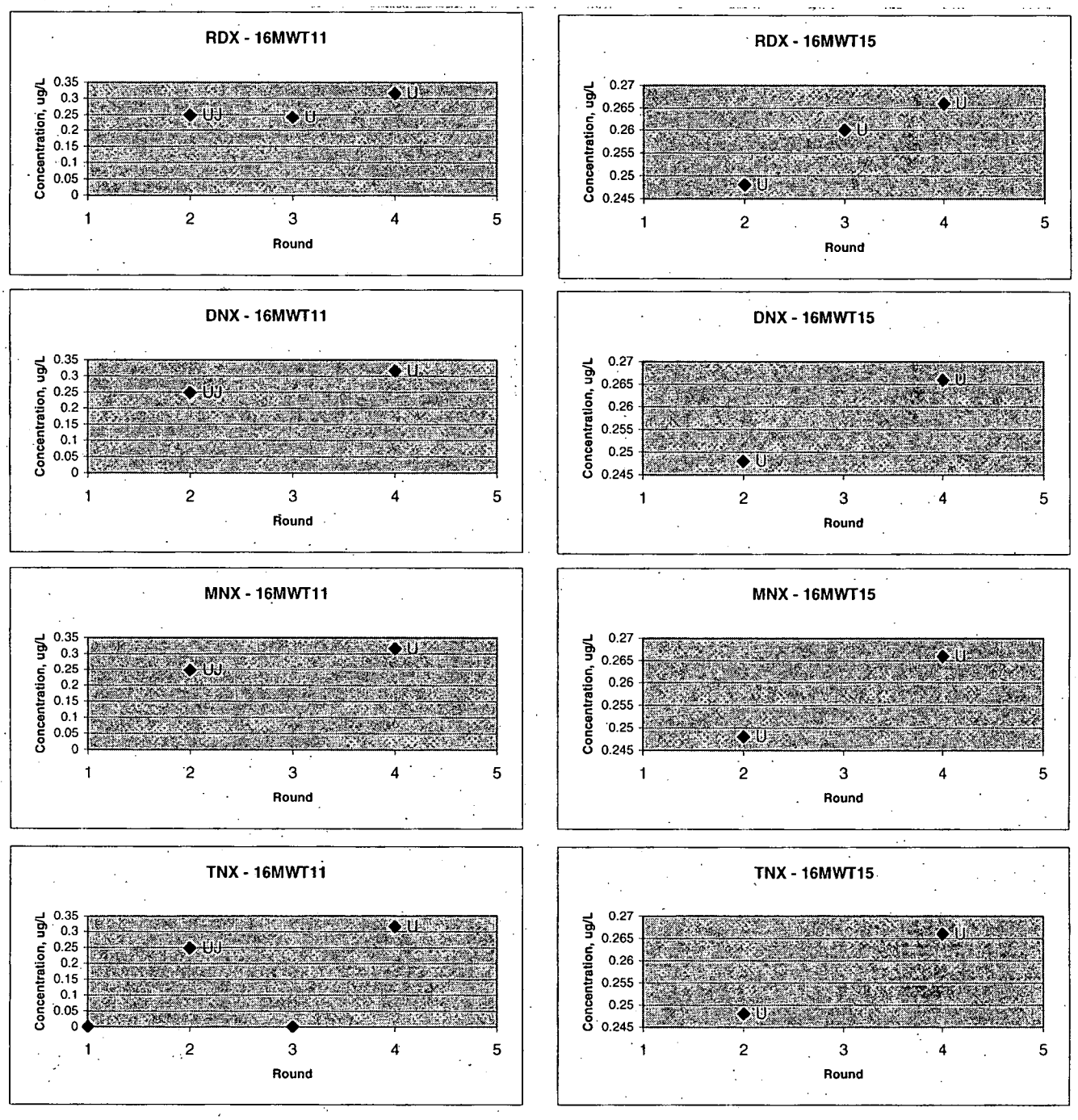
U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.
J – Indicates that the chemical was detected; however, the associated numerical result is considered to be an estimate of the true concentration.

FIGURE 4-7
TEMPORAL PLOTS FOR TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN MIDDLE WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.
J – Indicates that the chemical was detected; however, the associated numerical result is considered to be an estimate of the true concentration.

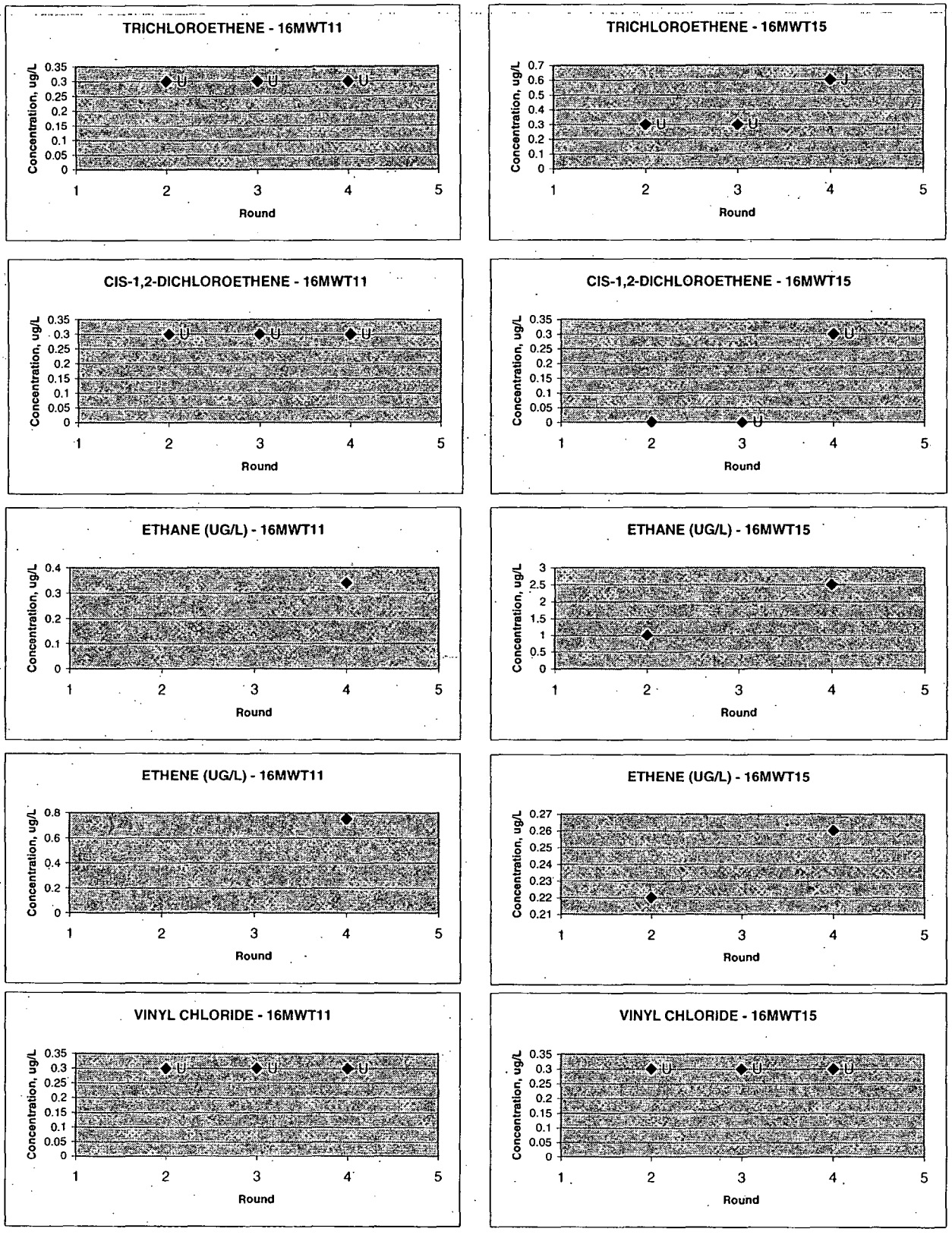
FIGURE 4-8
TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN LOWER WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.

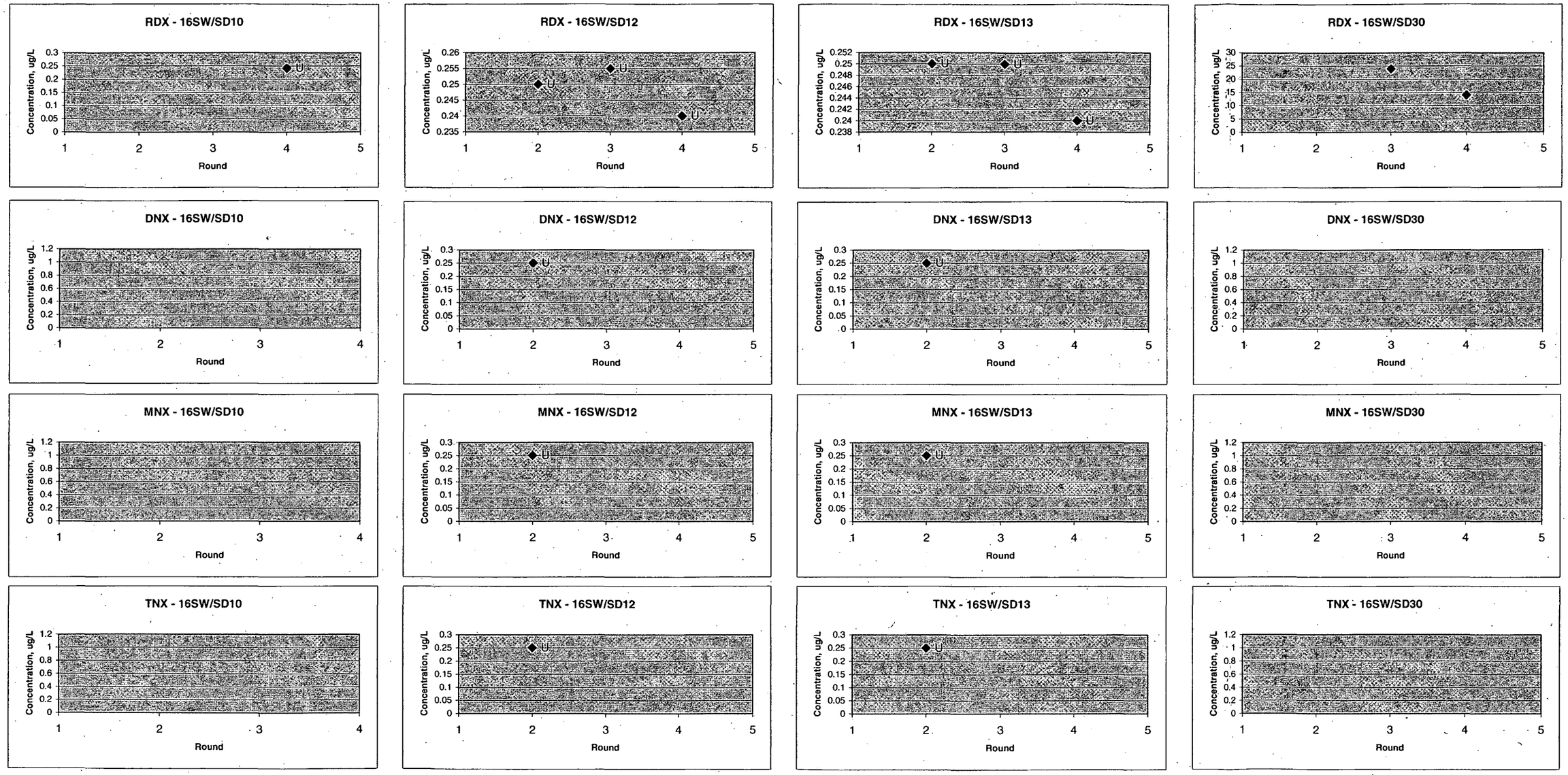
UJ – Indicates that the chemical was not detected; however, the detection limit (sample-specific detection limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate or imprecise.

FIGURE 4-9
TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN LOWER WATER BEARING ZONE AT SWMU 16
NSWC CRANE
CRANE, INDIANA



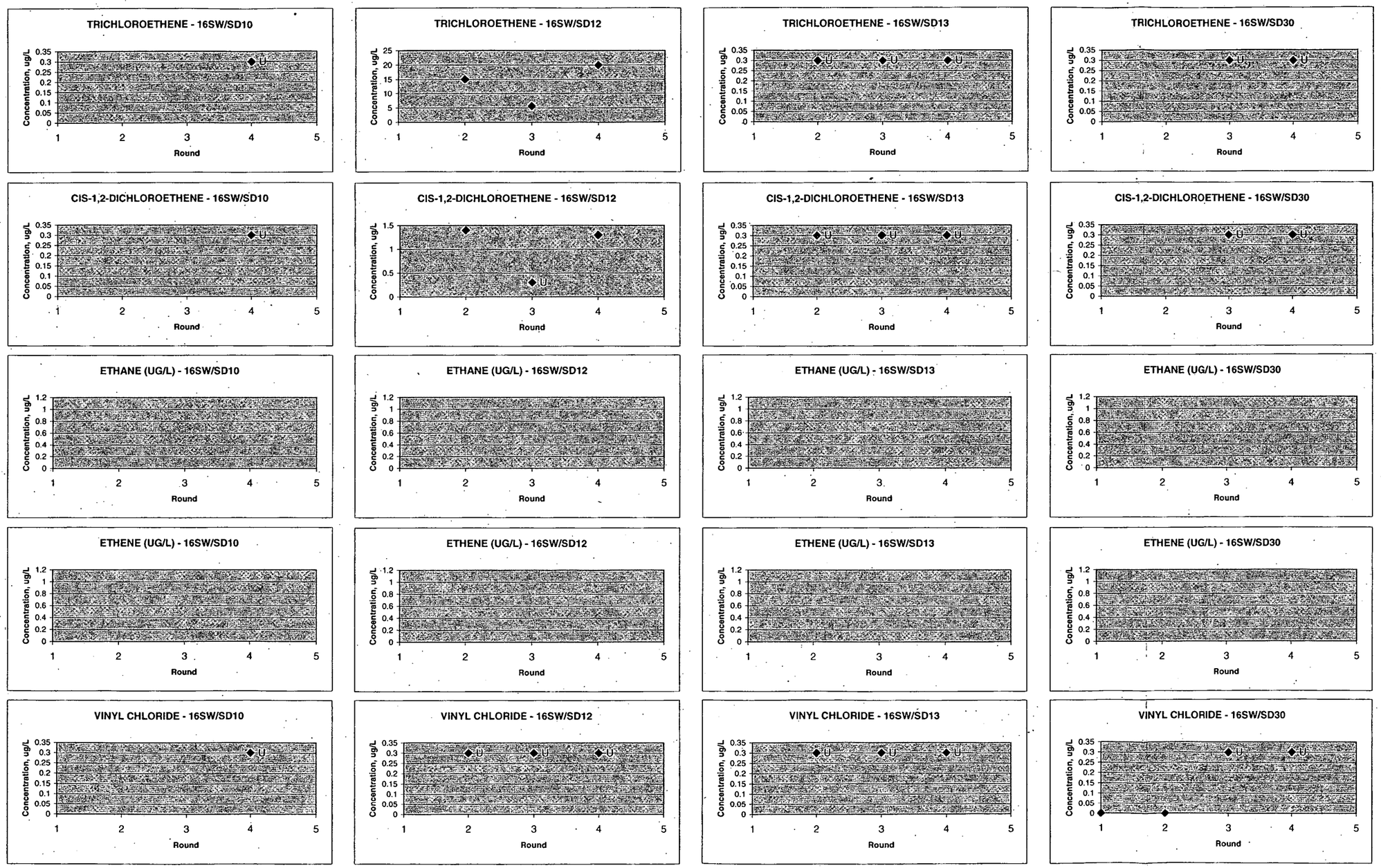
U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.
J – Indicates that the chemical was detected; however, the associated numerical result is considered to be an estimate of the true concentration.

FIGURE 4-10
TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 16
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.

FIGURE 4-11
TEMPORAL PLOTS OF TRICHLOROETHENE AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 16
NSWC CRANE
CRANE, INDIANA



U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.

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

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 4

A.1.1 SWMU 16 GROUND WATER SAMPLE LOG SHEETS ROUND 4

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GW~~T~~ 0204
Sample Location: ~~16MWT~~ WES 14-02-83
Sampled By: [illegible]
C.O.C. No.: 3680 ~~3~~ 81 36
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 2-4-05								
Time: 1615								
Method: Bladder	clear	6.54	.479	13.04	1.1	4.68	28.2	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 2-4-05								
Method: Bladder								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 28.74								
Static Water Level (WL): 15.88								
One Casing Volume(gal/L) 7.8								
Start Purge (hrs): 1435								
End Purge (hrs): 1610								
Total Purge Time (min): 95								
Total Vol. Purged (gal/L) 9.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT_____-F

Pump intake @ 19'

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [illegible]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: ~~N1245~~ 7448

WELL ID.: 16GW02
DATE: 2-4-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (~~mL/Min.~~ L)	Flowrate (mL/Min.)	pH (S.U.) 1.0	Cond. (mS/cm) 3	Turb. (NTU)	DO (mg/L) 10	Temp. (Celsius) 3	ORP (mV) 10	Comments (Volume & Color)
1435	15.88	–	–	–	–	–	–	–	–	Start purge
1445	15.91	1.0	100	6.70	.597	28	6.09	13.65	8.5	clear
1455	15.92	2.0	100	6.74	.579	8.2	5.19	13.76	23.8	"
1505	15.93	3.0	100	6.74	.567	7.4	5.55	13.84	23.2	"
1515	15.93	4.0	100	6.71	.537	6.7	5.61	13.96	26.7	"
1525	15.94	5.0	100	6.67	.528	2.8	5.68	14.00	29.3	"
1535	15.96	6.0	100	6.65	.511	2.2	5.31	13.87	31.1	"
1545	15.97	7.0	100	6.62	.497	1.9	5.17	13.52	32.6	"
1555	15.97	8.0	100	6.60	.490	1.4	4.90	13.14	34.4	"
1605	15.97	9.0	100	6.60	.481	1.2	4.63	13.07	29.9	"
1610	15.97	9.5	50	6.59	.479	1.1	4.68	13.04	28.2	Stop purge

Water Quality Meter (SN) 99K1014 AG
Control Box type (SN) 1087
Turbidity Meter (SN) 4536 3303

Pump Intake 19'

7.8 L : Well Volume

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GW(92)0304
Sample Location: 16MWT03
Sampled By: T. ROJAHN
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 2-5-05								
Time: 1157								
Method: SAME	CLEAR	*5.00	0.333	14.69	7.9	13.83	266	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 2-5-05								
Method: Bladder Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 38.31								
Static Water Level (WL): 20.50								
One Casing Volume(gal/L): 11								
Start Purge (hrs): 0932								
End Purge (hrs): 1152								
Total Purge Time (min): 140								
Total Vol. Purged (gal/L): 11.8								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT NA -F

17.81 x 0.163 = 2.9 gal or 11.0 L

Pump intake @ 28'

*PAPER strip ; YSI pH probe malfunctioned

Circle if Applicable:

MS/MSD — Duplicate ID No.: —

Signature(s): Terry Rojahn

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MW03 / WES-14-03-03
DATE: 2-5-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
0932	20.50	—	—	—	—	—	—	—	—	START PURGE
0942	21.60	900	90	5.00	0.301	38	2.76	12.00	231	CLEAR
0952	22.43	1800	90	5.00	0.312	31	3.77	12.26	243	"
1002	23.02	2700	90	5.00	0.312	23	4.66	12.34	249	"
1012	23.29	3600	90	5.00	0.312	20	5.92	12.49	254	"
1022	23.59	4500	90	5.00	0.313	18	6.31	12.60	258	"
1032	23.61	5400	90	5.00	0.315	14	6.85	12.75	258	"
1042	23.60	6200	80	5.00	0.316	10	7.30	12.85	260	"
1052	23.56	7000	80	5.00	0.319	10	9.45	13.15	260	"
1102	23.52	7800	80	5.00	0.321	12	9.65	13.45	258	"
1112	23.59	8600	80	5.00	0.323	10	11.45	14.33	261	"
1122	23.63	9400	80	5.00	0.324	6.8	11.59	14.47	262	"
1132	23.65	10200	80	5.00	0.323	6.6	11.49	14.45	264	"
1142	23.73	11000	80	5.00	0.321	8.1	13.50	14.58	267	"
1147	23.66	11400	80	5.00	0.322	7.3	13.77	14.67	268	"
1152	23.63	11800	80	5.00	0.323	7.9	13.83	14.69	266	"
1157	—	—	—	—	—	—	—	—	—	START SAMPLING

Water Quality Meter (SN): 02A0527 AF
Control Box type (SN): MP10 1087
Turbidity Meter (SN): 0355 4197

Pump Intake: 28'

SIGNATURE(S): Ty Hoyt

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GW~~T~~ 0404
Sample Location: 16MW~~T~~ 04
Sampled By: T. ROJAHN
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2-06-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1030								
Method: BLADDER PUMP	CLEAR	4.5	0.672	12.87	0.05	5.79	319	—

PURGE DATA:

Date: 2-06-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: SAME								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2"Ø PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 49.16								
Static Water Level (WL): 28.80								
One Casing Volume(gal/L): 12.5								
Start Purge (hrs): 08:55								
End Purge (hrs): 1025								
Total Purge Time (min): 90								
Total Vol. Purged (gal/L): 13.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	3 ~~(2)~~ L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	3 ~~(2)~~ L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	3 ~~(1)~~ L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	9 ~~(3)~~ 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	3 ~~(1)~~ L HDPE	Yes/No
Methane, Ethane, Ethene	4°C ~~/HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT NA -F 20.28 x 0.163 = 3.3 gal or 12.5

Pump intake @ 38'

Circle if Applicable:

MS/MSD YES

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MW04 / WES-
DATE: 02/06/05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
0855	28.88	—	—	—	—	—	—	—	—	START PURGE
0905	28.89	1500	150	4.5	0.655	5.5	2.23	12.65	+314	CLEAR
0915	28.90	3000	150	4.5	0.657	4.0	2.89	12.60	317	"
0925	28.90	4500	150	4.5	0.659	3.5	3.52	12.65	319	"
0935	28.90	6000	150	4.5	0.661	2.3	4.18	12.66	320	"
0945	28.90	7500	150	4.5	0.666	1.7	5.20	12.69	321	"
0955	28.90	9000	150	4.5	0.669	1.3	5.42	12.72	321	"
1005	28.90	10500	150	4.5	0.670	0.65	5.60	12.77	321	"
1015	28.90	12000	150	4.5	0.671	0.45	5.62	12.80	321	"
1025	28.90	13500	150	4.5	0.672	0.05	5.79	12.87	319	"
1030	—	—	—	—	—	—	—	—	—	START SAMPLING

Water Quality Meter (SN): 02A0527 AF
Control Box type (SN): 1087
Turbidity Meter (SN): 0355-4/97

Pump Intake: 38'

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT0404
Sample Location: 16MWT04
Sampled By: TIRUMAN
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 2-5-05								
Time: 1540								
Method: SAME	CLEAR	*5.50	0.180	15.09	2.3	7.25	+23.1	—

PURGE DATA:

Date: 2-05-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2"ϕ PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 27.59								
Static Water Level (WL): 14.29								
One Casing Volume(gal/L): 8.2								
Start Purge (hrs): 1415								
End Purge (hrs): 1535								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 8.3								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT NA -F

13.3 x 0.163 = 2.2 gal or 8.2

Pump intake @ 22' DEDICATED PUMP

* PAPER STRIP YSI pH probe malfunctioned

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):
—	FD020505 01	[signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MWT04
DATE: 2-5-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color. etc)
1415	14.29	0	—	—	—	—	—	—	—	START PURGE
1425	14.75	1000	100	5.50	0.175	4.6	5.17	15.15	189	CLEAR
1435	14.90	2000	100	5.50	0.176	3.4	5.37	15.05	197	"
1445	14.93	3000	100	5.50	0.178	2.3	5.54	14.99	206	"
1455	14.93	4000	100	5.50	0.179	3.0	6.40	15.03	210	"
1505	14.95	5000	100	5.50	0.180	3.2	6.75	15.07	213	"
1515	14.96	6100	110	5.50	0.181	2.8	7.26	15.14	222	"
1525	14.96	7200	110	5.50	0.180	2.5	7.13	15.15	227	"
1535	14.95	8300	110	5.50	0.180	2.3	7.25	15.09	231	"
1540	—	—	—	—	—	—	—	—	—	START SAMPLING

Water Quality Meter (SN) 02A0527-AF
Control Box type (SN) 1087
Turbidity Meter (SN) 0355 4197

Pump Intake 22'

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT0605
Sample Location: 16MWT06
Sampled By: CD
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2/5/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1325	(Visual)	(S. U.)	(mS/cm)	(°C)	(NTU)	(mg/L)	(mV)	NA
Method: bladder pump	clear	5.96	.889	15.57	17.9	2.64	14.5	–

PURGE DATA:

Date: 2/5/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: bladder pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 28.30'								
Static Water Level (WL): 17.87'								
One Casing Volume(gal/L): 6.29								
Start Purge (hrs): 0920								
End Purge (hrs): 1320								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 13.70								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ $Na_2S_2O_3$	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[✓] ~~16GWT~~ ~~F~~

Pump intake @ 24.67' BTOC
dedicated bladder pump

28.30
- 17.87
10.43 (.163) = 1.70 gal
= 6.29 L

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MWT06
DATE: 2/5/05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color. etc)
0920	17.87	—	—	—	—	—	—	—	—	start purge
0930	19.16	1.800	200	6.13	.817	11.1	3.31	12.68	93.2	clear
0940	19.35	2.800	100	6.12	.788	9.48	3.47	11.61	79.7	clear
0950	19.59	3.800	100	6.10	.778	16.8	3.34	11.62	72.5	clear
1000	19.78	4.500	70	6.09	.770	16.0	3.36	11.27	70.4	clear
1010	19.93	5.200	70	6.07	.774	17.6	3.31	11.66	68.6	clear
1020	20.09	5.800	60	6.05	.778	18.1	3.28	11.89	68.4	clear
1030	20.23	6.400	60	6.04	.783	18.4	3.32	11.92	64.6	clear
1040	20.34	6.900	50	6.04	.787	18.1	3.29	12.05	61.7	clear
1050	20.45	7.500	60	6.03	.792	18.4	3.17	12.32	59.1	clear
1100	20.61	8.000	50	6.03	.802	16.6	3.01	12.66	57.3	clear
1110	20.72	8.400	40	6.02	.813	17.6	2.94	13.02	54.0	clear
1120	20.88	8.700	30	6.01	.825	19.1	2.84	13.55	53.5	clear
1130	21.00	9.100	40	6.01	.828	20.6	2.85	13.42	49.9	clear
1140	21.09	9.500	40	6.01	.829	19.7	2.71	13.80	43.8	clear
1150	21.21	9.900	40	6.02	.838	19.5	2.74	13.76	38.1	clear
1200	21.27	10.100	20	6.02	.850	19.4	2.78	14.49	33.4	clear
1210	21.38	10.600	50	6.02	.877	20.3	2.75	13.74	29.9	clear
1220	21.50	11.100	50	6.02	.846	17.9	2.71	14.19	18.4	clear
1230	21.61	11.600	50	6.02	.856	18.6	2.73	14.56	11.3	clear
1240	21.72	12.100	50	6.02	.849	19.6	2.74	14.12	4.0	clear
1250	21.81	12.500	40	6.00	.858	19.4	2.68	14.59	2.8	clear
1300	21.90	12.900	40	6.00	.872	19.8	2.68	15.09	0.8	clear
1310	21.98	13.300	40	5.97	.893	21.4	2.70	16.10	22.0	clear
1320	22.07	13.700	40	5.96	.889	17.9	2.64	15.57	14.5	clear, end purge
1325	—	—	—	—	—	—	—	—	—	start sample

Water Quality Meter (SN): 01D0956 AA
Control Box type (SN): MP10 - 1231
Turbidity Meter (SN): 4175 - 1503

Pump Intake: 24.67' bTOC
dedicated bladder pump

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 09 03
Sample Location: 16MWT09
Sampled By: CO
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2/6/05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1020								
Method: bladder pump	clear	4.82	.456	12.18	0.00	1.41	169.4	—

PURGE DATA:

Date: 2/6/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: bladder pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 27.70'								
Static Water Level (WL): 15.31'								
One Casing Volume(gal/L): ~~15.31~~ ← 7.47								
Start Purge (hrs): 0845								
End Purge (hrs): 1015								
Total Purge Time (min): 90								
Total Vol. Purged (gal/L): 9.22								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[✓] ~~16GWT_____F~~

Pump intake @ 21.85' BTOC
dedicated bladder pump

27.70
−15.31
12.39 (.163) = 2.02 gal
= 7.47 L

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16 MWT 09
DATE: 2/6/05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
0845	15.31	—	—	—	—	—	—	—	—	Start purge
0855	15.85	1.320	120	5.19	.886	5.53	1.54	12.39	90.5	clear
0905	15.87	2.420	110	5.10	.666	2.14	1.53	12.22	112.7	clear
0915	15.91	3.520	110	4.93	.529	0.81	1.89	12.13	153.9	clear
0925	15.96	4.620	110	4.85	.493	0.43	1.79	12.18	164.8	clear
0935	15.96	5.620	100	4.81	.470	0.24	1.63	12.22	170.8	clear
0945	15.99	6.620	100	4.79	.459	0.13	1.58	12.21	175.3	clear
0955	15.94	7.420	80	4.79	.450	0.11	1.52	11.84	169.7	clear
1005	15.94	8.320	90	4.82	.457	0.05	1.45	11.99	163.7	clear
1015	15.96	9.220	90	4.82	.456	0.00	1.41	12.18	169.4	clear, end purge
1020	—	—	—	—	—	—	—	—	—	start sample

Water Quality Meter (SN): OID 0956 AA
Control Box type (SN): MP10 - 1231
Turbidity Meter (SN): 47S - 1503

Pump Intake: 21.85' bTOC
dedicated bladder pump

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 1003
Sample Location: 16MWT 10
Sampled By: Goerdt
C.O.C. No.: 368153685
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2-6-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1345								
Method: Bladder	Clear	3.31	1.168	14.10	4.3	7.14	315.2	—

PURGE DATA:

Date: 2-6-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 27.15								
Static Water Level (WL): 22.46								
One Casing Volume(gal/L) 2.8								
Start Purge (hrs): 1220								
End Purge (hrs): 1340								
Total Purge Time (min): ~~140~~	80							
Total Vol. Purged (gal/L) 8.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT_____-F

Pump intake @ 25'

27.15
22.46
4.69 (.163) = 0.76 Gal
= 2.8 L

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MWT10
DATE: 2-6-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
1220	22.46	–	–	–	–	–	–	–	–	Start purge
1230	22.55	1.0	100	3.04	1.496	55	8.14	13.82	375.2	Clear
1240	22.57	2.0	100	3.10	1.458	51	7.18	13.85	358.3	"
1250	22.59	3.0	|	3.14	1.387	42	7.26	13.87	351.7	"
1300	22.61	4.0	|	3.19	1.314	35	7.31	13.89	345.2	"
1310	22.61	5.0	|	3.22	1.241	20	7.38	13.89	334.0	"
1320	22.63	6.0	|	3.26	1.193	9.2	7.24	14.03	323.9	"
1330	22.62	7.0	|	3.29	1.170	5.8	7.21	14.10	319.8	"
1340	22.62	8.0	|	3.31	1.168	4.3	7.14	14.10	315.2	Stop purge

Water Quality Meter (SN) 99X1014 AG
Control Box type (SN) MP10 1588
Turbidity Meter (SN) 4436 3303

Pump Intake 25'

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 1103
Sample Location: 16MWT 11
Sampled By: Goerdt
C.O.C. No.: 3680 ~~3690~~ (74)
Type of Sample: 3698 & 3699
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

4/5/04

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: See Below								
Time:								
Method: Bladder	clear	6.98	.756	11.82	2.8	9.72	-43.9	—

PURGE DATA:

Date: 2-4-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 98.65								
Static Water Level (WL): 96.31								
One Casing Volume (gal/L): 1.4								
Start Purge (hrs): 1058								
End Purge (hrs): 1144								
Total Purge Time (min): 46								
Total Vol. Purged (gal/L): 1.6								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	2/5/05 0850 (1) (2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	900mls (2) L Glass Amber 1 Bottle	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE SEE 2/20/05 Log Sheet	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT NA -F

Pump intake @ 97'

WL:
2-5-05 96.38

98.65
96.31
2.34 (.163) = .38 gal
= 1.4 L

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16GWT11
DATE: 2-4-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
1058	96.31	—	—	—	—	—	—	—	—	Start purge
1108	96.55	0.4	40	7.04	.673	—	16.54	9.99	60.6	clear
1118	96.86	0.8	40	6.87	.699	3.9	11.80	10.12	59.4	"
1128	97.20	1.2	40	6.90	.724	2.8	9.70	10.61	14.2	"
1138	97.25	1.6	40	6.98	.756	—	~~11.82~~ 9.72	11.82	-43.9	"
~~1145~~										
1144	W.L. near pump level - Dry well. Stop purge.									

Water Quality Meter (SN): 99K1014 AG
Control Box type (SN): 1087
Turbidity Meter (SN): 4536 3303

Pump Intake: 97'

SIGNATURE(S): [illegible]

PAGE 2 OF 2

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 1103
Sample Location: 16MWT 11
Sampled By: T. Kwan
C.O.C. No.: 3698 & 3699
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2/20/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1530	(Visual)	(S. U.)	(mS/cm)	(°C)	(NTU)	(mg/L)	(mV)	NA
Method: DED. BLADDER PUMP								—

PURGE DATA:

Date: NA	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type:	See Low Flow Purge Data Sheets							
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	1 { ~~(2)~~ L Glass Amber ALREADY Collected	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	~~(2)~~ L Glass Amber 2/5/05 @1435	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	2/20/05 @1530 (1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT NA -F

Pump intake @ 97'

NO PURGE AS PER INSTRUCTIONS
W/ WELLS THAT DRY OUT RAPIDLY

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Ty Nopal

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 1203
Sample Location: 16MWT 12
Sampled By: Gordy
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2-6-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1050								
Method: Bladder	Clear	4.89	1.898	12.28	1.7	4.22	134.6	—

PURGE DATA:

Date: 2-6-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 28.57								
Static Water Level (WL): 21.11								
One Casing Volume(gal/L) 4.5								
Start Purge (hrs): 0845								
End Purge (hrs): 1045								
Total Purge Time (min): 120								
Total Vol. Purged (gal/L) 6.95								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT_____-F

Pump intake @ 25'

28.57
21.11
7.46 (.163) = 1.22 gal
= 4.5 L

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 93 6 12MWT12
DATE: 2-6-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
0845	21.11	—	—	—	—	—	—	—	—	Start purge
0855	21.34	.45	45	5.11	2.185	5.1	5.44	10.86	86.6	clear
0905	21.31	.90	45	5.09	2.117	4.3	4.96	9.88	93.0	"
0915	21.28	1.35	45	5.06	2.094	3.3	4.85	9.87	98.0	"
0925	21.39	2.15	80	5.04	2.178	2.7	4.11	11.41	100.2	"
0935	21.52	3.05	90	5.02	2.191	—	3.80	12.10	103.7	"
0945	21.61	3.95	90	4.99	2.167	—	3.72	12.20	109.8	"
0955	21.59	4.45	50	4.97	2.136	2.4	3.82	11.74	112.9	"
1005	21.65	4.95	50	4.95	2.074	—	3.96	11.85	118.5	"
1015	21.63	5.45	50	4.94	2.041	—	4.06	11.97	124.6	"
1025	21.61	5.95	50	4.91	1.952	2.1	4.10	12.14	129.2	"
1035	21.62	6.45	50	4.90	1.907	2.2	4.21	12.18	132.7	"
1045	21.59	6.95	50	4.89	1.898	1.7	4.22	12.28	134.6	Stop purge

Water Quality Meter (SN): 99K1014 AG
Control Box type (SN): MP10 1588
Turbidity Meter (SN): 4536 3303

Pump Intake: 25'

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 1303
Sample Location: 16MWT 13
Sampled By: Goerdt
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 2-5-05								
Time: 0925								
Method: Bladder	Sl. cloudy	5.99	.299	13.12	380	3.22	12.0	—

PURGE DATA:

Date: 2-4-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder								
Monitor Reading (ppm): ~								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 20.32								
Static Water Level (WL): 11.39								
One Casing Volume(gal/L): 5.4								
Start Purge (hrs): 1257								
End Purge (hrs): 1425								
Total Purge Time (min): 88								
Total Vol. Purged (gal/L): 16.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT_____-F

Pump intake @ 17'

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: N~~1245~~ 7448

WELL ID.: 16~~B~~ WT13
DATE: 2-4-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume ~~(mL/Min.)~~ L	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Volume & Color)
1257	11.39	–	–	–	–	–	–	–	–	start purge
1307	12.00	1.5	150	5.96	.268	20	4.29	13.28	–	clear
1317	12.45	3.0	150	5.92	.265	33	3.59	13.32	38.7	"
1327	12.95	4.5	150	5.97	.269	–	3.44	13.33	12.7	"
1337	13.24	6.0	150	6.03	.274	40	3.31	13.37	5.2	"
1347	13.68	8.0	200	6.05	.280	47	3.19	13.24	-1.4	"
1357	14.14	10.0	200	6.02	.280	70	2.74	12.99	3.9	sl. cloudy
1407	15.28	13.0	300	6.04	.290	85	3.21	12.98	2.5	"
1417	*	16.0	300	5.99	.299	380	3.22	13.12	12.0	cloudy
1425		W.L. below pump intake								

Water Quality Meter (SN) 99K1014 AG
Control Box type (SN) 1057
Turbidity Meter (SN) 4536 3303

Pump Intake 17'

SIGNATURE(S): [illegible]

* W.L. below top of pump.

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT 1503
Sample Location: 16MWT 15
Sampled By: Goerdt
C.O.C. No.: 36805681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2-5-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1435								
Method: Bladder	Clear	7.43	.354	13.89	0.6	1.36	-21.7	—

PURGE DATA:

Date: 2-5-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 94.70								
Static Water Level (WL): 54.98								
One Casing Volume(gal/L): 24								
Start Purge.(hrs): 1025								
End Purge (hrs): 1430								
Total Purge Time (min): 245								
Total Vol. Purged (gal/L): 17								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	Yes/No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	Yes/No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes/No
Sulfide and Chloride	4°C	(1) L HDPE	Yes/No
Methane, Ethane, Ethene	4°C ~~HCl~~ Na_3PO_4	(2) 40 ml Vials	Yes/No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 16GWT_____-F

Pump intake @ 88'

94.70
54.98
39.72 (.163) = 6.47 gal
= ~~23~~
= 24 L

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MWT15
DATE: 2-5-05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
1025	54.98	~~50~~ 0.0	~~50~~	–	–	–	–	–	–	Start purge
1035	56.14	0.5	50	7.67	.366	2.4	6.44	12.32	-132.2	Clear
1045	57.38	1.0	50	7.67	.369	1.7	3.76	12.89	-136.5	Clear
1055	57.98	1.5	50	7.62	.365	1.2	3.16	13.07	-130.2	"
1105	58.90	2.0	50	7.55	.360	0.85	2.92	13.38	-114.0	"
1115	59.47	2.5	50	7.49	.358	1.1	2.61	13.49	-96.7	"
1125	60.98	3.0	50	7.44	.357	0.95	2.20	13.70	-82.0	"
1135	61.87	3.5	50	7.41	.357	–	2.17	13.71	-71.6	"
1145	62.52	4.0	50	7.38	.355	–	2.11	13.69	-59.1	"
1230	64.45	6.5	50	7.34	.358	–	2.09	13.78	-47.2	out of air exchanger replacement
1240	65.01	7.0	50	7.31	.361	–	2.06	14.21	12.7	Clear
1250	65.62	7.5	50	7.29	.363	–	2.04	14.82	31.7	"
1300	66.13	8.0	50	7.27	.368	0.85	2.03	15.01	55.3	"
1310	–	9.0	100	7.29	.364	0.98	1.73	14.65	56.5	"
1320	–	10.0	100	7.29	.364	–	1.69	14.58	54.7	
1330	–	11.0	100	7.30	.361	–	1.58	14.52	53.6	
1340	71.32	12.0	100	7.29	.362	–	1.57	14.47	51.5	
1350	–	13.0	100	7.29	.361	–	1.55	14.44	51.2	
1400	72.67	14.0	100	7.35	.355	–	1.51	13.96	31.6	
1410	73.42	15.0	100	7.36	.355	–	1.47	13.87	28.1	
1420	74.21	16.0	100	7.39	.355	–	1.42	13.88	10.6	
1430	74.94	17.0	100	7.43	.354	~~0.8~~ 0.6	1.36	13.89	-21.7	Stop purge

Water Quality Meter (SN): 99K1014 AG
Control Box type (SN): MP10 1588
Turbidity Meter (SN): 4536 3303

Pump Intake: 88'

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16GWT1703
Sample Location: 16MWT17
Sampled By: CD
C.O.C. No.: 3680 & 3681
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 2/5/05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1645								
Method: bladder pump	clear	5.17	.595	13.97	3.27	0.89	100.9	—

PURGE DATA:

Date: 2/5/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: bladder pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 26.02'								
Static Water Level (WL): 15.74'								
One Casing Volume(gal/L): 6.20								
Start Purge (hrs): 1510								
End Purge (hrs): 1640								
Total Purge Time (min): 90								
Total Vol. Purged (gal/L): 12.40								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	(Yes) No
Explosives SW-846 8330, Modified RDX Degradation Products	4°C	(2) L Glass Amber	(Yes) No
Nitrate + Nitrite (as N) EPA 353.2	4°C/H_2SO_4	(1) L HDPE	(Yes) No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	(Yes) No
Sulfide and Chloride	4°C	(1) L HDPE	(Yes) No
Methane, Ethane, Ethene	4°C/~~HCl~~ Na_3PO_4	(2) 40 ml Vials	(Yes) No

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[✓] ~~16GWT~~ ~~F~~

Pump intake @ 20.74' bTOC
dedicated bladder pump

26.02
-15.74
10.28 (.163) = 1.68 gal
= 6.20 L

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: 7448

WELL ID.: 16MWT17
DATE: 2/5/05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (L)	Flowrate (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments (Color, etc)
1510	15.74	—	—	—	—	—	—	—	—	start purge
1520	16.15	1.900	170	4.97	.709	23.4	1.07	14.67	103.4	slightly cloudy
1530	16.13	3.200	130	5.07	.695	22.0	0.98	14.62	78.2	slightly cloudy
1540	16.13	4.500	130	5.13	.685	12.4	0.94	14.26	46.7	clear
1550	16.14	5.800	130	5.13	.665	8.07	0.91	14.11	32.3	clear
1600	16.15	7.200	140	5.18	.644	6.55	0.90	14.05	15.9	clear
1610	16.17	8.500	130	5.19	.631	5.32	0.89	14.02	-2.4	clear
1620	16.17	9.800	130	5.18	.618	4.78	0.90	13.98	73.3	clear
1630	16.17	11.100	130	5.17	.605	4.22	0.89	13.96	91.6	clear
1640	16.18	12.400	130	5.17	.595	3.27	0.89	13.97	100.9	clear, end purge
1645	—	—	—	—	—	—	—	—	—	start sample

Water Quality Meter (SN) 01D0956 AA
Control Box type (SN) MP10-1231
Turbidity Meter (SN) 4175-1503

Pump Intake 20.74' bTOC
dedicated bladder pump

SIGNATURE(S): Chris Dooley

A.1.2 SWMU 16 SURFACE WATER SAMPLE LOG SHEETS ROUND 4

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

Sample ID No.: 16SW 10 0012 (TR)
Sample Location: 16SW/SD 10
Sampled By: T. ROSAHN
C.O.C. No.: 3679

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

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

SAMPLING DATA

Date: 2/03/05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1445								
Depth: SURFACE	Clear	3.65	0.126	5.44	6.9	8.95	218	–
Method: DIRECT								

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Volatiles SW-846 8260B	4°C/HCl	(3) 40ml Vials	Yes/No
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No

OBSERVATIONS/NOTES:

Filtered Sample Collected Yes[ ] No[X] 16GWT NA -F

Flow (TR) 1gpm
Suspect pH malfunction

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

Sample ID No.: 16SW 12 0~~3~~ (TU)
Sample Location: 16SW/SD 12
Sampled By: T. ROJAHN
C.O.C. No.: 3679

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

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

SAMPLING DATA

Date: 2/3/05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1425								
Depth: SURFACE	Clear	*3.75	0.164	5.95	3.0	10.07	218	—
Method: DIRECT								

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Volatiles SW-846 8260B	4°C/HCl	(3) 40ml Vials	Yes/No
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No

OBSERVATIONS / NOTES

Filtered Sample Collected Yes[ ] No[X] 16GWT NA -F

Flow ~1gpm
* suspect pH malfunction

MAP

Circle if Applicable:

MS/MSD — Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

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

Sample ID No.: 16SW 1303
Sample Location: 16SW/SD 13
Sampled By: T. ROJAHN
C.O.C. No.: 3679

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

SAMPLING DATA

Date: 2/3/05 Time: 1410	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Depth: SURFACE Method: DIRECT	CLEAR	*3.83	0.175	5.25	2.2	10.93	203	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Volatiles SW-846 8260B	4°C/HCl	(3) 40ml Vials	Yes/No
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No

OBSERVATIONS/NOTES

Filtered Sample Collected Yes[ ] No[X] 16GWT NA -F

Flow 1-5 gpm

* suspect pH Malfunction

MAP

Circle if Applicable:

MS/MSD | Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU16
Project No.: N7448 CTO 0343

Sample ID No.: 16SW 3002
Sample Location: 16SW/SD 30
Sampled By: T. Kosahn
C.O.C. No.: 3679

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

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

SAMPLING DATA

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 2-03-05 Time: 1120 Depth: SURFACE Method: DIRECT	CLEAR	*4.16	0.140	3.12	3.1	11.15	188	–

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Volatiles SW-846 8260B	4°C/HCl	(3) 40ml Vials	Yes/No
Explosives SW-846 8330 Nitroaromatics and Nitramines	4°C	(2) L Glass Amber	Yes/No

OBSERVATIONS/NOTES

Filtered Sample Collected Yes[ ] No[X] 16GWT NA -F

FLOW: 1 cc/ft
449 x 1 x .06' x 1.2' = 32

*suspect pH malfuction

MAP

Circle if Applicable:

MS/MSD	Duplicate ID No.:
YES	FD02030501

Signature(s):

A.2 SWMU 16 CHAIN OF CUSTODY RECORDS ROUND 4

A TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3679 PAGE 1 OF

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO N7448 343	NSWC CRANE	RALPH BASIAISKI	(412) 921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Terry Rojahn		TERRY ROJAHN	(412) 921-8857	940 SOUTH HARNEY ST.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB # 8447 8135 7413		SEATTLE, WA 98108

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G
PRESERVATIVE USED: 4°C/HCl 4°C

TYPE OF ANALYSIS: VOLATILES SW-846 8260B; NITROAROMATICS & NITRAMINES (8330)

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOLATILES SW-846 8260B	NITROAROMATICS & NITRAMINES (8330)							COMMENTS
2/03	1120	16SW3002	165W 30	–	–	SW	G	15	9	6							DO MS/MSD
2/03	1000	16TB02030501	QC	–	–	QC	G	2	2	–							TRIP BLANK
2/03	1410	16SW1303	165W 13	–	–	SW	G	5	3	2							
2/03	1425	16SW12043 (FC)	165W 12	–	–	SW	G	5	3	2							
2/03	1445	16SW10032 (FC)	165W 10	–	–	SW	G	5	3	2							
2/03	0000	FD02030501	QC	–	–	SW	G	5	3	2							DUP FROM 165W3002

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Terry Rojahn	2/03/05	1830	1. RECEIVED BY FEDERAL EXPRESS	2/03/05	1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3680 PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO N7448 343	NSWC CRANE	RALPH BASINSKI	(412) 921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		TERRY ROJAHN	(412) 921-8857	940 SOUTH HARNEY ST.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB# 8447 8135 7457		SEATTLE WA 98108

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOLATILES SW-846 8260B	NITROAROMATICS & NITRAMINES (8330)	RDX DEGRADATION PRODUCTS (MOD. 8330)	NITRATE + NITRITE (AS N) EPA 353.2	SULFATE & CHLORIDE	~~PARTIALLY, Carbonate~~ ~~Cations~~	NITROAROMATICS, NITRAMINES & RDX DEGRADATION (TR)		COMMENTS
							CONTAINER TYPE PLASTIC (P) or GLASS (G)		G	G	G	P	P	G	G		
							PRESERVATIVE USED		4°C/HCl	4°C	4°C	4°C/H2SO4	4°C	4°C	4°C		
2/04	1200	TB02040501 16GW	QC	-	-	QC	G	2	2								
2/04	1615	16GW0204	16MW 02	-	-	GW	G	9	3	2	2	1	1				
2/05	0850	16GWT1103	16MW T11	-	-	GW	G	1	-	-	-	-	-	-	1		Low volume
2/05	0925	16GWT1303	16MW T13	-	-	GW	G	9	3	2	2	1	1				
2/05	1157	16GW0304	16MW 03	-	-	GW	G	9	3	2	2	1	1				
2/05	1325	16GWT0605	16MW T06	-	-	GW	G	9	3	2	2	1	1				
2/05	1435	16GWT1503	16MW T15	-	-	GW	G	9	3	2	2	1	1				
2/05	1540	16GWT0404	16MW T04	-	-	GW	G	9	3	2	2	1	1				
2/05	1645	16GWT1703	16MW T17	-	-	GW	G	9	3	2	2	1	1				
2/05	0000	FD02050501	QC	-	-	GW	G	9	3	2	2	1	1				DUP FROM 16GWT0404
2/06	1020	16GWT0903	16MW T09	-	-	GW	G	9	3	2	2	1	1				
2/06	1030	16GW0404	16MW 04	-	-	GW	G	21	9	-	-	3	3	-	6		
2/06	1050	16GWT1203	16MW T12	-	-	GW	G	9	3	2	2	1	1				

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Terry Rojahn	2-07-05	1800	1. RECEIVED BY FEDERAL EXPRESS	2-07-05	1800
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

FORM TtNUS-001 4/02R

A TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3681 PAGE 1 OF

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO N7448 343	NSWC CRANE	RALPH BASINSKI	(412) 921-8308	MICRSEEPS / DEB HALLO
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		TERRY ROJAHN	(412) 921-8857	220 WILLIAM PITT WAY
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX AB # 8447 8135 7468		PITTSBURGH PA 15238

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: 4°C

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: METHANE, ETHANE & ETHENE w/NaSO4							COMMENTS
2/04	1615	16GW0204	16MW 02	–	–	GW	G	2	2							
~~2/05~~	~~0850~~	~~16GWT1103~~	~~16MW T11~~	~~–~~	~~–~~	~~GW~~	~~G~~	~~2~~	~~2~~						TX	NOT COLLECTED
2/05	0925	16GWT1303	16MW T13	–	–	GW	G	2	2							
2/05	1157	16GW0304	16MW 03	–	–	GW	G	2	2							
2/05	1325	16GWT0605	16MW T06	–	–	GW	G	2	2							
2/05	1435	16GWT1503	16MW T15	–	–	GW	G	2	2							
2/05	1540	16GWT0404	16MW T04	–	–	GW	G	2	2							
2/05	1645	16GWT1703	16MW T17	–	–	GW	G	2	2							
2/05	0000	FD02050501	TX ~~16MW~~ QC	–	–	GW	G	2	2							
2/06	1020	16GWT0903	16MW T09	–	–	GW	G	2	2							
2/06	1030	16GW0404	16MW 04	–	–	GW	G	2	2							
2/06	1050	16GWT1203	16MW T12	–	–	GW	G	2	2							
2/06	1345	16GWT1003	16MW T10	–	–	GW	G	2	2							

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	2-07-05	1800	1. RECEIVED BY FEDERAL EXPRESS	2-07-05	1800
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3685 PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO N7448 343	NSWC CRANE	RALPH BASINSKI	(412) 921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		TERRY ROJAHN	(412) 921-8857	940 SOUTH HARNEY ST.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB# 8447 8135 7457		SEATTLE, WA 98108

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOLATILES SW-846 8260B	NITROAROMATICS & NITRAMINES (8330)	RDX DEGRADATION PRODUCTS (MOD 8330)	NITRATE + NITRITE (AS N) EPA 353.2	SULFATE & CHLORIDE				COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)									G	G	G	Q	Q				
PRESERVATIVE USED									4°C/HCl	4°C	4°C	4°C/H2SO4	4°C				
2/06	1345	16GWT1003	16GW T10	-	-	GW	G	9	3	2	2	1	1				

1. RELINQUISHED BY Terry Rojahn	DATE 2-07-05	TIME 1800	1. RECEIVED BY FEDERAL EXPRESS	DATE 2-07-05	TIME 1800
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM TINUS-001

A TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3698 PAGE 1 OF

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
7448 CTO 343	NSWC CRANE	RALPH BASINSKI	(412)921-8308	MICROSEEPS / DEB HALLO
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Terry Rojahn		TERRY ROJAHN	(412)921-8857	220 WILLIAM PITT WAY
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB# 8447 8135 7527		Pittsburgh PA 15238

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G

PRESERVATIVE USED: 4°C / HCl pH<2

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: Methane, Ethane & Ethene								COMMENTS
2/20	1530	16GWT1103	16MW T11	-	-	GW	G	2	2								

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Terry Rojahn	2-21-05	1830	FEDERAL EXPRESS	2-21-05	1830
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 3699 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 7448 343	NSWC CRANE	RALPH BASINSKI	(412) 921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Terry Rojahn		TERRY ROJAHN	(412) 921-8857	940 SOUTH HARNEY ST.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB# 8447 8135 7516		SEATTLE WA 98108

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOLATILES SW 846 8260B	Nitrate + Nitrite (ASN) 353.2	SULFIDE & CHLORIDE						COMMENTS
CONTAINER TYPE PLASTIC (P) or GLASS (G)									G	P	P						
PRESERVATIVE USED									4°C/HCl	4°C/H2SO4	4°C						
2/20	1530	16GWT1103	16MW T11	-	-	GW	G	5	3	1	1						SLOW RECHARGE WELL (MIN. VOL.)

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Terry Rojahn	2/20/05	1830	1. RECEIVED BY FEDERAL EXPRESS	2/20/05	1830
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

FORM TINUS-001 4/02R

A.3 SWMU 16 WATER LEVEL MEASUREMENTS ROUND 4

MONITORING WELLS @ SWMU 16

WELL ID	WL	TIME		
16MW 01	~~15.88~~	~~0848~~	32.33	0947
02	15.91	0840		
03	~~28.88~~	~~0917~~	20.45	0932
04	~~14.29~~	~~0911~~	28.70	0938
05	34.88	0942		
16MW 101	15.88	0848		
02	12.61	0921		
03	28.88	0914		
04	14.29	0911		
05	32.11	0924		
06	17.79	0850		
07	Dry	0854	* Bottom @ 28'	
08	96.60	0859		
09	15.25	0903		
10	22.30	0906		
11	96.41	0908		
12	20.94	0928		
13	11.36	0919		
14	ABANDONED			
15	54.99	0917		
16	34.40	1135		
17	15.78	0844		
18	95.75	0956		
19	3.25	1012		
20	3.66	1014		
21	65.46	0936		

0830 - Attempted to check in @ Bldg 2708. Doors locked. (SWMU 16)

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

STAFF GAUGES @ SIKIMCI 16 (2-04-05)

STAFF GAUGE ID	W.L.	TIME	DEPTH ~~WIDTH~~ (TE) (AVE)	WIDTH ~~DEPTH~~ (AVE)	FLOW (SEC/FT)	FLOW RATE gpm
165601	DRY	1245	—	—	—	0
02	5.29	1314	STAGNATE	→	→	0
03	5.03	1253	STAGNATE	→	→	0
04	2.15	1259	"	→	→	0
05	DRY	1301	DRY	→	→	0
06	3.51	1119	NA	NA	NA	70-75
07	5.99	1130	0.34	3.8'	1 SEC	580
08	4.16	1141	NA	NA	NA	18
09	6.34	1151	0.17	3	3 sec	76
~~10~~ (TE)						
~~11~~ (TE)		END				

A.4 SWMU 16 EQUIPMENT CALIBRATION FORMS ROUND 4

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: YSI

SITE NAME: SWMUs 08 &15 12/13/15

MANUFACTURER: YSI

PROJECT No.: N1245, CTO 0331 6878/7498

SERIAL NUMBER: 01009 56 AA

Date of Calibration	Person Performing Calibration	INITIAL READINGS PH 7	PH 4	COND	DO	ORP	FINAL READINGS PH 7	PH 4	COND	DO	ORP	Calibration Standard (Lot No.)	Remarks and Comments
1/5/05	JG CD	6.99	4.05	455	9.87	252.5 17.61	7.00	4.00	1000	9.50	237.4 17.33	7.0 4110 8/23/05 4.0 4098 8/18/05	
1/6/05	JG CD	7.06	3.92	1069	9.22	219.3 17.61	6.99	4.00	1001	9.10	237.6 17.69	SPC 4387 1/21/05 ORP 03X0667	10/05
1/7/05	CD	7.01	4.21	1009	10.04	238.1 16.55	7.00	4.00	1000	9.61	238.0 16.68	"	
1/8/05	CD	7.10	3.79	946	9.74	250.2 15.07	7.00	4.00	1000	9.97	234.6 15.30	"	
1/9/05	CD	7.01	3.99	1094	9.94	233.8 15.47	7.00	4.00	1000	9.63	238.5 15.55	"	
1/11/05	CD	7.01	4.00	1005	7.64	227.6 17.28	7.00	4.00	1001	9.11	236.8 17.43	"	
1/12/05	TR	7.06	3.90	990	9.15	246 19.25	7.00	4.00	1000	9.07	237.4 19.32	"	
1/22/05	CD	7.04	3.96	1014	8.40	227.3 14.53	7.00	4.00	1000	8.60	238.2 14.62	"	replaced DO membrane
1/23/05	CD	7.00	4.03	998	10.53	242.2 10.63	7.00	4.00	1000	9.62	236.7 10.57	"	
1/25/05	CD	7.00	3.99	1101	10.96	227.9 15.31	7.00	4.00	1000	8.88	238.2 16.62	"	
							SWMU 13/16 R24						
2/1/05	CD	6.98	4.01	910	10.40	240.6 17.93	7.00	4.00	1000	8.79	237.5 17.57	SPC 4599 7/27/05	
2/2/05	JG	7.06	3.97	8.65	1136	233.8 18.05	7.00	4.00	1000	9.42	237.5 18.12	"	
2/3/05	JG	6.86	4.00	1100	9.86 ~~1100~~	241.6 18.23	7.00	4.00	1000	9.45	237.6 18.10	"	
2/5/05	CD	7.10	3.99	1109	4.77	235.6 16.24	7.00	4.00	1000	9.12	237.2 16.30	"	replaced DO membrane
2/6/05	CD	7.03	4.00	1036	9.12	238.6 17.10	7.00	4.00	1000	8.77	237.5 17.04	"	
2/7/05	JG	6.98	4.02	952	9.60	241.2 18.70	7.00	4.00	1000	8.92	238.6 18.60		
2/8/05	JG	6.58	4.03	1016	9.61	242.3 19.87	7.00	4.00	1000	9.15	237.5 19.89		

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: YSI

SITE NAME: SWMUs 08 &15 12/13/16

MANUFACTURER: YSI

PROJECT No.: N1245, CTO 0331
6878 & 7498

SERIAL NUMBER: 99K1014 AG

Date of Calibration	Person Performing Calibration	INITIAL READINGS PH 7	PH 4	COND	DO	ORP	FINAL READINGS PH 7	PH 4	COND	DO	ORP	Calibration Standard (Lot No.)	Remarks and Comments
1/5/05	JG CD	7.09	3.84	994	8.96	238.7 17.48	7.00	4.00	1000	9.70	239.8 17.51	7.00 4110 8/23/05 4.00 4098 8/18/05	
1/6/05	JG CD	7.03	3.89	536	8.63	268.7 18.38	7.00	4.01	1000	9.13	239.6 18.01	SPC 4387 1/21/05 ORP 03E0667 10/05	
1/7/05	JG	6.98	3.88	890	9.49	214.5 15.38	7.00	4.00	1000	9.66	240.0 15.63	"	
1/8/05	JG	6.92	3.90	826	9.24	220.7 14.37	7.00	4.00	1000	9.81	239.9 14.16	"	
1/10/05	CD	7.02	3.87	529	9.59	225.5 16.17	7.00	4.00	1000	9.71	251.6 16.44	"	
1/12/05	CD	7.06	3.89	1039	9.57	214.1 17.24	7.00	4.00	1000	9.26	253.1 17.89	"	
1/22/05	CD	6.99	3.89	1068	7.55	253.1 18.25	7.00	4.00	1000	8.43	235.1 18.34	"	replaced DO membrane
1/23/05	CD	7.04	3.82	1065	9.12	217.3 11.75	7.00	4.00	1000	9.91	252.5 11.75	"	
1/25/05	CD	7.08	3.84	1130	8.90	211.5 17.93	7.00	4.00	1000	8.85	252.9 17.92	"	
				SWMU			13/16		RD	4			
2/1/05	JG	7.02	3.88	978	14.73	210.1 18.40	7.00	4.00	1010	9.27	240.2 18.40	SPC 4599 7/27/05	
2/2/05	JG	7.04	3.95	947	15.62	18.56 208.8	7.00	4.00	1000	9.35	18.48 250.9		
2/3/05	JG	6.96	3.95	1155	12.01	18.14 221.7	7.00	4.00	1000	9.41	18.32 250.7		
2/4/05	JG	7.04	3.94	952	13.65	18.39 209.3	7.00	4.00	1000	9.37	18.32 237.4		
2/5/05	JG	7.00	3.92	945	12.95	18.38 208.6	7.00	4.00	1000	9.04	19.09 252.8		
2/6/05	JG	7.11	3.88	1151	12.52	19.74 208.3	7.00	4.00	1000	8.99	19.66 252.9		
2/7/05	JG	6.98	3.92	1173	10.05	208.2 19.77	7.00	4.00	1000	8.97	19.74 252.8		
2/8/05	JG	6.97	4.07	1154	9.02	211.2 19.70	7.00	4.00	1000	9.12	19.70 252.9		

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: YSI

SITE NAME: SWMUs ~~08 & 15~~ 13/16

MANUFACTURER: YSI

PROJECT No.: N~~1245~~ 7448, CTO ~~0391~~ 357 / 6878 CTO 343

SERIAL NUMBER: 02A 0~~359~~ 527 AF

Date of Calibration	Person Performing Calibration	INITIAL READINGS PH 7	PH 4	COND	DO	ORP	FINAL READINGS PH 7	PH 4	COND	DO	ORP	Calibration Standard (Lot No.)	Remarks and Comments
2/2/05	JG	6.97	3.94	1095	10.26	251.6 17.28	7.00	4.00	1000	9.25	237.5 17.27	7.0 4110 8/23/05 4.0 4098 8/18/05	
2/3/05	JG	6.87	4.06	888	11.11	234.7 ~~21.7~~	7.00	4.00	1000	9.52	237.4 17.02	SPC ~~4098~~ 4590 7/27/05 ORP 03K 0667	10/05
2/5/05	JG	3.38	7.54	1.53	9.39	17.11 242.6	7.00	4.00	1000	8.84	237.5 17.17	"	
2/6/05	CO	—	—	1014	6.91	236.5 17.01	—	—	1000	8.87	237.6 17.17	"	broken pH probe, replaced DO membrane
2/7/05	JG	—	—	1007	9.15	20.26 237.5	—	—	1000	9.12	20.29 237.5	"	"
2/8/05	JG	—	—	1005	9.42	18.50 236.8			1000	9.10	18.25 237.4	"	

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: YSI

SITE NAME: SWMUs 08 &15 & 12

MANUFACTURER: YSI

PROJECT No.: N1245, CTO 0331 6878

SERIAL NUMBER: 01D0956 AA

Date of Calibration	Person Performing Calibration	INITIAL READINGS PH 7	PH 4	COND	DO	ORP	FINAL READINGS PH 7	PH 4	COND	DO	ORP	Calibration Standard (Lot No.)	Remarks and Comments
2/15/05	CD	7.03	3.99	1024	10.32	242.2 16.04	7.00	4.00	1000	9.47	237.7 16.08	4.0 4098 8/18/05 7.0 4594 7/28/06	
2/16/05	CD	6.97	4.03	1007	10.22	238.9 12.97	7.00	4.00	1000	9.75	236.4 13.03	SPC 4599 7/27/05 CRP 03150667	
2/17/05	CD	7.00	3.96	1015	9.38	~~216.1~~ ~~(244.10)~~	7.00	4.00	1000	9.48	~~237.5~~ ~~(13.93)~~	"	
						237.7 14.10					237.2 14.43		
2/18/05	CD	7.00	4.01	997	9.43	234.9 12.36	7.00	4.00	1000	9.77	237.3 12.36	"	
2/19/05	CD	6.99	3.97	1007	9.45	241.3 10.57	7.00	4.00	1000	9.90	237.3 10.57	"	
2/20/05	CD	7.00	4.04	1030	7.69	231.2 14.17	7.00	4.00	1000	9.56	237.5 14.17	"	
2/21/05	CD	7.03	3.99	1002	7.43	236.1 16.67	7.00	4.00	1000	9.41	237.5 16.62	"	
2/22/05	CD	7.03	4.01	1014	14.86	233.2 13.47	7.00	4.00	1000	9.55	237.5 13.74	"	
3/2/05	JG	7.02	4.18	1029	4.24	233.7 14.77	7.00	4.00	1000	9.75	237.5 14.72	"	
3/3/05	JG	6.98	3.99	974	8.80	236.3 14.26	7.00	4.00	1000	9.38	237.5 14.20	"	
3/4/05	JG	7.02	4.24	1065	5.78	234.5 17.62	7.00	4.00	1002	9.74	237.5 17.74	"	
3/5/05	JG	7.25	3.78	974	11.74	234.6 16.31	7.00	4.00	1001	9.23	237.5 16.00	"	
3/6/05	JG	6.97	3.94	995	9.25	235.7 16.72	7.00	4.00	1000	9.54	237.5 16.30	"	
3/7/05	JG	7.03	4.03	948	6.38	237.4 17.14	7.00	4.00	1001	9.15	237.5 17.10		

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME: NSWC CRANE

INSTRUMENT NAME/MODEL: YSI

SITE NAME: SWMUs 08 & 15 & 12

MANUFACTURER: YSI

PROJECT No.: N1245, CTO 0331 E6878

SERIAL NUMBER: 99K1014 AG

Date of Calibration	Person Performing Calibration	INITIAL READINGS PH 7	PH 4	COND	DO	ORP	FINAL READINGS PH 7	PH 4	COND	DO	ORP	Calibration Standard (Lot No.)	Remarks and Comments
2/15/05	CD	7.10	3.84	1185	5.61	210.5 16.37	7.00	4.00	1000	9.31	252.9 16.37	4.0 4098 8/18/05 7.0 4594 7/28/06	replaced DO membrane
2/16/05	CD	7.07	3.83	1199	8.50	211.4 13.91	7.00	4.00	1000	9.53	252.9 13.73	SPC 4599 7/27/05 ORP 03K0667	
2/17/05	CD	7.00	3.95	1212	7.51	210.1 14.10	7.00	4.00	1000	9.35	252.9 13.93	"	
2/18/05	CD	7.05	3.85	1209	7.92	210.6 13.35	7.00	4.00	1000	9.49	252.9 13.29	"	
2/19/05	CD	7.06	3.90	1196	7.94	210.6 11.94	7.00	4.00	1000	9.63	252.9 11.32	"	
2/20/05	CD	6.98	3.93	1241	7.92	206.3 15.82	7.01	4.00	999	7.89	252.9 15.91	"	
2/21/05	CD	7.01	3.99	1262	8.21	203.2 16.39	7.00	4.00	1000	9.27	252.9 16.40	"	
2/22/05	CD	6.98	3.96	1268	8.88	202.2 14.46	7.00	4.00	1000	9.47	252.9 14.07	"	
3/2/05	SG	6.75	4.06	1305	10.54	201.3 16.95	7.00	4.00	1000	9.70	252.9 16.78	"	
3/3/05	SG	6.92	4.04	926	10.34	198.8 14.26	7.00	4.00	1000	9.33	252.9 14.71		
3/4/05	SG	6.94	4.04	1397	8.83	197.2 16.70	7.00	4.00	1000	9.32	252.9 16.50		

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: SWMUs 08/15 12/13/16

PROJECT NO.: 1245 6878 / 7448

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
1-5-05	LaMotte	4175-1503	QS	0	—	9.96	10.0	NA	ok
1-6-05	"		QS	0	—	9.99	10.0		ok
1-7-05	"		QS	0	—	10.00	10.0		ok
1-8-05	"		QS	0	—	10.0	10.0		ok
1-9-05	"		CO	0.05	0	10.0	10.0		ok
1-10-05	"		CO	0	—	10.0	—		ok
1-11-05	"		CO	0	0	10.0	10.0		ok
1-12-05	"		CO	0	0	9.87	10.0		ok
1-22-05	"		CO	0	—	10.0	—		ok
1-23-05	"		TR	0	0	10.0	—		ok
1-25-05	"		CO	0.0	—	10.0	—		ok

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: Swmu 08/15 12/13/16

PROJECT NO.: 1245 6878 / 7448

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
1-5-05	Lamotte	4536-3303	QD	0	–	9.98	10.0		ok
1-6-05	"		QD	0	–	10.0	–		ok
1-7-05	"		QD	0	–	10.0	–		"
1-8-05	"		QD	0	–	10.0	–		ok
1-12-05	"		CD	0	–	10.0	–		OK
1-22-05	"		CD	0	–	10.0	–		OK
1-23-05	"		TK	0	0	10.0	–		OK
1-25-05	"		CD	0.0	–	10.0	–		OK

Turbidity Meter
LaMotte
0355-4197

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: NSWC CRANE

PROJECT NO.: 7440/6878

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
2-2-05	2020	0355-4197	TK	0.0	0.0	0.0	0.0	Provided by Vendor	ok
2-3-05			[illegible]	0	0	11	9.9		ok
2-5-05			[illegible]	0	0	9.2	10		
2-6-05			CD	0	0	10	10		ok
2-7-05			TK	0	0	10	10		ok

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: SWMU 13/16 RD4 12 Rd 2

PROJECT NO.: 7448/6878

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
2-1-05	LaMotte	4536-3303	QS	0	0	10	10	NA	
2-2-05			QS	0	0	10	10		
2-3-05			QS	0	0	10	10		
2-4-05			QS	0	0	11	10		
2-5-05			QS	0	0	10	10		
2-6-05			CD	0	0	10	10		OK
2-7-05			TR	0	0	10	10		
2-8-05			QS	0	0	9.8	10		
2-15-05			CD	0	0	9.9	10		OK
2-16-05			CD	0	0	10	10		OK
2-17-05			CD	0	0	9.5	10		ok
2-18-05			CD	0	0	10	10		ok
2-19-05			CD	0	0	10	10		ok
2-20-05			CD	0	0	10	10		OK
2-21-05			CD	0	0	10.31	10		OK
2-22-05			CD	0	0	10.64	10		OK

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: SWMU 13/16 RA 4 12 Rd 2

PROJECT NO.: 7448 6878

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
2-1-05	Lamotte	4175-1503	CD	0	0	10	10	NA	
2-2-05			CD	0	0	10	10		
2-3-05			CD	0	0	9.97	10		
2-4-05			CD	0	0	10.12	10		
2-5-05			CD	0.7	0	9.98	10		
2-6-05			CD	0	0	9.90	10		OK
2-7-05			TR	0	0	10	10		OK
2-15-05			CD	0	0	9.27	10		replaced battery
2-16-05			CD	0	0	10.54	10		OK
2-17-05			CD	0	0	9.41	10		OK
2-18-05			CD	0	0	9.95	10		OK
2-19-05			CD	0	0	10.26	10		OK
2-20-05			CD	0	0	10	10		OK
2-21-05			CD	0	0	10.07	10		OK
2-21-05			CD	0	0	10.56	10		OK

APPENDIX B

SMWU 16 MISCELLANEOUS FIELD DOCUMENTATION ROUND 4

B.1 SWMU 16 SITE LOGBOOK ROUND 4

NSWC CRANE

N7448

SWMU 13 & 16

1376

TABLE OF CONTENTS

	PAGE No.
ROUND 3	1-121
B-2930 SOIL MONITORING	132-137
ROUND 4	122-159
B-2930 SOIL MONITORING	149-151

SCIENTIFIC BINDERY PRODUCTIONS, 60 EAST 13TH STREET, CHICAGO, ILLINOIS 60605

* START ROUND #4 *

SUMMARY 1/19

- Complete GWL & Stage Gauge Meas.
- Conduct Well Insp. @ Monitoring Wells 7/1 - 7/5

TITLE NSWC CRANE

PROJECT NO. 7448

BOOK NO. 1376

WED. 1/19/05

Work continued from Page WEATHER: Cold & OVERCAST TEMP 30's

0720 Hrs - ARRIVE @ B3245 - FAX J. SCHUBERT 1 PAGE FAX (WL MEAS.)

C.D. - DECON & T.R. PREP TO MEAS. WL & STAFF GAUGES @ SWMU13

MW ID	W.L.	TIME	MW ID	WL	TIME
13MWT01	7.24	1711	T31	9.71	1336
02	16.07	1706	32	8.40	1343
03	9.84	1713	33	8.93	1330
04	13.57	1704	34	4.98	1442
05	6.02	1658	35	64.30	1510
06	11.37	1715	36	18.73	1410
07	3.92	1701	37	13.67	1406
08	4.15	1703	38	61.78	1408
09	8.16	1417	39	12.76	1401
10	13.65	1517	40	17.89	1351
11	8.61	1511	41	66.28	1356
12	10.52	1506	42	11.45	1358
13	11.79	1317	43	8.06	1620
14	13.51	1321	44	64.46	1616
15	(TA) ~~11.79~~ 13.11	1503	45	69.81	1445
16	13.04	1451	46	56.87	1403
17	9.15	1449	47	7.20	1300
18	19.04	1500	48	10.13	0954
19	9.45	1334	49	7.22	1012
20	4.48	1421	50	7.44	1016
21	8.98	1446	51	4.07	1018
22	7.71	1437			
23	7.96	1424			
24	8.83	1426			
25	6.65	1432			
26	9.60	1430			
27	8.20	1505			
28	77.82	1418			
29	5.25	1311			
30	11.08	1327			

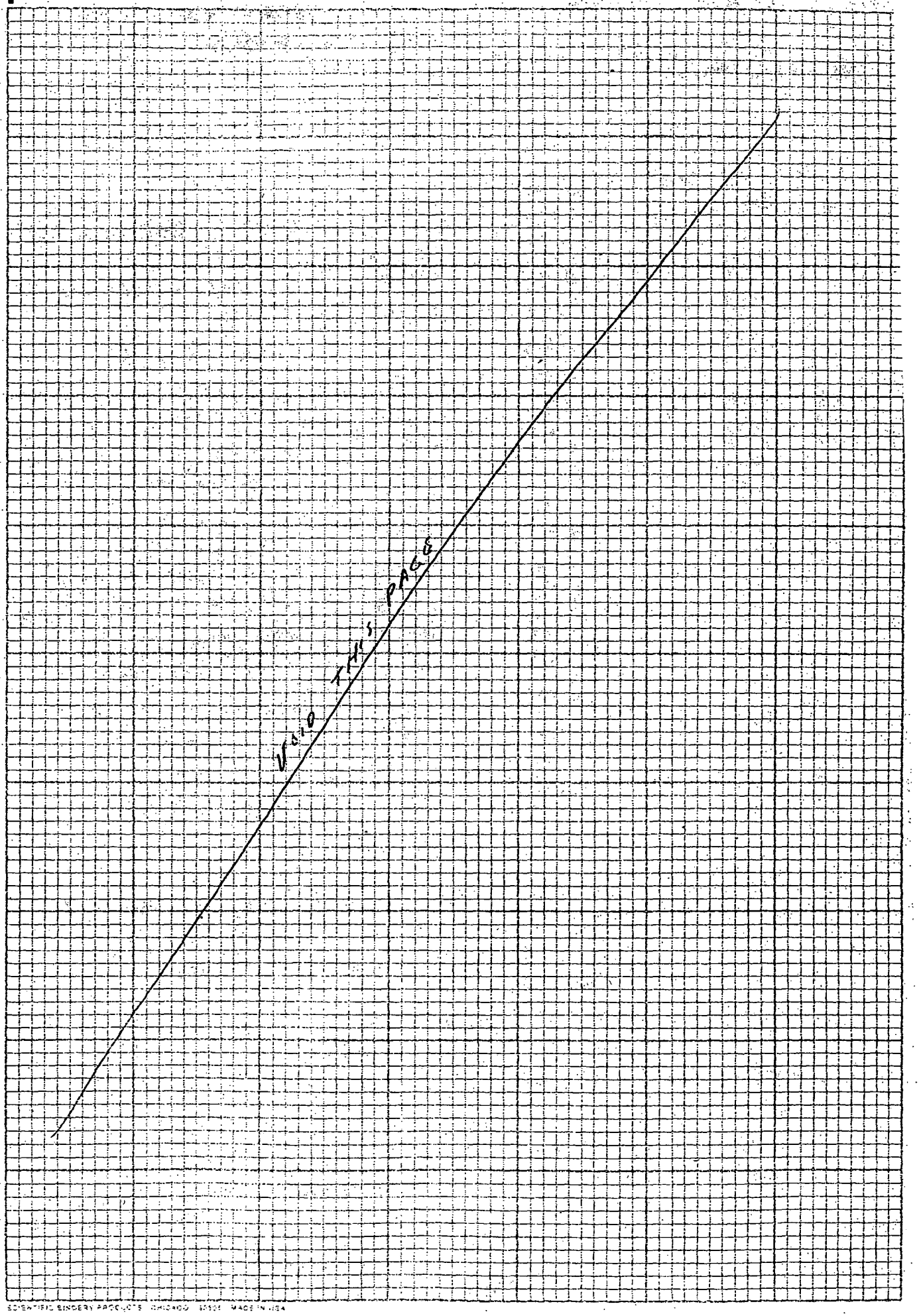
SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Tony Rizzo

DATE 1/19/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE



SCIENTIFIC SINDERY PRODUCTS CHICAGO 60625 MADE IN USA

WED 1/19/05 con't

Work continued from Page

STAFF GAUGE ID	WATER LEVEL	TIME	FLOW = MEAS. OR ESTIMATE	FLOW GPM
135601	1.77	1706	<1	<1
02	3.70	1709	1ft/sec 0.04 x 0.7'	12.5
03	DRY	1255	—	—
04	2.44	1310	SAME AS SG (Rev) 11	1.5
05	3.88	1319	~1gpm	~1
06	2.35	1325	<1gpm	<1
07	1.52	1430	<1gpm	<1
08	5.10	1439	<5gpm	<5
09	4.17	1457	<5gpm	<5
10	4.96	1515	1ft/sec 0.05 x 0.7	16
11	2.45	1304	1.5 gpm (meas)	1.5
12	6.88	1053	1ft/sec 0.05 x 12.5	280
13	5.70	1036	(Rev) ~~1ft/sec~~ 10 gpm meas.	10
14	6.31	10	1ft/3 SEC 0.15 x 1.3'	2
15	4.95	1006	1ft/sec .05 x 18'	403
16	DRY	0948	—	—
17	DRY	0938	—	—
18	8.18	0930	1ft/sec .3 x 9'	1210

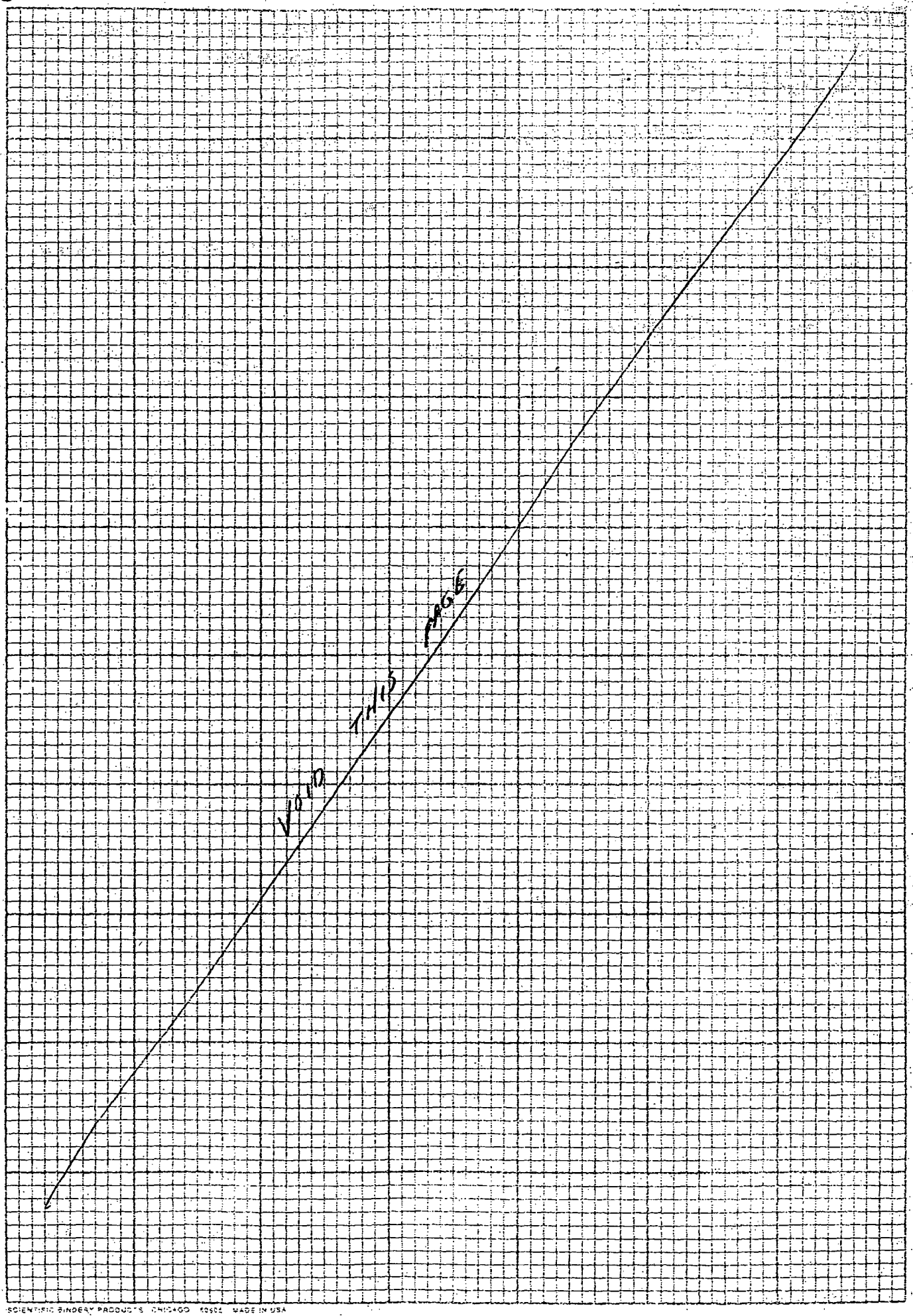
1100 Hrs - REPLACED MISSING WELL CAP @ SWMW 9
1115 Hrs - FLAT TIRE
REPAIR TIRE W/ FIX A FLAT @ BASE GAS STATION
1150 Hrs - LUNCH
1225 Hrs - ARRIVE @ B-3245
CHECK IN W/ OFFICE
1255 Hrs - MEAS. STAFF GAUGES & W.L. AGAIN @ SWMW13
1534 Hrs - ARRIVE B 3245 PICK UP WELL INS. SHEETS FOR SWMW17
1544-1600 Hrs - PERFORM WELL INSPECTIONS FOR 7/1 - 7/5
1616 Hrs - RESUME WATER LEVEL MEASUREMENTS @ T43 & T44

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page 127

SIGNATURE Terry Rogers DATE 1-19-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE



SCIENTIFIC BINDERY PRODUCTS CHICAGO 60604 MADE IN USA

WED 1-19-05 cont

Work continued from Page

1625 Hrs - NEED to wait until 1700 Hrs to ENTER B-165 BUFFER ZONE

1700 Hrs - RESUME WATER LEVEL MEAS.

1718 Hrs - Complete water level & staff Gauge meas.

1726 Hrs - RETURN to B-3245

- Drop USE EQ.

1730 Hrs - LEAVE FOR Hotel

LSWD

SIGNATURE Ty Rogers DATE 1-19-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 1/22/05

- PURGE 13MWT45
- PURGE & SAMPLE 13MWT21
- cut day short due to very bad weather conditions.

TITLE NSWC CRANE

PROJECT NO. 7448

BOOK NO. 1376

SAT. 1-22-05

Work continued from Page Weather - Strong wind snow & temp in teens

0705 Hrs - Arrive @ B-3245

- Prep. to sample G.W
- Call YSI - change DO membrane
- Check in w/ T. Johnson @ Home
  - Need to check on Microseeps lab for methane, ethane & ethene samples for SWMU 16
- Pick wells @ SWMU 13 that are close in order to train C.D. on bladder pump sampling
- Prep. vehicles for GW sampling

1030 Hrs - Arrive @ SWMU 13

SAMPLE ID	Start Purge	END Purge	VOL. Purges	Sample Time	Sampler
13GWT4503	1100	1300	16 L	NA	TR
13GWT21	1120	1250	9.36 L	1255	CD

1405 Hrs - Finish clean up @ SWMU 13

1420 Hrs - Return to B-3245

- Process samples
- Bring in all EQ, meters subject to cold
- Unload Nitrogen cylinder for travel to Motel

1505 Hrs - Leave B-3245 for Hotel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rogers

DATE 1/22/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

B 100 P ©

Sample Summary for 1/23/05

Sample ID	Start Purge	End Purge	Vol Purged	Sample Time	Sampl.
13GWT0104	0950	1100	7.3 L	1105	T.R.
13GWT1704	0935	1225	16.6 L	1235	C.D.
13GWT4503	1122	1122	16 L	1250 (1/23)	T.R.
13GWT1104	1400	1500	5.5 L	1505	TR
13GWT3403	1345	1505	10.6 L	1510	CD

TITLE NSWC CRANE

CREW
C. Doolan
T. Rosahn

PROJECT NO. 7448

BOOK NO. 1376

SUN - 1-23-05

Work continued from Page

Weather - Very Cold (Teens) & Mostly Sunny

0730 Hrs - Arrive @ B 3245
- PREP FOR GW SAMPLING
- CALI. YSIs & Turb. METERS

0930 Hrs - Arrive @ SWMU 13
- WATER LEVEL @ 13MWT45 = 7.20' with [illegible]
- Assist EQ PREP to start sampling 13MWT17

0940 Hrs - Arrive @ 13MWT01

0950 Hrs Start Purge @ 13MWT01
END Purge @ 1100 Hrs
Start Sampling @ 1105 Hrs
Finish @ 1150 Hrs

1200 Hrs - Check on CO - having problems w/ M-Scope - give him mine

1215 Hrs - Pick up sandwich @ Subway

1230 Hrs - Return to SWMU 13 - REPLACE M-Scope battery
M-Scope OK Now

1250 Hrs - Start sampling @ 13MWT45

1537 Hrs - Finish Clean up @ 13MWT45 min. sample vol.

1348 Hrs - HELD CO get set up @ 13MWT34

1400 Hrs - Start Purge @ 13MWT11
END PURGE = 1500 Hrs
SAMPLE TIME = 1505 Hrs

1615 Hrs - Finish @ 13MWT11

1645 Hrs - Arrive @ B 3245
- Secure samples for Ship.
- Unload EQ & Gas cylinders from SUVS
- ~~PREP. SAMPLE~~ PAPERWORK

1655 Hrs - Leave B-3245 For Hotel Room

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature]

DATE 1/23/05

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

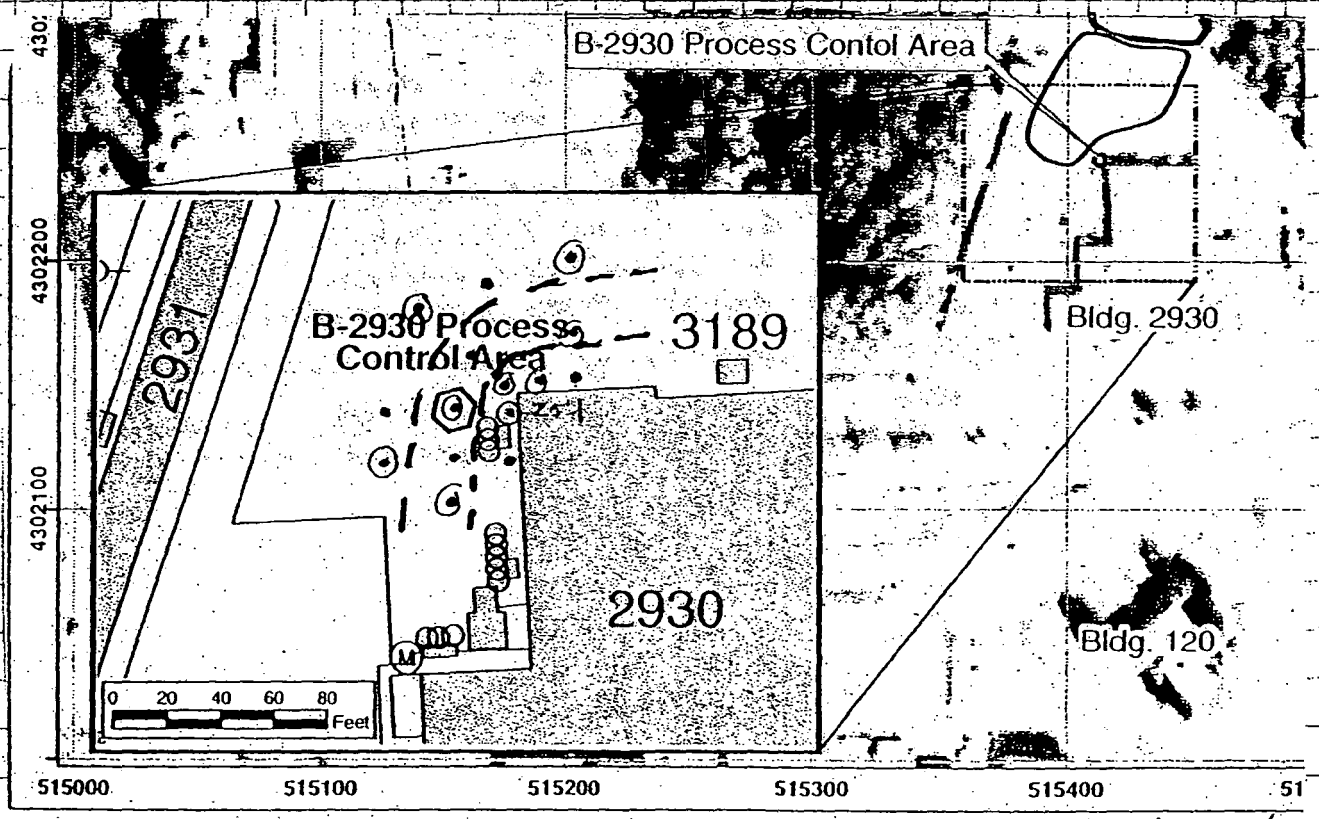
SAMPLE SUMMARY 1/25/05 :

- RECON 8-2930 W/ T. BRENT
- CONF CALL W/ B. GATES, T. BRENT & R. BASINSKI
  NEED to lay out sample locations ASAP for utility clearance
- RECON RIFLE RANGE for bullets
- PICK 55 Gal Drums (ten received) W/ ~50 lbs of additional weight
- Assemble bladder pump for 13MWT51
- SAMPLE monitoring WELLS 13MWT47 & 14
- MEAS. VLLs of NEW WELLS @ SWMU 16 PER R. BASINSKI'S Request for Round 3

TUES 1-25-05

Work continued from Page

0700 Hrs - Arrive @ B 3245
TR check in w/ T. Brent. CD prep for GW sampling
0710 Hrs - Arrive @ B-2930 w/ T. Brent
NEED DPT to sample - well packed gravel
Propose the following (see Figure):



⊙ = 3 Loc. / composite
• + ⊙ = 5 Loc. / Composite

3-5 borings - 5' from wall composite
3-5 " - 30' " " "
3-5 " - 60' " " "

0775 Hrs - Return to BLDG A 3245
• Develope Figure & Fax to R. Basiaski
• Prep. Paperwork for GW sampling & Assist CD with GW Prep.
2845 Hrs - Arrive @ 13 MHT 47
• Assist CD w/ carrying eq to well & start up
2920 Hrs - Return to B-3245

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page 135

SIGNATURE Ty Rogers DATE
DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

END

Cont from P. 135 :

WELL ID	WL	TIME
16MWT21	65.44	1745
16MWT20	3.43	1602
16MWT19	3.21	1800

1810 Hrs - Leave Base
1855 Hrs - Finish Car Wash
1932 Hrs - Check out supplies & eq. @ Lowe's

END

SCIENTIFIC SINGER PRODUCTS CHICAGO STATE MADE IN USA

TUES 1-25-05 Cont

Work continued from Page

0920 Hrs - Return to B-3245
- PAPERWORK
- FAX C.O.C FROM MON SHIPMENT to LAUCKS
- FAX " " FRI & MON. SHIPMENT to OFFICE

1000 Hrs - Check in w/ Walt Wagonner
RIFLE Range Recon

1135 Hrs - Check out w/ Mr. Wagonner

1150 Hrs - Pick up a sub & subway

1200 Hrs - Arrive @ B 3245
- Check in w/ OFFICE (J. Goodt - to make labels & folders for SWMU 12)
- Prep for Conf. Call

1230 Hrs - Conf. Call
w/ B. Gates, T. Brent & R. Bosinski Regarding B-2930
NEED to start out right away for utility clearance - will purchase some eq. & supplies tonight

1300 Hrs - Conf. Call over
SEE what supplies we have - 9 steel Rods & five cones; Tom will get some 55 gal Drums to SECTION OFF WORK AREA.

1320 Hrs - Check on C.D. - watch well while he gets lunch @ subway

1420 Hrs - Return to B-3245
- T. Brent RECEIVED 4 drums - TR opened drums & put some weight inside of EACH drum
- PAPERWORK
- Check bladder pump for 13MW751
PUMP Not fully ASSEMBLED - TR ASSEMBLED CAP to twin bonded tubing
- Pick samples for SHIPMENT on COC 3672 via FED EX AB# 8447 8135 7928

1700 Hrs - CD - LEFT B 3245 to Drop OFF FED EX SHIPMENT
TR - Some clean up

1730 Hrs - TR START WKS @ SWMU 16 NOW WE'RE ON

Work continued to Page 134

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE Tr[illegible] DATE 1/25/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

VIA THIS PAGE

10 EMPIRE STANDARD PRODUCTS CHICAGO 60601 MADE IN USA

Work continued from Page

0700 Hrs - Arrive @ B 3245
- Decon Augers
- Prep to lay out 9 soil boring locations @ B-2930
- Fax COC # 3678 to Laucks Lab. & office

0800 Hrs - Arrive @ B 2930
Stake out 9 Boiling locations & set up traffic barricades for steel rods in Parking lot

0925 Hrs - Return to B 3245
- Call J. Goerdt - have him order Tyvek bags (1000)
- Call Lab - request 12 cases of HDPE w/ H_2SO_4 + 9 sets of TOC containers w/ H_3PO_4
- Call In Oxygen order 4 Cylinders of Nitrogen Ask them to pick up 1 empty
- Clean & mop - bathroom, hallways, Lab & office

1045 Hrs - Leave B 3245 for Airport
Remainder of Day Travel
END

SIGNATURE
DATE 1-26/05
DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

TRAVEL DAY 1-31-2005:

- CHECKED ON STATUS OF WATER CHEM. CONTAINERS W/ H_2SO_4 & TOC CONTAINERS W/ H_3PO_4 WITH ANN HO OF LAUCKS; ANN SAID THEY WERE drop shipped by SUPPLIERS & SHOULD ARRIVE ON THURS 2/3/05.
- SEE page 139

SCIENTIFIC BINDERS MANUFACTURE CHICAGO 60622 MADE IN USA

Work continued from Page

TRAVEL DAY

1100 Hrs - CHECK IN @ MOTEL
- GET ON TETRALINK - FROM I PROCUREMENT
- ORDER 3 BEOPHARS & 2 bladder PUMPS FOR SWMU 12 GW SAMPLING
- SEND E-MAIL to confirm address to T. PATTON FOR SHIPPING

1250 Hrs - ARRIVE @ B-3245 - CO made final arrangements for NEXT SHIFT
- CHECK IN w/ T. BRENT
- Fix broken WATER line discharge BEHIND B-3245 REPLACED VALVE & HOSE, etc.
- Stocked up CONTAINERS INSIDE OFFICE

1500 Hrs - CHECKED IN @ Public Works to FIND out status OF dig permit FOR B-2930 - DONNA out FOR the day.

1520 Hrs - LEAVE NOTE FOR T. Brent (Donna out will check in with her tomorrow)

1540 Hrs - LEAVE B-3245 FOR Motel

END

SIGNATURE Tony Rojahn

DATE 1-31-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 2-01-05 :

SAMPLE #/ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	SAMPLER
13GWT 0905	0925	1045	7.33 L	1050	CD
13GWT 2803	0930	1330	19.6 L	1345	JG
13GWT 3103	1245	1445	12.9 L	1450	CD

SCIENTIFIC BINDERY PRODUCTS CHICAGO 60605 MADE IN U.S.A.

Work continued from Page

WEATHER - ~~Mostly~~ Partly Cloudy & 40's / 30's

0700 Hrs - ARRIVE @ B-3245

- PULL together PAPERWORK & Labels etc FOR WELLS 13MWT09 & 31 FOR CD & 13MWT28 & 13 FOR JG
- MAKE UP bottle sets FOR ABOVE WELLS
- ORGANIZE PAPERWORK, FILES & WORK BENCHES
- RECEIVE Geopumps (3) & bladder Pumps (2) FROM FED. EX.
- Missing Turbidity meter & M-Scope ordered by JG FROM the OFFICE last WEEK
- CHECKED ON ABOVE w/ T. PATTON - SEEMS PROBLEM lies w/ I Procurement - wrong delivery date
- CHECK IN w/ Donna Zollman regarding dig permit FOR B 2930 - SHOULD be FINISHED BY Thurs (needs water, sewer, security & communications to complete the permit)
- Split up PAPERWORK FROM last shift (N1245, 6878 & 7448)
- XEROX Flow SHEETS FOR SWMUS 13 & 16
- CALLED R. Basinski - No RESPONSE left MESSAGE

1215 Hrs - LUNCH / CHECK IN w/ CD

1245 Hrs - RETURN to B-3245

- WORK on Log book
- Checked in w/ R. BASINSKI - Discussed B-2390, SW samples FOR SWMU 12, DPT Status FOR B-2390 & Samples @ SWMU 15 Borings 47 & 48
- CHECK on TABLE 3-15 FOR Rounds 4-9 NEED to do 1 Dup & 1 MS/MSD per ROUND
- Organize & consolidate Containers & supplies in garage
- Go through all coolers FOR Bubble WRAP & Temp. blanks
- REFRIGERATE Temp Blanks
- PREP. COCs FOR SWMUS 13, 16 & 12
- up DATED COC #3673 w/ samples shown on P 140

1700 Hrs - LEFT B-3245 FOR Motel

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page —

SIGNATURE Terry Rojahn DATE 2-1-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 02/02/05:

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	SAMPLER
13GWT4603	0850	1010	8.9L	1015	CD
13GWT4003	0930	1100	11L	1105	JG
13GWT3703	1135	1255	8.6L	1300	CD
13GWT1304	1235	1455	21.6L	1500	JG

COMPLETED SURFACE WATER SAMPLING @ SWMU 13.

TITLE NSWC CRANE

CREW
J. Goerdt (JG)
C. Doolan (CD)
T. Rosahn (TR)

PROJECT NO. 7448
BOOK NO. 1376

WED 2-2-05

Work continued from Page Weather - Mostly Cloudy - Overcast & 30's

0700 Hrs - Arrive @ B-3245
- Select wells for CD & JG to sample
- Locate SW sample locations on Fig 3-3 (SWMU 13) and Fig. 3-4 (SWMU 16) for sampling this shift
- Prep. to sample surface water @ SWMU 13

0855 Hrs - Collected 13SW2203
0955 Hrs - " 13SW1403
1010 Hrs - " 13SW1503
1023 Hrs - " 13SW1603
1045 Hrs - " 13SW3003
1100 Hrs - Arrive @ B-3245 - Process above samples
1200 Hrs - Lunch
1235 Hrs - Collected 13SW2002
1300 Hrs - " 13SW1902
1340 Hrs - " 13SW1103
1414 Hrs - Finish @ Location 13SW11
1420 Hrs - Check on CD
1450 Hrs - Arrive @ B-3245
- Process samples
- Paperwork & Package samples for shipment
- Order Nitrogen Cylinders
- Fax COCs 3673 & 3678 to office & lab

1630 Hrs - Leave B-3245 for Fed.Ex
1710 Hrs - Drop off samples on AB # 8947 8135 7917

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Terry Rosahn
DATE 2-2-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

SAMPLE SUMMARY 020305:

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	SAMPLE TIME	SAMPLER
13GWT1504	0850	1110	15.9L	1115	CD
13GWT5102	0850	1135	26.8L	1140	JG

FINISHED SAMPLING GW @ SWMU 13 this date.
@SWMU16
Completed surface water sampling with the
collection of SW @ 16SW10, 12, 13 & 30
SHIPPED SAMPLES IN COCS 3677 & 3679 via
FED EX. 18# 8447 8135 7913

50 SHEETS 5 SQUARES PRODUCTS CORPORATION MADE IN USA

THURS 2-3-05

Work continued from Page WEATHER - Mostly Sunny & 48°s

0705 Hrs - Arrive @ B-3245
- Select wells & Prep Paperwork for Gwl crew
  Also select wells 12MWT05 & 26 for this afternoon
- Should complete GWL sampling @ SWMU 13 this date
- Call Dave Baker several times to give him a heads up that we will be starting work in SWMU 12 MFA - missed him both times

0820 Hrs - Install Bladder Pump @ 13MWT51 w/ JG

QED PUMP CERTIFICATION

13MWT51

Quality Certification Manager: [illegible] — Date: MAY 28 2004

Pump Model: T1250 — Batch Serial Number: 050402

If you need further information on
QED's Pump Certification Program,
please contact QED Environmental Systems at 1-800-624-2026

0850 Hrs - Return to B-3245
- Checked in w - Dave Baker (MFA Supervisor) - OK to work inside MFA.
- Talked to T. Brent to let security known we will be working in MFA Area

0925 Hrs - Check in on DC @ 13MWT15
0938 Hrs - Check contractors lock @ MFA South Gate - OK
0949 Hrs - Stop & SWMU 16 Break bldg - FRI. No work @ B-146
Check contractor Lock - OK
1000 Hrs - Return to B-3245
- H_2SO_4 Containers arrived - Stock office
- Prep. to collect SW samples @ SWMU 16

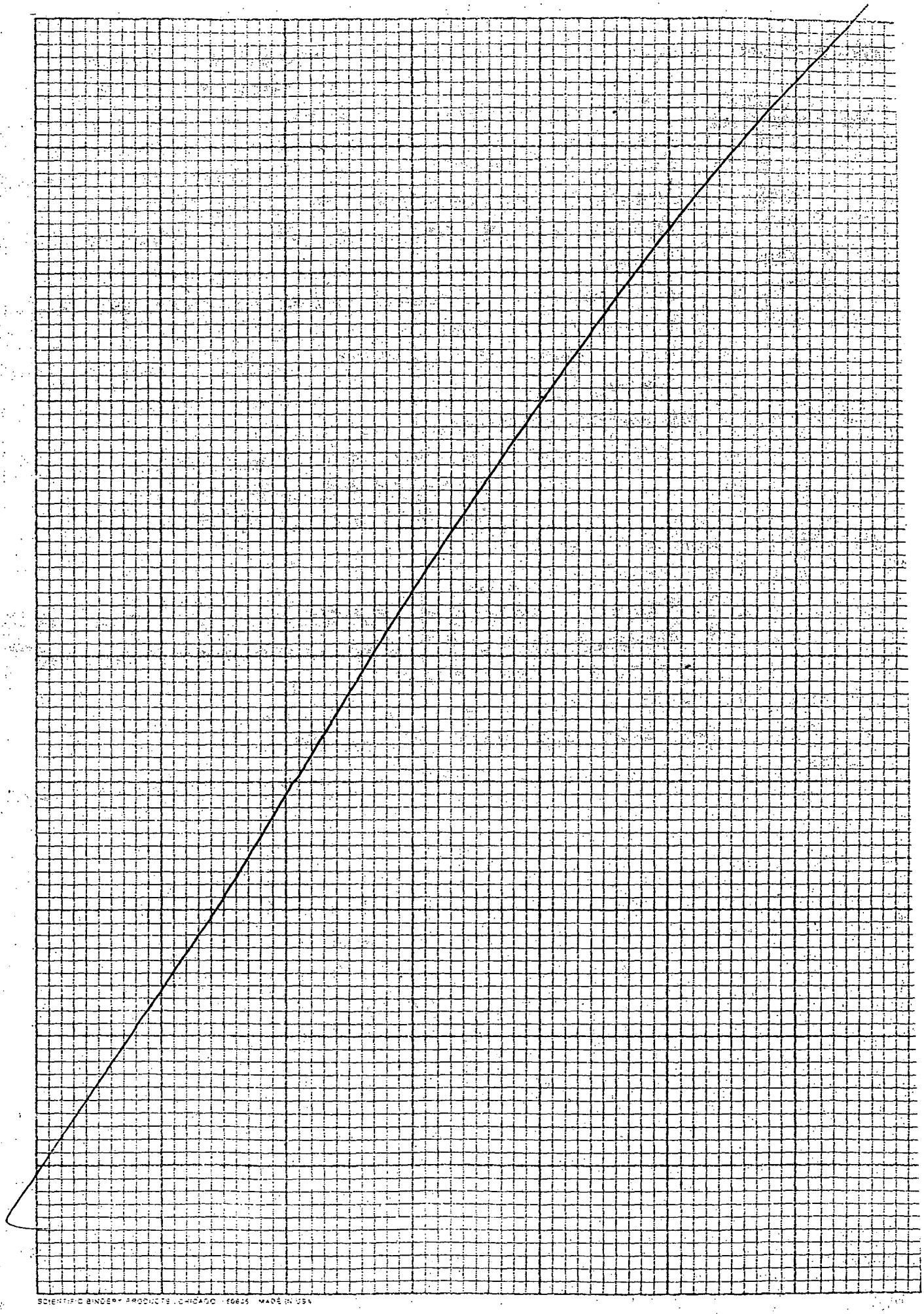
SCIENTIFIC BINDERY PRODUCTIONS Choice of TRIM BLANK 16TB02030501

Work continued to Page

SIGNATURE [signature] DATE 2/3/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

B 100 P ©


SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60625 MADE IN USA

2-03-05 Cont'd

Work continued from Page

1105 Hrs - Arrive @ SWMU 16 to collect SW samples
1120 Hrs - Collected 16SW3002 & FD020305-01
1145 Hrs - Return to B-3245 to Process the above samples
1235 Hrs - Lunch
1300 Hrs - Pick up dig Permit for B-2930 @ Public Works
1313 Hrs - Return to B-3245
• Assist Colin D. w/ Prep for Peristaltic Well @ SWMU 12
1335 Hrs - Arrive @ SWM 16
Collected 16SW1303 1410 Hrs
16SW1204 1425 Hrs
16SW1003 1445 Hrs
1510 Hrs - Arrive @ B-3245
• Unload Truck
• Process samples & paperwork COCs # 3677 & 3679
• Package samples for shipment on AB#
8447 8135 7413
1700 Hrs - Leave B-3245 for FED EX
1731 Hrs - Drop off samples @ FED. EX.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 2/03/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

MONITORING WELLS @ SWMU 16

WELL ID	WL	TIME		
16MW 01	~~15.88~~	~~0848~~	32.33	0947
02	15.91	0840		
03	~~25.88~~	~~0914~~	20.45	0932
04	~~17.29~~	~~0911~~	28.70	0938
05	34.88	0942		
16MWT 01	15.88	0848		
02	12.61	0921		
03	28.88	0914		
04	14.29	0911		
05	32.11	0924		
06	17.79	0850		
07	[illegible]	0854	* Bottom @ 28'	
08	96.60	0859		
09	15.25	0903		
10	22.30	0906		
11	96.41	0908		
12	20.94	0928		
13	11.36	0919		
14	ABONDONED			
15	54.99	0917		
16	34.40	1135		
17	15.78	0844		
18	95.75	0956		
19	3.25	1012		
20	3.66	1014		
21	65.46	0936		

0830 - Attempted to enter in a bldg 2708. Doors locked. (SWMU 16)

STEN-REO BINDERY PRODUCTS CHICAGO 60605 MADE IN USA

B-2930 SAMPLING

TITLE NSWC CRANE

CREW
JG
CD
TR
GES - Josh Dutton

PROJECT NO. 7448

BOOK NO. 1376

FRI 2-4-05

Work continued from Page

WEATHER - Mostly Sunny high 40's low 50's

0645 Hrs - Arrive @ B 3245
- Prep. for soil sampling
- Give Josh Dutton & C.D. site specific HES training

0805 Hrs - Arrive @ B-2930

0900 Hrs - Collect B2930SSCP001 0002 } MS/MSD & FD02040501 @ B2930
0925 Hrs - " B2930SSCP002 0002 } SEE P. 131 for Boring locations
0955 Hrs - " B2930SSCP003 0002 }

1020 Hrs - Finish clean up @ B 2930, broke down barricade & removed rebar stakes

1030 Hrs → Arrive @ B-3245
- Unload Drums
- Unload SUV - refrigerate samples
- Prep to meas. staff gauges @ SWMU 16

1115 Hrs - Arrive @ SG06 @ SWMU 16
MEAS. SG06-09

1200 Hrs - Lunch

1235 Hrs - Return to SWMU 16
MEAS. staff gauges SG01-05

1340 Hrs - Return to B-3245
- Calc. flows & FAX GW & SG measurements to J. Schubert
- Also, FAX DOECs from 2-3-05 to office (#s 3682, 3677 & 3679) to E. Sedlmyerek
- Process soil samples & prep for shipping
- Check in w/ office (R. Basinski) - discuss survey of Dump site A wells (7/1-7/5) - ok to survey - R.B. will FAX a map of said wells

1705 Hrs - Left B-3245 for FED-EX.
SHIPPED SAMPLES on COCs #3683 & 3684 via FED-EX AB# 8447 8135 7424

1739 Hrs - Drop off samples @ FED-EX.

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2-4-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

STAFF GAUGES @ SWMU 16 (2-04-05)

STAGE GAUGE ID	W.L.	TIME	DEPTH ~~WIDTH~~ (TC) (AVE)	WIDTH ~~DEPTH~~ (AVE)	FLOW (SEC/FT)	FLOW RATE
165601	DRY	1245	—	—	—	0
02	5.29	1314	STAGNATE	→		0
03	0.03	1253	STAGNATE	→		0
04	2.15	1259	"	→		0
05	DRY	1301	DRY	→		0
06	3.51	1119	NA	NA	NA	102
07	5.99	1130	0.34	3.9'	1 sec	580
08	4.16	1141	NA	NA	NA	18
09	6.34	1151	0.17	3	3 sec	76
~~10 (TC)~~						
~~11 (TC)~~		END				

SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

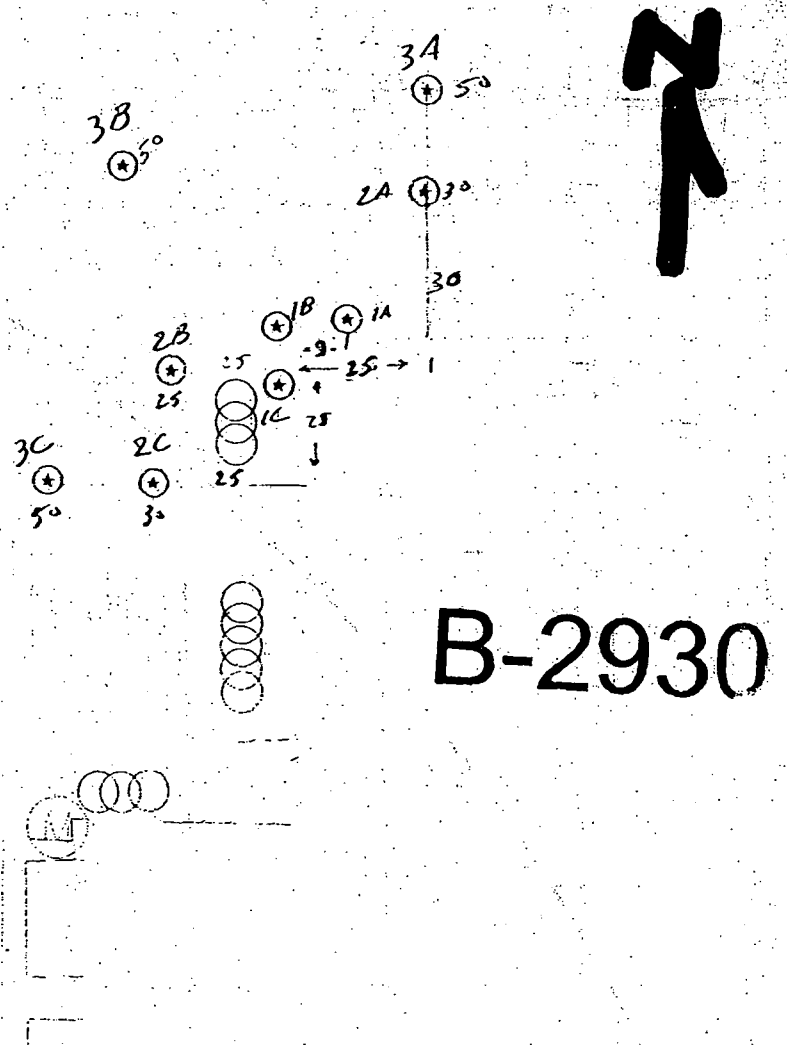
FRI 2-04-05 Con't

Work continued from Page

SAMPLE SUMMARY FOR 02-04-05:

- B2930 SAMPLING COMPLETED this date
- MEAS. WATER LEVELS OF STAFF GAUGES & WELLS @ SWMU 16

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	SAMPLE TIME	SAMPLER
16MWT11	1058	1144	1.6 L	NA	JG
16MWT13	1257	1425	16.0 L	NA	JG
16MW02	1435	1610	9.5 L	1615	JG



Work continued to Page

SCIENTIFIC SIGNATURE

DATE 2-4-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 02/05/05 :

SEE TABLE PAGE 153

SIENTIFIC SUPPLIER PRODUCTS CHICAGO 30805 MADE IN USA

TITLE NSWC CRANE

SAT 2-5-05

CREW
JG
CD
TR

PROJECT NO. 7448

BOOK NO. 1376

Work continued from Page

WEATHER: Mostly Sunny & mild 40's & 50's

0653 Hrs - Arrive @ B3245

- Select Wells to be sampled - Prep. Paperwork
- Prep for GW SAMPLING / Prep. Sample Containers sets

0900 Hrs - Arrive @ SWMU 16
to sample ground water

SAMPLE ID	Start Purge	End Purge	Vol. Purged	Sample Time	Sampler / Remarks
16GWT1103	2/4/05	→		0850	JG (EXP. only)
16GWT1303	2/4/05	→		0925	JG
16GW0304	0932	1152	16.8 L	1157	TR
16GWT0605	0920	1320	13.7 L	1325	CD
16GWT1503	1025	1430	17 L	1435	JG
16GWT0404	1415	1535	8.3 L	1540	TR DUP FD020505-01
16GWT1703	1510	1640	12.4 L	1645	CD

1800 Hrs - Arrive @ B 3245
Refrigerate samples
Drop off EQ, meters, etc

1820 Hrs - Leave B-3245 for Motel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 02-05-05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

Sample Summary 02/06/05 :

See TABLE on Page 155

CD also sampled 12MW01

SCIENTIFIC SINGERY PRODUCTS CHICAGO 57865 MADE IN USA

SUN 2-06-05

Work continued from Page WEATHER - OVERCAST & 50°s

0655 Hrs - ARRIVE @ B3245
- SELECT WELL to be sampled & PERF. PAPERWORK
- PREP FOR GROUNDWATER SAMPLING
- PREP SAMPLE SETS (Containers)

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	SAMPLE TIME	SAMPLER / REMARKS
16GWT0903	0845	1015	9.2L	1020	CD
16GW0904	0855	1025	13.5L	1030	TR D.O MS/MSD
16GWT1203	0845	1045	7.0L	1050	JG
16GWT1003	1220	1340	8.0L	1345	JG

1300 Hrs - LUNCH & SET CD up w/ WELL 12MWT01 to sample
1330 Hrs - SET up @ 16MWT11 to attempt to collect additional sample - well didn't recharge since 2/5/05.
1410 Hrs - ARRIVE @ B3245
- CLEAN up OFFICE
- RESTOCK sample containers
- PAPER WORK
- WAIT FOR CD to complete sampling @ 12MWT01

1530 Hrs - CD ARRIVES @ B3245
1545 Hrs - LEAVE B3245 FOR MOTEL

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 2/06/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

VOID THIS PAGE

SCIENTIFIC SINGER PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 7448

BOOK NO. 1376

MON. 02-07-05

Work continued from Page

SHIPPED SAMPLES ON COC # 3681, 3680 & 3685

LABS = Microseeps, Laucks

END

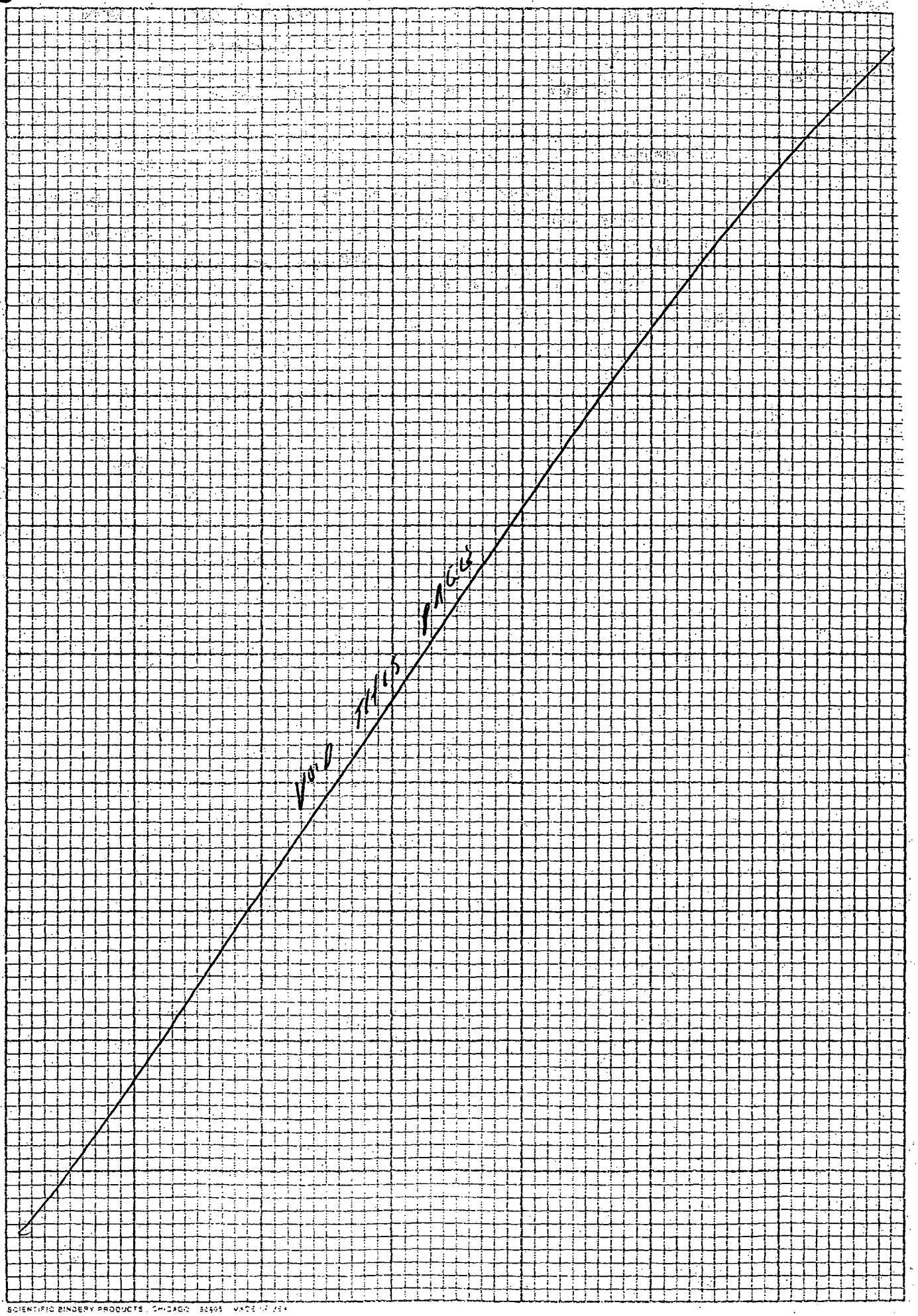
SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 2-07-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE



SCIENTIFIC BINDERY PRODUCTS . CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 7448

BOOK NO. 1376

SUN 2-20-05

Work continued from Page WEATHER - Rain/Overcast 50°s

1530 HRS - SAMPLED 16 MWT 11 (16 GWT 1103)

- FOR VOLATILES / Nitrate + Nitrite / Sulfide & Chloride
  SEE COC # 3699 - will ship to Lancs on 2/21/05
- Add Gases Methane, Ethane & Ethane
  SEE COC # 3698 - will ship to microseeps on 2/21/05

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 2/20/05

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS DATE

APPENDIX C

SWMU 16 HEALTH AND SAFETY DOCUMENTATION ROUND 4

C.1 SWMU 16 HEALTH AND SAFETY DOCUMENTATION ROUND 4

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigation activities at NSWC Crane, and that I have received site-specific training that included the elements presented below:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- The contents of the health and safety plan including Table 5-1 and 6-1
- Emergency response procedures (evacuation and assembly points)
- Review contents of relevant Material Safety Data Sheets
- Review of Safe Work Permits

I have been given the opportunity to ask questions and that my questions have been answered to my satisfaction. The dates of my training and my medical surveillance requirements are accurate and correct to the best of my knowledge.

	Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam	
1245	Jay McFall	12/7/04	2/19/04	N/A	N/A	7/30/04	
SWMU 9	DOU COBSTORHOFF	"	1/93	8/04	8/04	2/12/03	
	TERRY ROWAHN	"	10/85	1/04	1/04	11/10/04	ALSO SWMU 9
1245 6878 7448	[illegible]	12/8/04	12/91	10/04	NA	11/7/04	
	Stan Conti	12/8/04	8/83	5/04	8/84	12/6/04	
	Colin Doolan	11/6/05	5/99	12/04	NA	12/04	

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

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

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

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

STATUS

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

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

3. ☐ **NOT QUALIFIED**

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

COMMENTS:

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

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

Signature: Peter P Greaney MD

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

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Terry Rojahn

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

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

January 30, 2004

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

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

WORKCARE™

A Trademark of WorkCare, Inc.

RELEASE TO DUTY

CLINIC INSTRUCTIONS: Complete and give to employee before they leave the facility. This is a requirement of Tetra-Tech.

Employee Name: Stanley J. Conti

Office Location: PIT

Yes	No	
☑	☐	To work with hazardous materials in accordance with 29 CFR 1910.120.
☑	☐	To use respiratory protective equipment in accordance with 29 CFR 1910.134.

Based on the limited information available to me at this time, I find no necessity for immediate restrictions and I release this employee for duty. It is understood and agreed upon by the employer or potential employer of this examinee that subsequent comprehensive review of all laboratory and other test data by WorkCare may detect health conditions not apparent to me. It is further agreed and understood that such health conditions may necessitate the need for workplace restrictions. Examination has been performed in compliance with 1910.120 and 1910.134.

Signed: [illegible] M.D.

Date: 12-6-94

Employee

Bring this form back to the office and fax it to:
Matt Soltis, Corporate Health & Safety (412) 921-4040

333 S. Anita Drive, Suite 630, Orange, CA 92868 • (714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154
E-mail: info@workcare.com • Website: www.workcare.com

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Stan Cohtl

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER
AND SUPERVISOR REFRESHER TRAINING

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

May 14, 2004
Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, Pennsylvania 15220-2745
(412) 921-7090 • FAX (412) 921-4040 • www.tetratech.com

March 11, 2003

Mr. Stanley Conti
Tetra Tech NUS, Inc.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220

Whom It May Concern:

This letter is to certify that Mr. Stanley Conti successfully completed a course of instruction in Hazardous Materials Handling for Hazardous Waste Site Workers which meets the criteria established in 29 CFR 1910.120(e)(3)(i). This course was prepared and conducted by Tetra Tech NUS (formerly Brown and Root Environmental, a division of HALLIBURTON NUS Corporation) in September 1983. If you have any questions, please feel free to contact me.

Very truly yours,

James K. Lafley
Manager, Training Resources

JKL:lld

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

EMPLOYEE:	Goerdt, James	COMPANY:	TT/NUS
SSN:	481-86-2691	POSITION:	Environmental Scientist
DATE OF EXAM:	11/07/2003	LOCATION:	TT/NUS-Pittsburgh
EXPIRATION DATE:	11/07/2005	SITE:	Pittsburgh

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

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

STATUS

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

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

3. ☐ **NOT QUALIFIED**

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

COMMENTS:

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

Name of Physician: Scott Hardy, M.D. Date: 11/11/03

Signature: Scott Hardy MD

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

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Jim Goerdt

has successfully completed an 18-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

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

October 22, 2004

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

APPLIED EDUCATIONAL SERIES

James D. Goerdt

APPLIED ASSOCIATES INTERNATIONAL INC.

CERTIFICATE

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

ISSUE DATE: December 13, 1991

EXPIRATION: December 13, 1992

CERTIFICATE: HAZ9112001058

STEVEN L. WILLIAMS
President

THOMAS O. MURRAY
Certified Industrial Hygenist

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

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Baseline Examination **UPDATE**

EMPLOYEE:	Doolan, Colin	**COMPANY:**	TT/NUS
SSN:	XXX-XX-8351	**POSITION:**	Earth Scientist
DATE OF EXAM:	12/02/2004	**LOCATION:**	TT/NUS-Pittsburgh
EXPIRATION DATE:	12/02/2006	**SITE:**	Pittsburgh

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

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

STATUS

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

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

3. ☐ **NOT QUALIFIED**

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

COMMENTS: ***Status changed to Biennial.***

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

Name of Physician: Peter P. Greaney, M.D. Date: 12/07/04

Signature: Peter P. Greaney MD

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

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Colin A. Doolan

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER
REFRESHER TRAINING

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

December 23, 2004
Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

TETRA TECH NUS, INC.
661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetratech.com

PITT-12-4-053

December 30, 2004

Project Numbers 3961, 1245, 7448, and 6878

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: William Gates (Code ES31)
P.O. Box 190010
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Numbers 0160, 0331, 0343, an[redacted]

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. employees under the CLEAN contract, and to attest that the individuals identified herein are in compliance with applicable OSHA regulations. This information is being submitted as specified in Section H.14 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62467-94-D-0888. The specific OSHA regulations involved for this project pertain to employee health and safety training and medical surveillance requirements, as identified in OSHA 29 CFR 1910.120.

The subject project and planned activities include staking locations of intrusive sampling; installation/development and sampling of monitoring wells; surface water, seep and sediment sampling; and soil sampling using DPT and hand augering techniques at the NSWC Crane site in Indiana. This is scheduled to be conducted from January 4-28, 2005. The individuals that will perform these tasks are employees of Tetra Tech NUS. They will follow these listed health and safety plans:

- Health and Safety Plan for Solid Waste Management Unit 7, dated December 2004, prepared under CTO 0160.
- Health and Safety Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Environmental Indicator Investigation for SWMUs 18, 19, 20, and the Old Gun Tub Storage Lot, dated November 2004, prepared under CTO 0331.
- Health and Safety Plan for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- Health and Safety Plan for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.

These individuals are as follows:

Stan Conti
Colin Doolan
Jim Goerdt
Terry Rojahn

APPENDIX D
ANALYTICAL DATA
SWMU 16
ROUND 4

APPENDIX D.1

SUMMARY OF ANALYTICAL RESULTS

SWMU 16

ROUND 4

GROUNDWATER

UPPER PENNSYLVANIAN WATER BEARING ZONE

TAB[illegible]
SUMMARY OF A[illegible]TIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM UPPER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
SAMPLING ROUND	04	04	04	04	04	04	04	04	04
LOCATION	16MW02	16MW03	16MWT04	16MWT04	16MWT06	16MWT09	16MWT10	16MWT13	16MWT17
SAMPLE NUMBER	16GW0205	16GW0304	16GWT0404	16GWT0404-D	16GWT0605	16GWT0903	16GWT1003	16GWT1303	16GWT1703
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/4/2005	2/5/2005	2/5/2005	2/5/2005	2/5/2005	2/6/2005	2/6/2005	2/5/2005	2/5/2005
Volatile Organics (ug/L)									
1,1,1,2-TETRACHLOROETHANE	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
1,1,1-TRICHLOROETHANE	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
1,1,2,2-TETRACHLOROETHANE	0.3 U	0.3 U	0.3 U	0.3 U	3.9	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	250	0.3 U	0.3 U	2.1	44
1,1-DICHLOROETHANE	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
1,1-DICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	140	0.3 U	0.3 U	0.3 U	8.1
1,2,3-TRICHLOROPROPANE	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
1,2-DIBROMO-3-CHLOROPROPANE	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
1,2-DIBROMOETHANE	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
1,2-DICHLOROETHANE	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
1,2-DICHLOROPROPANE	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
2-BUTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-HEXANONE	0.5 U	0.5 U	0.5 U	0.5 U	1.8 J	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	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	36	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	0.5 U	0.5 U	0.5 U	0.5 U	33	0.5 U	0.5 U	7.6	0.5 U
ACROLEIN	0.5 UR	0.5 UR	0.5 UR	0.5 UR	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	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	4.6	0.3 U	0.3 U	0.3 U	1.3
BROMODICHLOROMETHANE	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
BROMOFORM	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
BROMOMETHANE	0.3 U	0.3 UJ	0.3 UJ	0.3 UJ	0.3 U	0.3 UJ	0.3 UJ	0.3 U	0.3 U
CARBON DISULFIDE	0.3 U	0.3 U	0.3 U	0.3 U	2.5	0.3 U	0.3 U	0.3 U	0.3 U
CARBON TETRACHLORIDE	0.3 U	17	0.3 U	0.3 U	0.3 U	0.3 U	2.4	0.3 U	0.3 U
CHLOROBENZENE	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
CHLORODIBROMOMETHANE	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
CHLOROETHANE	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U
CHLOROFORM	0.3 U	5.5	0.3 U	0.3 U	20	0.6 J	2.4	0.3 U	3.5
CHLOROMETHANE	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
CHLOROPRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	5200	0.3 U	0.3 U	8.2	310
CIS-1,3-DICHLOROPROPENE	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
DIBROMOMETHANE	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
DICHLORODIFLUOROMETHANE	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
ETHANE	0.078	0.005 U	0.0088 J	0.005 UJ	2.3	0.074	0.082	0.065	0.6
ETHENE	0.005 U	0.026	0.014 J	0.005 UJ	29	0.081	0.03	0.035	0.17
ETHYL METHACRYLATE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.3 U	0.3 U	0.3 U	0.3 U	4.4	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	0.3 U	0.3 U	0.3 U	0.3 U
METHANE	72	0.87	9.2 J	1.5 J	440	1.9	1	84	75
METHYL IODIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYL METHACRYLATE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE 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

TABLE 0.1
SUMMARY OF ANALYTIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM UPPER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
SAMPLING ROUND	04	04	04	04	04	04	04	04	04
LOCATION	16MW02	16MW03	16MWT04	16MWT04	16MWT06	16MWT09	16MWT10	16MWT13	16MWT17
SAMPLE NUMBER	16GW0205	16GW0304	16GWT0404	16GWT0404-D	16GWT0605	16GWT0903	16GWT1003	16GWT1303	16GWT1703
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/4/2005	2/5/2005	2/5/2005	2/5/2005	2/5/2005	2/6/2005	2/6/2005	2/5/2005	2/5/2005
STYRENE	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
TETRACHLOROETHENE	0.3 U	0.3 U	0.3 U	0.3 U	190	0.3 U	0.3 U	0.3 U	3.4
TOLUENE	0.3 U	0.3 U	0.3 U	0.3 U	310	0.3 U	0.3 U	0.3 U	0.5 J
TOTAL XYLENES	0.3 U	0.3 U	0.3 U	0.3 U	6.7	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	21	0.3 U	0.3 U	0.3 U	5.8
TRANS-1,3-DICHLOROPROPENE	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
TRANS-1,4-DICHLORO-2-BUTENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.3 U	5	5	5	440000	10	2.4	1900	18000
TRICHLOROFLUOROMETHANE	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 ACETATE	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	660	0.3 U	0.3 U	0.3 U	3.8
Energetics (ug/L)									
1,3,5-TRINITROBENZENE	0.278 U	0.258 U	0.25 U	0.269 U	2	0.24 U	0.255 U	0.264 U	0.24 U
1,3-DINITROBENZENE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
2,4,6-TRINITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	8.2	0.24 U	0.255 U	0.264 U	0.24 U
2,4-DIAMINO-6-NITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	0.31 J	0.24 U	0.255 U	0.264 U	0.24 U
2,4-DINITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	1.2	0.24 U	0.255 U	0.264 U	0.24 U
2,6-DIAMINO-4-NITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
2,6-DINITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	0.92 J	0.24 U	0.255 U	0.264 U	0.24 U
2-AMINO-4,6-DINITROTOLUENE	0.278 U	0.52 J	0.3 J	0.34 J	34	0.26 J	0.255 U	0.264 U	0.24 U
2-NITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
3,5-DINITROANILINE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
3-NITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	1.8 J	1.8 J	0.264 U	0.24 U
4,4'-TN-AZOXY	0.555 U	0.515 U	0.5 U	0.538 U	0.48 U	0.48 U	0.51 U	0.528 U	0.48 U
4-AMINO-2,6-DINITROTOLUENE	0.278 U	0.91	0.75	0.83	18	0.61 J	0.42 J	0.264 U	0.24 U
4-NITROTOLUENE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
DNX	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
HMX	0.278 U	5.7	8.2	7.8	0.72 J	9.3	5.1	0.264 U	0.24 U
MNX	0.278 U	0.36 J	1.2	1.2	0.24 U	0.43 J	0.3 J	0.264 U	0.24 U
NITROBENZENE	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
RDX	0.278 U	55	68	74	7.3	92	50	0.264 U	4.9
TETRYL	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
TNX	0.278 U	0.258 U	0.25 U	0.269 U	0.24 U	0.24 U	0.255 U	0.264 U	0.24 U
Field Parameters									
DISSOLVED OXYGEN (mg/L)	4.68	13.83	7.25		2.64	1.41	7.14	3.22	0.89
OXIDATION REDUCTION POTENTIAL (MV)	28.2	266	231		14.5	169.4	315.2	12	100.9
PH (S.U.)	6.59	5	5.5		5.96	4.82	3.31	5.99	5.17
SPECIFIC CONDUCTANCE (MS/CM)	0.479	0.323	0.18		0.889	0.456	1.168	0.299	0.595
TEMPERATURE (C)	13.04	14.69	15.09		15.57	12.18	14.1	13.12	13.97
TURBIDITY (NTU)	1.1	7.9	2.3		17.9	0	4.3	380	3.27
Miscellaneous Parameters (mg/L)									
CHLORIDE	25 J	5 J	11 J	12 J	54 J	13 J	9 J	21 J	110 J
NITRITE/NITRATE-N	0.45	0.75	0.88	0.84	0.025 U	0.56	0.72	0.025 U	0.025 U
SULFATE	8700	150	32	32	480	290	1100	50	190

TAB
SUMMARY OF ANALYTIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM UPPER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

CLASSIFICATION	UPGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD	DOWNGRAD
SAMPLING ROUND	04	04	04	04	04	04	04	04	04
LOCATION	16MW02	16MW03	16MWT04	16MWT04	16MWT06	16MWT09	16MWT10	16MWT13	16MWT17
SAMPLE NUMBER	16GW0205	16GW0304	16GWT0404	16GWT0404-D	16GWT0605	16GWT0903	16GWT1003	16GWT1303	16GWT1703
SAMPLE CODE	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/4/2005	2/5/2005	2/5/2005	2/5/2005	2/5/2005	2/6/2005	2/6/2005	2/5/2005	2/5/2005

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.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration non-compliances, and extremely low analyte recoveries).

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.

APPENDIX D.2

SUMMARY OF ANALYTICAL RESULTS

SWMU 16

ROUND 4

GROUNDWATER

MIDDLE PENNSYLVANIAN WATER BEARING ZONE

TABLE D.2
SUMMARY OF ANALYTIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM MIDDLE PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

SAMPLING ROUND	04	04
LOCATION	16MW04	16MWT12
SAMPLE NUMBER	16GW0404	16GWT1203
SAMPLE CODE	NORMAL	NORMAL
SAMPLE DATE	2/6/2005	2/6/2005
Volatile Organics (ug/L)		
1,1,1,2-TETRACHLOROETHANE	0.3 U	0.3 U
1,1,1-TRICHLOROETHANE	0.3 U	0.3 U
1,1,2,2-TETRACHLOROETHANE	0.3 U	0.3 U
1,1,2-TRICHLOROETHANE	0.3 U	0.3 U
1,1-DICHLOROETHANE	0.3 U	0.3 U
1,1-DICHLOROETHENE	0.3 U	0.3 U
1,2,3-TRICHLOROPROPANE	0.3 U	0.3 U
1,2-DIBROMO-3-CHLOROPROPANE	0.3 U	0.3 U
1,2-DIBROMOETHANE	0.3 U	0.3 U
1,2-DICHLOROETHANE	0.3 U	0.3 U
1,2-DICHLOROPROPANE	0.3 U	0.3 U
2-BUTANONE	0.5 U	0.5 U
2-HEXANONE	0.5 U	0.5 U
3-CHLOROPROPENE	0.5 U	0.5 U
4-METHYL-2-PENTANONE	0.5 U	0.5 U
ACETONE	0.5 U	0.5 U
ACROLEIN	0.5 UR	0.5 UR
ACRYLONITRILE	0.5 U	0.5 U
BENZENE	0.3 U	0.3 U
BROMODICHLOROMETHANE	0.3 U	0.3 U
BROMOFORM	0.3 U	0.3 U
BROMOMETHANE	0.3 UJ	0.3 UJ
CARBON DISULFIDE	0.3 U	0.3 U
CARBON TETRACHLORIDE	0.3 U	0.3 U
CHLOROBENZENE	0.3 U	0.3 U
CHLORODIBROMOMETHANE	0.3 U	0.3 U
CHLOROETHANE	0.5 UJ	0.5 UJ
CHLOROFORM	0.3 U	0.3 U
CHLOROMETHANE	0.3 U	0.3 U
CHLOROPRENE	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	0.3 U	0.3 U
CIS-1,3-DICHLOROPROPENE	0.3 U	0.3 U
DIBROMOMETHANE	0.3 U	0.3 U
DICHLORODIFLUOROMETHANE	0.3 U	0.3 U
ETHANE	0.005 U	0.17
ETHENE	0.005 U	0.12
ETHYL METHACRYLATE	0.5 U	0.5 U
ETHYLBENZENE	0.3 U	0.3 U
METHACRYLONITRILE	0.3 U	0.3 U
METHANE	1.1	1.6
METHYL IODIDE	0.5 U	0.5 U
METHYL METHACRYLATE	0.5 U	0.5 U
METHYLENE CHLORIDE	0.3 U	0.3 U
STYRENE	0.3 U	0.3 U
TETRACHLOROETHENE	0.3 U	0.3 U
TOLUENE	0.3 U	0.3 U
TOTAL XYLENES	0.3 U	0.3 U
TRANS-1,2-DICHLOROETHENE	0.3 U	0.3 U
TRANS-1,3-DICHLOROPROPENE	0.3 U	0.3 U
TRANS-1,4-DICHLORO-2-BUTENE	0.5 U	0.5 U
TRICHLOROETHENE	1.4	0.5 J
TRICHLOROFLUOROMETHANE	0.3 U	0.3 U
VINYL ACETATE	0.5 UJ	0.5 UJ
VINYL CHLORIDE	0.3 U	0.3 U

TABLE D.2
SUMMARY OF ANALYTIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM MIDDLE PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

SAMPLING ROUND	04	04
LOCATION	16MW04	16MWT12
SAMPLE NUMBER	16GW0404	16GWT1203
SAMPLE CODE	NORMAL	NORMAL
SAMPLE DATE	2/6/2005	2/6/2005
Energetics (ug/L)		
1,3,5-TRINITROBENZENE	0.264 U	0.26 U
1,3-DINITROBENZENE	0.264 U	0.26 U
2,4,6-TRINITROTOLUENE	0.264 U	0.26 U
2,4-DIAMINO-6-NITROTOLUENE	0.264 U	0.26 U
2,4-DINITROTOLUENE	0.264 U	0.26 U
2,6-DIAMINO-4-NITROTOLUENE	0.264 U	0.26 U
2,6-DINITROTOLUENE	0.264 U	0.26 U
2-AMINO-4,6-DINITROTOLUENE	0.264 U	0.26 U
2-NITROTOLUENE	0.264 U	0.26 U
3,5-DINITROANILINE	0.264 U	0.26 U
3-NITROTOLUENE	0.264 U	0.26 U
4,4'-TN-AZOXY	0.528 U	0.52 U
4-AMINO-2,6-DINITROTOLUENE	0.264 U	0.26 U
4-NITROTOLUENE	0.264 U	0.26 U
DNX	0.264 U	0.26 U
HMX	0.264 U	0.26 U
MNX	0.264 U	0.26 U
NITROBENZENE	0.264 U	0.26 U
RDX	0.58	0.26 U
TETRYL	0.264 U	0.26 U
TNX	0.264 U	0.26 U
Field Parameters		
DISSOLVED OXYGEN (mg/L)	5.79	4.22
OXIDATION REDUCTION POTENTIAL (MV)	319	134.6
PH (S.U.)	4.5	4.89
SPECIFIC CONDUCTANCE (MS/CM)	0.672	1.898
TEMPERATURE (C)	12.87	12.28
TURBIDITY (NTU)	0.05	1.7
Miscellaneous Parameters (mg/L)		
CHLORIDE	15 J	15 J
NITRITE/NITRATE-N	0.025 U	0.025 U
SULFATE	660	1300

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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.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times

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

APPENDIX D.3

SUMMARY OF ANALYTICAL RESULTS

SWMU 16

ROUND 4

GROUNDWATER

LOWER PENNSYLVANIAN WATER BEARING ZONE

TABLE D.3
SUMMARY OF ANALYTIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM LOWER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

SAMPLING ROUND	04	04
LOCATION	16MWT11	16MWT15
SAMPLE NUMBER	16GWT1103	16GWT1503
SAMPLE CODE	NORMAL	NORMAL
SAMPLE DATE	2/4/2005	2/5/2005
Volatile Organics (ug/L)		
1,1,1,2-TETRACHLOROETHANE	0.3 U	0.3 U
1,1,1-TRICHLOROETHANE	0.3 U	0.3 U
1,1,2,2-TETRACHLOROETHANE	0.3 U	0.3 U
1,1,2-TRICHLOROETHANE	0.3 U	0.3 U
1,1-DICHLOROETHANE	0.3 U	0.3 U
1,1-DICHLOROETHENE	0.3 U	0.3 U
1,2,3-TRICHLOROPROPANE	0.3 U	0.3 U
1,2-DIBROMO-3-CHLOROPROPANE	0.3 U	0.3 U
1,2-DIBROMOETHANE	0.3 U	0.3 U
1,2-DICHLOROETHANE	0.3 U	0.3 U
1,2-DICHLOROPROPANE	0.3 U	0.3 U
2-BUTANONE	0.5 U	0.5 U
2-HEXANONE	0.5 U	0.5 U
3-CHLOROPROPENE	0.5 U	0.5 U
4-METHYL-2-PENTANONE	0.5 U	0.5 U
ACETONE	0.5 UJ	0.5 U
ACROLEIN	0.5 UR	0.5 UR
ACRYLONITRILE	0.5 U	0.5 U
BENZENE	0.3 U	0.3 U
BROMODICHLOROMETHANE	0.3 U	0.3 U
BROMOFORM	0.3 U	0.3 U
BROMOMETHANE	0.3 U	0.3 UJ
CARBON DISULFIDE	0.3 U	0.3 U
CARBON TETRACHLORIDE	0.3 U	0.3 U
CHLOROBENZENE	0.3 U	0.3 U
CHLORODIBROMOMETHANE	0.3 U	0.3 U
CHLOROETHANE	0.5 U	0.5 UJ
CHLOROFORM	0.3 U	0.3 U
CHLOROMETHANE	0.3 U	0.3 U
CHLOROPRENE	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	0.3 U	0.3 U
CIS-1,3-DICHLOROPROPENE	0.3 U	0.3 U
DIBROMOMETHANE	0.3 U	0.3 U
DICHLORODIFLUOROMETHANE	0.3 U	0.3 U
ETHANE	0.34	2.5
ETHENE	0.075	0.26
ETHYL METHACRYLATE	0.5 U	0.5 U
ETHYLBENZENE	0.3 U	0.3 U
METHACRYLONITRILE	0.3 U	0.3 U
METHANE	540	9400
METHYL IODIDE	0.5 U	0.5 U
METHYL METHACRYLATE	0.5 U	0.5 U
METHYLENE CHLORIDE	0.3 U	0.3 U
STYRENE	0.3 U	0.3 U
TETRACHLOROETHENE	0.3 U	0.3 U
TOLUENE	0.3 U	0.3 U
TOTAL XYLENES	0.3 U	0.3 U
TRANS-1,2-DICHLOROETHENE	0.3 U	0.3 U
TRANS-1,3-DICHLOROPROPENE	0.3 U	0.3 U
TRANS-1,4-DICHLORO-2-BUTENE	0.5 U	0.5 U
TRICHLOROETHENE	0.3 U	0.6 J
TRICHLOROFLUOROMETHANE	0.3 U	0.3 U
VINYL ACETATE	0.5 U	0.5 UJ
VINYL CHLORIDE	0.3 U	0.3 U

TABLE D.3
SUMMARY OF ANALYTIC RESULTS
ROUND 4 GROUNDWATER SAMPLES FROM LOWER PENNSYLVANIAN ZONE
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

SAMPLING ROUND	04	04
LOCATION	16MWT11	16MWT15
SAMPLE NUMBER	16GWT1103	16GWT1503
SAMPLE CODE	NORMAL	NORMAL
SAMPLE DATE	2/4/2005	2/5/2005
Energetics (ug/L)		
1,3,5-TRINITROBENZENE	0.316 U	0.266 U
1,3-DINITROBENZENE	0.316 U	0.266 U
2,4,6-TRINITROTOLUENE	0.316 U	0.266 U
2,4-DIAMINO-6-NITROTOLUENE	0.316 U	0.266 U
2,4-DINITROTOLUENE	0.316 U	0.266 U
2,6-DIAMINO-4-NITROTOLUENE	0.316 U	0.266 U
2,6-DINITROTOLUENE	0.316 U	0.266 U
2-AMINO-4,6-DINITROTOLUENE	0.316 U	0.266 U
2-NITROTOLUENE	0.316 U	0.266 U
3,5-DINITROANILINE	0.316 U	0.266 U
3-NITROTOLUENE	0.316 U	0.266 U
4,4'-TN-AZOXY	0.632 U	0.532 U
4-AMINO-2,6-DINITROTOLUENE	0.316 U	0.266 U
4-NITROTOLUENE	0.316 U	0.266 U
DNX	0.316 U	0.266 U
HMX	0.316 U	0.266 U
MNX	0.316 U	0.266 U
NITROBENZENE	0.316 U	0.266 U
RDX	0.316 U	0.266 U
TETRYL	0.316 U	0.266 U
TNX	0.316 U	0.266 U
Field Parameters		
DISSOLVED OXYGEN (mg/L)	9.72	1.36
OXIDATION REDUCTION POTENTIAL (MV)	-43.9	-21.7
PH (S.U.)	6.98	7.43
SPECIFIC CONDUCTANCE (MS/CM)	0.756	0.354
TEMPERATURE (C)	11.82	13.89
TURBIDITY (NTU)	2.8	0.6
Miscellaneous Parameters (mg/L)		
CHLORIDE	5	3 J
NITRITE/NITRATE-N	0.025 U	0.025 U
SULFATE	4	0.5 U

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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.

APPENDIX D.4

SUMMARY OF ANALYTICAL RESULTS

SWMU 16

ROUND 4

SURFACE WATER

TABLE D.4
SUMMARY OF ANALYTIC RESULTS
ROUND 4 SURFACE WATER SAMPLES
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

SAMPLING ROUND	04	04	04	04	04
LOCATION	16SW/SD10	16SW/SD10	16SW/SD10	16SW/SD10	16SW/SD10
SAMPLE NUMBER	16SW1002	16SW1002	16SW1002	16SW1002	16SW1002
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/3/2005	2/3/2005	2/3/2005	2/3/2005	2/3/2005
Volatile Organics (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 U	0.5 U	0.5 U	0.5 U	0.5 U
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	1.3	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 U	0.3 U	0.3 U	0.3 U	0.3 U
ETHYL METHACRYLATE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
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
METHYLENE CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
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	20	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 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Energetics (ug/L)					
1,3,5-TRINITROBENZENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
1,3-DINITROBENZENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
2,4,6-TRINITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
2,4-DINITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
2,6-DINITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
2-AMINO-4,6-DINITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U

TABLE D.4
SUMMARY OF ANALYTIC RESULTS
ROUND 4 SURFACE WATER SAMPLES
SWMU 16 (CAST HIGH EXPLOSIVES FILL/B-146 INCINERATOR)
NSWC CRANE
CRANE, INDIANA

SAMPLING ROUND	04	04	04	04	04
LOCATION	16SW/SD10	16SW/SD10	16SW/SD10	16SW/SD10	16SW/SD10
SAMPLE NUMBER	16SW1002	16SW1002	16SW1002	16SW1002	16SW1002
SAMPLE CODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SAMPLE DATE	2/3/2005	2/3/2005	2/3/2005	2/3/2005	2/3/2005
2-NITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
3-NITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
4-AMINO-2,6-DINITROTOLUENE	0.242 U	0.24 U	0.24 U	0.44 J	0.44 J
4-NITROTOLUENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
HMX	0.242 U	0.24 U	0.24 U	3.6	3.4
NITROBENZENE	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
RDX	0.242 U	0.24 U	0.24 U	14	13
TETRYL	0.242 U	0.24 U	0.24 U	0.245 U	0.248 U
Field Parameters					
DISSOLVED OXYGEN (mg/L)	8.95	10.07	10.93	11.15	
OXIDATION REDUCTION POTENTIAL (MV)	218	218	203	188	
PH (S.U.)	3.65	3.75	3.83	4.16	
SPECIFIC CONDUCTANCE (MS/CM)	0.126	0.164	0.175	0.14	
TEMPERATURE (C)	5.44	5.95	5.25	3.12	
TURBIDITY (NTU)	6.9	3	2.2	3.1	

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.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration non-compliances, and extremely low analyte recoveries).

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.

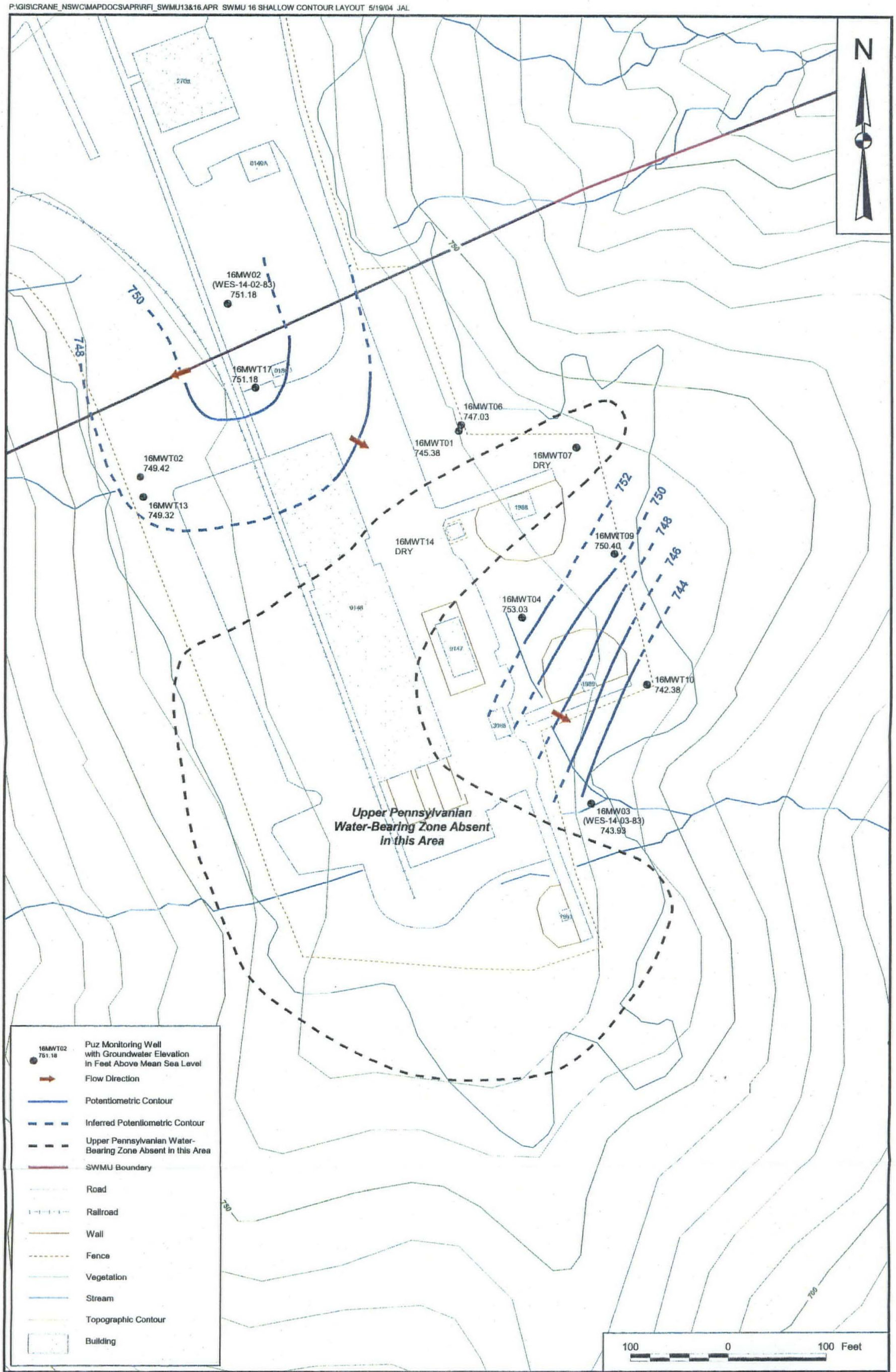
APPENDIX E

SWMU 16

POTENTIOMETRIC SURFACE MAPS

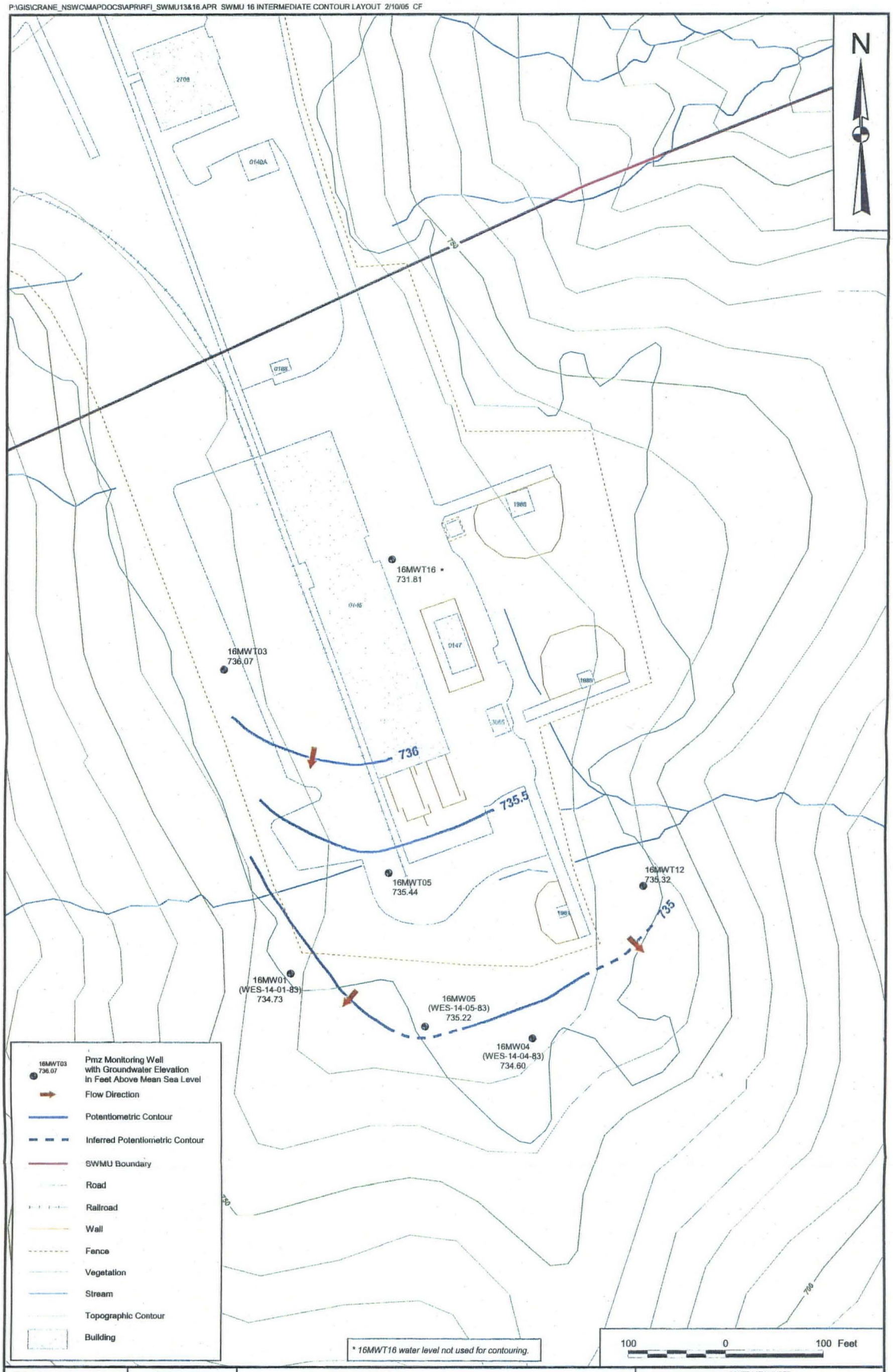
JANUARY 24, 2004

P:\GIS\CRANE_NSWC\MAPDOCS\APR\RFI_SWMU13&16.APR SWMU 16 SHALLOW CONTOUR LAYOUT 5/19/04 JAL



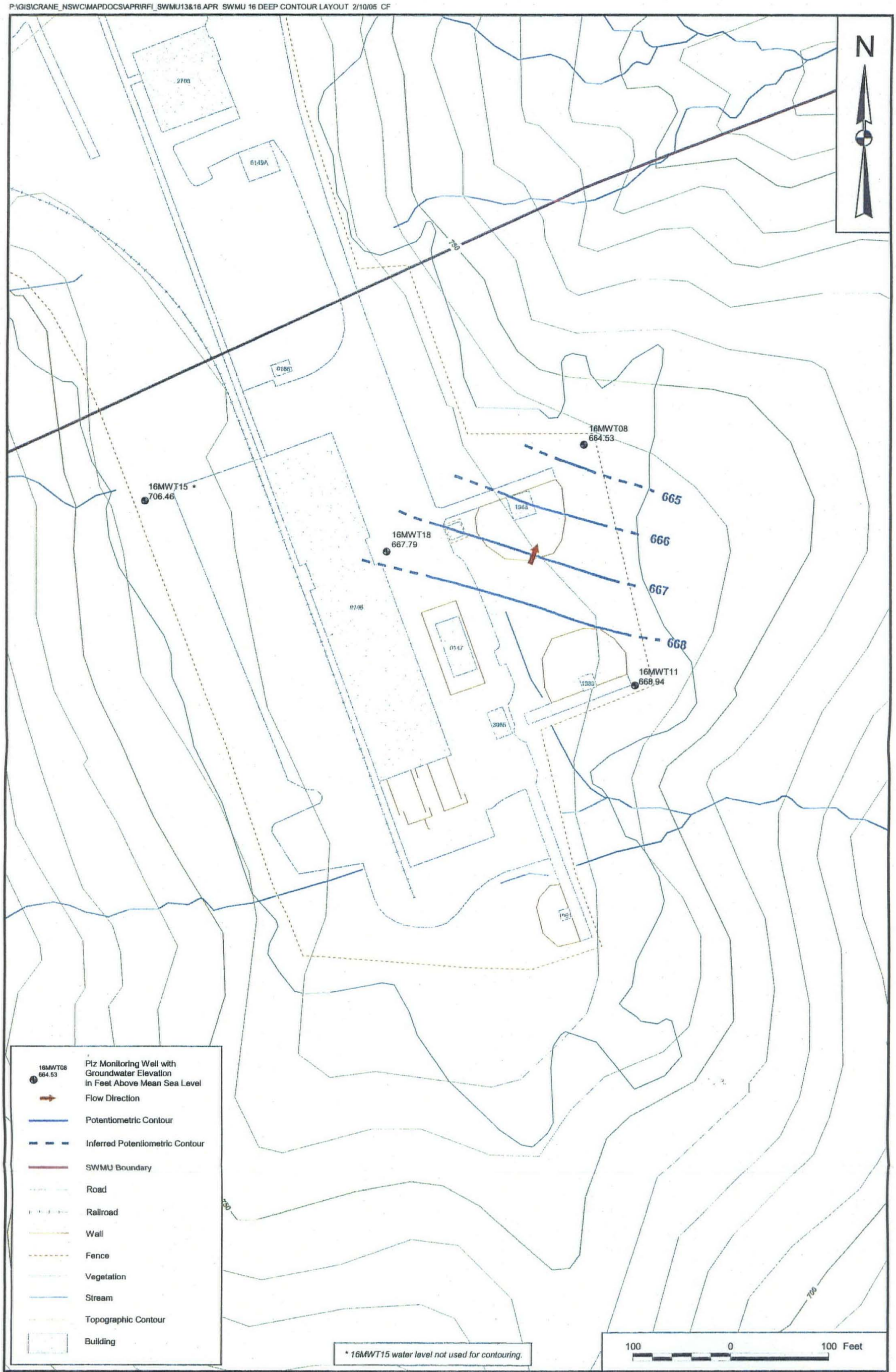
DRAWN BY A. JANOCHA	DATE 2/23/04	POTENTIOMETRIC SURFACE MAP FOR UPPER PENNSYLVANIAN WATER-BEARING ZONE - JANUARY 24, 2004 SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER 7448
CHECKED BY J. LUCAS	DATE 5/13/04		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 4 - 7 REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\RFI_SWMU13&16.APR SWMU 16 INTERMEDIATE CONTOUR LAYOUT 2/10/05 CF



DRAWN BY A. JANOCHA	DATE 2/23/04	POTENTIOMETRIC SURFACE MAP FOR MIDDLE PENNSYLVANIAN WATER-BEARING ZONE - JANUARY 24, 2004 SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER 7448
CHECKED BY J. LUCAS	DATE 5/13/04		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 4 - 8 REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\RFI_SWMU13&16.APR SWMU 16 DEEP CONTOUR LAYOUT 2/10/05 CF



DRAWN BY A. JANOCHA	DATE 2/23/04	POTENTIOMETRIC SURFACE MAP FOR LOWER PENNSYLVANIAN WATER-BEARING UNIT - JANUARY 24, 2004 SWMU 16 - CAST HIGH EXPLOSIVES FILL/BUILDING 146 INCINERATOR NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER 7448
CHECKED BY J. LUCAS	DATE 3/17/04		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 4 - 9 REV 0