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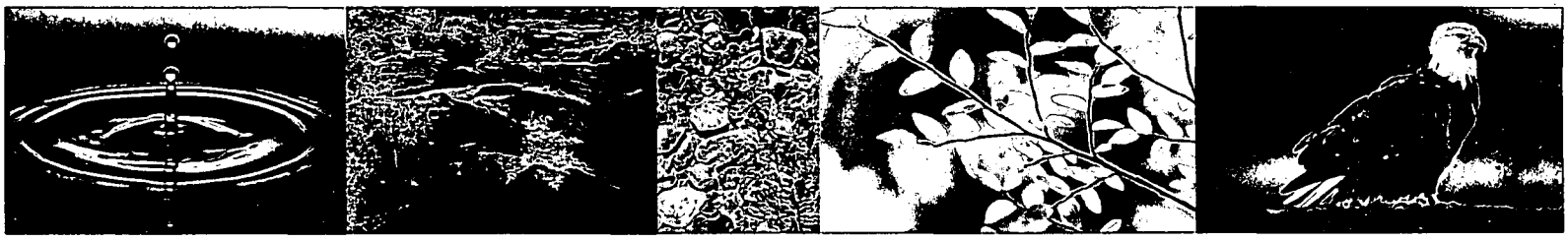

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Monitored Natural Attenuation Report
for
Mine Fill A (SWMU 12)

Round No. 3

Naval Surface Warfare Center Crane
Crane, Indiana

Contract Task Order 0357

December 2005

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

TETRA TECH NUS, Inc.

REVISION 0
DECEMBER 2005

MONITORED NATURAL ATTENUATION REPORT FOR MINE FILL A (SWMU 12)

ROUND NO. 3

NAVAL SURFACE WARFARE CENTER, CRANE
CRANE, INDIANA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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LIST OF ACRONYMS

µg/L	micrograms per liter
asml	above mean sea level
CMS	Corrective Measures Study
DNX	hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
DO	Dissolved Oxygen
IRA	Interim Removal Action
MFA	Mine Fill A
mL	milliliters
Mgd	Mississippian Glen Dean Water Bearing Zone
MNA	Monitored natural attenuation
MNX	hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
NSWC	Naval Surface Warfare Center
ORP	Oxidation-reduction potential
Puz	Upper Pennsylvanian Water Bearing Zone
Pmz	Middle Pennsylvanian Water Bearing Zone
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RDX	Royal demolition explosive
RFI	RCRA Facility Investigation
SOPs	Standard operating procedures
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit
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 Mine Fill A (MFA), also known as solid waste management unit (SWMU) 12. The purpose of the RFI was to determine whether explosives in groundwater, surface water, or sediment present unacceptable risk, or if any residual explosives in soil present unacceptable levels of risk to human health and the environment. The RFI was conducted at SWMU 12 in accordance with applicable RCRA corrective action requirements and provides data on the nature and extent of select explosive, metals, miscellaneous semivolatile organic compound (SVOC) and volatile organic compound (VOC) concentrations in surface soils, subsurface soils, sediment, surface water and groundwater. The RFI indicates that explosives contamination remains in soil around buildings and that explosives have migrated to groundwater and unacceptable levels of risk remain for various combinations of human and ecological receptors, with the majority of risk attributable to the use of groundwater by select human receptors.

MFA was used for the production of large mines, depth charges, rocket heads, aerial bombs, and projectiles in buildings. MFA also includes battery and soil disposal areas that are located at the extreme south end of the SWMU. In the past, explosives powders discharged from production building roof vents that accumulated on the roofs were washed down to the ground by precipitation, resulting in the contamination of soils. In addition, wastewaters containing explosives were discharged into nearby ditches. The battery area was used to dispose of AA household type batteries on the ground surface. The soil disposal area was used to dump soil and construction debris on the ground surface. During the period 1997 to 2000, an interim removal action (IRA) was conducted in which explosive-contaminated soils were removed for treatment via bioremediation. Treated soils were then placed into the excavations from which the contaminated soils were removed. Just prior to the MFA battery area IRA, the batteries were all but unrecognizable, and only their inner cores were visible on the ground surface. MFA is currently used as a renovation facility for explosives-loaded bombs, demilitarized gas generators, and paint bombs.

A corrective measures study (CMS) will be conducted at SWMU 12. Among the remedial alternatives expected to be evaluated will be the potential for natural attenuation to reduce concentrations of explosives in the groundwater. 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). In order to determine whether residual explosives are naturally degrading at SWMU 12, a long-term groundwater monitoring plan for explosives and explosives degradation products is being conducted. The long-term monitoring program, as planned, consists of nine rounds of sampling to provide information on trends in groundwater concentrations of explosives and explosives degradation products. Recently, two rounds of quarterly groundwater, soils, sediments, seeps, and surface water sampling and analyses were completed at SWMU 12. Information regarding the results of Rounds 1 through 2 is presented in the SWMU 12 RFI (Tetra Tech NUS, Inc. [TtNUS], 2005). Recently, Round 3 only included groundwater and surface water sampling.

The purpose of this report is to present the results of groundwater and surface water monitoring activities in Round 3, including field documentation, and to provide the framework for evaluation of data once all nine rounds have been completed. Field documentation associated with Round 3 is provided in Appendices A, B, and C of this report. Appendices D and E present analytical results for Round 3 and potentiometric surface maps for groundwater elevations obtained in Round 2, respectively. 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 12. Information obtained from the long term monitoring program will be used in the CMS to evaluate the effectiveness of MNA. The MNA monitoring program being conducted at SWMU 12 meets the U.S. EPA Region V MNA requirements.

2.0 FIELD INVESTIGATION

This section presents sampling activities, procedures, and documentation utilized during Round 3 field operations performed in 2005 for NSWC Crane SWMU 12.

2.1 OVERVIEW

Field activities for Round 3 were conducted in May 2005. All work performed for Round 3 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. Copies of all field forms, records, field logbooks, and health and safety documentation associated with the Round 3 field investigation are provided in Appendices A through C of this document.

2.2 SAMPLING OPERATIONS

This section describes the methodology for surface water and groundwater sampling activities performed at SWMU 12 during Round 3. Table 2-1 contains well construction information and water level/elevation data for Rounds 1, 2, and 3. A listing of all SWMU 12 sample analytical fractions conducted for groundwater and surface water in Round 3 is provided in Table 2-2. Further discussion of the target analytes for each fraction in Round 3 sampling is discussed in Section 3 of the QAPP Addendum No. 2. Instruments used in the field were calibrated daily prior to use according to manufacturer's requirements and in accordance with all applicable standard operating procedures (SOPs). No nonconformances or suspected deficiencies occurred during sampling in Round 3.

2.2.1 Groundwater Purging and Sampling

During Round 3, the groundwater monitoring wells were sampled by peristaltic pump, bladder pump, or Teflon bailer. Groundwater quality parameters including pH, specific conductance, temperature, dissolved oxygen (DO), and oxidation reduction potential (ORP) were measured during purging at 5- to 10-minute intervals using a YSI Model 600 series multi-parameter water quality meter and flow-through cell. Longer intervals were used for slower pumping wells. Water levels and pumping rates were also measured during purging at 5- to 10-minute intervals. Purging continued until a minimum of one well volume was removed and the above parameters stabilized, or until the well had been purged for 4 hours, in accordance with SOP CTO166-16 and SOP CTO166-15. 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 21 proposed groundwater samples were collected at SWMU 12 during Round 3 (See Table 2-2). All pertinent field data were recorded on a groundwater sample log sheet (see Appendix A.1.1). Monitoring well 12MWT30 was sampled and approximately 100 milliliters (mL) was collected prior to the well drying out. The well was revisited the following day and was still dry. See Figure 2-1 for all groundwater sampling locations.

2.2.2 Surface Water Sampling

Surface water samples were collected from intermittent streams, drainage ditches, and surface runoff locations in Round 3 throughout SWMU 12. All samples were collected at previously sampled locations which had been marked with a labeled, wooden survey stake, and fluorescent flagging to facilitate relocation of the sample locations.

All eight proposed surface water samples were collected during Round 3 and were analyzed for select explosives (See Table 2-2). 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 to monitor both field and laboratory procedures. The procedures for collecting these QA/QC samples are detailed in the approved QAPP Addendum No 2. The QA/QC samples included field duplicates, equipment rinsate blanks, source water blanks, and temperature blanks.

2.4 WATER LEVEL MEASUREMENTS AND AQUIFER TESTING

2.4.1 Groundwater Level Measurements

A complete synoptic round of water levels for all SMWU 12 groundwater wells was taken in Round 3. The synoptic water level measurements were obtained within a 24 to 48 hour time period. Measurements were taken with an electrical water level indicator (M-scope), using the top of the riser pipe as the reference point to determine water depth for monitoring wells and using a surveyed mark for staff gauge

measurements. All measurements were taken in accordance with the specific SOP identified in the QAPP Addendum No. 2. A mark was placed at the top of the riser pipe to ensure that measurements were taken from a consistent reference point. Water level measurements and staff gauge measurements were recorded to the nearest 0.01 foot on groundwater level measurement forms, which are provided in Appendix A.3 of this document. Table 2-1 contains water level/elevation data.

TABLE 2-1

MONITORING WELL CONSTRUCTION INFORMATION AND
WATER LEVEL MEASUREMENTS FOR ROUNDS 1, 2, AND 3
SWMU 12 (MINE FILL A)
ROUND 3
NSWC CRANE
CRANE, INDIANA

Well or Gauge Number	Installation Date	Northing (feet)	Easting (feet)	Ground Elevation (feet amsl)	Top of Riser or Reference Point Elevation (feet amsl)	Total Depth (feet bgs)[1]	Screened Interval				Water-Bearing Zone	October 17, 2004		December 15, 2004		January 18, 2005		May 18, 2005	
												Round 1		Round 1		Round 2		Round 3	
							Top (feet bgs)	Bottom (feet bgs)	Top (feet amsl)	Bottom (feet amsl)		Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)
MONITORING WELLS																			
12MWT01	7/24/04	1312852.79	3026150.48	724.06	726.87	35.0	24.00	34.00	700.06	690.06	Puz	11.10	715.77	9.68	717.19	9.34	717.53	9.27	717.60
12MWT02	7/25/04	1312701.31	3026218.56	723.57	725.64	29.0	18.00	28.00	705.57	695.57	Puz	10.02	715.62	8.63	717.01	8.32	717.32	8.25	717.39
12MWT03	8/31/04	1312747.34	3026026.90	732.39	734.44	26.0	15.00	25.00	717.39	707.39	Puz	16.91	717.53	16.21	718.23	16.00	718.44	15.29	719.15
12MWT04	9/10/04	1312647.57	3026082.64	728.62	730.74	25.0	14.00	24.00	714.62	704.62	Puz	14.94	715.80	13.67	717.07	13.35	717.39	13.29	717.45
12MWT05	9/8/04	1312511.09	3026137.13	722.90	725.36	25.0	14.00	24.00	708.90	698.90	Puz	10.12	715.24	8.72	716.64	8.41	716.95	8.41	716.95
12MWT06	8/15/04	1311833.50	3026562.65	724.59	726.70	24.0	13.00	23.00	711.59	701.59	Puz	9.54	717.16	10.51	716.19	10.75	715.95	10.18	716.52
12MWT07	8/27/04	1311707.13	3026615.62	726.03	728.40	25.0	14.00	24.00	712.03	702.03	Puz	11.80	716.60	13.05	715.35	13.42	714.98	12.62	715.78
12MWT08	7/25/04	1311609.35	3026660.10	726.73	728.83	24.0	13.00	23.00	713.73	703.73	Puz	12.03	716.80	13.05	715.78	13.19	715.64	12.71	716.12
12MWT09	8/29/04	1311595.76	3026580.09	725.78	728.00	25.0	14.00	24.00	711.78	701.78	Puz	13.44	714.56	13.60	714.40	13.40	714.60	12.37	715.63
12MWT10	8/11/04	1311456.81	3026649.95	723.84	726.68	25.0	14.00	24.00	709.84	699.84	Puz	15.17	711.51	14.67	712.01	14.19	712.49	13.17	713.51
12MWT11	8/14/04	1313014.33	3026776.15	738.45	740.79	25.0	14.00	24.00	724.45	714.45	Puz	15.55	725.24	12.96	727.83	12.88	727.91	13.01	727.78
12MWT12	8/14/04	1312972.30	3026791.19	739.51	741.66	25.0	14.00	24.00	725.51	715.51	Puz	13.03	728.63	10.61	731.05	9.95	731.71	10.18	731.48
12MWT13	7/31/04	1313060.01	3026835.37	733.55	735.81	21.0	10.00	20.00	723.55	713.55	Puz	8.21	727.60	5.30	730.51	4.63	731.18	4.83	730.98
12MWT14	8/31/04	1312965.79	3026875.34	734.54	736.67	26.0	15.00	25.00	719.54	709.54	Puz	19.51	717.16	20.05	716.62	20.75	715.92	21.28	715.39
12MWT15	8/31/04	1312876.08	3026906.85	734.40	736.74	25.0	14.00	24.00	720.40	710.40	Puz	16.32	720.42	18.52	718.22	19.17	717.57	18.24	718.50
12MWT16	8/14/04	1312096.13	3027182.94	743.63	745.97	25.0	14.00	24.00	729.63	719.63	Puz	20.97	725.00	21.95	724.02	22.13	723.84	21.62	724.35
12MWT17	8/15/04	1312047.38	3027205.14	744.84	747.23	26.0	15.00	25.00	729.84	719.84	Puz	22.79	724.44	24.11	723.12	24.63	722.60	23.73	723.50
12MWT18	8/27/04	1312114.82	3027253.63	743.93	745.94	26.0	15.00	25.00	728.93	718.93	Puz	21.55	724.39	22.61	723.33	23.06	722.88	22.68	723.26
12MWT19	8/28/04	1312026.45	3027292.38	744.55	746.89	27.0	16.00	26.00	728.55	718.55	Puz	25.83	721.06	27.06	719.83	27.77	719.12	27.68	719.21
12MWT20	9/1/04	1311919.40	3027337.61	744.40	746.56	26.0	15.00	25.00	729.40	719.40	Puz	23.86	722.70	24.97	721.59	25.35	721.21	25.45	721.11
12MWT21	9/12/04	1312878.00	3026436.50	735.16	737.72	25.0	14.00	24.00	721.16	711.16	Puz	21.42	716.30	19.92	717.80	19.54	718.18	19.46	718.26
12MWT22	9/11/04	1311937.84	3026901.94	737.50	739.74	25.0	14.00	24.00	723.50	713.50	Puz	16.56	723.18	17.40	722.34	17.71	722.03	17.10	722.64
12MWT23	8/10/04	1311150.87	3027466.57	737.29	739.75	31.0	20.00	30.00	717.29	707.29	Puz	27.20	712.55	28.22	711.53	28.65	711.10	21.89	717.86
12MWT24	8/10/04	1310974.75	3027184.02	738.28	740.60	31.0	20.00	30.00	718.28	708.28	Puz	32.07	708.53	32.38	708.22	32.34	708.26	32.35	708.25

TABLE 2-1

MONITORING WELL CONSTRUCTION INFORMATION AND
WATER LEVEL MEASUREMENTS FOR ROUNDS 1, 2, AND 3
SWMU 12 (MINE FILL A)
ROUND 3
NSWC CRANE
CRANE, INDIANA

Well or Gauge Number	Installation Date	Northing (feet)	Easting (feet)	Ground Elevation (feet amsl)	Top of Riser or Reference Point Elevation (feet amsl)	Total Depth (feet bgs)(1)	Screened Interval				Water-Bearing Zone	October 17, 2004		December 15, 2004		January 18, 2005		May 18, 2005	
												Round 1		Round 1		Round 2		Round 3	
							Top (feet bgs)	Bottom (feet bgs)	Top (feet amsl)	Bottom (feet amsl)		Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)
12MWT24A	8/16/04	1310968.91	3027192.97	737.99	740.53	54.0	44.00	54.00	693.99	683.99	Puz	34.68	705.85	35.00	705.53	35.23	705.30	34.93	705.60
12MWT25	9/12/04	1313924.59	3026269.42	746.55	748.66	26.0	15.00	25.00	731.55	721.55	Puz	17.80	730.86	17.35	731.31	17.35	731.31	16.55	732.11
12MWT26	9/12/04	1313638.57	3025981.12	741.64	743.72	25.0	14.00	24.00	727.64	717.64	Puz	10.56	733.16	10.91	732.81	11.01	732.71	10.02	733.70
12MWT27	9/2/04	1313736.63	3026477.23	738.42	740.52	26.0	15.00	25.00	723.42	713.42	Puz	10.96	729.56	9.35	731.17	9.24	731.28	9.18	731.34
12MWT28	8/30/04	1313506.96	3026352.09	743.27	745.53	26.0	15.00	25.00	728.27	718.27	Puz	12.96	732.57	12.78	732.75	12.78	732.75	11.8	733.73
12MWT29	9/10/04	1312653.54	3026079.78	729.13	731.23	89.0	70.00	88.00	659.13	641.13	Pmz	59.97	671.26	61.20	670.03	61.34	669.89	59.83	671.40
12MWT30	8/29/04	1311604.34	3026576.32	725.67	727.59	90.5	70.00	90.00	655.67	635.67	Pmz	92.71	634.88	92.74	634.85	92.69	634.90	92.56	635.03
12MWT31	8/30/04	1312970.99	3026872.87	734.55	736.75	89.0	68.00	88.00	666.55	646.55	Pmz	85.17	651.58	68.86	667.89	68.72	668.03	67.87	668.88
12MWT32	9/1/04	1312015.49	3027297.24	744.51	747.44	100.0	79.00	99.00	665.51	645.51	Pmz	68.55	678.89	85.93	661.51	86.11	661.33	84.75	662.69
12MWT33	9/2/04	1313725.86	3026481.26	738.32	740.49	95.0	74.00	94.00	664.32	644.32	Pmz	44.99	695.50	42.44	698.05	41.80	698.69	41.34	699.15
12MWT34	8/13/04	1310967.35	3027183.73	738.02	740.52	87.0	76.00	86.00	662.02	652.02	Pmz	88.42	652.10	88.32	652.20	88.12	652.40	87.98	652.54
12MWT35	8/27/04	1312711.38	3027111.95	732.17	734.64	27.0	16.00	26.00	716.17	706.17	Puz	12.33	722.31	12.53	722.11	12.70	721.94	12.11	722.53
12MWT36	8/27/04	1312466.54	3027186.16	736.51	738.63	26.0	15.00	25.00	721.51	711.51	Puz	13.15	725.48	14.19	724.44	14.58	724.05	14.12	724.51
12MWT37	7/29/04	1311630.57	3027496.41	736.35	738.77	25.0	14.00	24.00	722.35	712.35	Puz	22.20	716.57	25.74	713.03	26.24	712.53	25.98	712.79
12MWT38	9/11/04	1312353.89	3026531.17	726.05	728.03	25.0	14.00	24.00	712.05	702.05	Puz	10.03	718.00	10.64	717.39	10.63	717.40	9.69	718.34
12MWT39	7/30/04	1311015.63	3027662.97	735.33	737.64	35.0	24.00	34.00	711.33	701.33	Puz	35.83	701.81	36.05	701.59	35.82	701.82	35.56	702.08
12MWT40	8/12/04	1310616.56	3027037.67	725.37	727.50	29.0	18.00	28.00	707.37	697.37	Puz	22.23	705.27	23.11	704.39	23.18	704.32	23.04	704.46
12MWT41	10/27/04	1310642.00	3026376.75	621.30	622.97	35.0	24.00	34.00	597.30	587.30	Mgd	NA	NA	20.33	602.64	20.42	602.55	19.75	603.22
12MWT42	9/1/04	1312364.70	3026127.28	717.93	720.22	29.0	13.00	28.00	704.93	689.93	Puz	15.03	705.19	13.02	707.20	12.13	708.09	11.69	708.53
12MWT43	11/12/04	1310955.52	3026125.55	677.03	679.01	81.0	65.00	80.00	612.03	597.03	Plz	NA	NA	78.15	600.86	78.56	600.45	78.19	600.82
12MWT44	10/27/04	1310276.64	3026617.87	624.81	626.69	35.5	25.00	35.00	599.81	589.81	Mgd	NA	NA	26.25	600.44	26.58	600.11	26.14	600.55
12MWT45	10/29/04	1313384.30	3027614.01	688.37	691.07	25.0	14.00	24.00	674.37	664.37	Pmz	NA	NA	17.07	674.00	16.03	675.04	15.62	675.45
12MWT46	10/30/04	1312828.63	3027864.12	673.31	675.67	24.5	14.00	24.00	659.31	649.31	Pmz	NA	NA	16.07	659.60	16.02	659.65	15.80	659.87
12MWT47	10/31/04	1312455.99	3028025.00	660.79	663.12	25.0	14.00	24.00	646.79	636.79	Pmz	NA	NA	12.85	650.27	12.67	650.45	14.00	649.12
12MWT48	11/9/04	1312052.61	3028122.50	647.84	650.05	30.0	19.00	29.00	628.84	618.84	Pmz	NA	NA	30.50	619.55	30.41	619.64	30.36	619.69

TABLE 2-1

MONITORING WELL CONSTRUCTION INFORMATION AND
WATER LEVEL MEASUREMENTS FOR ROUNDS 1, 2, AND 3
SWMU 12 (MINE FILL A)
ROUND 3
NSWC CRANE
CRANE, INDIANA

Well or Gauge Number	Installation Date	Northing (feet)	Easting (feet)	Ground Elevation (feet amsl)	Top of Riser or Reference Point Elevation (feet amsl)	Total Depth (feet bgs)(1)	Screened Interval				Water-Bearing Zone	October 17, 2004		December 15, 2004		January 18, 2005		May 18, 2005	
												Round 1		Round 1		Round 2		Round 3	
							Top (feet bgs)	Bottom (feet bgs)	Top (feet amsl)	Bottom (feet amsl)		Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)	Depth to Water (feet btor)	Water Elevation (feet amsl)
12MWT49	11/10/04	1310956.27	3028138.17	616.96	619.25	30.0	19.00	29.00	597.96	587.96	Mgd	NA	NA	30.03	589.22	25.66	593.59	26.24	593.01
12MWT50	10/29/04	1310582.27	3028100.87	606.85	609.01	35.0	24.00	34.00	582.85	572.85	Mgd	NA	NA	DRY	NA	35.34	573.67	34.76	574.25
WES-7-1-81	—	1309481.87	3026477.49	628.95	631.95	41.5	27.02	36.20	601.93	592.75	Plz	NA	NA	NA	NA	20.41	611.54	19.86	612.09
WES-7-2-81	—	1309501.85	3026589.93	601.72	604.72	35.0	20.27	29.62	581.45	572.10	Mgd	NA	NA	NA	NA	34.26	570.46	33.93	570.79
WES-7-3-81	—	1309677.40	3026457.16	596.22	599.22	38.0	23.40	32.72	572.82	563.50	Mgd	NA	NA	NA	NA	28.82	570.40	27.11	572.11
WES-7-4-81	—	1309586.54	3026531.10	595.22	598.22	39.0	24.31	33.64	570.91	561.58	Mgd	NA	NA	NA	NA	26.53	571.69	26.23	571.99
WES-7-5-81	—	1309640.94	3026503.16	593.50	596.50	39.0	24.30	33.65	569.20	559.85	Mgd	NA	NA	NA	NA	24.25	572.25	23.98	572.52
STAFF GAUGES																			
12SG01	10/14/04	1313149.25	3026817.59	NA	730.97	NA	NA	NA	NA	NA	NA	NA	NA	3.19	NA	Dry	NA	Dry	NA
12SG02	10/14/04	1312731.07	3027125.37	NA	731.64	NA	NA	NA	NA	NA	NA	NA	NA	Dry	NA	Dry	NA	Dry	NA
12SG03	10/14/04	1312335.43	3027317.19	NA	735.03	NA	NA	NA	NA	NA	NA	NA	NA	1.87	NA	Dry	NA	1.92	733.11
12SG04	10/14/04	1311657.15	3027481.28	NA	736.72	NA	NA	NA	NA	NA	NA	NA	NA	4.50	NA	Dry	NA	4.11	732.61
12SG05	10/14/04	1310844.41	3026971.44	NA	724.28	NA	NA	NA	NA	NA	NA	NA	NA	Dry	NA	Dry	NA	Dry	NA
12SG06	10/14/04	1312141.14	3026445.52	NA	713.38	NA	NA	NA	NA	NA	NA	NA	NA	3.75	NA	3.95	NA	Dry	NA
12SG07	10/14/04	1312447.98	3026302.90	NA	713.45	NA	NA	NA	NA	NA	NA	NA	NA	4.28	NA	4.26	NA	4.27	709.18
12SG08	10/14/04	1316378.17	3028951.05	NA	668.56	NA	NA	NA	NA	NA	NA	NA	NA	5.05	NA	5.23	NA	5.74	662.82
12SG09	10/14/04	1308584.68	3028722.93	NA	529.35	NA	NA	NA	NA	NA	NA	NA	NA	17.24	NA	17.40	NA	17.40	511.95
12SG10	10/14/04	1307698.34	3029600.29	NA	517.21	NA	NA	NA	NA	NA	NA	NA	NA	14.58	NA	14.69	NA	14.69	502.52
12SG11	10/14/04	1305640.98	3027744.30	NA	513.47	NA	NA	NA	NA	NA	NA	NA	NA	20.00	NA	19.94	NA	19.90	493.57
12SG12	10/14/04	1308475.83	3027438.49	NA	538.45	NA	NA	NA	NA	NA	NA	NA	NA	6.02	NA	6.05	NA	6.06	532.39

Notes:

1 = Total depth of boring, total depth of well may be less.
amsl = Above mean sea level (NAVD88).
bgs = Below ground surface.
btor = Below top of riser/reference point.
Mgd = Mississippian (Glen Dean) aquifer
NA = Not applicable.
NAVD = North American Vertical Datum
Plz = Lower Pennsylvanian water-bearing zone
Puz = Upper Pennsylvanian water-bearing zone

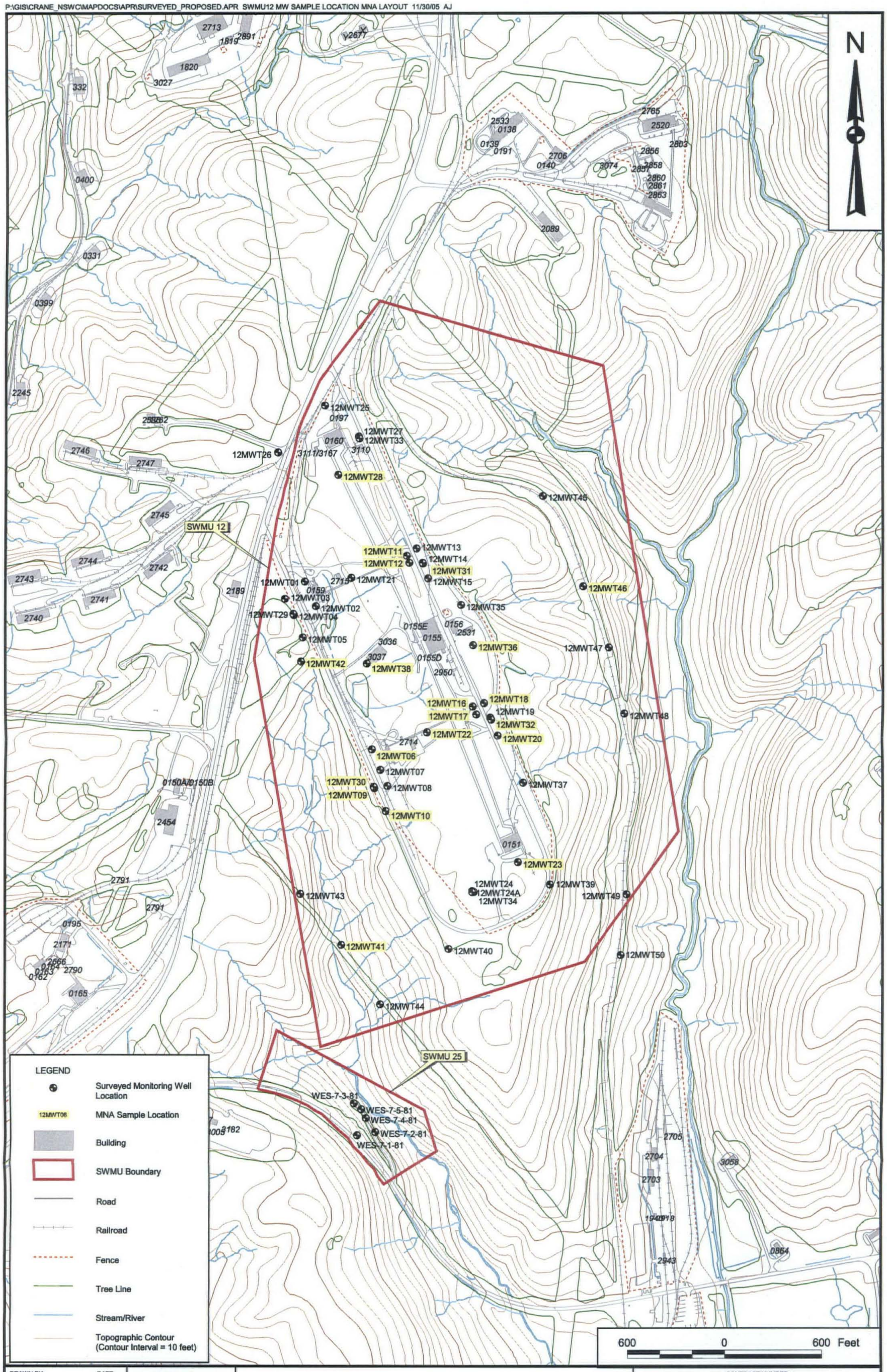
TABLE 2-2

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSES
SWMU 12 - MINE FILL A
ROUND 3
NSWC CRANE
CRANE, INDIANA

Sample Number	Analytical Fraction		
	Explosives		Miscellaneous
	Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846 8330, Modified	Nitrate + Nitrite (as N) EPA 353.2
Groundwater (Round 3)			
12GWT0303	X		
12GWT0603	X		
12GWT0903	X		
12GWT1003	X		
12GWT1103	X		
12GWT1203	X		
12GWT1603	X		
12GWT1703	X		
12GWT1803	X		
12GWT2003	X		
12GWT2203	X		
12GWT2303	X		
12GWT2803	X		
12GWT3001	X		
12GWT3103	X		
12GWT3203	X		
12GWT3603	X		
12GWT3803	X		
12GWT4103	X		
12GWT4203	X		
12GWT4703	X		
GW TOTALS	**21**	**0**	**0**
Surface Water (Round 3)			
12SW0903	X		
12SW1103	X		
12SW1403	X		
12SW2403	X		
12SW2503	X		
12SW2703	X		
12SW3102	X		
12SW3402	X		
SW TOTALS	**8**	**0**	**0**

X = Sample was collected as proposed.

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SURVEYED_PROPOSED.APR SWMU12 MW SAMPLE LOCATION MNA LAYOUT 11/30/05 AJ



DRAWN BY	DATE
A. JANOCHA	11/17/05
CHECKED BY	DATE
J. LUCAS	11/30/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

SURVEYED MONITORING WELL LOCATIONS

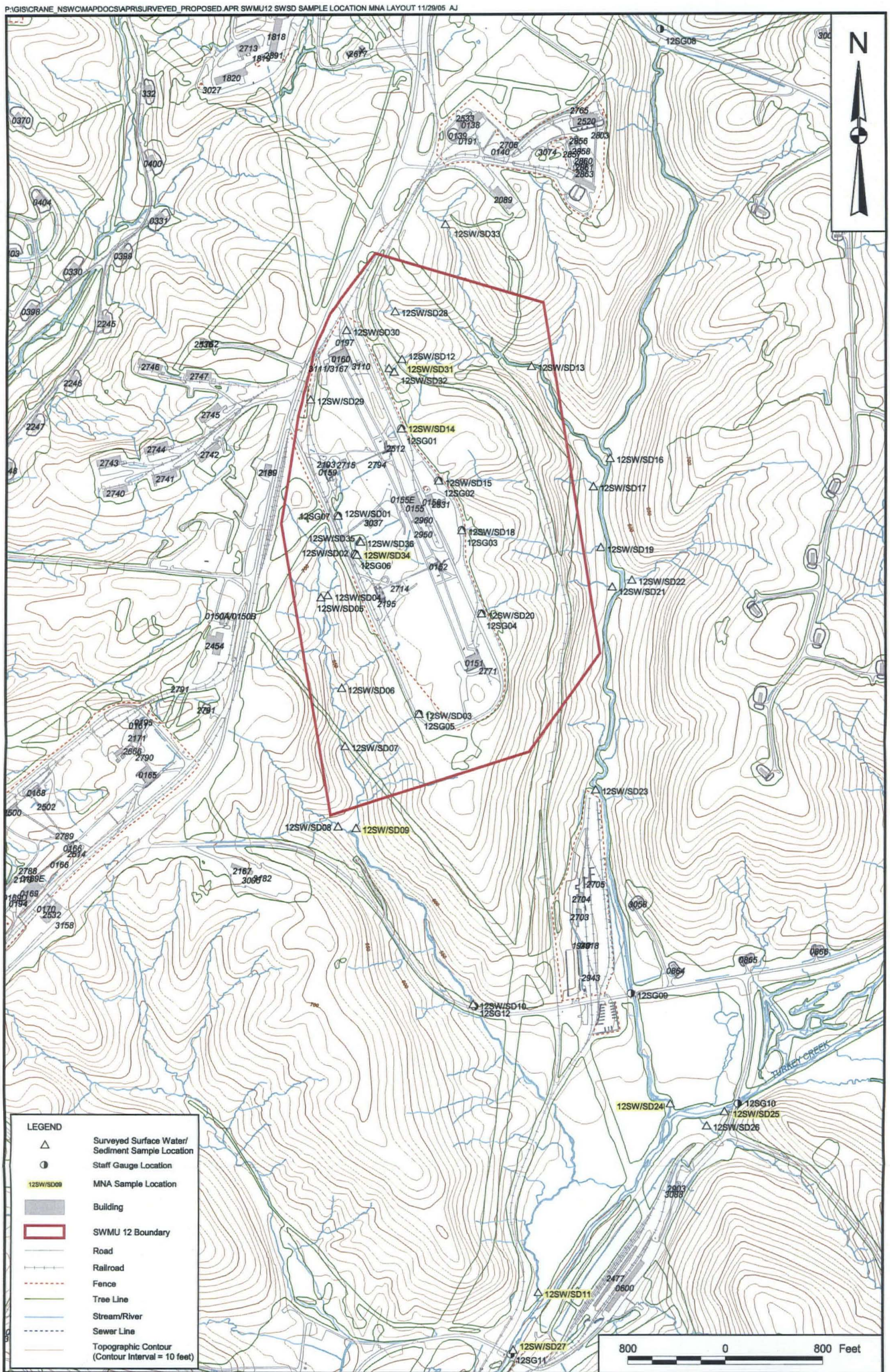
SWMU 12 - MINE FILL A AND SWMU 25 - HIGHWAY 58 DUMP SITE A

NSWC CRANE

CRANE, INDIANA

CONTRACT NUMBER	
CTO 0343	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 2 - 1	REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SURVEYED_PROPOSED.APR SWMU12 SWSD SAMPLE LOCATION MNA LAYOUT 11/29/05 AJ



DRAWN BY	DATE
A. JANOCHA	11/17/05
CHECKED BY	DATE
J. LUCAS	11/30/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

SURVEYED SURFACE WATER/SEDIMENT SAMPLE
AND STAFF GAUGE LOCATIONS
SWMU 12 - MINE FILL A
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

CONTRACT NUMBER	
CTO 0343	
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
DRAWING NO.	REV
FIGURE 2 - 2	0

3.0 DATA PRESENTATION

This section presents the analytical results for groundwater and surface water sampling conducted in Round 3 at SMWU 12 (see Tables 3-1 to 3-8). Analytical results for Rounds 1 through 2 are also provided to support data evaluation which is discussed in Section 4. Appendix D contains a summary of analytical results for groundwater and surface water samples collected in Round 3.

As stated previously, the SWMU 12 RFI indicated that explosives contamination remains in soil around SWMU 12 buildings and explosives have migrated to groundwater and surface water. RDX was identified as the most frequently detected explosive in groundwater and surface water. As a result, RDX is being considered as a parent compound for evaluating the effectiveness of natural attenuation at SWMU 12. 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). As a result, the presentation and interpretation of analytical results in Sections 3 and 4 for SWMU 12 monitoring will focus on RDX and its associated degradation products.

3.1 GROUNDWATER DATA

Groundwater analytical results for Rounds 1 through 3 at SWMU 12 are presented in Tables 3-1 through 3-6 for select monitoring well locations in the Upper and Middle Pennsylvanian, and the Mississippian Glen Dean Water Bearing Zones. These tables show a listing of concentrations for explosives, explosive degradation products, and miscellaneous field parameters, along with descriptive statistics for Round 4. Concentrations are presented in micrograms per liter (µg/L) and data validation qualifiers, as applicable. Due to the staggered nature of the groundwater sampling, not all wells were sampled in each of the three rounds of sampling.

3.1.1 Upper Pennsylvania Water Bearing Zone (Puz)

Monitoring results for Round 3 groundwater sampling at the Puz monitoring wells is presented in Table 3-1. As shown in Table 3-1, explosives were detected at wells 12MWT06, 12MWT09, 12MWT10, 12MWT11, 12MWT16, 12MWT17, 12MWT18, 12MWT20, 12MWT22, 12MWT38, and 12MWT42. No explosives were detected at wells 12MWT03 and 12MWT28. Well location 12MWT28 is considered to be upgradient of SWMU 12. Analytical data was not available for DNX, MNX, and TNX in Round 4 because groundwater samples were not analyzed for these parameters.

Table 3-2 presents descriptive statistics for monitoring results from Round 3 and indicates that RDX and HMX were the most frequently detected explosives in Round 3. The concentrations of RDX ranged from 4.2 micrograms per liter (µg/L) at 12MWT20 to 6,500 µg/L at 12MWT16. High RDX concentrations were also detected at wells 12MWT06 (5,000 µg/L) and 12MWT11 (4,100 µg/L). Groundwater concentrations of HMX ranged from 0.64 µg/L at 12MWT38 to 450 µg/L at 12MWT16. Several other explosives were also detected at monitoring wells 12MWT06, 12MWT09, 12MWT11, 12MWT16, and 12MWT22, but on a less frequent basis. These additional explosives included 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-trnitrotoluene (TNT), 2,4-diamino-6-nitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 3,5-dinitroaniline, and 4-amino-2,6-dinitrotoluene.

It is important to note that all target explosives were reported as non-detect at well 12MWT16 in Round 3. These results are questionable because there were positive detections of several explosives reported in Rounds 1 and 2. Conversely, well 12MWT32, located in the middle Pennsylvania Water Bearing Zone (Pmz), exhibited several cases of detections for explosives in Round 3, subsequent to reporting non-detections for all explosives in Rounds 1 and 2. When the results for Round 3 at well 12MWT32 are switched with the Round 3 results for 12MWT32, the concentration values for both wells relative to results for Rounds 1 and 2 appear reasonable because the concentrations are rendered consistent from round to round within each well. It appears that the Round 3 sample results for 12MWT16 and 12MWT32 were somehow switched. Assuming this was the case, concentration values for explosives in Round 3 at wells 12MWT16 and 12MWT32 were switched in Tables 3-1 and 3-3.

3.1.2 Middle Pennsylvania Water Bearing Zone (Pmz)

Monitoring results for sampling at the Lower Pennsylvanian Water Bearing Zone (Pmz) wells are presented in Table 3-3. Table 3-4 shows descriptive statistics for Round 4 detections and field parameters. In Round 4, there was only one detection for explosives and no detections of degradation products. The explosive 2-nitrotoluene was detected at well 12MWT30 (3.2 µg/L). As indicated in Section 3.1.1, an apparent sample switch occurred in Round 3 for samples collected at wells 12MWT16 (Puz) and 12MWT32 (Pmz). The analytical results for explosives presented in Table 3-3 for well 12MWT32 are the concentrations switched with well 12MWT16 (Table 3-1).

3.1.3 Mississippi Glen Dean Water Bearing Zone (Mgd)

Monitoring results for sampling conducted in the Mississippian Glen Dean (Mgd) water bearing zone in Round 3 are presented in Table 3-5. In Round 3, there were no detections of explosives or degradation

products. Through Round 3 there have been no positive detections of explosives. A summary of descriptive statistics for Round 3 field parameters is presented in Table 3-6.

3.2 SURFACE WATER DATA

Surface water analytical results for Round 3 are presented in Table 3-7, along with a statistical summary in Table 3-8. In Round 3, there were several detections of explosives; however, no detections of RDX degradation products. The most frequently detected explosives were RDX and HMX. RDX was detected in all downgradient surface water samples with concentrations ranging from 0.28 µg/L at 12SW27 to 99 µg/L at 12SW34. HMX was detected in five of the seven downgradient locations with concentrations ranging from 2 µg/L at 12SW11 to 35 µg/L at 12SW34.

Several other explosives were detected in Round 3 surface water samples. For example, the explosive 4-amino-2,6-dinitrotoluene was detected in five downgradient locations at concentrations ranging from 0.41 µg/L at 12SW24 to 51 µg/L at 12SW31. The other explosives detected in Round 3 on a less frequent basis and generally at low concentrations were 1,3,5-trinitrotoluene, 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, and 2-amino-4,6-dinitrotoluene.

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT03									12MWT06									12MWT09								
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	09/27/04	03/03/05	05/22/05							09/14/04	02/21/05	05/21/05							09/10/04	03/02/05	05/21/05						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	0.27 U	0.284 U	0.264 U							16	19	15							0.264 U	0.271 U	0.25 U						
1,3-DINITROBENZENE	0.27 U	0.284 U	0.264 U							8	8.9	7.4							0.264 U	0.271 U	0.25 U						
2,4,6-TRINITROTOLUENE	0.27 U	0.284 U	0.264 U							160	170	140							0.264 U	0.271 U	0.25 U						
2,4-DIAMINO-6-NITROTOLUENE	0.27 U	0.284 U								4.9 J	7.8 J								0.264 U	0.271 U							
2,4-DINITROTOLUENE	0.27 U	0.284 U	0.264 U							2.4 J	0.24 U	0.269 U							0.264 U	0.271 U	0.25 U						
2,6-DIAMINO-4-NITROTOLUENE	0.27 U	0.284 U								0.255 U	0.24 U								0.264 U	0.271 U							
2,6-DINITROTOLUENE	0.27 U	0.284 U	0.264 U							9.8 J	0.24 U	12							0.264 U	0.34 J	0.25 U						
2-AMINO-4,6-DINITROTOLUENE	0.27 U	0.284 U	0.264 U							32 J	40 J	68							5.4 J	4 J	4 J						
2-NITROTOLUENE	0.27 U	0.284 U	0.264 U							0.255 U	0.24 U	0.269 U							0.264 U	0.271 U	0.25 U						
3,5-DINITROANILINE	0.27 U	0.284 U								4.6	9.4								0.264 U	0.271 U							
3-NITROTOLUENE	0.27 U	0.284 U	0.264 U							0.255 U	0.24 U	0.269 U							0.264 U	0.271 U	0.25 U						
4,4'-TN-AZOXY	0.532 U	0.568 U								0.51 U	0.48 U								0.528 U	0.542 U							
4-AMINO-2,6-DINITROTOLUENE	0.27 U	0.284 U	0.264 U							34	53	62 J							7.3	5.2	4.6						
4-NITROTOLUENE	0.27 U	0.284 U	0.264 U							0.255 U	5.8 J	0.269 U							0.264 U	0.271 U	0.25 U						
DNX	0.27 U	0.284 U								1.6 J	1.9 J								0.264 U	0.271 U							
HMX	0.27 U	0.284 U	0.264 U							400	530	420							65	64	52						
MNX	0.27 U	0.284 U								23	30								0.264 U	0.33 J							
NITROBENZENE	0.27 U	0.284 U	0.264 U							0.255 U	0.24 U	0.269 U							0.264 U	0.271 U	0.25 U						
RDX	0.27 U	0.284 U	0.264 U							6300 J	7200	5000							480 J	510	370						
TETRYL	0.27 U	0.284 U	0.264 U							0.255 U	0.24 U	0.269 U							0.264 U	0.271 U	0.25 U						
TNX	0.27 U	0.284 U								0.255 U	0.74 J								0.264 U	0.271 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	2.66	12.29	3.32							5.67	3.51	1.27							4.61	5.57	0.99						
OXIDATION REDUCTION POTENTIAL (MV)	13.9	26	66							65	91	253.7							140	370.2	375						
PH (S.U.)	7.25	6.32	6.07							5.85	5.2	4.17							5.04	4.25	4.26						
SPECIFIC CONDUCTANCE (MS/CM)	1.638	1.425	1.205							0.282	0.265	0.317							0.403	0.313	0.257						
TEMPERATURE (°C)	14.58	12.55	16.3							17.35	11.39	13.69							18.78	10.31	14.69						
TURBIDITY (NTU)	303	7.71	290							0.75	0.28	0.1							6.99	2.31	3.3						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.11 J	0.15								0.005 U	0.01 UJ								0.005 U	0.01 U							
NITRITE/NITRATE-N	0.05 U	0.05 U								3.3 J	1.8								1.8 J	0.3							

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT10									12MWT11									12MWT12								
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	09/25/04	02/07/05	05/19/05							09/13/04	02/22/05	05/19/05							09/14/04	02/22/05	05/19/05						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	0.27 U	0.264 U	0.248 U							110	110	99							0.26 U	0.24 U	0.269 U						
1,3-DINITROBENZENE	0.27 U	0.264 U	0.248 U							4	6.3	7.5							0.26 U	0.24 U	0.269 U						
2,4,6-TRINITROTOLUENE	0.27 U	0.264 U	0.248 U							110	110	110							1.4	2.9	0.32 J						
2,4-DIAMINO-6-NITROTOLUENE	0.27 U	0.264 U								69 J	75 J								0.67 J	0.24 U							
2,4-DINITROTOLUENE	0.27 U	0.264 U	0.248 U							2.8 J	0.24 U	0.264 U							0.26 U	0.24 U	0.269 U						
2,6-DIAMINO-4-NITROTOLUENE	0.27 U	0.264 U								0.266 U	0.24 U								0.26 U	0.24 U							
2,6-DINITROTOLUENE	0.27 U	0.264 U	0.248 U							8.1 J	0.24 U	11							0.29 J	0.24 U	0.269 U						
2-AMINO-4,6-DINITROTOLUENE	0.27 U	0.264 U	0.248 U							39 J	31 J	52 J							6.1 J	5.3 J	4.2 J						
2-NITROTOLUENE	0.27 U	0.264 U	0.248 U							0.45 J	0.24 U	0.264 U							0.26 U	0.24 U	0.269 U						
3,5-DINITROANILINE	0.27 U	0.264 U								11	12 J								0.91 J	0.92 J							
3-NITROTOLUENE	0.27 U	0.264 U	0.248 U							0.266 U	0.24 U	0.264 U							0.26 U	1.6 J	0.269 U						
4,4'-TN-AZOXY	0.538 U	0.528 U								0.532 U	0.48 U								0.52 U	0.48 U							
4-AMINO-2,6-DINITROTOLUENE	0.27 U	0.264 U	0.248 U							78 J	43	41							6.9	6.4	4.2						
4-NITROTOLUENE	0.27 U	0.264 U	0.248 U							0.266 U	0.24 U	4.1 R							0.26 U	0.24 U	0.269 U						
DNX	0.27 U	0.264 U								0.266 U	1.9 J								1.3 J	0.36 J							
HMX	6.6	7.6 J	5.8							490	530	430							120	89 J	98						
MNX	0.39 J	0.33 J								10 J	2.4 J								7.8	4.8							
NITROBENZENE	0.27 U	0.264 U	0.248 U							0.266 U	0.24 U	0.264 U							0.26 U	0.24 U	0.269 U						
RDX	22	30	33							3900 J	4900	4100							480 J	380	390						
TETRYL	0.27 U	0.264 U	0.248 U							0.266 U	0.24 U	0.264 U							0.26 U	0.24 U	0.269 U						
TNX	0.27 U	0.264 U								0.266 U	11 J								0.26 U	0.54 J							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	4.78	5.26	0.58							1.63	1.71	1.4							0.97	1.76	1.47						
OXIDATION REDUCTION POTENTIAL (MV)	149	387	354							190	243.7	343.5							72	56	189.7						
PH (S.U.)	4.64	4.5	3.83							3.08	3.89	3.96							6.12	6.08	6.05						
SPECIFIC CONDUCTANCE (MS/CM)	0.724	0.57	0.587							0.299	0.197	0.249							0.683	0.607	0.79						
TEMPERATURE (°C)	17.5	12.1	15.02							20.89	10.33	17.1							18.58	10.82	22.38						
TURBIDITY (NTU)	4.1	2	0.35							0.5	0.21	2.4							0.35	0.71	6.8						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.06 U	0.13								0.04	0.11								0.03	0.1							
NITRITE/NITRATE-N	0.05	0.05 U								10 J	4.8								2.9 J	4.7							

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
UPPER PENNSYLVANIA WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT16									12MWT17									12MWT18								
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	09/12/04	02/16/05	05/22/05							09/11/04	02/22/05	05/19/05							09/26/04	03/03/05	05/22/05						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	1.1 J	1.3 J	2.4 J							0.66 J	0.82 J	0.74 J							0.27 U	0.25 U	0.252 U						
1,3-DINITROBENZENE	0.271 U	0.245 U	0.25 U							0.43 J	0.34 J	0.266 U							0.27 U	0.28 J	0.252 U						
2,4,6-TRINITROTOLUENE	0.271 U	8.2	10							0.255 UJ	2.3	2.2							0.27 U	0.25 U	0.252 U						
2,4-DIAMINO-6-NITROTOLUENE	1.6 J	1.8 J								0.57 J	1.4 J								0.27 U	0.25 U							
2,4-DINITROTOLUENE	0.271 U	0.3 J	0.32 J							0.255 UJ	0.258 U	0.3 J							0.27 U	0.25 U	0.252 U						
2,6-DIAMINO-4-NITROTOLUENE	0.271 U	0.245 U								0.255 UJ	0.258 U								0.27 U	0.25 U							
2,6-DINITROTOLUENE	1.8	1.7 J	1.9							0.82 J	1.6	12 J							0.27 U	0.25 U	0.252 U						
2-AMINO-4,6-DINITROTOLUENE	76	100 J	120 J							14 J	30 J	12 J							0.27 U	0.25 U	0.252 U						
2-NITROTOLUENE	0.271 U	0.245 U	0.25 U							0.255 UJ	0.258 U	0.266 U							0.27 U	0.25 U	0.252 U						
3,5-DINITROANILINE	0.271 U	5.8								0.78 J	1.6								0.27 U	0.25 U							
3-NITROTOLUENE	0.68 J	0.245 U	0.25 U							0.255 UJ	0.258 U	0.266 U							0.27 U	0.25 U	0.252 U						
4,4'-TN-AZOXY	0.542 U	0.49 U								0.51 UJ	0.515 U								0.538 U	0.5 U							
4-AMINO-2,6-DINITROTOLUENE	160	190	210							25 J	43	41							0.27 U	0.25 U	0.252 U						
4-NITROTOLUENE	0.271 U	0.245 U	0.25 U							0.255 UJ	0.258 U	0.266 U							0.27 U	0.25 U	0.252 U						
DNX	22	18								3.7 J	6.1								0.27 U	0.25 U							
HMX	370	400	450							76 J	130	110 J							0.48 J	1 J	0.92						
MNX	250	200								44 J	79								0.27 U	0.25 U							
NITROBENZENE	0.271 U	0.245 U	0.25 U							0.255 UJ	0.258 U	0.266 U							0.27 U	0.25 U	0.252 U						
RDX	6300 J	7400	6500							1600 J	2600	2000							20	32	24						
TETRYL	0.271 U	0.245 U	0.25 U							0.255 UJ	0.258 U	0.266 U							0.27 U	0.25 U	0.252 U						
TNX	7.8	6.2								1.3 J	2								0.27 U	0.25 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	4.79	4.49	4.27							6.05	8.3	8.54							2.38	19.36	0.38						
OXIDATION REDUCTION POTENTIAL (MV)	54	101.4	246.5							144	131	249.9							41	376.6	14.9						
PH (S.U.)	6.05	6.25	4.27							5.43	5.88	4.72							4.95	4.13	4.58						
SPECIFIC CONDUCTANCE (MS/CM)	0.616	0.336	0.337							1.212	0.592	0.621							2.472	2.132	1.457						
TEMPERATURE (°C)	15.52	15.02	16.89							19.24	13.02	15.88							17	12.75	14.9						
TURBIDITY (NTU)	512	144	31							226	131	29							15	26.4	40						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.07	0.11								0.04	0.18 J								0.18 J	0.34							
NITRITE/NITRATE-N	5.7 J	4.2								4.6 J	1.7								0.71	0.05 U							

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT20									12MWT22									12MWT23								
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	09/27/04	0207/05	05/22/05							10/10/04	02/21/05	05/21/05							09/10/04	02/20/05	05/21/05						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	0.245 U	0.238 U	0.258 U							2.6	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
1,3-DINITROBENZENE	0.245 U	0.238 U	0.258 U							0.49 J	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
2,4,6-TRINITROTOLUENE	0.245 U	0.238 U	0.258 U							96	0.26 J	0.255 U							0.258 U	0.24 U	0.275 U						
2,4-DIAMINO-6-NITROTOLUENE	0.245 U	0.238 U								2.3 J	0.48 J								0.258 U	0.24 U							
2,4-DINITROTOLUENE	0.245 U	0.238 U	0.258 U							0.73	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
2,6-DIAMINO-4-NITROTOLUENE	0.245 U	0.238 U								0.266 U	0.24 U								0.258 U	0.24 U							
2,6-DINITROTOLUENE	0.245 U	0.238 U	0.258 U							2	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
2-AMINO-4,6-DINITROTOLUENE	0.245 U	0.238 U	0.258 U							5.9	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
2-NITROTOLUENE	0.245 U	0.238 U	0.258 U							0.266 U	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
3,5-DINITROANILINE	0.245 U	0.238 U								0.63 J	0.24 U								0.258 U	0.24 U							
3-NITROTOLUENE	0.245 U	0.238 U	0.258 U							0.266 U	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
4,4'-TN-AZOXY	0.49 U	0.475 U								0.532 U	0.48 U								0.515 U	0.48 U							
4-AMINO-2,6-DINITROTOLUENE	0.245 U	0.238 U								9.6	0.62	0.255 U							0.258 U	0.24 U	0.275 U						
4-NITROTOLUENE	0.245 U	0.238 U	0.258 U							0.266 U	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
DNX	0.245 U	0.238 U								0.266 U	0.24 U								0.258 U	0.24 U							
HMX	0.245 U	0.238 U	0.258 U							32	5	3.7							0.258 U	0.24 U	0.275 U						
MNX	0.245 U	0.238 U								0.81	0.43 J								0.258 U	0.24 U							
NITROBENZENE	0.245 U	0.238 U								0.266 U	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
RDX	1.4	3.1	4.2							590	34	26							0.258 U	0.24 U	0.275 U						
TETRYL	0.245 U	0.238 U	0.258 U							0.266 U	0.24 U	0.255 U							0.258 U	0.24 U	0.275 U						
TNX	0.245 U	0.238 U								0.266 U	0.24 U								0.258 U	0.24 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	2.5	4.26	0.47							6.02	6.1	5.84							5.08	1.79	1.73						
OXIDATION REDUCTION POTENTIAL (MV)	89.5	45.4	365							365.3	182.1	290.6							301	504.6	498.5						
PH (S.U.)	5.35	5.25	4.84							5.27	5.61	5.65							2.94	3.33	2.93						
SPECIFIC CONDUCTANCE (MS/CM)	2.095	1.696	1.783							0.448	0.186	0.172							6.359	4.644	5.05						
TEMPERATURE (°C)	18.4	12.07	17.33							15.13	12.51	13.54							18.14	12.66	17.46						
TURBIDITY (NTU)	1	0.8	3.8							7.79	9.66	73							218	6.8	12						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.18	0.2								0.005 UJ	0.01 UJ								8.9 J	4 J							
NITRITE/NITRATE-N	0.67	0.97								0.63	0.19								2.3 J	0.22							

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT28									12MWT36									12MWT38								
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	09/13/04	02/15/05	05/23/05							09/24/04	03/04/05	05/22/05							10/09/04	02/20/05	05/19/05						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
1,3-DINITROBENZENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
2,4,6-TRINITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
2,4-DIAMINO-6-NITROTOLUENE	0.269 U	0.242 U								0.252 U	0.24 U								0.25 U	0.242 U							
2,4-DINITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
2,6-DIAMINO-4-NITROTOLUENE	0.269 U	0.242 U								0.252 U	0.24 U								0.25 U	0.242 U							
2,6-DINITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
2-AMINO-4,6-DINITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
2-NITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
3,5-DINITROANILINE	0.269 U	0.242 U								0.252 U	0.24 U								0.25 U	0.242 U							
3-NITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
4,4'-TN-AZOXY	0.538 U	0.485 U								0.505 U	0.48 U								0.5 U	0.485 U							
4-AMINO-2,6-DINITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.26 J	0.271 U							0.25 U	0.242 U	0.252 U						
4-NITROTOLUENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
DNX	0.269 U	0.242 U								0.39 J	0.24 U								0.25 U	0.242 U							
HMX	0.269 U	0.242 U	0.271 U							6.1	6.9	5.7							0.35 J	0.71 J	0.64 J						
MNX	0.269 U	0.242 U								1.1	1.1								0.25 U	0.36 J							
NITROBENZENE	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
RDX	0.269 U	0.242 U	0.271 U							41	42	35							42	52 J	59						
TETRYL	0.269 U	0.242 U	0.271 U							0.252 U	0.24 U	0.271 U							0.25 U	0.242 U	0.252 U						
TNX	0.269 U	0.242 U								0.252 U	0.24 U								0.25 U	0.242 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	7.29	4.17	1.63							3.69	2.63	2.98							6.88	3.67	2.87						
OXIDATION REDUCTION POTENTIAL (MV)	75	82.7	237.4							332.5	222.7	232.6							171.3	399.7	420						
PH (S.U.)	6.33	6.41	6							6.02	6.29	6							4.2	3.6	3.7						
SPECIFIC CONDUCTANCE (MS/CM)	1.937	1.208	1.05							0.65	0.55	0.464							0.607	0.33	0.297						
TEMPERATURE (°C)	16.31	16.17	14.49							19.94	13.02	16.67							17.61	10.48	15.02						
TURBIDITY (NTU)	10.83	9.03	4.72							0.82	0.22	0							5	1.21	1.4						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.005 U	0.01 U								0.1 J	0.01 U								0.005 UJ	0.08 J							
NITRITE/NITRATE-N	0.81 J	0.25								5.4	6.1								0.07	0.05 U							

4.0 DATA EVALUATION

Section 4 presents groundwater and surface water monitoring data for Rounds 1 through 3. The information presented includes temporal plots of RDX and degradation product concentration results for each groundwater and surface water sampling location included in the SWMU 12 long term monitoring program. Also presented in this section are potentiometric surface maps showing groundwater elevations at all SWMU 13 wells in Rounds 5 and 6. The objective of the long term monitoring program at SWMU 12 is to collect enough monitoring data (up to nine rounds) to determine the nature and extent of contamination, whether residual explosives are naturally degrading, and provide data for making remedy decisions for residual explosives 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 12 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 12 long term monitoring program is providing analytical results for select explosives. As indicated in the SWMU 12 RFI, RDX is considered to be the principal chemical of concern because it is a site-related contaminant and has been detected more frequently and at higher concentrations than any other explosive. The degradation products for RDX are DNX, MNX, and TNX. The long-term monitoring program is scheduled to include nine rounds of sampling, under non-pumping conditions, to provide information on trends in groundwater and surface water concentrations of explosives and explosives degradation productions. To date, three rounds of groundwater sampling events have been conducted in September 2004, March 2005, and May, 2005. The remaining six rounds of sampling are expected to be completed by the end of 2006.

- **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 12, 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 12 long term monitoring program includes 20 wells. The location of each well relative to the contamination plume at SWMU 12 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 SMWU 12 long term monitoring program includes wells located in the Puz, Pmz, and Mgd water bearing zones to evaluate if contamination is migrating vertically to the lower aquifer (Mgd). Through Round 3 explosives contamination has been detected in the Puz and Pmz aquifers, but not in the Mgd 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. The monitoring wells associated with the Puz, Pmz, and Mgd are identified in Section 4.1.

- **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 November or December 2006. A final report evaluating the MNA program through nine rounds of sampling is expected to be issued in March 2007. 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 12 MNA report summarizing nine rounds of sampling will include temporal plots of RDX and degradation product concentrations, along with a detailed statistical evaluation.

- **Additional rounds of samples, beyond nine rounds, may be required to demonstrate the decreasing trend.** SWMU 12 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 12 long term monitoring program.

- **The monitoring data should be collected from appropriate locations that are distributed both vertically and horizontally throughout the plume.** The SWMU 12 long term monitoring program includes monitoring wells located in the Puz, Pmz, and Mgd water bearing zones to evaluate if contamination is migrating vertically 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. The relative position of each MNA monitoring well is described in Section 4.1.

- **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 products.** All sampling is being conducted under non-pumping conditions. The SWMU 12 monitoring program is providing analytical results for RDX and the degradation products DNX, MNX, and TNX.

  - **Routine and Other Indicator Parameters.** The monitoring data also includes the routine indicator parameters DO, ORP, pH, specific conductance, temperature, turbidity, ammonia, and nitrite/nitrate concentrations.

  - **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.

- **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 12 monitoring program includes quarterly monitoring which will measure RDX and degradation product concentrations and routine indicator parameters by season. The final MNA report will include the presentation of temporal plots to discern seasonal trends of RDX and degradation product concentrations, as well as routine indicator parameters.

4.1 GROUNDWATER MONITORING PROGRAM

MNA groundwater sampling is being conducted at 20 select well locations across SWMU 12 (see Figure 2-1). Fifteen wells are located in the Puz aquifer; four wells are located in the Pmz aquifer; and the remaining well is in the Mgd aquifer. 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. The selected wells are distributed as follows in the Puz, Pmz and the Mgd:

Puz Aquifer Wells

- Three source area wells (12MWT06, 12MWT11, and 12MWT16)
- Three wells located within the center of the plume (12MWT09, 12MWT12, and 12MWT17)
- Seven wells at the leading edge of the plume (12MWT42, 12MWT38, 12MWT36, 12MWT10, 12MWT22, 12MWT20, and 12MWT18)
- One well upgradient of the plume (12MWT28)
- Two wells laterally downgradient of the plume (12MWT03 and 12MWT23)

Pmz Aquifer Wells

- Three wells vertically below the plume (12MWT30, 12MWT31, and 12MWT32)
- One well laterally downgradient of the plume (12MWT46)

Mgd Aquifer Well

- One well laterally downgradient of the plume (12MWT41)

In Rounds 3 through 9, all groundwater samples are being analyzed for explosives and well stabilization parameters with occasional analyses for routine indicator MNA parameters and RDX degradation products. Groundwater elevations are also being collected during each sampling round.

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 12SW/SD09, 12SW/SD11, 12SW/SD14, 12SW/SD24, 12SW/SD25, 12SW/SD27, 12SW/SD31, and 12SW/SD34. The location 12SW/SD25 is considered to be upgradient of SWMU 12. In Rounds 3 through 9, samples from these locations are being analyzed for explosives, degradation products, and the routine indicator parameters DO, ORP, pH, specific conductance, temperature, turbidity, ammonia and nitrite/nitrate concentrations.

4.3 ROUND 3 POTENTIOMETRIC SURFACES

Figures 4-1, 4-2, and 4-3 show the Round 3 (May 18, 2005) potentiometric surface elevation maps for the Puz, Pmz, and Mgd water bearing zones, respectively. Groundwater elevations for each zone in Round 2 are shown in Appendix E. The groundwater elevations collected in Round 3 for all three zones were compared to groundwater elevations reported in the RFI for Round 2 (see Appendix E). The comparison revealed only minor fluctuations in groundwater elevations at most wells from Round 2 to Round 3 and similar flow directions for each zone.

Figure 4-1 presents the potentiometric surface for the Puz measured in Round 3. The highest elevations (731 to 734 feet above mean sea level [amsl]) were measured in six monitoring wells at the far northwest end of SWMU 12. As also noted in Round 2, there are two ridges of higher groundwater elevations that extend from the groundwater high at the north end of SWMU 12. The larger more pronounced ridge runs southeast along the centerline of the SWMU 12 ridgetop through wells 12MWT16, 12MWT17, and 12MWT23. The groundwater elevations then decrease along this groundwater ridge. To the northeast and southwest of this groundwater ridge, the groundwater elevations decreased rapidly to the sides of the ridge. Shallow groundwater on the northeastern side of this groundwater ridge flows to the northeast and shallow groundwater on the southwestern side of the ridge flows southwest.

A second ridge extends from the northern high area toward the southwest. The groundwater elevations decrease gradually along the crest of the groundwater ridge at well 12MWT28 down to 708.53 feet amsl at well 12MWT42. Groundwater is flowing toward the cropline on the sides of the ridges. Figure 4-1 also

shows that the groundwater flow arrows on the western side of SWMU 12 ridge and the eastern side of the SWMU 9 ridge are flowing in almost opposite directions.

Figure 4-2 shows groundwater elevations measured in the Pmz monitoring wells in Round 3. Similar to the groundwater in the Puz, the highest groundwater elevation in the Pmz was found at the northwestern end of SWMU 12 (699.15 ft amsl at well 12MWT33). A groundwater ridge in the Pmz also extends from the northwest end of the SWMU toward the southeast. Groundwater elevations decrease toward the southeast and toward the southwest from the groundwater ridge. The lowest groundwater elevations in the Pmz were measured in wells 12MWT30 (635.03 ft amsl) on the southwest side of SWMU 12 and 12MWT48 (619.99 ft amsl) on the southeast side of SWMU 12.

Water levels measured in the Mgd in Round 4 are presented in Figure 4-3. The groundwater elevations ranged from 574.25 ft amsl at 12MWT51 to 603.22 ft amsl at 12MWT41. As also shown previously in Round 2, the general groundwater flow direction in the Mississippian limestone is moving toward the south and southeast toward Turkey Creek.

4.4 GROUNDWATER TEMPORAL PLOT TREND ANALYSIS

This section presents temporal plots of RDX and product concentrations by round for groundwater and surface water. The temporal plots are arranged in columns by monitoring well location showing concentration trends for RDX followed by the trend for each degradation product. The analytical results for each round are shown as a data point and include the validation qualifier if applicable and datum presented in Table 3-1. The absence of a data point in a round indicates no sample was collected or no analysis was conducted for a specific parameter.

Puz Aquifer

Figure 4-4 shows temporal plots of RDX and degradation by-product groundwater concentrations for Rounds 1 through 3 in the Puz. Through Round 3, RDX has been detected all at MNA monitoring locations with the exception of 12MWT03, 12MWT23, and 12MWT28. Monitoring well 12MWT28 is upgradient of the contamination plume. The wells 12MWT03 and 12MWT23 are laterally downgradient of the plume. Various combinations of degradation products have been detected at all monitoring locations in Rounds 1 and 2 with the exception of 12MWT03, 12MWT18, 12MWT20, 12MWT23, 12MWT28, and 12MWT42. At the present time, insufficient data is available at these wells to conduct an evaluation regarding trends for RDX and the degradation product concentrations.

Pmz Aquifer

Figure 4-5 shows temporal plots of RDX and degradation by-product concentrations for Round 1 through 3 in Pmz wells. Through Round 3, there have been no positive detections of RDX or degradation products in the Pmz monitoring wells.

Mgd Aquifer

Figure 4-6 shows temporal plots of RDX and degradation product concentrations for Round 1 through 3 in Mgd wells. Through Round 3, there have been no positive detections of RDX or degradation products at the Mgd monitoring well 12MWT41.

4.5 SURFACE WATER TEMPORAL PLOT TREND ANALYSIS

Figure 4-7 shows temporal plots of explosives and degradation product surface water concentrations for Rounds 1 through 3. Through Round 3, RDX has been detected at all surface water sampling locations with the exception of 12SW/SD25, which is considered to be an upgradient location. The only RDX degradation product detected through Round 3 is MNX at locations 12SW/SD09, 12SW/SD14, and 12SW/SD34. At the present time, insufficient data is available at these locations to conduct an evaluation regarding trends for RDX and the degradation product concentrations.

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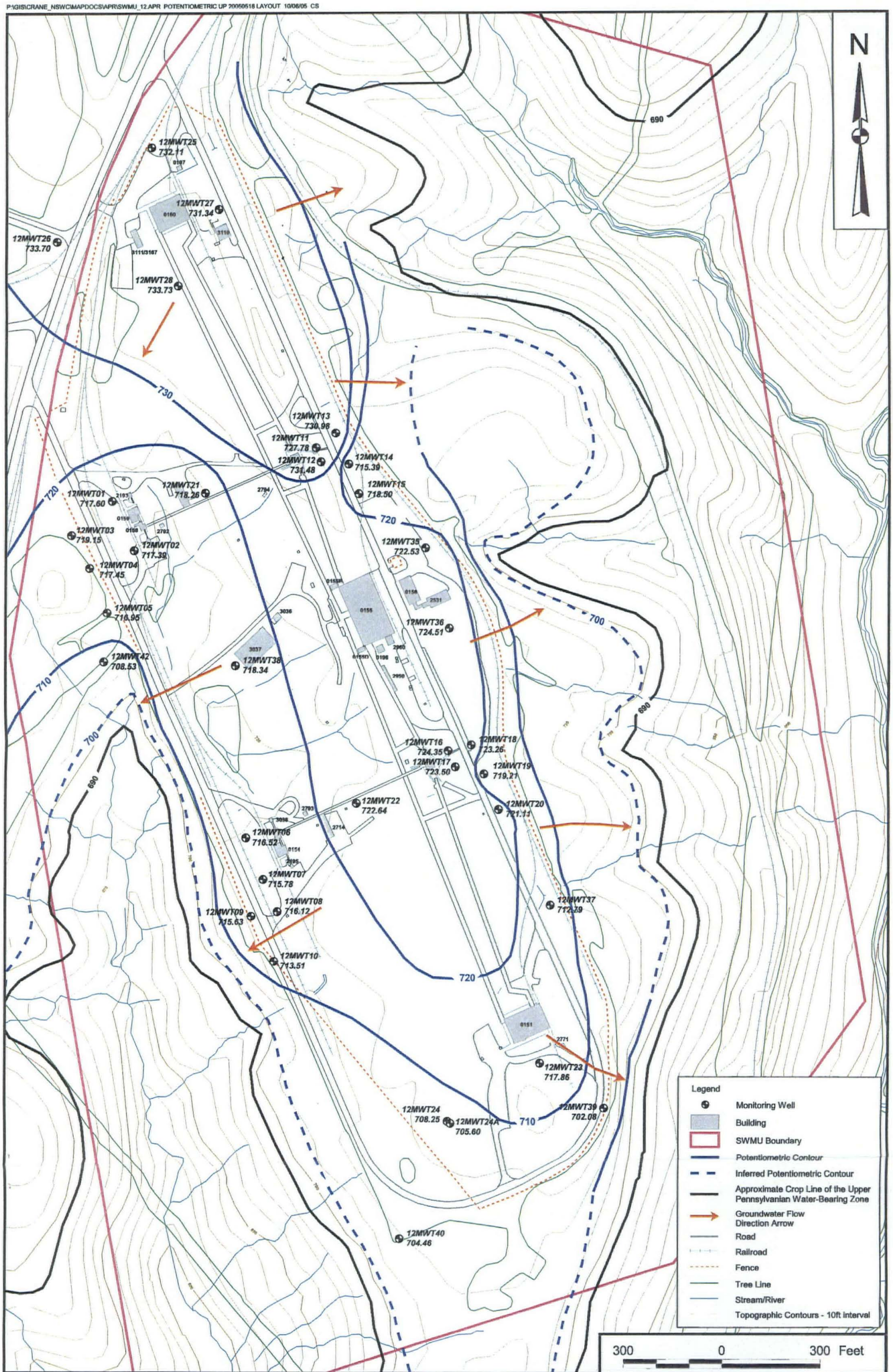

DRAWN BY	DATE
C. FOSTER	10/03/05
CHECKED BY	DATE
J. LUCAS	10/03/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR THE UPPER PENNSYLVANIAN WATER-BEARING ZONE - MAY 18, 2005

SWMU 12 MINE FILL A

NSWC CRANE

CRANE, INDIANA

CONTRACT NUMBER	
6878	
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FIGURE 4 - 1	0

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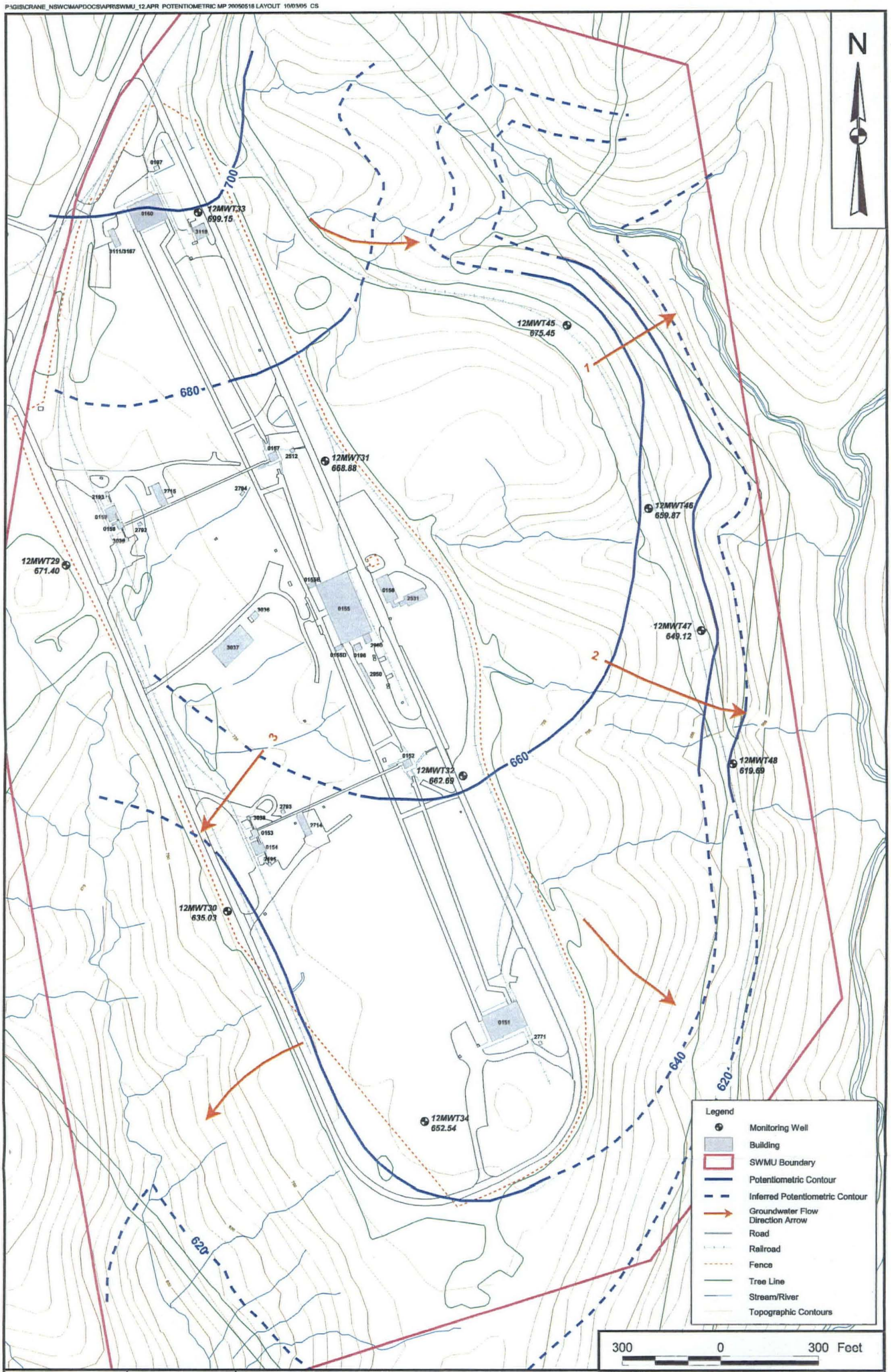

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C. FOSTER	10/03/05
CHECKED BY	DATE
J. LUCAS	10/03/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR THE MIDDLE PENNSYLVANIAN WATER-BEARING ZONE - MAY 18, 2005

SWMU 12 MINE FILL A

NSWC CRANE

CRANE, INDIANA

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FIGURE 4 - 2	0

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APPROVED BY DATE

DRAWING NO. FIGURE 4 - 3

REV 0

POTENTIOMETRIC SURFACE MAP FOR THE GLEN DEAN LIMESTONE (MISSISSIPPIAN) AQUIFER ON MAY 18, 2005
SWMU 12 MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY C. FOSTER DATE 10/03/05

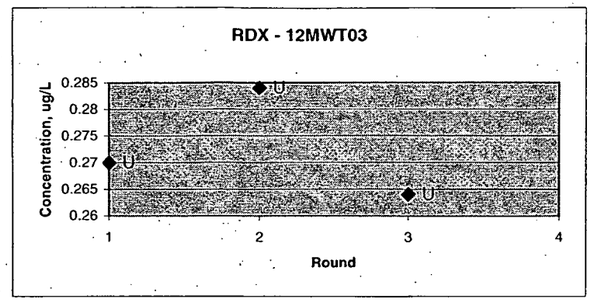
CHECKED BY J. LUCAS DATE 10/03/05

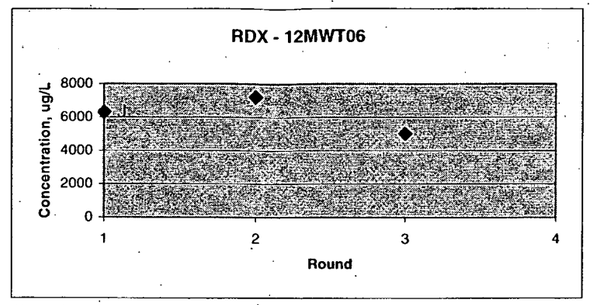
COST/SCHED-AREA

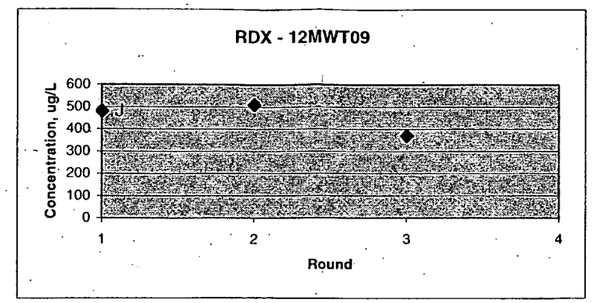
SCALE AS NOTED

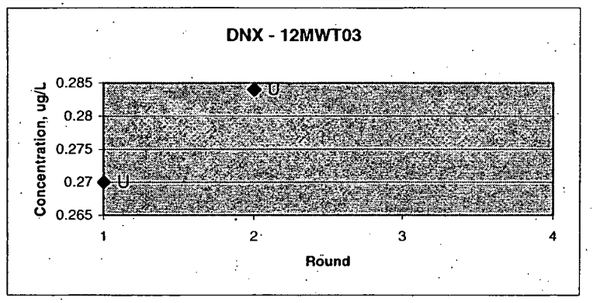
FIGURE 4-4

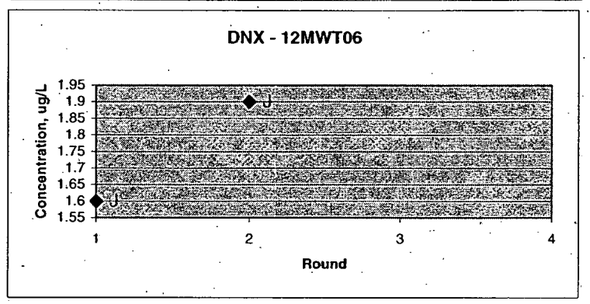
TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN UPPER WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 1 OF 6

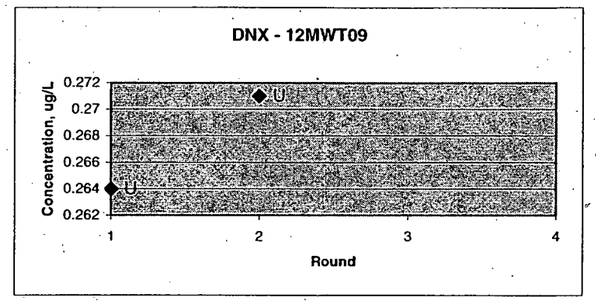


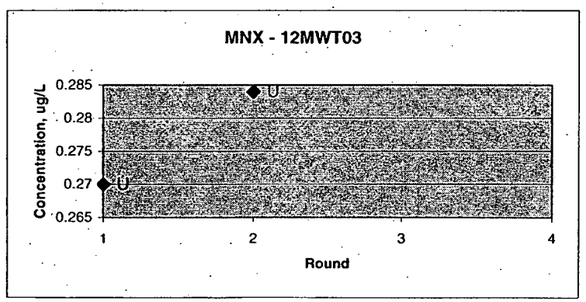


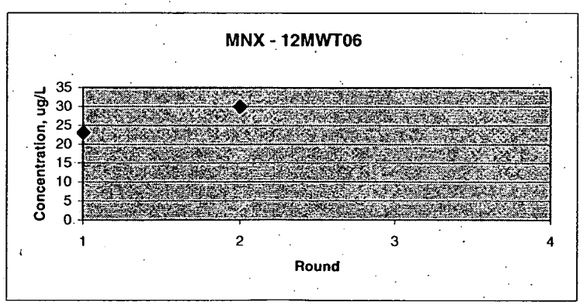


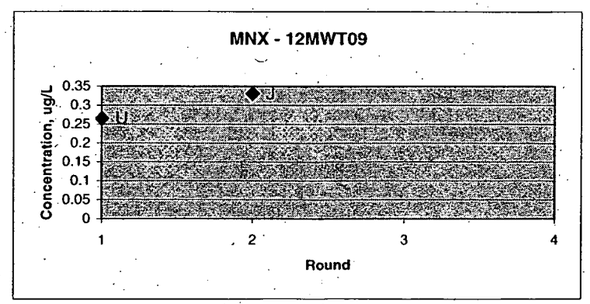


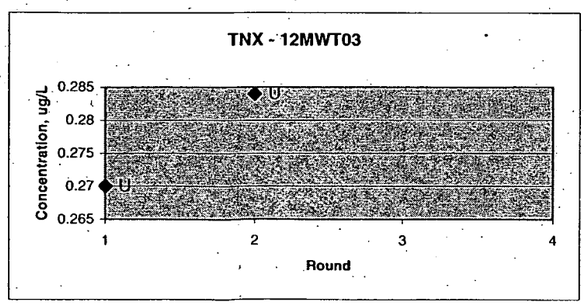


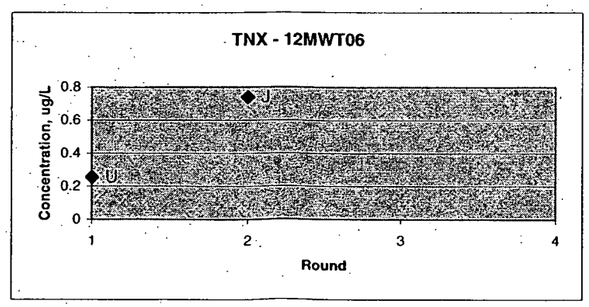












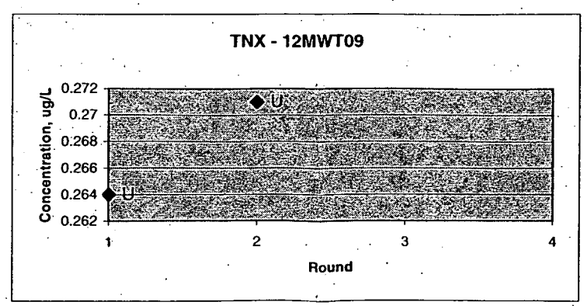


FIGURE 4-4

TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN UPPER WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA

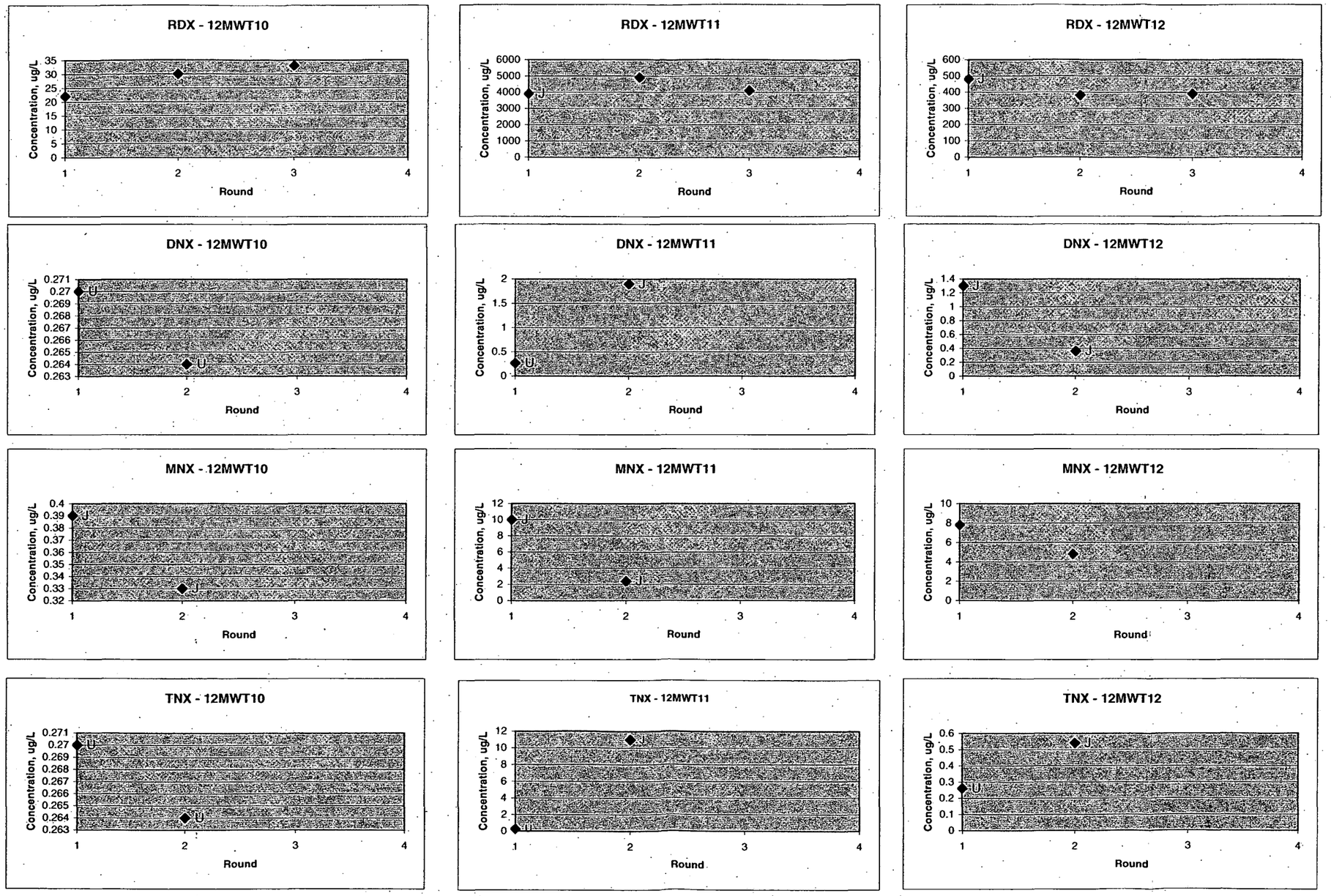


FIGURE 4-4

TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIA UPPER WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 3 OF 6

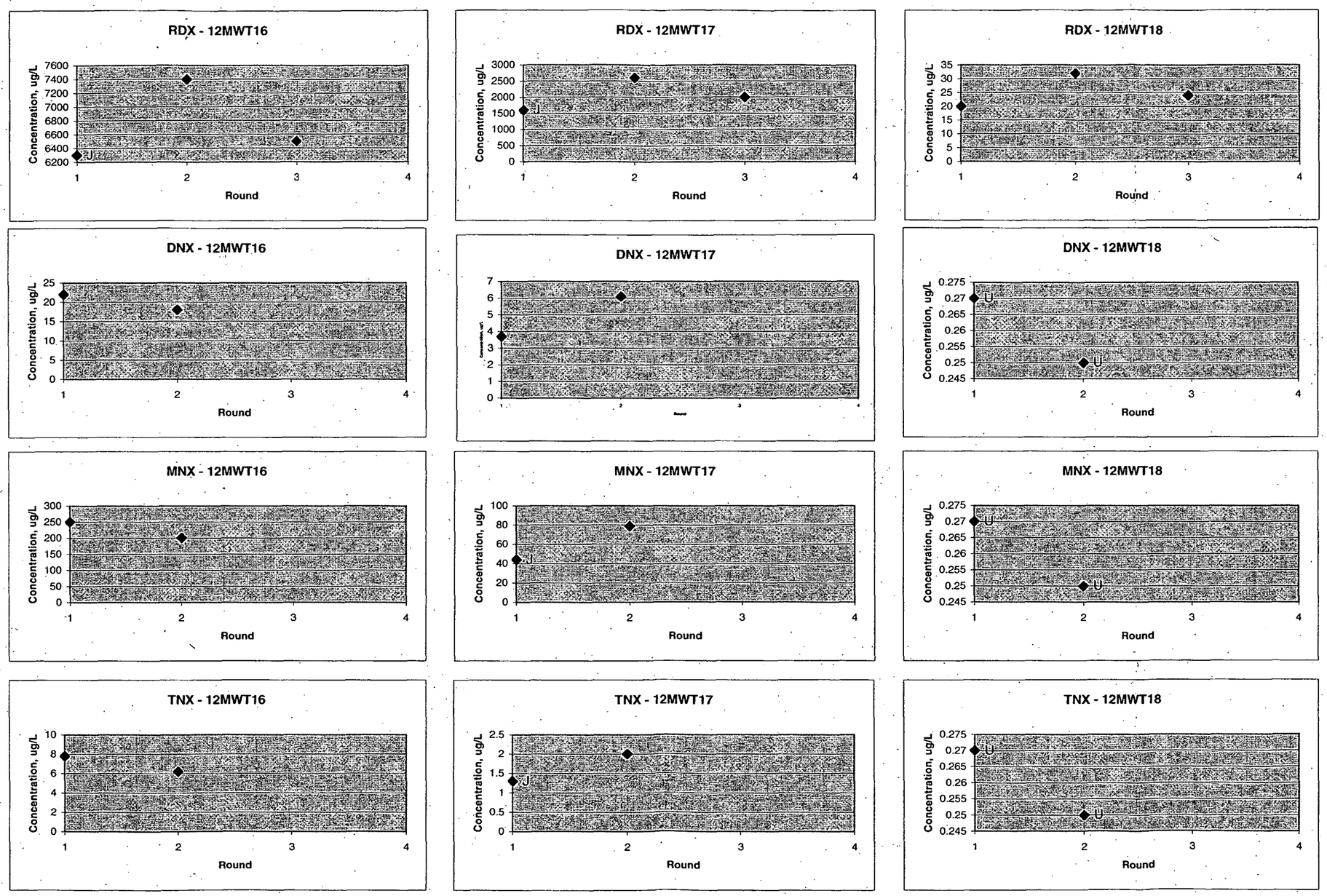
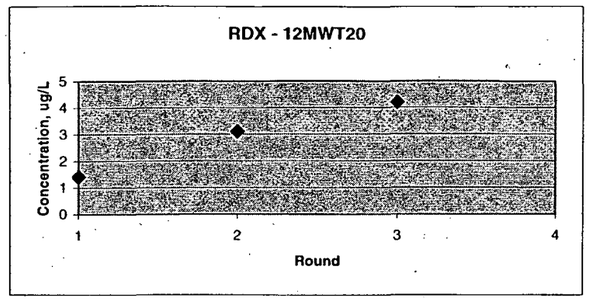
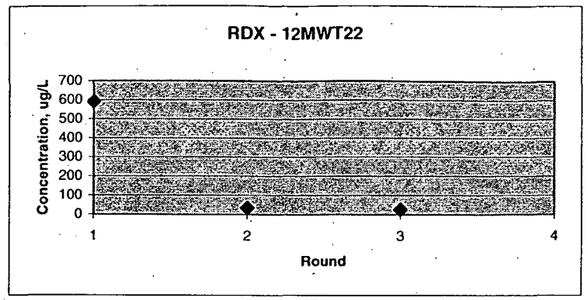
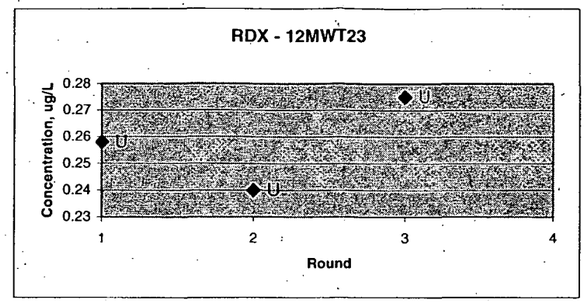


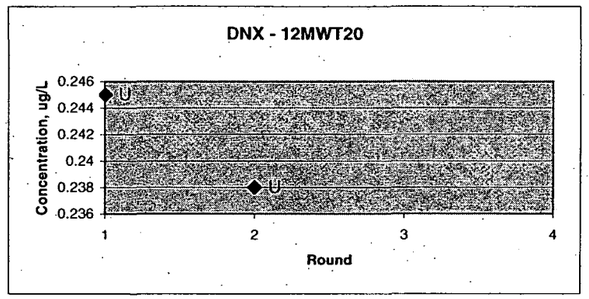
FIGURE 4-4

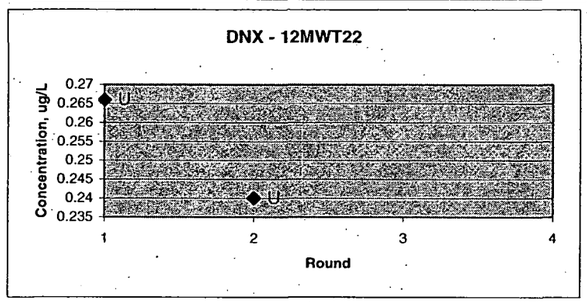
TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN UPPER WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA

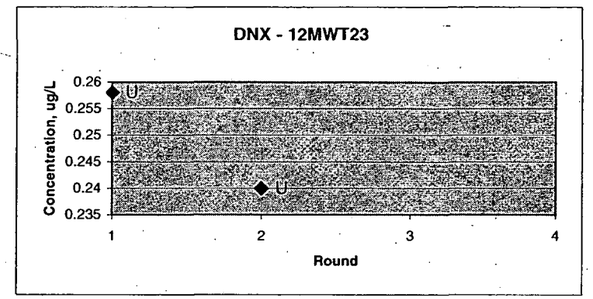


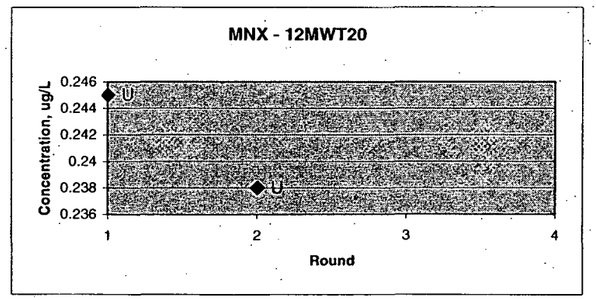


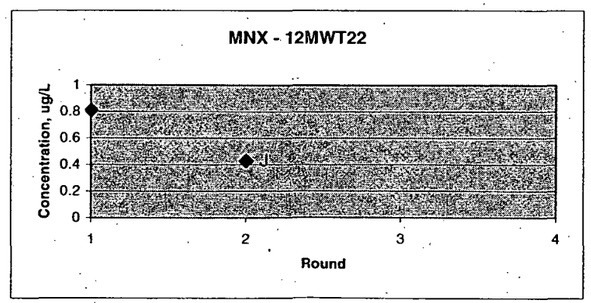


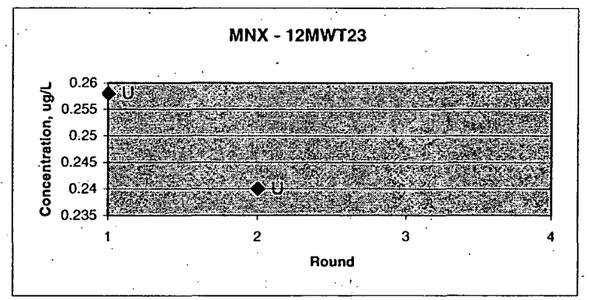


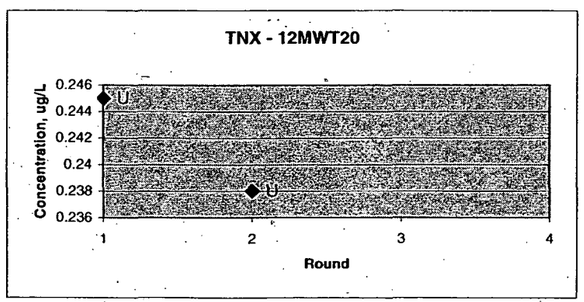


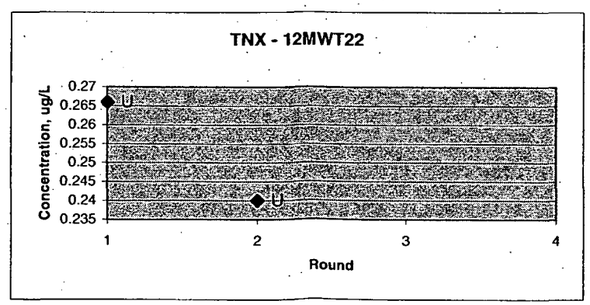












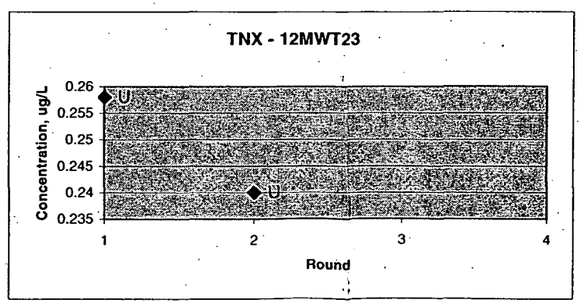


FIGURE 4-4

TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN UPPER WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA

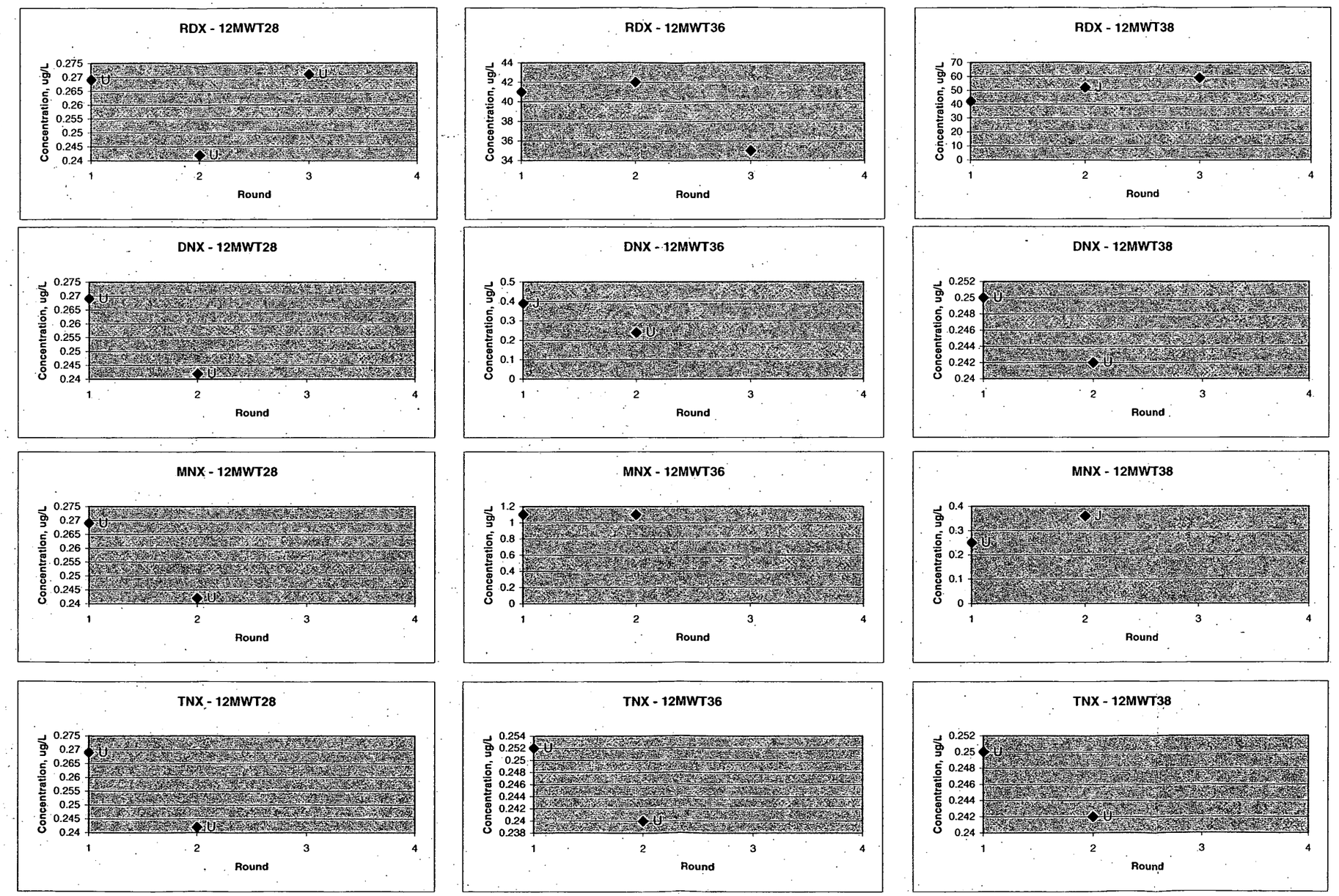
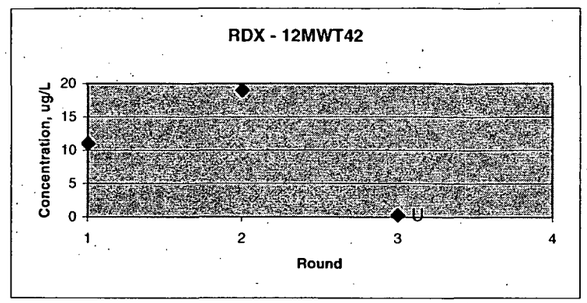
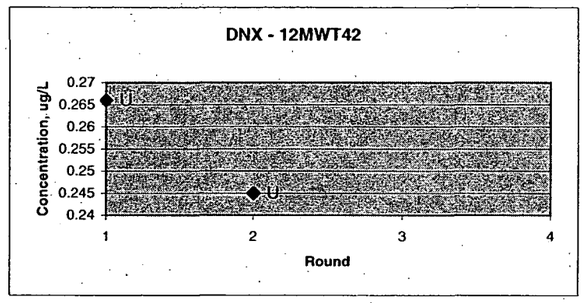
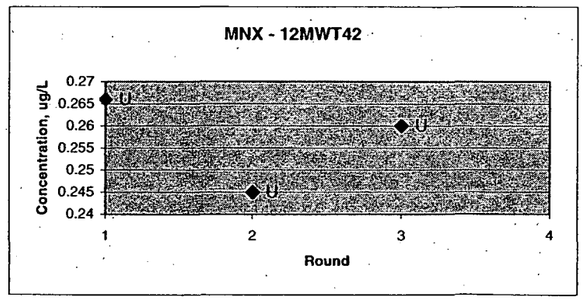


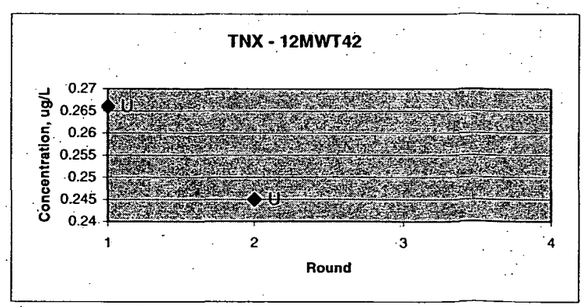
FIGURE 4-4

TEMPORAL PLOTS FOR RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN UPPER WATER BEARING ZONE AT SWMU 12
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.

J - Indicates the chemical was detected; however, the value is considered to be an estimate of the true concentration.

FIGURE 4-5

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN MIDDLE WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 1 OF 2

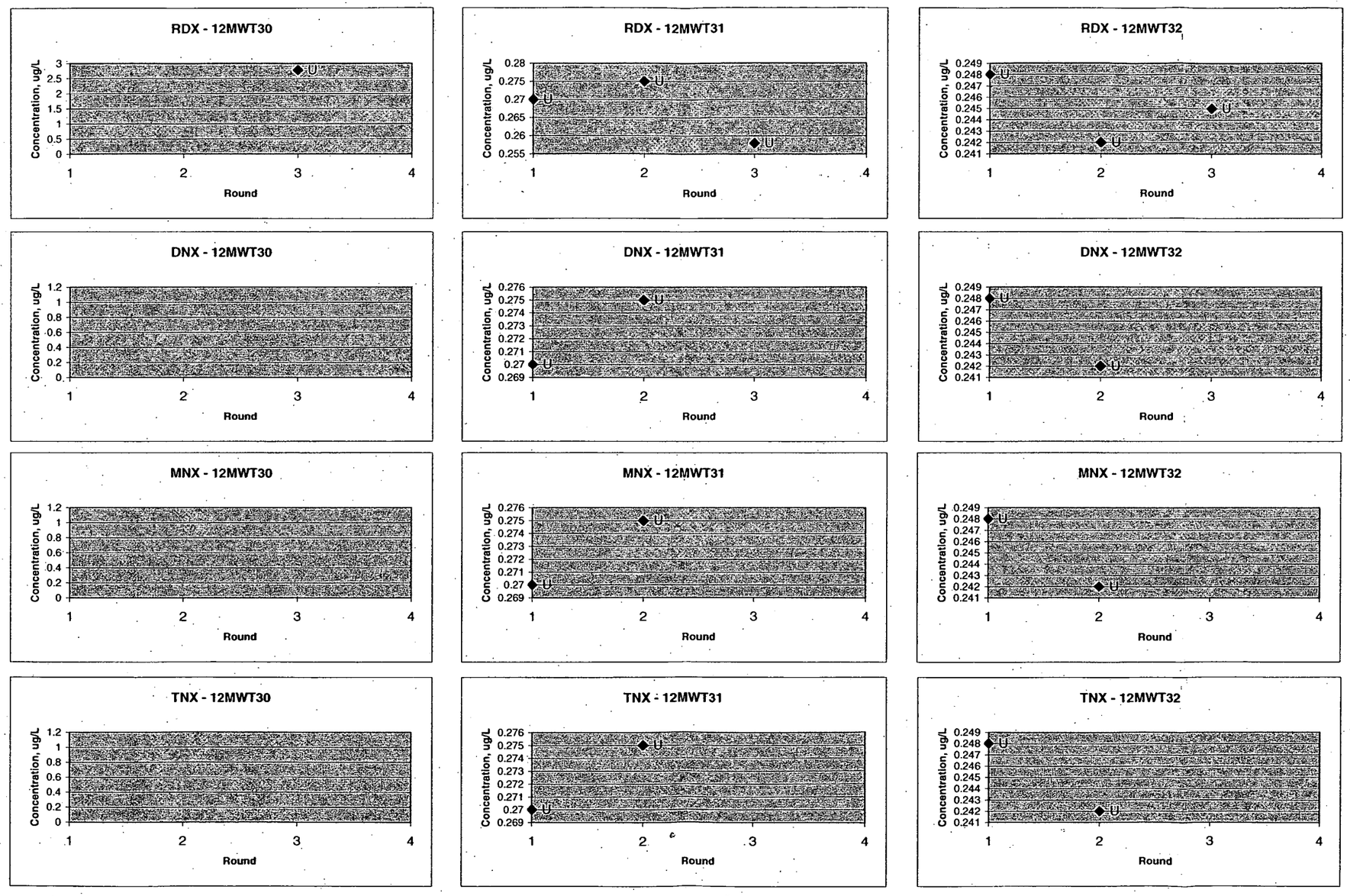
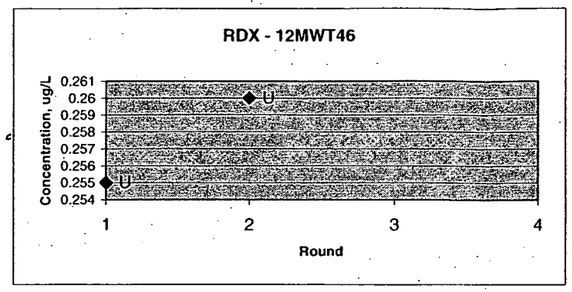
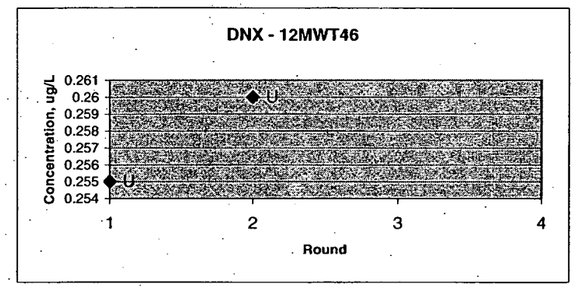
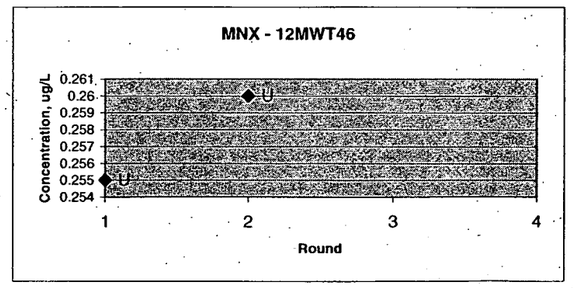


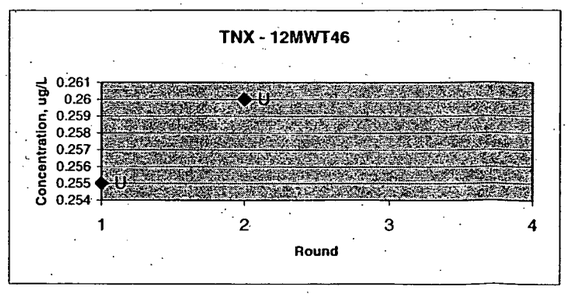
FIGURE 4-5

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE PENNSYLVANIAN MIDDLE WATER BEARING ZONE AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 2 OF 2









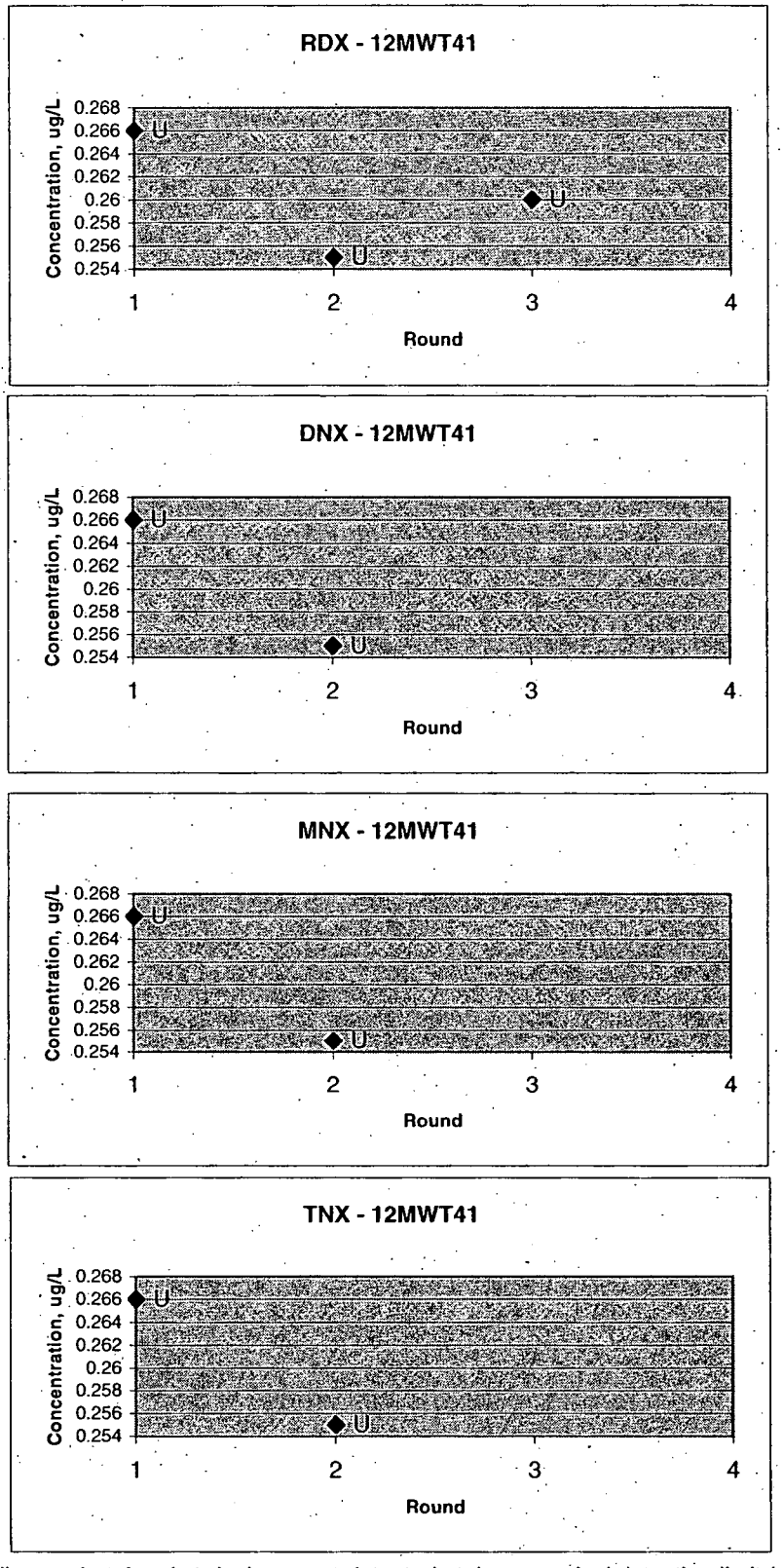
U - Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted. Non-detected results from the laboratory are reported in this manner.

J - Indicates the chemical was detected; however, the value is considered to be an estimate of the true concentration.

Note: It is suspected that the analytical results for explosives in Round 3 at well 12MWT32 were switched with the results for Round 3 at well 12MWT16. As a result, the reported analytical results for 12MWT32 have been switched with the results for 12MWT16 in Table 3-1.

FIGURE 4-6

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN THE MISSISSIPPIAN GLEN DEAN WATER BEARING ZONE AT SWMU 12
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.

FIGURE 4-7

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 1 OF 3

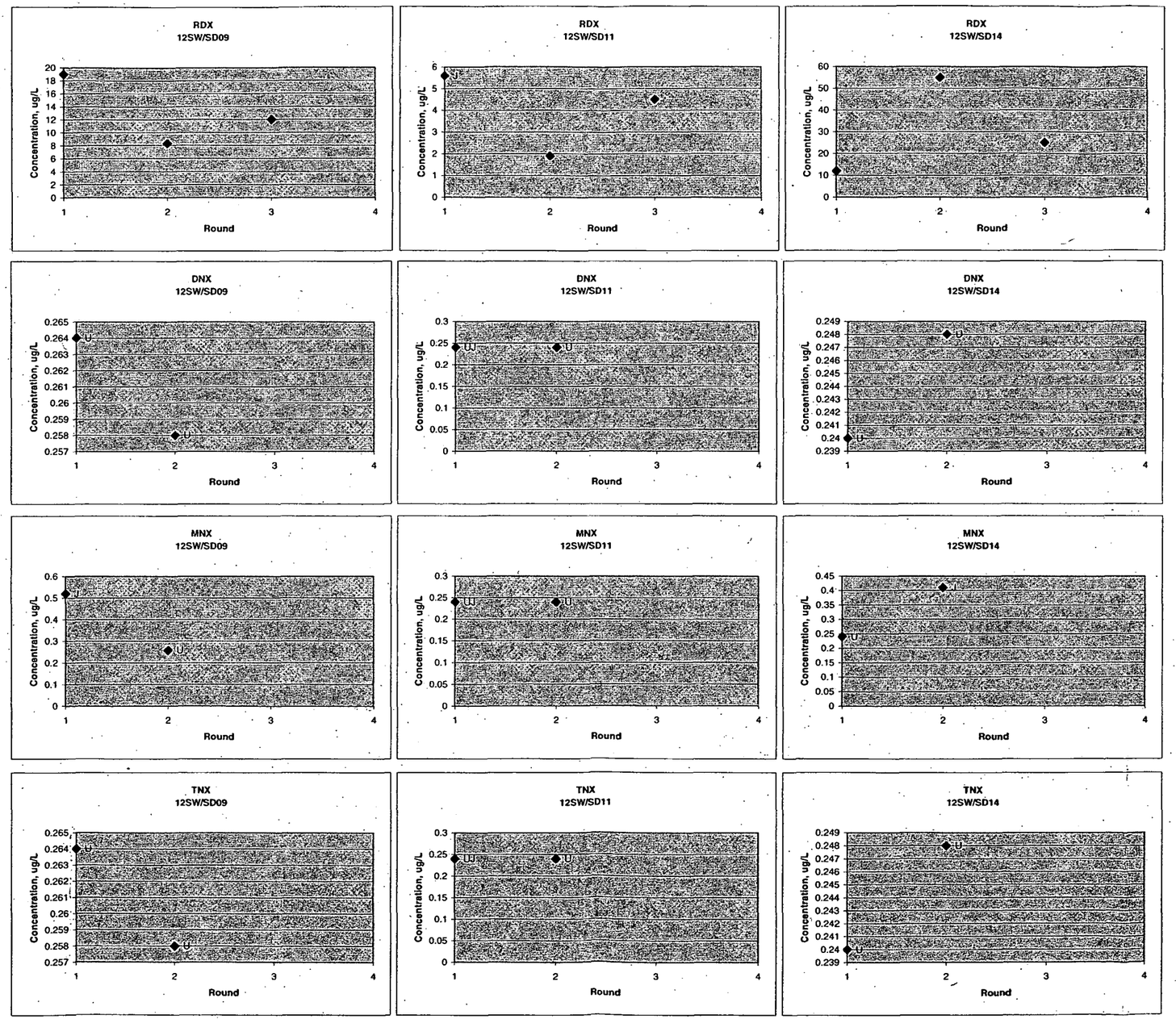


FIGURE 4-7

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 2 OF 3

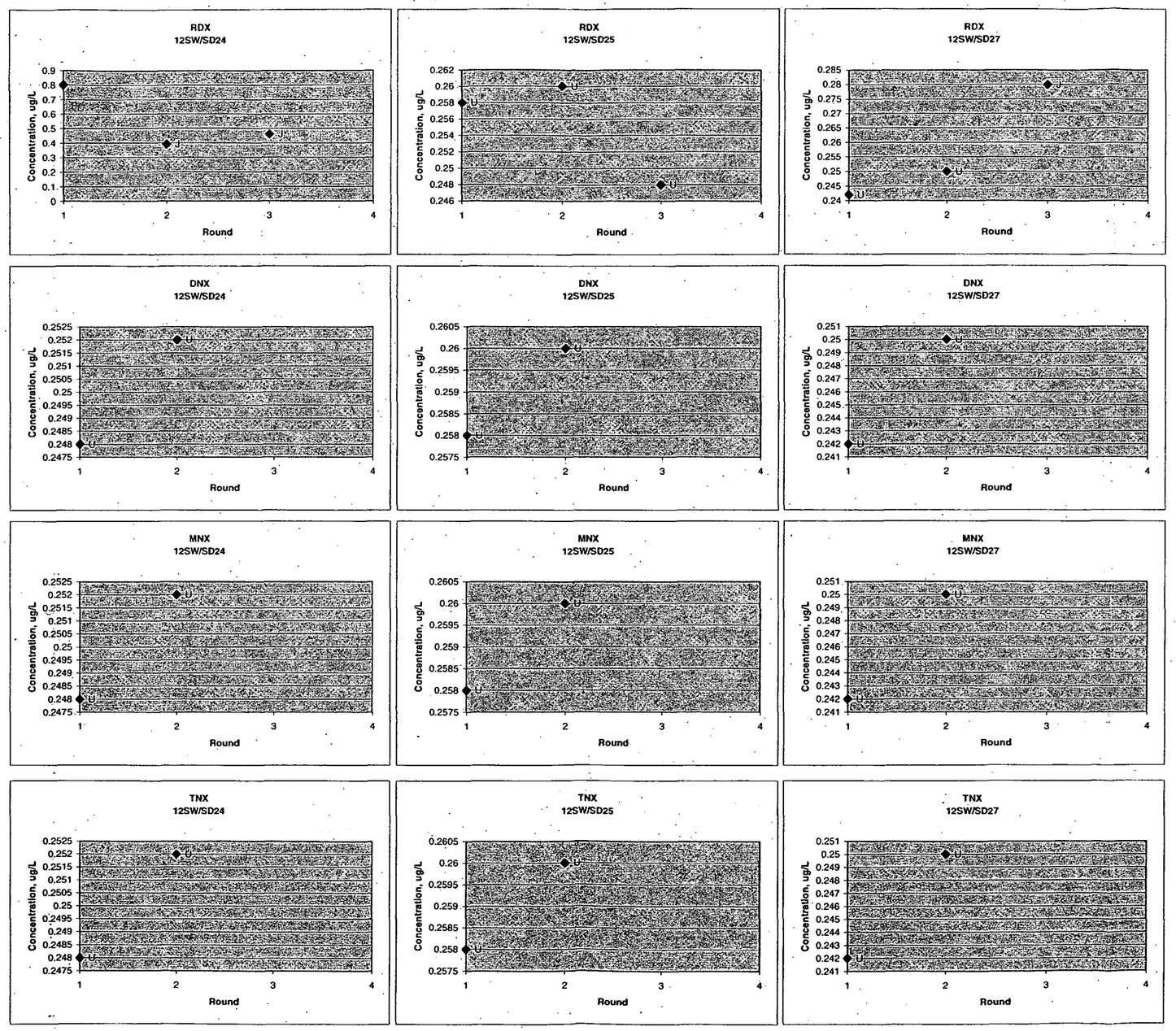
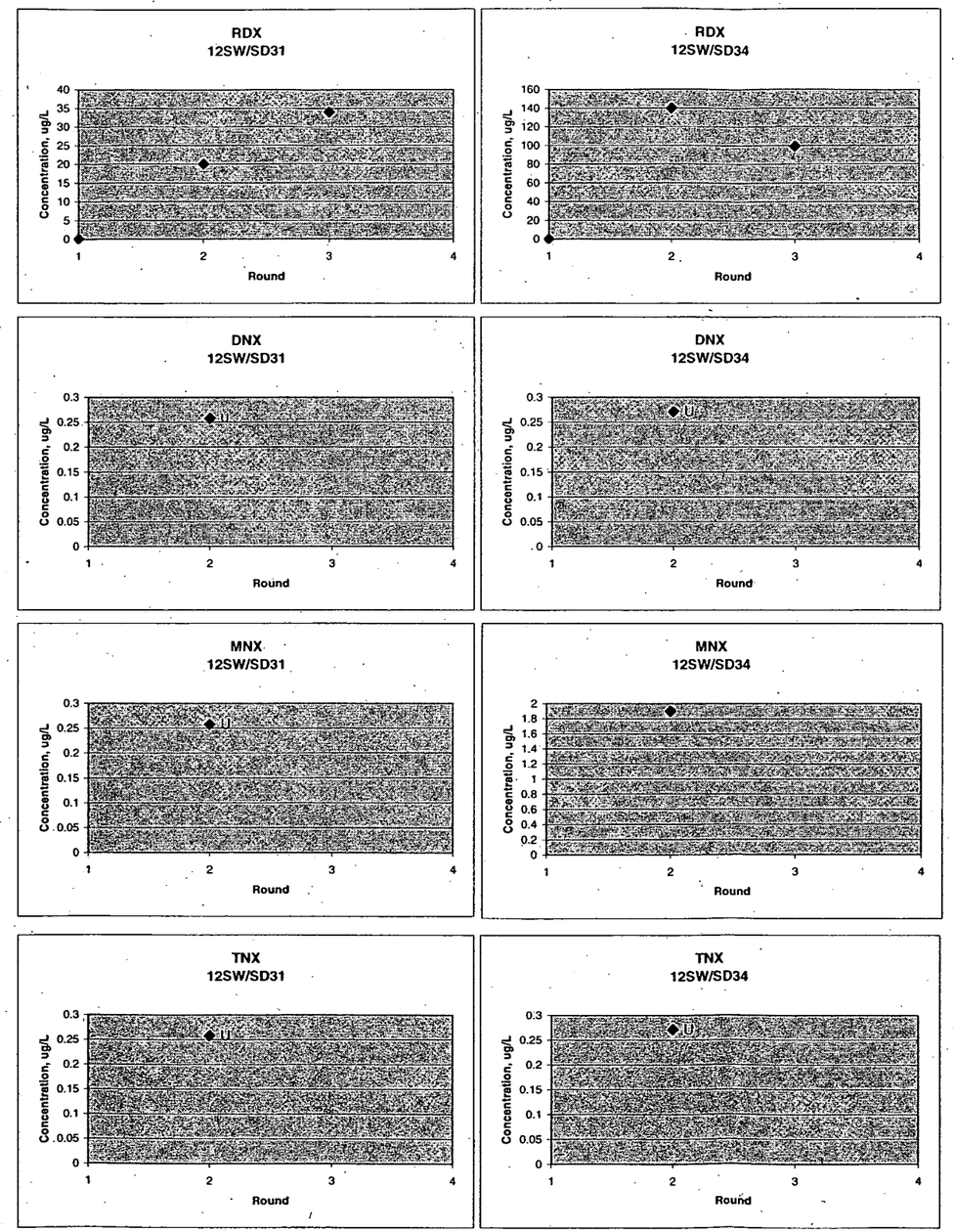


FIGURE 4-7

TEMPORAL PLOTS OF RDX AND DEGRADATION PRODUCT CONCENTRATIONS
IN SURFACE WATER AT SWMU 12
NSWC CRANE
CRANE, INDIANA
PAGE 3 OF 3



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.
J - Indicates that the chemical was detected; however, the associated result is considered to be an estimate of the true concentration.
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.

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. Resource Conservation and Recovery Act Facility Investigation Report for Mine Fill A (SWMU 12), Tetra Tech NUS, Inc., August.

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 12

ROUND 3

SAMPLE LOG SHEETS AND OTHER FIELD FORMS

APPENDIX A.1.1

SWMU 12

ROUND 3

GROUNDWATER SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 0303
Sample Location: 12MWT 03
Sampled By: T. ROJAHN
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

(5/22)

SAMPLING DATA:

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 5/22/05								
Time: 0988								
Method: SAME	Clear	6.07	1.205	1630	290 (19)	3.32	66	—

PURGE DATA:

Date: 5/21/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" Ø PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 27.8								
Static Water Level (WL): 15.18								
One Casing Volume(gal/L): 7.8								
Start Purge (hrs): 1123								
End Purge (hrs): 1436								
Total Purge Time (min): 193								
Total Vol. Purged (gal/L): 26.8								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F 12.62' X 0.163 = 2.06 gal or 7.8L

Dedicated pump intake @ 22.8'

TR

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: N6878

WELL ID.: 12MWT03
DATE: 5-21-05

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)
1123	15.18	0	—	—	—	—	—	—	—	Start Purge
1133	17.18	1500	150	6.16	1.224	28	0.44	15.90	170	CLEAR
1143	17.70	2300	80	6.15	1.311	13	2.19	16.55	217	CLEAR
1153	18.15	3100	80	6.14	1.331	5.3	3.46	16.90	267	CLEAR
1203	18.42	3900	80	6.16	1.341	32	3.72	17.16	273	CLEAR
1213	18.63	4700	80	6.05	1.334	12	3.60	17.03	291	CLEAR
1223	18.80	5200	50	6.08	1.370	8.2	3.48	18.06	298	CLEAR
1233	18.77	5450	25	6.20	1.467	6.9	4.01	21.23	269	CLEAR (Pump stopped)
1243	18.98	6050	60	6.05	1.397	6.0	3.30	19.17	233	CLEAR
1253	19.26	6800	75	5.98	1.328	5.5	2.64	16.90	236	CLEAR
	Increase	Pump rate to dry out well (Historically - draw down								↓
		will Not stabilize)								↓
1303	20.03	9800	200	5.99	1.229	5.4	1.86	14.45	150	CLEAR
1313	20.86	10800	200	5.99	1.227	16	2.17	14.46	132	CLEAR
1323	21.81	12800	200	5.85	1.249	17	2.43	14.52	123	CLEAR
1333	22.78	14800	200	5.83	1.250	19	2.50	14.62	120	CLEAR
1343	23.74	16800	200	5.82	1.234	22	2.51	14.70	108	CLEAR
1353	24.55	18800	200	5.82	1.210	25	2.29	14.77	96	CLEAR
1403	25.25	20800	200	5.76	1.168	130	2.44	14.99	73	CLEAR
1413	26.05	22800	200	5.91	1.183	700	2.35	14.54	69	Orangish (Fe) Sulfur
1423	26.92	24800	200	6.06	1.231	75	2.22	15.07	67	Sl. Cloudy
1433	27.65	26800	200	6.07	1.205	290	3.32	16.30	66	Cloudy
1436	—	—	—	—	—	—	—	—	—	DRY

Water Quality Meter (SN) 0120702 AF
Control Box type (SN) 347
Turbidity Meter (SN) 1728-1600

Pump Intake 22.8' → lower to Bottom

SIGNATURE(S): Terry Rogers

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 0603
Sample Location: 12MWT 06
Sampled By: Goeydt
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-21-05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1820	(Visual)	(S. U.)	(mS/cm)	(°C)	(NTU)	(mg/L)	(mV)	NA
Method: Peristaltic	clear	4.17	.317	13.69	0.1	1.27	253.7	—

PURGE DATA:

Date: 5-21-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 25.80								
Static Water Level (WL): 10.05								
One Casing Volume(gal/L): 9.5								
Start Purge (hrs): 1655								
End Purge (hrs): 1815								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 9.6								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 24.80

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	12FD05210501

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: N6878

WELL ID.: 12MWT06
DATE: 5-21-05

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)
1655	10.05	–	–	–	–	–	–	–	–	Start purge
1705	10.45	1.2	120	4.22	.320	3.6	1.76	14.12	238.8	clear
1715	10.~~97~~54	2.4	120	4.22	.318	2.8	1.47	13.97	243.2	"
1725	10.54	3.6	120	4.21	.317	2.6	1.40	13.80	244.0	"
1735	10.55	4.8	120	4.20	.317	–	1.36	13.76	245.3	"
1745	10.58	6.0	120	4.20	.317	–	1.31	13.72	246.5	"
1755	10.58	7.2	120	4.21	.317	1.7	1.31	13.71	248.7	"
1805	10.59	8.4	120	4.19	.317	–	1.29	13.70	251.2	"
1815	10.59	9.6	120	4.17	.317	0.1	1.27	13.69	253.7	end purge

Water Quality Meter (SN) 04C 3884
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 24.80

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 0903
Sample Location: 12MWT 09
Sampled By: T. Rojahn
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/21/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1627	(Visual)	(S. U.)	(mS/cm)	(°C)	(NTU)	(mg/L)	(mV)	NA
Method: SAME	CLEAR	4.26	0.257	14.69	3.3	0.99	375	---

PURGE DATA:

Date: 5-21-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): -								
Well Casing Diameter & Material								
Type: 2" ϕ PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 26.27								
Static Water Level (WL): 12.24								
One Casing Volume(gal/L): 8.7								
Start Purge (hrs): 1455								
End Purge (hrs): 1625								
Total Purge Time (min): 90								
Total Vol. Purged (gal/L): 8.7								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F 14.03 x 0.163 = 2.3 gal or 8.7 L

~~Dedicated~~ pump intake @ 21.3'

TC

Circle if Applicable:		Signature(s):
MS/MSD —	Duplicate ID No.: —	Terry Rojahn

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC CRANE
PROJECT NUMBER: N6878

WELL ID.: 12MWT09
DATE: 5/21/05

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)
1455	12.24	0	—	—	—	—	—	—	—	START PURGE
1505	13.85	1200	120	4.24	0.297	55	1.32	15.29	351	CLEAR
1515	14.03	2400	120	4.13	0.278	7.5	1.66	15.64	387	CLEAR
1525	13.48	3300	90	4.22	0.273	1.5	1.65	15.55	377	CLEAR
1535	13.24	4200	90	4.31	0.257	5.5	1.65	15.53	372	CLEAR
1545	13.18	5100	90	4.18	0.235	10	1.47	15.34	380	CLEAR
1555	13.13	6000	90	4.28	0.242	11	1.33	15.26	375	CLEAR
1605	13.10	6900	90	4.26	0.252	5.7	1.15	14.78	372	CLEAR
1615	13.10	7800	90	4.24	0.255	4.2	1.05	14.84	373	CLEAR
1625	13.10	8700	90	4.26	0.257	3.3	0.99	14.69	375	CLEAR
1627	—	—	—	—	—	—	—	—	—	SAMPLE TIME

Water Quality Meter (SN) 0L0702 AF
Control Box type (SN) 347
Turbidity Meter (SN) 1728-1600

Pump Intake 21.3'

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 1003
Sample Location: 12MWT 10
Sampled By: T. ROJAHN
C.O.C. No.: 3240
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5/19/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 1703	(Visual)	(S. U.)	(mS/cm)	(°C)	(NTU)	(mg/L)	(mV)	NA
Method: SAME	CLEAR	3.83	0.587	15.02	0.35	0.58	354	--

PURGE DATA:

Date: 5/19/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: PERISTALTIC								
Monitor Reading (ppm): –								
Well Casing Diameter & Material								
Type: 2" Ø PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 26.81								
Static Water Level (WL): 12.91								
One Casing Volume(gal/L): 8.6								
Start Purge (hrs): 1300								
End Purge (hrs): 1700								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 14								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT —-F

13.9 X 0.163 = 2.3 gal or 8.6 L

Dedicated pump intake @ 21.8'

TA

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: N6878

WELL ID.: 12MWT10
DATE: 5/19/05

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)
1300	12.91	0	—	—	—	—	—	—	—	START PURGE
1310	14.81	1200	120	3.71	0.593	7.6	0.84	15.37	309	CLEAR
1320	15.15	2000	80	3.75	0.608	4.5	0.88	17.07	318	CLEAR
1330	15.39	2500	50	3.81	0.606	1.0	0.17	17.20	320	CLEAR
1340	15.78	3100	60	3.77	0.596	0.42	1.11	17.23	326	CLEAR
1350	16.05	3800	70	3.63	0.580	0.00	1.07	17.39	338	CLEAR
1400	16.04	4000	20	3.80	0.594	0.40	0.97	17.83	334	CLEAR (PUMP STOPED 2 TIMES BRIFLY)
1410	16.41	4800	80	3.68	0.570	0.30	0.56	16.76	345	CLEAR
1420	16.71	5500	70	3.73	0.569	0.35	0.69	16.69	342	CLEAR
1430	17.00	6300	80	3.73	0.566	0.20	0.53	16.57	343	CLEAR
1440	17.04	7000	70	3.73	0.569	0.15	0.64	16.65	344	CLEAR
1450	17.12	7500	50	3.76	0.570	0.05	0.79	16.46	347	CLEAR
1500	17.21	8000	50	3.72	0.574	0.10	0.81	16.59	354	CLEAR
1510	17.30	8500	50	3.72	0.573	0.15	0.92	15.76	356	CLEAR
1520	17.38	9000	50	3.78	0.580	0.10	0.80	15.74	357	CLEAR
1530	17.44	9500	50	3.75	0.580	0.25	0.75	15.42	355	CLEAR
1540	17.49	10000	50	3.77	0.582	0.40	0.78	15.38	354	CLEAR
1550	17.51	10300	30	3.78	0.579	0.45	0.68	14.98	352	CLEAR (PUMP STOPPED BRIFLY)
1600	17.58	11000	70	3.75	0.578	0.40	0.67	14.90	353	CLEAR
1610	17.64	11500	50	3.82	0.589	0.30	0.76	15.30	350	CLEAR
1620	17.75	12000	50	3.83	0.588	0.30	0.74	15.37	351	CLEAR
1630	17.82	12500	50	3.82	0.594	0.25	0.61	15.64	350	CLEAR
1640	17.90	13000	50	3.83	0.601	0.20	0.63	16.04	351	CLEAR
1650	17.97	13500	50	3.83	0.593	0.35	0.60	15.14	353	CLEAR
1700	18.10	14000	50	3.83	0.587	0.35	0.58	15.02	354	CLEAR
1703	—	—	—	—	—	—	—	—	—	START SAMPLING

Water Quality Meter (SN) 01L0702 AF
Control Box type (SN) 347
Turbidity Meter (SN) 1728-1600

Pump Intake 21.8

SIGNATURE(S): Terry Rogel

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 1103
Sample Location: 12MWT 11
Sampled By: Goerdt
C.O.C. No.: 3240
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-19-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1050								
Method: Peristaltic	Clear	3.96	.249	17.10	2.4	1.40	343.5	--

PURGE DATA:

Date: 5-19-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 26.40								
Static Water Level (WL): 12.99								
One Casing Volume(gal/L): 8.1								
Start Purge (hrs): 0845								
End Purge (hrs): 1045								
Total Purge Time (min): 120								
Total Vol. Purged (gal/L): 18.2								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 25.40' bb

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: N6878

WELL ID.: 12MWT11
DATE: 5-19-05

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)
0845	12.99	–	–	–	–	–	–	–	–	Start purge
0855	13.39	1.7	170	3.98	.245	6.2	3.05	16.41	293.9	clear
0905	14.15	3.2	150	3.98	.249	–	2.23	17.86	315.1	"
0915	14.39	4.7	150	3.97	.247	–	1.83	17.41	324.9	"
0925	14.65	6.2	150	3.96	.246	–	1.64	17.03	339.0	"
0935	14.81	7.7	150	3.96	.246	3.7	1.56	17.07	341.8	"
0945	14.85	9.2	150	3.96	.247	–	1.52	17.00	341.1	"
0955	14.89	10.7	150	3.96	.246	2.8	1.51	16.87	341.3	"
1005	14.94	12.2	150	3.96	.245	2.6	1.48	16.78	340.8	"
1015	14.98	13.7	150	3.97	.247	–	1.41	16.92	341.2	"
1025	14.95	15.2	150	3.97	.249	2.2	1.43	17.08	342.6	"
1035	14.96	16.7	150	3.97	.252	2.1	1.45	17.12	343.8	"
1045	14.93	18.2	150	3.96	.249	2.4	1.40	17.10	343.5	end purge

Water Quality Meter (SN) 04C 3884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 25.40'

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT~~0003~~ 12
Sample Location: 12MWT ~~0012~~
Sampled By: Goerdt
C.O.C. No.: 3240
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-19-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1300								
Method: Peristaltic	Clear	6.05	.790	22.38	6.8	1.47	189.7	--

PURGE DATA:

Date: 5-19-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 26.40								
Static Water Level (WL): 10.15								
One Casing Volume(gal/L): 9.8								
Start Purge (hrs): 1115								
End Purge (hrs): 1255								
Total Purge Time (min): 100								
Total Vol. Purged (gal/L): 11.4								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 25.4'

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: N6878

WELL ID.: 12MWT ~~10~~ 12
DATE: 5-19-05

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)
1115	10.15	–	–	–	–	–	–	–	–	Start purge
1125	10.35	1.5	150	6.09	.739	–	2.36	18.99	115.5	–
1135	10.36	2.6	110	6.06	.737	87	1.87	18.22	152.7	Sl. cloudy
1145	10.38	3.7	110	6.06	.737	65	1.74	18.38	164.9	"
1155	10.37	4.8	110	6.06	.751	48	1.68	19.22	166.4	"
1205	10.37	5.9	110	6.06	.760	29	1.62	19.89	168.3	Clear
1215	10.38	7.0	110	6.06	.773	24	1.72	20.35	169.0	"
1225	10.36	8.1	110	6.06	.781	18	1.57	21.08	175.1	"
1235	10.36	9.2	110	6.05	.789	11	1.53	21.83	181.3	"
1245	10.38	10.3	110	6.05	.791	8.5	1.54	22.30	186.4	"
1255	10.35	11.4	110	6.05	.790	6.8	1.47	22.38	189.7	end purge

Water Quality Meter (SN) 04C3884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 25.4'

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 1603
Sample Location: 12MWT 16
Sampled By: Gould
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-22-05 Time: 0850 Method: Peristaltic	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
	Clear	4.27	.337	16.89	31	4.27	246.5	—

PURGE DATA:

Date: 5-21-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 26.85								
Static Water Level (WL): 21.55								
One Casing Volume(gal/L) 3.2								
Start Purge (hrs): 1520								
End Purge (hrs): 1625								
Total Purge Time (min): 65								
Total Vol. Purged (gal/L) 9								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 25.85'

5/22/05 WL = 22.80

Well historically does not stabalize prior to sampling. Increased flow to dry out the well.

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: N6878

WELL ID.: 12 MWT 16
DATE: 5-21-05

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)
1520	21.55	–	–	–	–	–	–	–	–	Start purge
1530	22.07	1.0	100	4.67	.378	37	4.96	20.84	222.9	Clear
1540	22.80	2.0	100	4.48	.364	22	4.84	19.96	230.2	"
1550	23.17	3.0	100	4.36	.361	14	4.90	19.84	237.6	"
1600	24.03	5.0	200	4.30	.335	47	4.34	16.71	244.7	"
1610	24.74	7.0	200	4.29	.335	38	4.32	16.56	245.7	"
1620	25.45	9.0	200	4.27	.337	31	4.27	16.89	246.5	"
1625			Well Dry							end purge

Water Quality Meter (SN) 04C 3884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 25.85'

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 1703
Sample Location: 12MWT 17
Sampled By: Goerdt
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-22-05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time: 0830	(Visual)	(S. U.)	(mS/cm)	(°C)	(NTU)	(mg/L)	(mV)	NA
Method: Peristaltic	4.72	Clear	.621	15.88	29	8.54	244.9	--

PURGE DATA:

Date: 5-21-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
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): 24.91								
One Casing Volume(gal/L): 1.7								
Start Purge (hrs): 1405								
End Purge (hrs): 1450								
Total Purge Time (min): 45								
Total Vol. Purged (gal/L): 4L								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 26.7

5/22/05 WL = 24.43

Well historically ~~dries out~~ does not stabilize while purging. Increased flow to drag out well.

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: N6878

WELL ID.: 12MWT17
DATE: 5-21-05

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)
1405	24.91	–	–	–	–	–	–	–	–	
1415	25.00	1.0	100	4.78	.595	45	9.12	15.40	227.3	clear
1425	25.87	2.0	100	4.74	.606	55	8.75	15.83	233.5	"
1435	26.40	3.0	100	4.73	.636	38	8.58	16.20	244.2	"
1445	27.38	4.0	100	4.72	.621	29	8.54	15.88	249.9	"
1450			Well Dry							Stop purge

Water Quality Meter (SN) 04C 3884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 26.7

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 1803
Sample Location: 12MWT 18
Sampled By: T. ROJAHN
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

(5/22)

SAMPLING DATA:

	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Date: 5-22-05								
Time: 0900								
Method: SAME	CLEAR	4.58	1.457	14.90	40 (11)	0.38	14.90	—

PURGE DATA:

Date: 5/21/05.	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" ϕ PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 28.00								
Static Water Level (WL): 22.58								
One Casing Volume(gal/L): 3.3								
Start Purge (hrs): 0918								
End Purge (hrs): 1030								
Total Purge Time (min): 72								
Total Vol. Purged (gal/L) 12								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F

Dedicated pump intake @ 28

5.42' x 0.163 = 0.884 / o.c. 3.3 c

WELL Historically goes dry

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: N6878

WELL ID.: 12MWT18
DATE: 5/21/05

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)
0918	22.58	0	–	–	–	–	–	–	–	Start Purge
0928	23.42	1500	150	4.77	1.340	4.2	3.32	15.03	271	CLEAR
0938	24.03	3000	150	5.36	1.127	1.8	5.16	14.84	244	CLEAR
0948	24.75	4500	150	5.22	1.161	1.5	5.01	14.88	251	CLEAR
0958	25.38	6000	150	5.05	1.238	5.0	4.01	14.91	264	CLEAR
1008	26.18	8000	200	4.81	1.323	38	2.41	14.91	275	CLEAR
1018	26.93	1000	200	4.78	1.351	45	1.60	14.89	279	CLEAR
1028	27.62	1200	200	4.58	1.457	40	0.38	14.90	292	CLEAR
1030	–	–	–	–	–	–	–	–	–	DRY

Water Quality Meter (SN) 01L0702 AF
Control Box type (SN) 347
Turbidity Meter (SN) 1728-1600

Pump Intake 28'

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 2003
Sample Location: 12MWT 20
Sampled By: T. ROJAHN
C.O.C. No.: 3246
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-22-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1702								
Method: SAME	CLEAR	4.84	1.783	17.33	3.8	0.47	365	—

PURGE DATA:

Date: 5/22/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2"Ø PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 27.85								
Static Water Level (WL): 25.10								
One Casing Volume(gal/L): 1.7L								
Start Purge (hrs): 1539								
End Purge (hrs): 1659								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 7.4								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F 2.75 x 0.163 = 0.4 gal or 1.7L

~~Dedicated~~ pump intake @ 26

TR

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: N6878

WELL ID.: 12MWT20
DATE: 5-22-05

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)
1539	25.10	0	–	–	–	–	–	–	–	START PURGE
1549	25.25	1100	110	4.88	2.429	40	0.000	16.32	+225	CLEAR
1559	25.27	2100	100	5.24	1.733	31	0.000	16.24	225	CLEAR
1609	25.27	2900	80	5.40	1.520	22	0.04	16.31	220	CLEAR
1619	25.28	3800	90	5.39	1.455	11	0.36	16.15	225	CLEAR
1629	25.28	4700	90	5.25	1.529	8.2	0.43	16.78	251	CLEAR
1639	25.28	5600	90	5.08	1.624	6.0	0.59	17.11	299	CLEAR
1649	25.28	6500	90	4.91	1.718	4.7	0.39	17.23	346	CLEAR
1659	25.28	7400	90	4.84	1.783	3.8	0.47	17.33	365	CLEAR
1702	–	–	–	–	–	–	–	–	–	SAMPLE TIME
	REMOVED:	4 WELL VOLUMES								

Water Quality Meter (SN) 0L0702 AF
Control Box type (SN) 347
Turbidity Meter (SN) 1728 - 1600

Pump Intake 27'

SIGNATURE(S): Terry Rigel

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 2203
Sample Location: 12MWT 22
Sampled By: Goodrich
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-21-05 Time: 0850	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Method: Peristaltic	Clear	5.65	.172	13.54	* 73	5.84	290.6	--

PURGE DATA:

Date: 5-20-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 26.70								
Static Water Level (WL): 16.85								
One Casing Volume(gal/L) 5.9								
Start Purge (hrs): 1545								
End Purge (hrs): 1740								
Total Purge Time (min): 115								
Total Vol. Purged (gal/L) 22								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F Well dried out while purging

~~Dedicated~~ pump intake @ 25.70'

5/21/05 WL = 17.95

* taken prior to sampling on 5-21-05

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: N6878

WELL ID.: 12MWT22
DATE: 5-20-05

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)
1545	16.85	–	–	–	–	–	–	–	–	Start Purge
1555	18.06	2.0	200	5.65	.205	–	7.33	13.87	270.2	Clear
1605	18.88	4.0	200	5.64	.195	61	6.61	13.89	298.7	
1615	19.17	6.0	200	5.59	.191	50	6.57	13.91	301.2	
1625	20.06	8.0	200	5.53	.187	45	6.27	13.92	306.7	
1635	20.82	10.0	200	5.48	.182	31	6.03	13.96	318.1	
1645	22.12	12.0	200	5.48	.175	22	5.84	13.58	330.5	
1655	22.87	14.0	200	5.52	.176	18	5.72	13.57	313.1	
1705	23.48	16.0	200	5.59	.177	12	5.66	13.52	307.2	
1715	24.50	18.0	200	5.55	.178	140	5.27	13.74	290.1	Cloudy
1725	25.62	20.0	200	5.49	.174	200	5.28	13.68	300.3	"
1735	26.30	22.0	200	5.65	.172	550	5.84	13.54	290.6	"
1740		Well	Dry							End Purge

Water Quality Meter (SN) 01L0702AF
Control Box type (SN) 328
Turbidity Meter (SN) 1728-1600

Pump Intake ~~25.70~~ 26.50'

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 2303
Sample Location: 12MWT 2303
Sampled By: Goerzt
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration 2303
[] High Concentration

SAMPLING DATA:

Date: 5-21-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 0815								
Method: Peristaltic	Clear	2.93	5.05	17.46	12	1.73	498.5	—

PURGE DATA:

Date: 5-20-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" pvc			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 32.48								
Static Water Level (WL): 27.85								
One Casing Volume(gal/L): 2.8								
Start Purge (hrs): 1410								
End Purge (hrs): 1532								
Total Purge Time (min): 82								
Total Vol. Purged (gal/L): 10.8								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F Well dried out during purge.

~~Dedicated~~ pump intake @ 31.5'

5/21/05 WL = 29.82

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: N6878

WELL ID.: 12MWT23
DATE: 5-20-05

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)
1410	27.85	–	–	–	–	–	–	–	–	Start purge
1420	28.37	1.4	140	2.87	4.91	28	.64	16.23	547.7	clear
1430	28.95	2.8	140	2.87	4.89	19	1.54	16.31	547.2	"
1440	29.60	4.3	150	2.89	4.81	17	2.41	16.41	548.1	"
1450	29.88	5.8	150	2.87	4.78	–	2.27	16.65	528.6	"
1500	30.61	7.3	150	2.88	4.86	–	2.17	16.83	517.8	"
1510	30.95	8.8	150	2.87	4.93	–	1.87	17.07	498.2	"
1520	31.46	9.8	100	3.02	5.06	15	1.60	17.56	496.4	"
1530	31.52	10.8	100	2.93	5.05	12	1.73	17.46	498.5	"
1532	well		Dry							end purge

Water Quality Meter (SN) QL 0702 AF
Control Box type (SN) 328
Turbidity Meter (SN) 1728-1600

Pump Intake 31.48

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 2803
Sample Location: 12MWT 28
Sampled By: Goerdt
C.O.C. No.: 3246
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-23-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1720								
Method: Peristaltic	Clear	6.0	1.05	14.44	4.72	1.63	237.4	--

PURGE DATA:

Date: 5-23-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 27.80								
Static Water Level (WL): 11.45								
One Casing Volume(gal/L): 25.5								
Start Purge (hrs): 13.15								
End Purge (hrs): 1715								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L) 25.5								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 26.8

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: N6878

WELL ID.: 12MW128
DATE: 5-23-05

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)
1315	11.45	–	–	–	–	–	–	–	–	Start purge
1325	12.63	1.2	1.20	–	1.08	23.8	2.78	15.64	181.3	clear
1335	13.83	2.3	1.10	–	1.06	15.9	2.53	15.76	189.3	"
1345	14.42	3.4	1.10	6.0	1.06	–	2.28	15.78	198.2	"
1355	15.17	4.5	1.10	–	1.06	–	2.18	15.97	204.2	"
1405	16.03	5.6	1.10	–	1.06	10.4	2.11	15.69	211.1	"
1415	17.57	6.7	1.10	–	1.05	9.6	2.07	15.81	214.3	
1425	18.20	7.8	1.10	–	1.05	–	2.00	15.99	219.0	
1435	18.52	8.9	1.10	–	1.05	7.85	1.97	16.03	221.7	
1445	18.96	10.0	1.10	6.0	1.05	6.05	1.96	15.94	225.5	
1455	19.27	11.1	1.10	–	1.05	5.87	1.93	16.11	228.7	
1505	19.53	12.2	1.10	–	1.06	5.21	1.91	16.20	232.5	
1515	19.98	13.3	1.10	–	1.06	3.38	1.87	16.34	236.2	
1525	20.31	14.4	1.10	6.0	1.05	–	1.72	16.31	236.9	
1535	20.58	15.5	1.10	–	1.05	–	1.66	16.32	237.3	
1545	20.82	16.6	110	–	1.06	3.12	1.67	16.53	237.6	
1555	21.13	17.7	110	–	1.08	4.66	1.69	16.94	238.3	
1605	21.31	18.8	110	–	1.09	–	1.65	17.18	241.1	
1615	21.38	19.7	90	–	1.13	–	1.58	18.66	242.6	
1625	21.41	20.6	90	6.0	1.21	5.62	1.61	19.01	244.7	
1635	21.46	21.5	90	–	1.27	4.17	1.65	21.35	245.8	
1645	21.52	22.5	100	–	1.34	3.02	1.68	23.75	233.5	Pump off briefly
1655	21.53	23.5	100	–	1.27	–	1.71	20.50	234.2	
1705	21.55	24.5	100	6.0	1.05	6.85	1.67	15.05	238.8	
1715	21.61	25.5	100	–	1.05	4.72	1.63	14.49	237.4	end purge

Water Quality Meter (SN) 043884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 26.8'

SIGNATURE(S): [signature]

* pH bulb broken on YSI meter. Using pH indicator strips.

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 3001
Sample Location: 12MWT 30
Sampled By: T. ROJAHN
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-21-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 0830								
Method: BAILER (TEFLON)	NA							--

Grey

PURGE DATA:

Date: NA	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:								
Monitor Reading (ppm):		No	Purge	Well	Dries		out	
Well Casing Diameter & Material								
Type:			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 92.9								
Static Water Level (WL): 92.52								
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)~~ TR L Glass Amber	Yes / No
Volatiles SW-846-8260B	4°C/HCl	(3) 40 ml Vials	Yes / No
		5/21 = ~ 50-100 ml	
		5/22 = DRY	

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F

1630 Hrs - W.L. = 92.70

~~Dedicated~~ pump intake @ ~~Bottom~~ NA (TR)

(TR)

Circle if Applicable:

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

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 3103
Sample Location: 12MWT 31
Sampled By: T. ROJAHN
C.O.C. No.: 3246
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-23-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1330								
Method: SAME	CLEAR	7.58	0.374	18.04	25	3.77	335	—

PURGE DATA:

Date: 5-23-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: BLADDER PUMP								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2"Ø PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 91.25								
Static Water Level (WL): 66.86								
One Casing Volume(gal/L): 15								
Start Purge (hrs): 0925								
End Purge (hrs): 1325								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 22.1								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F 24.39 × 0.163 = 4.0941 in 15L

Dedicated pump intake @ 89'

FR

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: N6878

WELL ID.: 12MW1T 31
DATE: 5/23/05

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)
0925	66.86	0	—	—	—	—	—	—	—	Start PURGE
0935	68.60	1300	130	7.66	0.363	90	0.28	15.97	99	V. Sl. Cloudy
0945	69.84	2400	110	7.53	0.361	50	2.07	15.99	242	CLEAR
0955	70.68	3400	100	7.53	0.364	45	2.40	16.56	294	CLEAR
1005	71.28	4100	70	7.44	0.364	40	2.55	16.60	323	CLEAR
1015	71.79	5000	90	7.56	0.366	29	2.65	16.87	325	CLEAR
1025	72.27	5900	90	7.51	0.363	28	2.77	16.77	335	CLEAR
1035	72.58	6800	90	7.53	0.363	24	2.84	16.89	336	CLEAR
1045	72.96	7700	90	7.58	0.363	21	2.94	17.07	322	CLEAR
1055	73.33	8600	90	7.63	0.366	19	2.98	17.31	317	CLEAR
1105	73.67	9500	90	7.57	0.367	17	3.05	17.51	303	CLEAR
1115	74.05	10400	90	7.63	0.366	17	3.11	17.52	298	CLEAR
1125	74.40	11300	90	7.57	0.368	15	3.25	17.79	303	CLEAR
1135	74.70	12200	90	7.64	0.367	14	3.30	17.85	301	CLEAR
1145	74.97	13100	90	7.66	0.366	15	3.41	17.98	312	CLEAR
1155	75.28	14000	90	7.65	0.366	14	3.48	18.02	313	CLEAR
1205	75.56	14900	90	7.64	0.368	13	3.57	18.15	312	CLEAR
1215	75.90	15800	90	7.68	0.369	14	3.59	18.23	307	CLEAR
1225	76.24	16700	90	7.68	0.371	16	3.66	18.27	305	CLEAR
1235	76.55	17600	90	7.70	0.372	20	3.70	18.15	299	CLEAR
1245	76.85	18500	90	7.70	0.373	22	3.73	18.21	302	CLEAR
1255	77.17	19400	90	7.65	0.373	20	3.70	18.12	309	CLEAR
1305	77.45	20300	90	7.64	0.376	22	3.81	18.39	320	CLEAR
1315	77.75	21200	90	7.61	0.375	24	3.80	18.22	325	CLEAR
1325	78.03	22100	90	7.58	0.374	25	3.77	18.04	335	CLEAR
1330	—	—	—	—	—	—	—	—	—	Start SAMPLING

Water Quality Meter (SN) 0120702 AF
Control Box type (SN) MP10-1600
Turbidity Meter (SN) 1728-1600

Pump Intake 89'

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 3203
Sample Location: 12MWT 32
Sampled By: T. ROJAHN
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-22-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1450								
Method: SAME	CLEAR	6.20	1.324	19.18	50	*0.00	41	—

PURGE DATA:

Date: 5-22-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Bladder								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2"ϕ PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 100.6								
Static Water Level (WL): 84.28								
One Casing Volume(gal/L): 10.1								
Start Purge (hrs): 1045								
End Purge (hrs): 1445								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 21.7								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT — -F

16.23' x 0.163 = 2.79 gal or 10.1

~~Dedicated~~ pump intake @ 99'

* Possible malfunction

(TR)

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: N6878

WELL ID.: 12MWT 32
DATE: 5-22-05

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)
1045	84.28	0	—	—	—	—	—	—	—	START PURGE
1055	84.91	1000	100	6.43	1.320	>1000	*0.00	18.32	42	GREY
1105	85.26	1700	70	6.37	1.298	900	0.00	18.52	45	LT. GREY
1115	85.68	2400	70	6.38	1.290	660	0.00	18.30	46	" "
1125	86.04	3100	70	6.39	1.283	550	0.00	18.12	48	" "
1135	86.47	4000	90	6.39	1.300	380	0.00	18.35	47	" "
1145	86.77	4900	90	6.37	1.289	230	0.00	18.15	52	CLOUDY
1155	87.09	5800	90	6.34	1.297	150	0.00	18.18	55	SL. Cloudy
1205	87.45	6700	90	6.32	1.287	95	0.00	18.09	57	V.SL. Cloudy
1215	87.70	7600	90	6.32	1.287	75	0.00	18.18	60	" " "
1225	88.15	8500	90	6.30	1.287	55	0.00	18.14	62	" " "
1235	88.52	9400	90	6.30	1.291	46	0.00	18.50	66	CLEAR
1245	88.88	10300	90	6.30	1.296	39	0.00	18.71	70	CLEAR
1255	89.18	11300	100	6.30	1.302	40	0.00	18.58	77	CLEAR
1305	89.55	12300	100	6.25	1.288	32	0.00	18.43	83	CLEAR
1315	89.95	13300	100	6.25	1.292	28	0.00	18.57	81	CLEAR
1325	90.34	14300	100	6.25	1.295	24	0.00	18.71	80	CLEAR
1335	90.68	15300	100	6.24	1.297	21	0.00	18.86	79	CLEAR
1345	90.94	16300	100	6.28	1.286	21	0.00	18.27	75	CLEAR
1355	91.30	17300	100	6.22	1.299	20	0.00	18.86	69	CLEAR
1405	91.65	18300	100	6.15	1.307	21	0.00	19.07	65	CLEAR
1415	92.02	19300	100	6.16	1.306	25	0.00	18.97	52	CLEAR
1425	92.35	20300	100	6.20	1.341	30	0.00	19.94	42	CLEAR
1435	92.62	21000	70	6.18	1.325	35	0.00	19.40	42	CLEAR
1445	92.85	21700	70	6.20	1.324	50	0.00	19.18	41	CLEAR
1450	—	—	—	—	—	—	—	—	—	START SAMPLING

Water Quality Meter (SN) 01L0702 AF
Control Box type (SN) MP10-1600
Turbidity Meter (SN) 1728-1600

Pump Intake 99'

* Malfunctional possible

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 3603
Sample Location: 12MWT 36
Sampled By: Goeyat
C.O.C. No.: 3246
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-22-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1705								
Method: Peristaltic	Clear	6.0	.464	16.67	0	2.98	232.6	—

PURGE DATA:

Date: 5-22-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 27.56								
Static Water Level (WL): 13.85								
One Casing Volume(gal/L): 8.3								
Start Purge (hrs): 1415								
End Purge (hrs): 1705								
Total Purge Time (min): 165								
Total Vol. Purged (gal/L): 17.1								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

Dedicated pump intake @ 27'

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: N6878

WELL ID.: 12MWT36
DATE: 5-22-05

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)
1415	13.85	–	–	–	–	–	–	–	–	Start purge
1425	15.40	1.1	110	–	.472	0.0	4.45	16.50	156.7	clear
1435	15.82	2.2	110	–	.473	0.0	3.31	16.79	178.6	"
1445	16.21	3.3	110	–	.473	0.0	3.29	16.62	195.5	"
1455	16.56	4.4	110	6.0	.472	0.0	3.21	16.64	203.4	"
1505	16.71	5.5	110	–	.473	0.0	3.19	16.71	206.1	"
1515	16.30	6.6	110	–	.482	0.0	3.16	18.24	212.7	pump stopped briefly
1525	16.45	7.6	100	–	.471	0.0	3.14	17.06	214.1	clear
1535	16.76	8.6	100	6.0	.458	0.0	3.11	16.08	219.1	"
1545	16.91	9.6	100	–	.456	0.0	3.12	16.03	221.4	"
1555	17.23	10.6	100	–	.453	0.0	3.12	15.97	221.6	"
1605	17.48	11.6	100	–	.449	0.0	2.87	15.58	222.3	"
1615	17.52	12.6	100	–	.451	0.0	2.88	15.96	223.9	
1625	17.59	13.6	100	–	.456	0.0	2.89	16.21	225.1	
1635	17.66	14.6	100	6.0	.459	0.0	2.89	16.42	226.3	
1645	17.74	15.6	100	–	.463	0.0	2.90	16.51	228.1	
1655	17.73	16.6	100	–	.462	0.0	3.03	16.65	231.1	
1700	17.69	17.1	100	–	.464	0.0	2.98	16.67	232.6	end purge

Water Quality Meter (SN): 043884 AB
Control Box type (SN): 328
Turbidity Meter (SN): 2843-7501

Pump Intake: 27'

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 3803
Sample Location: 12MWT 38
Sampled By: Gerald
C.O.C. No.: 3240
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-19-05 Time: 1810	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Method: Peristaltic	Clear	3.70	.297	15.02	1.4	2.87	420.0	--

PURGE DATA:

Date: 5-19-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" pvc			See Low Flow Purge Data Sheets					
Total Well Depth (TD): 26.70								
Static Water Level (WL): 9.47								
One Casing Volume(gal/L): 10.4								
Start Purge (hrs): 1405								
End Purge (hrs): 1805								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 22.5								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 26.20'

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: N6878

WELL ID.: 12MWT38
DATE: 5-19-05

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)
1405	9.47	–	–	–	–	–	–	–	–	Start purge
1415	10.40	1.2	120	3.61	.310	110	4.83	15.77	483.5	Sl. cloudy
1425	11.15	2.4	120	3.60	.307	–	4.61	15.79	491.6	"
1435	11.87	3.6	120	3.60	.304	65	3.75	15.82	499.5	"
1445	12.35	4.5	90	3.62	.364	–	3.49	15.43	467.7	Heavy rain &
1455	–	5.4	90	3.63	.298	–	3.41	15.50	467.4	lightning
1505	–	6.3	90	3.63	.294	–	3.41	14.76	451.1	
1515	13.98	7.2	90	3.65	.292	14	3.27	14.70	439.9	Clear
1525	–	8.1	90	3.65	.293	–	3.16	15.07	438.9	"
1535	14.85	9.0	90	3.66	.292	2.3	3.14	14.87	431.7	"
1545	–	9.9	90	3.66	.291	–	3.22	14.67	435.5	"
1555	15.88	10.8	90	3.67	.292	–	3.25	14.87	434.3	"
1605	16.15	11.7	90	3.67	.292	1.3	3.25	14.88	432.9	"
1615	–	12.6	90	3.67	.293	–	3.23	14.80	427.0	"
1625	16.65	13.5	90	3.68	.293	–	3.18	14.93	424.4	"
1635	17.04	14.4	90	3.68	.293	1.2	3.18	14.97	422.5	"
1645	17.24	15.3	90	3.69	.293	1.3	3.17	14.86	420.6	"
1655	–	16.2	90	3.69	.292	1.1	3.17	14.90	420.7	"
1705	17.69	17.1	90	3.69	.291	–	3.12	14.78	416.5	"
1715	17.87	18.0	90	3.69	.291	–	3.08	14.61	416.4	"
1725	18.06	18.9	90	3.69	.290	–	2.96	14.48	411.6	"
1735	18.20	19.8	90	3.70	.291	1.9	2.96	14.61	411.9	"
1745	–	20.7	90	3.70	.295	–	2.84	15.00	416.5	"
1755	–	21.6	90	3.70	.294	–	2.87	14.82	415.8	"
1805	19.34	22.5	90	3.70	.297	1.4	2.87	15.02	420.0	End purge

Water Quality Meter (SN) 04C3884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake ~26.20'

SIGNATURE(S): [signature]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 4103
Sample Location: 12MWT 41
Sampled By: Goerdt
C.O.C. No.: 3246
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-23-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1135								
Method: Peristaltic	Clear	6.0	.579	13.77	7.6	0.59	23.8	–

PURGE DATA:

Date: 5-23-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 36.60								
Static Water Level (WL): 19.55								
One Casing Volume(gal/L): 10.3								
Start Purge (hrs): 0820								
End Purge (hrs): 1130								
Total Purge Time (min): 190								
Total Vol. Purged (gal/L): 20.0								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ pump intake @ 31.6'

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: N6878

WELL ID.: 12MWT41
DATE: 5-23-05

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)
0820	19.55	–	–	–	–	–	–	–	–	Start purge
0830	19.97	1.2	120	–	.558	95	1.88	13.07	225.8	v. lt. brown
0840	21.27	2.4	120	–	.556	73	1.56	12.91	172.6	"
0850	22.08	3.6	120		.556	70	1.62	12.96	119.8	Clear
0900	23.60	4.8	120	–	.556	65	1.25	12.98	119.0	"
0910	23.82	6.0	120	6.0	.558	58	1.28	13.07	116.1	"
0920	24.10	7.0	100	–	.561	50	1.12	13.24	100.6	"
0930	24.10	8.0	100	–	.565	48	1.18	13.28	97.9	"
0940	24.12	9.0	100	–	.571	46	1.05	13.30	96.2	"
0950	24.18	10.0	100	–	.574	40	1.00	13.34	91.0	"
1000	24.26	11.0	100	6.0	.575	–	0.97	13.36	82.0	
1010	24.35	12.0	100	–	.578	–	0.91	13.39	67.8	
1020	24.45	13.0	100	–	.579	31	0.85	13.41	60.5	
1030	24.48	14.0	100	–	.579	–	0.74	13.56	49.9	
1040	24.49	15.0	100	–	.579	24	0.69	13.60	42.7	
1050	24.51	16.0	100	6.0	.579	18	0.67	13.64	36.4	
1000	24.50	17.0	100	–	.578	13	0.63	13.71	29.2	
1110	24.51	18.0	100	–	.578	10.0	0.61	13.78	27.0	
1120	24.51	19.0	100	6.0	.579	9.6	.60	13.84	23.9	
1130	24.51	20.0	100	–	.579	7.2	0.59	13.77	23.8	end purge

Water Quality Meter (SN) 043884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 31.6'

* pH bulb broken on YSI meter. Using pH indicator strips.

SIGNATURE(S):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 4203
Sample Location: 12MWT 42
Sampled By: Gossett
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-22-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1325								
Method: Peristaltic	Clear	5.0	.346	15.26	5.0	2.47	398.2	—

PURGE DATA:

Date: 5-22-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 30.45								
Static Water Level (WL): 11.60								
One Casing Volume(gal/L): 11.4								
Start Purge (hrs): 0920								
End Purge (hrs): 1320								
Total Purge Time (min): 240								
Total Vol. Purged (gal/L): 24								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

Dedicated pump intake @ 29.45'

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: N6878

WELL ID.: 12MW42
DATE: 5-22-05

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)
0920	11.60	–	–	–	–	–	–	–	–	start purge
0930	12.62	1.0	100	–	.273	80	2.06	13.23	162.1	sl. cloudy
0940	13.18	2.0	100	–	.237	41	1.79	13.15	191.2	"
0950	14.26	3.0	100	–	.283	18	1.69	13.19	237.1	clear
1000	15.17	4.0	100	–	.213	4.0	1.49	13.02	298.8	"
1010	15.38	5.0	100	–	.213	3.7	1.52	13.08	314.2	
1020	15.69	6.0	100	5.0	.210	2.1	1.48	13.11	321.7	
1030	15.98	7.0	100	–	.207	–	1.46	13.14	329.6	
1040	16.36	8.0	100	–	.203	–	1.42	13.18	334.2	
1050	16.81	9.0	100	–	.201	2.8	1.41	13.19	347.6	
1100	16.94	10.0	100	–	.202	0.85	1.47	13.21	351.2	
1110	17.38	11.0	100	–	.203	–	1.53	13.26	354.8	
1120	17.57	12.0	100	5.0	.207	0.48	1.58	13.29	358.7	
1130	17.91	13.0	100	–	.208	0.10	1.62	13.47	360.6	
1140	18.07	14.0	100	–	.212	–	1.68	13.58	362.8	
1150	18.24	15	100	–	.221	–	1.72	13.72	366.7	
1200	18.51	16	100	–	.237	–	1.83	13.84	371.4	
1210	18.73	17	100	–	.246	–	1.88	13.91	373.5	
1220	18.92	18	100	5.0	.268	–	1.91	14.07	378.1	
1230	19.15	19	100	–	.299	0.18	1.95	14.29	379.7	
1240	19.23	20	100	–	.315	–	2.05	14.38	395.5	
1250	19.41	21	100	–	.324	–	2.15	14.73	387.6	
1300	19.56	22	100	–	.332	0.11	2.26	14.88	389.2	
1310	19.69	23	100	5.0	.339	–	2.34	14.92	394.7	
1320	19.74	24	100	–	.346	0.14	2.47	15.26	398.2	end purge

Water Quality Meter (SN) 043884AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 29.45'

SIGNATURE(S): [illegible]

* pH bulb broken using indicator strips.

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12GWT 4703
Sample Location: 12MWT 47
Sampled By: Gould
C.O.C. No.: 3243
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 5-21-05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1145								
Method: Peristaltic	clear	5.11	.640	12.59	4.3	5.30	231.8	–

PURGE DATA: *5.11

Date: 5-21-05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Peristaltic								
Monitor Reading (ppm): –								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Data Sheets							
Total Well Depth (TD): 26.80								
Static Water Level (WL): 13.92								
One Casing Volume(gal/L) 7.8								
Start Purge (hrs): 1030								
End Purge (hrs): 1140								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L) 12.6								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[] No[X] 12GWT_____-F

~~Dedicated~~ (yes) pump intake @ 21.8

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: N6878

WELL ID.: 12MWT47
DATE: 5-21-05

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)
1030	13.92	–	–	–	–	–	–	–	–	Start purge
1040	13.93	1.8	180	5.19	.656	82	7.26	12.62	200.1	sl. cloudy
1050	13.92	3.6	180	5.17	.648	15	7.29	12.59	205.4	clear
1100	13.92	5.4	180	5.15	.636	8.7	6.43	12.49	216.1	"
1110	13.92	7.2	180	5.13	.645	6.5	6.09	12.53	222.5	"
1120	13.92	9.0	180	5.12	.648	4.9	5.21	12.55	224.6	"
1130	13.92	10.8	180	5.11	.642	4.7	5.23	12.57	227.3	"
1140	13.92	12.6	180	5.11	.640	4.3	5.30	12.59	231.8	end purge

Water Quality Meter (SN) 04C 3884 AB
Control Box type (SN) 328
Turbidity Meter (SN) 2843-4501

Pump Intake 21.8

SIGNATURE(S): [signature]

APPENDIX A.1.2

SWMU 12

ROUND 3

SURFACE WATER SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

Sample ID No.: 12SW 0903
Sample Location: 12SW/SD 03
Sampled By: JG/TR
C.O.C. No.: 3240

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

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

SAMPLING DATA

Date: 5/20/09	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1015								
Depth: SURFACE	Clear	7.01	0.117	15.30	21	9.65	193	—
Method: Direct								

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	(Yes) / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / (No)
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / (No)
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / (No)
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / (No)
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / (No)
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / (No)
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / (No)
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / (No)

OBSERVATIONS / NOTES

Filtered Sample Collected Yes[ ] No[X] 12SW_____-F

FLOW =

x	D	v
3.5	0.5	1sec/ft

786 gpm

MAP

Circle if Applicable:

MS/MSD — Duplicate ID No.: —

Signature(s): Ty Lyal

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12SW 1103
Sample Location: 12SW/SD 11
Sampled By: JG/TR
C.O.C. No.: 3240

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: 5/20/05 Time: 0905 Depth: SURFACE Method: DIRECT	Clear	6.63	0.116	14.57	19	9.21	109	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	(Yes) / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / (No)
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / (No)
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / (No)
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / (No)
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / (No)
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / (No)
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / (No)
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / (No)

OBSERVATIONS / NOTES:

Filtered Sample Collected Yes[ ] No[X] 12SW ____ -F

Flow

0, .2, .52, .65, .65, 0.65 0

Width 8' VEL. 1sec/Ft

Depth = 0.38

1,365 gpm

MAP

Circle if Applicable:

MS/MSD ____ Duplicate ID No.: ____

Signature(s): [signature]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

[] Stream
[] Spring
[] Pond
[] Lake
[] Other: Drainage Ditch
[] QA Sample Type:

Sample ID No.: 12SW 1403
Sample Location: 12SW/SD 14
Sampled By: JG/TR
C.O.C. No.: 3240

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

SAMPLING DATA

Date: 5/20/05	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
Time: 1030								
Depth: SURFACE	clear-tannish	7.36	0.320	17.33	800	7.98	187	—
Method: DIRECT								

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	Yes / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / No
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / No
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / No
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / No
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / No
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / No

OBSERVATIONS / NOTES

Filtered Sample Collected Yes[ ] No[X] 12SW — -F

Flow 1-5 gpm

MAP

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

Sample ID No.: 12SW 2403
Sample Location: 12SW/SD 24
Sampled By: JG/TK
C.O.C. No.: 3240

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

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

SAMPLING DATA

Date: 5/20/05 Time: 0955 Depth: Surface Method: Direct	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
	Clear	7.16	0.144	15.08	17	9.88	187	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	Yes / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / No
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / No
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / No
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / No
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / No
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / No

OBSERVATIONS / NOTES

Filtered Sample Collected ~~Yes~~ / ~~No~~ 12SW —-F

W - 5.5'
D = 0, 0.2 (0.23), 0.35, 0.62, 0
V = 0.5 sec/ft or 2 ft/sec

1136.0 gpm

MAP

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Tey [illegible]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

Sample ID No.: 12SW 2503
Sample Location: 12SW/SD 25
Sampled By: JG/TR
C.O.C. No.: 3240

[] 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: 5/20/05 Time: 0920 Depth: Surface Method: Direct	Clear	6.88	0.082	14.17	16	10.27	173	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	Yes / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / No
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / No
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / No
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / No
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / No
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / No

OBSERVATIONS/NOTES:

Filtered Sample Collected Yes[ ] No[X] 12SW — -F

Flow:
W 24'
D 2.2'
Vel. ~~0.5~~ 2 ft/sec

Flow 47,414 gpm

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

Sample ID No.: 12SW2703
Sample Location: 12SW/SD27
Sampled By: JG / TK
C.O.C. No.: 3240

[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: 5/20/05 Time: 0845 Depth: SURFACE Method: Direct	CLEAR	6.77	0.087	14.18	30	10.02	172	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	Yes / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / No
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / No
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / No
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / No
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / No
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / No

OBSERVATIONS / NOTES

Filtered Sample Collected Yes[ ] No[X] 12SW—-F

FLOW

D W V
71' x 20' ~~0.33ft/ft~~ (Fx)
3ft/sec

+ 26,940 gpm

MAP

Circle if Applicable:

MS/MSD YES

Duplicate ID No.: 12F0052005 01

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NSWC CRANE, SWMU12
Project No.: N6878 CTO 0357

[] Stream
[] Spring
[] Pond
[] Lake
[] Other: Drainage Ditch
[] QA Sample Type:

Sample ID No.: 12SW 3102
Sample Location: 12SW/SD 31
Sampled By: JG/TK
C.O.C. No.: 3240

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

SAMPLING DATA

Date: 5/20/05 Time: 1110 Depth: Surface Method: Direct	Color (Visual)	pH (S. U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Other NA
	Clear	7.42	0.184	15.90	40	9.63	138	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	Yes / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / No
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / No
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / No
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / No
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / No
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / No

OBSERVATIONS / NOTES

Filtered Sample Collected Yes[ ] No[X] 12SW_____-F

Flow!
5-10 gpm

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, SWMU12
Project No.: N6878 CTO 0357

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

Sample ID No.: 12SW 3402
Sample Location: 12SW/SD 34
Sampled By: JG/TR
C.O.C. No.: 3240

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: 5/20/05 Time: 1048 Depth: SURFACE Method: Direct	Sl. cloudy	7.58	0.462	16.28	130	8.61	177	—

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected
Explosives SW-846 8330	4°C	(2) L Glass Amber	Yes / No
Miscellaneous Explosives	4°C	(2) L Glass Amber	Yes / No
Total Metals SW-846-6020 & Toatl Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Dissolved Metals SW-846-6020 & Dissolved Mercury SW-846-7470A	4°C/HNO3	(1) L HDPE	Yes / No
Nitrate & Nitrite (as N) EPA 353.2	4°C/H2SO4	(1) L HDPE	Yes / No
Ammonia (as N) EPA 350.1	4°C/H2SO4	(1) L HDPE	Yes / No
Semivolatiles SW-846-8270C	4°C	(2) L Glass Amber	Yes / No
Selected Ion Monitoring	4°C	(2) L Glass Amber	Yes / No
Semivolatiles SW-846-8151A	4°C	(2) L Glass Amber	Yes / No

OBSERVATIONS / NOTES

Filtered Sample Collected Yes[ ] No[X] 12SW — -F

W - 1.5'
D - 0.1
V = 1ft/sec

Flow = 67 gpm

MAP

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

APPENDIX A.2

SWMU 12

ROUND 3

CHAIN OF CUSTODY RECORDS

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3240 PAGE 1 OF

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 6878 357	NSWC CRANE	RALPH BASINKI	(412) 921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
TR FOR Jim GOERDT		TERRY ROJAHN	(412) 921-8857	940 S. HARNEY St
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB # 8447 8135 4778		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
PRESERVATIVE USED: °C, X

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: EXPLOSIVES (8330) Nitro. & Nitrat.	COMMENTS
5/19	1050	12GWT1103	12MW T11	–	–	GW	G	2	2	
5/19	1300	12GWT1203	12MW T12	–	–	GW	G	2	2	
5/19	1703	12GWT1003	12MW T10	–	–	GW	G	2	2	
5/19	1810	12GWT3803	12MW T38	–	–	GW	G	2	2	
5/20	0845	12SW2703	12SW SD27	–	–	~~SW~~ SED	G	4	4	DO MS/MSD
5/20	0905	12SW1103	12SW SD11	–	–	SW	G	2	2	
5/20	0920	12SW2503	12SW SD25	–	–	SW	G	2	2	
5/20	0955	12SW2403	12SW SD24	–	–	SW	G	2	2	
5/20	1015	12SW0903	12SW SD09	–	–	SW	G	2	2	
5/20	1030	12SW1403	12SW SD14	–	–	SW	G	2	2	
5/20	1048	12SW3402	12SW SD34	–	–	SW	G	2	2	
5/20	1110	12SW3102	12SW SD31	–	–	SW	G	2	2	
5/20	0000	12FD05200501	QC	–	–	SW	G	2	2	FROM 12SW2703

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	5-20-05	1830	1. RECEIVED BY FEDERAL EXPRESS	5-20-05	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. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 3243 PAGE 1 OF

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 357 6878	NSWC CRANE	RALPH BASINSKI	(412) 921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: TERRY ROJAHN	PHONE NUMBER: (412) 921-8857	ADDRESS: 940 S. HARNEY ST.
Terry Rojahn		CARRIER/WAYBILL NUMBER: FED. EX. AB # 8447 8135 4789		CITY, STATE: 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
PRESERVATIVE USED: 4°C
TYPE OF ANALYSIS: EXPLOSIVES (8330) NITRO. & NITRA.

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAP (G) COMP (C)	No. OF CONTAINERS									COMMENTS
5/21	0815	12GWT2303	12MWT23	-	-	GW	G	2	2								
5/21	0850	12GWT2203	12MWT22	-	-	GW	G	2	2								
5/21	1145	12GWT4703	12MWT47	-	-	GW	G	4	4								DO MS/MSD
5/21	1627	12GWT0903	12MWT09	-	-	GW	G	2	2								
5/21	1820	12GWT0603	12MWT06	-	-	GW	G	2	2								
5/21	0000	12FD05210501	QC	-	-	GW	G	2	2								DUP OF 12GWT0603
5/21	0830	12GWT3001	12MWT30	-	-	GW	G	1	1								ONLY 50-100ml collected!
5/22	0830	12GWT1703	12MWT17	-	-	GW	G	2	2								
5/22	0850	12GWT1603	12MWT16	-	-	GW	G	2	2								
5/22	0900	12GWT1803	12MWT18	-	-	GW	G	2	2								
5/22	0948	12GWT0303	12MWT03	-	-	GW	G	2	2								
5/22	1325	12GWT4203	12MWT42	-	-	GW	G	2	2								
5/22	1450	12GWT3203	12MWT32	-	-	GW	G	2	2								

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: Terry Rojahn	5-23-05	1900	1. RECEIVED BY: FEDERAL EXPRESS	5-23-05	1900
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 3246 PAGE 1 OF

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 6878 357	NSWC CRANE	RALPH BASINSKI	(412)921-8308	LAUCKS / HUGH PRENTICE
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		TERRY ROJAHN	(412)921-8857	940 S. HARNEY ST
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FED. EX. AB # 8447 8135 4789		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
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: EXPLOSIVES (8330) Nitro. & Nitra.	COMMENTS
5/22	1702	12GWT2003	12GW T20	-	-	GW	G	2	2	
5/22	1705	12GWT3603	12GW T36	-	-	GW	G	2	2	
5/23	1135	12GWT4103	12GW T41	-	-	GW	G	2	2	
5/23	1330	12GWT3103	12GW T31	-	-	GW	G	2	2	
5/23	1720	12GWT2803	12GW T28	-	-	GW	G	2	2	

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	5-23-05	1900	1. RECEIVED BY FEDERAL EXPRESS	5/23/05	1900
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

APPENDIX A.3

SWMU 12
ROUND 3
WATER LEVEL MEASUREMENTS

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: NSWC CRANE
Project No.: N6878
Location: SWMU 12
Personnel: T. Rojahn/J. Goerdt
Weather Conditions: Mostly Sunny, 70°s
Measuring Device: M-Scope
Tidally Influenced: Yes ___ No _X_
Remarks: ----

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet bgs)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
12MWT01	5/18/2005	1057	726.87	35.00	9.27	NA	717.60	
12MWT02	5/18/2005	1034	725.64	29.00	8.25	NA	717.39	
12MWT03	5/18/2005	1047	734.44	26.00	15.29	NA	719.15	
12MWT04	5/18/2005	1044	730.74	25.00	13.29	NA	717.45	
12MWT05	5/18/2005	1040	725.36	25.00	8.41	NA	716.95	
12MWT06	5/18/2005	1104	726.70	24.00	10.18	NA	716.52	
12MWT07	5/18/2005	1102	728.40	25.00	12.62	NA	715.78	
12MWT08	5/18/2005	1015	728.83	24.00	12.71	NA	716.12	
12MWT09	5/18/2005	1025	728.00	25.00	12.37	NA	715.63	
12MWT10	5/18/2005	1013	726.68	25.00	13.17	NA	713.51	
12MWT11	5/18/2005	0912	740.79	25.00	13.01	NA	727.78	
12MWT12	5/18/2005	0914	741.66	25.00	10.18	NA	731.48	
12MWT13	5/18/2005	0834	735.81	21.00	4.83	NA	730.98	
12MWT14	5/18/2005	0902	736.67	26.00	21.28	NA	715.39	
12MWT15	5/18/2005	0908	736.74	25.00	18.24	NA	718.50	
12MWT16	5/18/2005	1110	745.97	25.00	21.62	NA	724.35	
12MWT17	5/18/2005	0931	747.23	26.00	23.73	NA	723.50	
12MWT18	5/18/2005	0927	745.94	26.00	22.68	NA	723.26	
12MWT19	5/18/2005	0937	746.89	27.00	27.68	NA	719.21	
12MWT20	5/18/2005	0935	746.56	26.00	25.45	NA	721.11	
12MWT21	5/18/2005	1053	737.72	25.00	19.46	NA	718.26	
12MWT22	5/18/2005	1019	739.74	25.00	17.10	NA	722.64	
12MWT23	5/18/2005	1002	739.75	31.00	21.89	NA	717.86	
12MWT24	5/18/2005	0957	740.60	31.00	32.35	NA	708.25	
12MWT24A	5/18/2005	0953	740.53	54.00	34.93	NA	705.60	

* All measurements to the nearest 0.01 foot

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name:	NSWC CRANE	**Project No.:**	N6878
Location:	SWMU 12	**Personnel:**	T. Rojahn/J. Goerdt
Weather Conditions:	Mostly Sunny, 70°s	**Measuring Device:**	M-Scope
Tidally Influenced:	Yes ___ No _X_	**Remarks:**	----

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet bgs)*	Water Level Indicator Reading (feet)	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
12MWT25	5/18/2005	0825	748.66	26.00	16.55	NA	732.11	
12MWT26	5/18/2005	1118	743.72	25.00	10.02	NA	733.70	
12MWT27	5/18/2005	0828	740.52	26.00	9.18	NA	731.34	
12MWT28	5/18/2005	1115	745.53	26.00	11.8	NA	733.73	
12MWT29	5/18/2005	1043	731.23	89.00	59.83	NA	671.40	
12MWT30	5/18/2005	1027	727.59	90.50	92.56	NA	635.03	
12MWT31	5/18/2005	0904	736.75	89.00	67.87	NA	668.88	
12MWT32	5/18/2005	0939	747.44	100.00	84.75	NA	662.69	
12MWT33	5/18/2005	0830	740.49	95.00	41.34	NA	699.15	
12MWT34	5/18/2005	0954	740.52	87.00	87.98	NA	652.54	
12MWT35	5/18/2005	0921	734.64	27.00	12.11	NA	722.53	
12MWT36	5/18/2005	0924	738.63	26.00	14.12	NA	724.51	
12MWT37	5/18/2005	0945	738.77	25.00	25.98	NA	712.79	
12MWT38	5/18/2005	1031	728.03	25.00	9.69	NA	718.34	
12MWT39	5/18/2005	0949	737.64	35.00	35.56	NA	702.08	
12MWT40	5/18/2005	1008	727.50	29.00	23.04	NA	704.46	
12MWT41	5/18/2005	1129	622.97	35.00	19.75	NA	603.22	
12MWT42	5/18/2005	1038	720.22	29.00	11.69	NA	708.53	
12MWT43	5/18/2005	1355	679.01	81.00	78.19	NA	600.82	
12MWT44	5/18/2005	1127	626.69	35.50	26.14	NA	600.55	
12MWT45	5/18/2005	1258	691.07	25.00	15.62	NA	675.45	
12MWT46	5/18/2005	1302	675.67	24.50	15.80	NA	659.87	
12MWT47	5/18/2005	1306	663.12	25.00	14.00	NA	649.12	
12MWT48	5/18/2005	1309	650.05	30.00	30.36	NA	619.69	
12MWT49	5/18/2005	1317	619.25	30.00	26.24	NA	593.01	

* All measurements to the nearest 0.01 foot

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name:	NSWC CRANE	**Project No.:**	N6878
Location:	SWMU 12	**Personnel:**	T. Rojahn/J. Goerdt
Weather Conditions:	Mostly Sunny, 70°s	**Measuring Device:**	M-Scope
Tidally Influenced:	Yes ___ No X	**Remarks:**	----

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet bgs)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
12MWT50	5/18/2005	1321	609.01	35.00	34.76	NA	574.25	
WES-7-1-81	5/18/2005	1344	631.95	41.50	19.86	NA	612.09	
WES-7-2-81	5/18/2005	1339	604.72	35.00	33.93	NA	570.79	
WES-7-3-81	5/18/2005	1335	599.22	38.00	27.11	NA	572.11	
WES-7-4-81	5/18/2005	1338	598.22	39.00	26.23	NA	571.99	
WES-7-5-81	5/18/2005	1337	596.50	39.00	23.98	NA	572.52	
Staff Gauges							Surface Water Elevation	
12SG01	5/18/2005	1416	730.97	NA	Dry	NA	NA	Dry
12SG02	5/18/2005	1418	731.64	NA	Dry	NA	NA	Dry
12SG03	5/18/2005	1421	735.03	NA	1.92	NA	733.11	Stagnate
12SG04	5/18/2005	1425	736.72	NA	4.11	NA	732.61	Stagnate
12SG05	5/18/2005	1427	724.28	NA	Dry	NA	NA	Dry
12SG06	5/18/2005	1435	713.38	NA	Dry	NA	NA	Dry
12SG07	5/18/2005	1439	713.45	NA	4.27	NA	709.18	Flow = 1-5 gpm
12SG08	5/18/2005	1450	668.56	NA	5.74	NA	662.82	Flow = 10-20 gpm
12SG09	5/18/2005	1527	529.35	NA	17.40	NA	511.95	Flow = 337 gpm
12SG10	5/18/2005	1500	517.21	NA	14.69	NA	502.52	Flow = 25,458gpm
12SG11	5/18/2005	1518	513.47	NA	19.90	NA	493.57	Flow = 6,466gpm
12SG12	5/18/2005	1539	538.45	NA	6.06	NA	532.39	Flow = 180 gpm

* All measurements to the nearest 0.01 foot

APPENDIX A.4

SWMU 12
ROUND 3
EQUIPMENT CALIBRATION FORMS

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : NSWC CRANE SWMU09 INSTRUMENT NAME/MODEL: YSI / 600 XL

SITE NAME: Mine Fill B (13) Mine Fill A (2) MANUFACTURER: YSI

PROJECT No.: 7448/00042/6878 SERIAL NUMBER: 04C 3884 AB

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
5-3-05	JG/JW	7.12	3.89	1093	8.85	226.5 15.83	6.99	4.00	1000	9.50	237.5 15.98		
5-4-05	JG/JW	7.05	3.92	1021	9.62	236.5 17.41	7.00	4.00	1000	9.53	237.5 17.35		
5-5-05	JG	7.06	3.94	987	9.38	231.6 17.60	7.00	4.00	1000	9.36	237.5 17.48		
5-6-05	JG	6.99	3.94	1012	9.76	234.5 18.18	7.00	4.00	1000	9.32	237.5 18.23		
5-7-05	JG	7.02	4.06	1101	8.21	232.1 19.01	7.00	4.00	1000	9.51	237.5 18.87		
5-8-05	JG	7.09	3.92	982	8.99	234.5 19.57	7.00	4.00	1000	8.83	237.5 19.41	replaced DO membrane	
5-17-05	JG	6.89	3.88	963	9.20	237.7 18.48	7.00	4.00	1001	8.88	237.5 18.40	"not used"	
5-18-05	JG		Not used				–	–	–	–	–		
5-19-05	JG	6.99	4.01 checked				–	–	–	–	–		
5-21-05	JG	6.99	4.02	988	7.41	235.8 19.11	4.00	7.00	999	8.96	237.5 19.20		
5-22-05	JG	–	–	1082	9.78	236.7 18.26	–	–	999	8.98	237.5 18.33	PH bulb is broken	
5-23-05	JG	–	–	1004	9.93	236.2 19.53	–	–	1000	8.82	237.5 19.54		
6-1-05	CD	10.00	4.39	938	6.66	213.7 18.86	7.00	4.00	1000	8.96	~~237.7 18.86~~ 237.5 18.58		replaced DO membrane replaced pH bulb
											~~237.6 18.83~~ CD		
6-2-05	CD	5.68	6.73	1003	8.90	237.6 18.98	7.01	4.02	1000	8.80	237.5 18.87		
6-3-05	CD	5.75	3.92	1041	8.97	236.1 20.20	7.11	4.01	1000	8.76	237.5 20.01		
6-4-05	CD	7.13	4.14	1010	8.83	237.0 20.33	7.05	4.00	1000	8.76	237.5 20.02		
6-5-05	CD	7.10	3.25	1044	8.56	232.2 22.35	7.00	4.00	1000	8.34	237.5 22.29		

SWMU 8

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME: NSWC CRANE SWMU 09

INSTRUMENT NAME/MODEL: YSI / 6600 XLM

SITE NAME: Mine Fill B (13) Mine Fill A (12)

MANUFACTURER: YSI

PROJECT No.: 7448/0004 2/6878

SERIAL NUMBER: 01L0702AF

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
5-3-05	JG/JW	6.83	3.92	1136	9.71	241.2 16.76	7.00	4.00	1000	9.54	235.0 16.65	PH 4 4098 PH 7 4110	pH
5-4-05	JG/JW	7.06	3.99	1001	10.46	235.7 16.56	7.00	4.00	1000	9.61 ~~100~~	234.9 16.61	SpC 4559 ORP 0341234	
5-5-05	JW/JG	7.03	4.09	990	6.54	232.0 17.26	7.00	4.00	1000	9.48	235.0 17.25		
5-6-05	JW	7.05	3.87	1122	11.65	234.6 19.68	7.00	4.00	1000	8.98	234.4 19.95		
5-7-05	JW	—	-	—	—	—	—	-	—	—	—		USE 5/6/05 CALIBRATION DO NOT USE INSTRUMENT
5-9-05	JW	6.93	4.16	992	4.93	229.6 19.37	7.00	4.00	1000	8.85	235.1 19.02		
5-18-05	TR	7.08	3.89	992	8.13	236.1 19.02	7.00	4.00	1.000	9.10	235.0 18.5		
5-19-05	JG	6.90	3.79	1160	8.52	236.3 19.83	7.00	4.00	999	8.72	235.0 19.61		
5-20-05	JG	6.99	4.04	1002	9.10	241.3 19.94	7.00	4.00	999	8.88	235.0 19.95		
5-21-05	JG	7.12	3.48	995	11.07	232.3 18.93	7.00	4.00	1000	9.00	233.0 18.89		
5-22-05	JG	6.17	4.24	1040	8.61	227.0 19.55	7.00	4.00	1000	8.78	235.0 19.57		
5-23-05	JG	7.02	3.97	1016	6.77	235.2 19.70	7.00	4.00	1000	8.85	235.0 19.61		
5-24-05	JG	6.80	4.11	962	7.35	237.9 18.96	7.00	4.00	1000	9.06	235.0 18.83		
SWMU 8 6-1-05	CD	6.85	3.72	1063	11.47	229.8 17.79	7.00	4.00	1000	8.88	235.0 17.86	PH 4 4098 PH 7 4110	replaced DO membrane
6-2-05	CD	6.99	4.01	991	9.06	234.7 19.07	7.00	4.00	1000	8.80	235.0 18.91		
6-3-05	CD	6.94	3.97	997	8.66	235.4 20.01	7.00	4.00	1000	8.72	235.1 19.93		
6-4-05	CD	7.04	4.02	1000	8.83	234.0 20.08	7.00	4.00	1000	8.76	235.0 20.03		

Tetra Tech NUS, Inc.

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : NSWC CRANE SWMU 09

INSTRUMENT NAME/MODEL: YSI / 600 XL

SITE NAME: Mine Fill B (13)

MANUFACTURER: YSI

PROJECT No.: 7448/00042

SERIAL NUMBER: 99E00409AA

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
5-3-05	JG/JW	7.00	3.95	1025	9.24	242.3 16.64	7.00	4.00	1000	9.58	237.5 16.70		
5-4-05	JG/JW	7.01	4.08	971	9.89	236.4 17.55	7.00	4.00	1000	9.52	237.5 17.63		
5-5-05	JG	6.98	4.12	991	10.30	235.8 17.70	7.01	4.00	1000	9.38	237.5 17.82		
5-6-05	JG	7.10	3.99	989	6.30	232.9 18.97	7.00	4.00	1000	9.26	237.5 19.01		
5-7-05	JG	NA*	4.16*	1105	7.20	366.8 19.56	N/A*	4.00*	1000	9.42	237.5 19.54		* pH bulb broken

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: Turbidimeter

SITE NAME: SWMU 9 Mine Fill B (13) Mine Fill A (12)

MANUFACTURER: Lamotte

PROJECT No.: 74456/00042/6878

SERIAL NUMBER: 1728-1600

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		
5/3/05		JW / JG	0.00	0.00	9.7	10		
5/4/05		JSW	0.00	0.00	9.86	10		
5/5/05		JSW	0.00	0.00	10	10		
5/6/05		JSW	0.00	0.00	10	10		
5/7/05		JSW	–	–	–	–		USE 5/6/05 CALIBRATION - DID NOT USE INSTRUMENT
5/8/05		JSW	0.00	0.00	9.8	10		
5/18/05		TK	0.00	0.00	10	10		
5/19/05		JG	0	0	11	10		
5/20/05		TK	0.00	0.00	10	10		
5/21/05		JG	0	0	10	10		
5/22/05		JG	0	0	10	10		
5/23/05		JG	0	0	9.9	10		
5/24/05		JG	0	0	10	10		
6-1-05		CD	0	0	10	10		
6-2-05		CD	0	0	10	10		
6-3-05		CD	0	0	10	10		
6-4-05		CD	0	0	10	10		
6-5-05		CD	0	0	10.40	10.00		

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: Turbidimeter

SITE NAME: Mine Fill B(13)

MANUFACTURER: LaMotte

PROJECT No.: 7448

SERIAL NUMBER: 2843-4501

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		
5-3-05		JG/JW	0	0	9.5	9.9		OK
5-4-05		JG	0	0	10	10		
5-5-05		JG	0	0	9.9	10		
5-6-05		JG	0	0	10	10		
5-7-05		JG	0	0	9.9	10		
5-19-05		JG	0	0	10	10		
5-21-05		JG	0.65	0	9.7	10		
5-22-05		JG	0	0	10	10		
5-23-05		JG	0	0	10	10		
6-1-05		CD	0	0	9.38	10		
6-2-05		CD	0	0	10.45	10		
6-3-05		CD	0	0	8.89	10		
6-4-05		CD	0	0	10.59	10		

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: Turbidimeter

SITE NAME: Mine Fill B (J3)

MANUFACTURER: LaMotte

PROJECT No.: 7448

SERIAL NUMBER: 0359-4197

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		
5-3-05		JG	0	0	9.7	10.0		
5-4-05		JG	0	0	9.7	10.0		
5-5-05		JG	0.5	0	10	10		
5-6-05		JG	0	0	10	10		
5-7-05		JG	0	0	10	10		
5-8-05		JG	0	0	10	10		

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : NSWC CRANE

INSTRUMENT NAME/MODEL: MINI RAE 2000

SITE NAME: SWMU 13, 16 & 12

MANUFACTURER: RAE SYSTEMS

PROJECT No.: 7448 & 6878

SERIAL NUMBER: 110-003829

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		
5/3/05	SAME	TR	—	—	0.0/100	0.0/100	00324-04	EXP. DATE 11/15/05
5/6/05	"	TR	—	—	0.0/100	0.0/100	"	"
5/19/05	"	TR	—	—	0.0/116	0.0/100	"	"

APPENDIX B

SMWU 12
ROUND 3
MISCELLANEOUS FIELD DOCUMENTATION

APPENDIX B.1

SWMU 12

ROUND 3

SITE LOGBOOK ROUND 3

NSWC CRNR

No. 678

SWMU 12

1374

TABLE OF CONTENTS

	PAGE No.
ROUND 1	1-125
ROUND 2	126-179
ROUND 3	180-201

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

START ROUND #3

VOID THIS PAGE

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60653 MADE IN USA

TITLE NSWC CRANE J. Goerdt T. Rosahn J. Schubert PROJECT NO. 6878 181

MON 05-16-05 BOOK NO. 1374

Work continued from Page

TRAVEL DAY

1230HRS - ARRIVE @ B 3245

- SWEEP FLOORS ; CLEAN OFFICE
- MISSING EQ & TUBING (NOTED) - CALL SANDY
- CHECKED @ B 41 (SHIP/RECEIVING) NOT THERE
- MADE RES. FOR TRAVEL NEXT SHIFT
- PREP to PURCHASE SUPPLIES
  WATER, duct tape & STRAPPING tape
- SET UP MEETING W/ D. FULKERSON OF FD JACOBI SUPPLING SER.

1639 HRS - PURCHASE DUCT tape & STRAPPING tape @ MENARDS

END

TIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

TURE Ted Rosahn DATE 5/16/05

SED TO AND UNDERSTOOD BY DATE WITNESS DATE

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SCIENTIFIC BINDERY PRODUCTS., CHICAGO 52605 MADE IN USA

TITLE NSWC CRANE

CREW
TR
JG
JS

PROJECT NO. 6878
BOOK NO. 1374

TUES. 05-17-05

Work continued from Page

0650 Hrs - ARRIVE @ B-3245

- RECEIVED BOTTLE SHIPMENT - NEXT DOOR
  WENT THROUGH & ORGANIZED BOTTLES IN GARAGE (B-3245)
- RECEIVED / FOUND EQ. & SUPPLY SHIPMENT
- PREP. to SAMPLE SEDIMENT @ SWMU 13
  THIS DATE SEE NOTE BOOK 1376

END

NTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

LATURE

DATE 05-17-05

LOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SIMMU 12 - Staff Gauges 5-18-05

STAFF GAUGE	Water LEVEL	TIME	AVE Depth	AVE WIDTH	Flow Rate	FLOW
125601	DRY	1416	—	—	—	0
02	DRY	1418	—	—	—	0
03	1.92	1421	—	—	—	stagnate
04	4.11	1425	—	—	—	stagnate
05	DRY	1427	—	—	—	0
06	DRY	1435	—	—	—	0
07	4.27	1439	—	—	—	1-5 gpm
08	5.74	1450	—	—	—	10-20 gpm
09	17.40	1527	0.25'	3	1 sec/ft	337 gpm
10	14.69	1500	2.1'	27'	1 sec/ft	25,458 gpm
11	19.90	1518	0.80	18'	"	6,466 gpm
12	6.06	1539	0.05	8'	"	180 gpm

SCIENTIFIC BINDERS PRODUCTS . CHICAGO . 60605 MADE IN USA

WED 5-18-05

Work continued from Page

Weather - Mostly sunny w/ Temp in 70°s

0700 Hrs - Arrive @ B-3245
- Prep to dev. well 5B @ landfill @ request of T. Brent - Call YSI & LaMotte
- Call Mini Ray for W.Ls @ SWMU 12

0825 Hrs - J.G started taking water level meas. @ SWMU 12 (SEE PAGE 187)

1230 Hrs - TR ~~joined~~ & JG con't taking W.Ls @ SWMU 12
TR joined JG after developing monitoring well 5B @ the landfill w/ S. Pope of SAIC

1400 Hrs - J.G. left SWMU 12 to con't sampling temporary wells @ SWMU 9; while T.R. con't work @ SWMU 12 - meas. stream flow & staff gauges (SEE PAGE 184)

1600 Hrs - T.R. stopped @ SWMU 9 & checked on J.G.

1615 Hrs - T.R. arrived @ B-3245
- Paperwork & sample shipment for SWMU 9 Remainder of Day

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 5/18/05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

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SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

PROJECT NO. 6878

BOOK NO. 1374

WED 5-18-05

Work continued from Page

WELL ID	TIME	WL	PID	WELL	TIME	WL	PID
12MWT 01	1057	9.27	0.0	33	0830	41.34	0.0
02	1034	8.25	0.0	34	0935	87.48 ~~21.28~~	0.0
03	1047	15.29	0.0	35	0921	12.11	0.3
04	1044	13.29	0.0	36	0924	14.12	0.0
05	1040	8.41	0.1	37	0945	25.98	0.0
06	1104	10.18	0.0	38	1031	9.69	0.0
07	1102	12.62	0.4	39	0949	35.56	0.0
08	1015	12.71	0.1	40	1008	23.07	0.0
09	1025	12.37	0.1	41	1129	19.75	0.0
10	1013	13.17	0.0	42	1038	11.69	0.0
11	0912	13.01	0.0	43	1355	78.19	0.0
12	0914	10.18	0.0	44	1127	26.14	0.0
13	0834	4.83	0.0	45	1258	15.62	0.0
14	0902	** 67.87	0.1	46	1302	15.80	1.5
15	0908	18.24	0.2	47	1306	14.00	0.4
16	~~0940~~ 1110	21.62	0.0	48	1309	30.36	0.0
17	0931	23.73	0.0	49	~~1127~~ 1317	~~26.14~~ 26.24	0.0
18	0927	22.68	0.0	50	1321	34.76	0.0
19	0937	27.68	0.0				
20	0935	25.45	0.0	7/3	1335	27.11	0.0
21	1053	19.46	0.0	7/2	1339	33.93	0.0
22	1019	17.10	0.0	7/1	1344	19.86	0.1
23	1002	21.89	0.0	7/4	1338	26.23	1.4
24	0957	32.35	0.0	7/5	1337	23.98	0.0
24A	0953	34.93	0.0				
25	0825	16.55	0.0				
26	1118	10.02	0.0				
27	0828	9.18	0.0				
28	1115	11.80	0.1				
29	1043	59.83	0.1				
30	1027	92.56	0.0				
31	0904	** 21.28	0.2				
32	0939	84.75	0.0				

switch W.L.

* no cap

** ERROR

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature]

DATE 5-18-05

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

SAMPLE SUMMARY 05-19-05 :

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	START SAMPLE	COMMENTS
12 GWT1103	0845	1045	18.2L	1050	(JG)
12 GWT1203	1115	1255	11.4L	1300	(JG)
12 GWT1003	1300	1700	14.0L	1703	(TR)
12 GWT3003	1805	1805	22.5	1810	(JG)

SCIENTIFIC BINDERY PRODUCTS, CHICAGO - 60605 - MADE IN USA

THURS - 05-19-05

Work continued from Page

Weather - Mostly Cloudy → Rain, Temp 60's

0700 HRS - Arrive @ B-3245

- Fax COCs 3239 & 3717 to Office & Lab
  ↳ SWMU 9 ↳ SWMU 13
- Select well to be sampled this date @ SWMU 12
- Prep. labels & containers for surface water sampling @ SWMU 12 & SW/SD labels & container for SWMU 09 for Tomorrow
- Phone conversations w/:
  R. Basinski - regarding SWMU 12
  E. Seidlmyer - " " 12 & 9
  M. Francis - " " 9
- Prep to sample groundwater @ SWMU 12

1000 HRS - Left Bldg for Bloomington Gate to meet w/ D. Fulkerson of Jacobs Sodding

1035 Hrs - Dave Fulkerson arrived
Showed Mr. Fulkerson restoration sites @ SWMUs 12 & 15

1130 Hrs - Drop Mr. Fulkerson off outside Bloomington Gate

1140 Hrs - Returned to B-3245

- Talked to R. Basinski - should be getting a BID from Jacobs by tomorrow morning; also introduced David to T. Brent in the event David would run into any site access problems
- Loaded SUV w/ EQ & supplies for GW sampling

1210 Hrs - Lunch

1235 Hrs - Check on J.G

1245 Hrs - Arrive @ 12MWT10

See page 188 for detailed info.

1740 Hrs - Check on JG @ MWT38

1755 Hrs - Return to B-3245

- Drop off EQ & Refrigerants Samples

1820 Hrs - Leave B-3245 for Bloomington

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE Ty Nagel

DATE 5/19/05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

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SCIENTIFIC BINDERY PRODUCTS ...CHICAGO 60605 MADE IN USA

TITLE NSWC CRANE

CREW (JG) (TR)

FRI 05-20-05

PROJECT NO. 6878

BOOK NO. 1374

Work continued from Page

0700 Hrs - Arrive @ B-3245
- Paperwork
- Check in w/ Mr. Fitzgerald (Mr. Baker off today) Regarding access to MFA-OK (07:30 Hrs)
- Prep. to sample SW

0835 Hrs - Arrive @ SWMU 12

Surface Water ID	Sample Time	Flow	Comments
12SW1103	0905	1,365 gpm	
12SW2503	0920	47,414 gpm	
12SW2403	0955	1,136 gpm	
12SW0903	1015	786 gpm	
12SW1403	1030	1-5 gpm	
12SW3402	1048	67 gpm	
12SW3102	1110	5-10 gpm	
12SW2703	0845	~26,940 gpm*	MS/MSD # 12FD052005-01

1120 Hrs - Tried to flow drainage up stream of 12SW31 very difficult to tell - water travels through a series of under pipes.

1150 Hrs - Lunch

1220 Hrs - Return to B-3245
- Prep to sample @ SWMU 9

1430 Hrs - (TR) Return to B-3245 (JG) to Purge 12MW22 & 23
- Process samples for shipment from both SWMU 12 & 09 on COC 3240 & 3242

1730 Hrs - Left B-3245 for Fed. Ex

1810 Hrs - Drop off samples @ Fed. Ex
Shipped via AB # 8947 8135 4778

E-mail T. Johnston Daily Summary & Fax COC to Laucks

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] **DATE** 5/20/05

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

SAMPLE SUMMARY 05/21/05 :

SAMPLE ID	START PURGE	END PURGE	VOL PURGED	SAMPLE TIME	COMMENTS
12GWT2303	1410	1532	10.8 L	0815	(JG) PURGED 5/20
12GWT2203	1545	1740	22 L	0850	(JG) PURGED 5/20
12GWT3001	NA	NA	NA	0830	(TK) Collected ≈50-100 ml
12GWT1803	0918	1030	12 L	NA	(TK) PURGE only
12GWT4703	1030	1140	12.6 L	1145	(JG) MS/MSD
12GWT0303	1123	1436	26.8 L	NA	(TK) PURGE only
12GWT1703	1405	1450	4 L	NA	(JG) PURGE only
12GWT1603	1520	1625	9 L	NA	(JG) PURGE only
12GWT0903	1455	1625	8.7 L	1627	(TK)
12GWT0603	1650	1815	9.6 L	1820	(JG) DUP 12ED052101

SCIENTIFIC NOTEBOOK PRODUCTS CHICAGO 55605 MADE IN USA

Sat. 5-21-05

Work continued from Page

WEATHER: Mostly Sunny & 70's

0655 Hrs - ARRIVE @ B-3245

- PICK WELLS to SAMPLE this date
- CALCULATE FLOWS on PAGE 191 for SURFACE WATER
- PREP. to SAMPLE WELLS @ SWMU 12
- PAPERWORK

0820 Hrs - ARRIVE @ SWMU 12 to sample ground water
SEE summary table on PAGE 192
OF WELLS Purged and/or sampled this date

1720 Hrs - (JT) RETURN to B-3245 (JG) ON 12 MWT06

- PAPERWORK
- DROP OFF EQ, REFRIGERATE sample
- DUMP PURGE WATER, Etc.
- CALCULATE FLOWS on PAGE 184
- WELLS SAMPLED this date are on COC # 3243

1845 Hrs - LEAVE B-3245 for Bloomington (JG ARRIVED)
E-MAIL SAMPLE SUMMARY to T. Johnston

END

SIGNATURE DATE 5/21/05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

B 100 P ©

SAMPLE SUMMARY : 5/22/05

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	START SAMPLING ~~PURGE~~	COMMENTS
12GWT1703	(NA)	PURGED 5/21	→	0830	(JG)
12GWT1603	(NA)	PURGED 5/21	→	0850	(JG)
12GWT1803	(NA)	PURGED 5/21	→	0900	(TC)
12GWT0303	(NA)	PURGED 5/21	→	0948	(TC)
12GWT4203	0920	1320	24 L	1325	(JG)
12GWT3203	1045	1445	21.7 L	1450	(TC)
12GWT2003	1539	1659	7.4 L	1702	(TC)
12GWT2603	1415	1705	17.1 L	1705	(JG)
12GWT3001	NA	NA	NA	5/21	DCY 5/22

SUN. 5-22-05

Work continued from Page

WEATHER - Mostly sunny & 70's

0655 HRS - ARRIVE @ B-3245

- SELLECT WELLS FOR SAMPLING / PAPERWORK
- PREP. to SAMPLE ground water

0900 HRS - ARRIVE @ SWMU 12

SEE PAGE 194 FOR monitoring WELL details

1740 HRS - RETURN to B-3245

- DROP OF EQ. & SECURE GAS cylinders to fence
- SECURE SAMPLES in Frig.

1810 HRS - LEAVE B-3245 FOR Bloomington

SEND T. JOHNSTON E-MAIL OF Daily SUMMARY

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE

DATE 5-22-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

SAMPLE SUMMARY 5-23-05

SAMPLE ID	START PURGE	END PURGE	VOL. PURGED	SAMPLE TIME	COMMENTS
12GWT0103	0820	1130	20.0L	1135	(JG)
12GWT3103	0925	1325	22.1L	1330	(JG)
12GWT2803	1315	1715	25.5L	1720	(JG)

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

MON 5-23-05

Work continued from Page Weather: Mostly Sunny - temp 80's

0650 Hrs - Arrive @ Pass office / Pick up new pass
- Prep. to sample ground water
- Contact MFA (Mr. Fitzgerald) for access
- Prep Dev. Log sheet for MW58 @ Landfill for T. Brent

0900 Hrs - Arrive @ SWMU 12
Prep to sample 12MWT31 w/ Bladder pump (TA)
SEE PAGE 126 FOR details

1330 Hrs - Sampled 12MWT31
1430 Hrs - Attempted to collect more sample volume @ @ 12MWT30 - well was dry
1450 Hrs - Return to B-3245 after checking on JG @ 12MWT28
- Check in w/ T. Johnston - discussed MWT30 only collected 50-100ml over the past 3 days - Tom said to have it analyzed anyway
- Talked to C. Doolan - Colin will order the eq. for slug testing
- Checked in w/ Lab
- Paperwork (COCs # 3243 & 3246)
- Prep samples for shipment via Fed. Ex. AB # 8447 8135 4789

1800 Hrs - Left B-3245 for Fed. Ex.
1830 Hrs - Drop off samples on COCs # 3243 & 3246

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 5-23-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

VOID THIS PAGE

TUES 5-24-05

Work continued from Page

0650 Hrs - Arrive @ B-3245

- FAX COCs 3243 & 3246 to LAB & OFFICE
- Talk w/ R. Clark regarding VOA & TPH sampling @ 09SD08 & 07 - will sample same
- Left message on R. Basinski's phone - 5/23 sample summary

0800 Hrs - Arrive @ SWMU 9

SEE Log book 2500

0830 Hrs - Return to B-3245

- Prep to Dev. Wells @ SWMU 8 & Install temporary wells reminder of day

END

Work continued to Page

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

SIGNATURE Tony Bell

DATE 5-24-05

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

Void this page

SCIENTIFIC BINDERY PRODUCTS, CHICAGO 60605 MADE IN USA

WED 5/25/05

Work continued from Page

Weather - Mostly sunny 60's

0700 Hrs - Arrive @ B-3245

- Assemble decined Bladder pumps
- Fax COC # 3247 to Lab & office for additional samples collected @ SWMU 9
- Clean office, sweep & mop floors bathroom, hallways Lab & office

0930 Hrs - Leave B-3245 for Indy Airport

Remainder of Day Travel

END

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE [signature] DATE 5-25-05

DISCLOSED TO AND UNDERSTOOD BY | DATE | WITNESS | DATE

APPENDIX C

SWMU 12

ROUND 3

HEALTH AND SAFETY DOCUMENTATION

APPENDIX C.1

SWMU 12

ROUND 3

HEALTH AND SAFETY DOCUMENTATION ROUND 3

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

PITT-04-5-067

April 29, 2005

Project Nos. 1245, 7448, 6878, 00042

Mr. William Gates (Code ES31)
Commander, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29119-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order Nos. 0331, 0343, 0357, 0376

Subject: Personnel Clearance for Site Visit

Dear Mr. Gates:

The purpose of this letter is to inform you of upcoming site activities to be performed by Tetra Tech NUS, Inc. (TtNUS) 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 May 2, 2005 through June 8, 2005. The individuals that will perform these tasks are employees of TtNUS. In performing these activities, the field team will adhere to the following Health and Safety Plans (HASPs):

- HASP for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15), dated November 2004, prepared under CTO 0331.
- HASP for Cast High Explosives Fill and B-146 Incinerator, dated August 2004, prepared under CTO 0343.
- HASP for Mine Fill A (SWMU 12), Revision 1, dated August 2004, prepared under CTO 0357.
- HASP for Risk Assessment and Corrective Measures Study (SWMU 9), dated February 2005, prepared under CTO 0376.

The following individuals will participate in the planned activities described above:

Jim Goerdt
Terry Rojahn
John Wright
Jeff Schubert

TETRA TECH NUS, INC.

In addition, Roger Clark will also visit Tetra Tech NUS, Inc. work sites at NWSC Crane during this period. However, he will be not participating in any intrusive activities (e.g., drilling, sampling, etc.) and will be restricted from approaching work areas while any intrusive activities are performed.

If you have any questions, concerns, or if I can be of further assistance, please do not hesitate to contact me.

Very truly yours,

Matthew M. Soltis, CIH, CSP
CLEAN Health and Safety Manager

MMS/mlg

cc: Mr. B. Gorman (Code ES34)
Ms. Debra Humbert, TtNUS, Inc.
Mr. Mark Perry, TtNUS, Inc.
Mr. Keith Henn, TtNUS, Inc.
Mr. Terry Rojahn, TtNUS, Inc.
Mr. Roger Clark, TtNUS, Inc.
File copy CTO 0331, 0343, 0357, 0376

NUS CORPORATION

Certificate of Training

THIS CERTIFIES THAT

TERRY ROJAHN

has successfully completed a course of instruction on

SUPERFUND TRAINING CLASS

prepared and conducted by the
NUS Corporation, Pittsburgh, Pennsylvania

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

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

E. Dennis Escher, P.E.
Vice President

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Terry R. Rojahn

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

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

February 25, 2005

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

Basinski, Ralph

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

Ralph:

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

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

If there are any questions, let me know.

Matt

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

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WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: Periodic Examination

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

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

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

STATUS

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

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

3. ☐ **NOT QUALIFIED**

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

COMMENTS:

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

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

Signature: Peter P. Greaney MD

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

AI LIED EDUCATIONAL SERIES

James D. Goerdt

APPLIED ASSOCIATES INTERNATIONAL INC.

CERTIFICATE

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

ISSUE DATE: December 13, 1991

EXPIRATION: December 13, 1992

CERTIFICATE: HAZ9112001058

STEVEN L. WILLIAMS
President

THOMAS O. MURRAY
Certified Industrial Hygenist

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

TETRA TECH NUS

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Jim Goerdt

has successfully completed an 8-hour course of instruction in

OSHA 29 CFR 1910.120

GENERAL SITE WORKER REFRESHER AND SUPERVISOR REFRESHER TRAINING

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

October 22, 2004

Date of Award

Clyde Snyder
Senior Instructor
Training Services

James K. Laffey
Manager
Training Services

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

APPENDIX D

SWMU 12
ROUND 3
ANALYTICAL DATA

APPENDIX D.1

SWMU 12
ROUND 3
SUMMARY OF GROUNDWATER WATER
ANALYTICAL RESULTS

TABLE D-2
SUMMARY OF ANALYTIC RESULTS
SWMU 12 (MINE FILL A) ROUND 3 GROUNDWATER
NSWC CRANE
CRANE, INDIANA

Classification	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE
Aquifer	PLZMGD	PMZ	PMZ	PMZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ
Phase	03	03	03	03	03	03	03	03	03	03
Location	12MWT41	12MWT30	12MWT31	12MWT32*	12MWT03	12MWT06	12MWT06	12MWT09	12MWT10	12MWT11
Sample Number	12GWT4103	12GWT3001	12GWT3103	12GWT3203	12GWT0303	12GWT0603	12GWT0603-D	12GWT0903	12GWT1003	12GWT1103
Sample Code	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL
Sample Date	5/23/2005	5/21/2005	5/23/2005	5/22/2005	5/22/2005	5/21/2005	5/21/2005	5/21/2005	5/19/2005	5/19/2005
Energetics (ug/L)										
1,3,5-TRINITROBENZENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	15	16	0.25 U	0.248 U	99
1,3-DINITROBENZENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	7.4	7.7	0.25 U	0.248 U	7.5
2,4,6-TRINITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	140	140	0.25 U	0.248 U	110
2,4-DINITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	0.269 U	0.278 U	0.25 U	0.248 U	0.264 U
2,6-DINITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	12	12	0.25 U	0.248 U	11
2-AMINO-4,6-DINITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	68	65	4 J	0.248 U	52 J
2-NITROTOLUENE	0.26 U	3.2 J	0.258 U	0.245 U	0.264 U	0.269 U	0.278 U	0.25 U	0.248 U	0.264 U
3-NITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	0.269 U	0.278 U	0.25 U	0.248 U	0.264 U
4-AMINO-2,6-DINITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	62 J	63 J	4.6	0.248 U	41
4-NITROTOLUENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	0.269 U	0.278 U	0.25 U	0.248 U	4.1 R
HMX	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	420	420 J	52	5.8	430
NITROBENZENE	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	0.269 U	0.278 U	0.25 U	0.248 U	0.264 U
RDX	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	5000	5000	370	33	4100
TETRYL	0.26 U	2.78 U	0.258 U	0.245 U	0.264 U	0.269 U	0.278 U	0.25 U	0.248 U	0.264 U
Field Parameters										
DISSOLVED OXYGEN - METER (MG/L)	0.59		3.77	0	3.32	1.27		0.99	0.58	1.4
OXIDATION REDUCTION POTENTIAL (MV)	23.8		335	41	66	253.7		375	354	343.5
PH (S.U.)	6		7.58	6.2	6.07	4.17		4.26	3.83	3.96
SPECIFIC CONDUCTANCE (MS/CM)	0.579		0.374	1.324	1.205	0.317		0.257	0.587	0.249
TEMPERATURE (C)	13.77		18.04	19.18	16.3	13.69		14.69	15.02	17.1
TURBIDITY (NTU)	7.6		25	50	290	0.1		3.3	0.35	2.4

TABLE D-2
SUMMARY OF ANALYTIC RESULTS
SWMU 12 (MINE FILL A) ROUND 3 GROUNDWATER
NSWC CRANE
CRANE, INDIANA

Classification	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE	UPGRAD
Aquifer	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ	PUZ-UPGRAD
Phase	03	03	03	03	03	03	03	03	03	03	03
Location	12MWT12	12MWT16*	12MWT17	12MWT18	12MWT20	12MWT22	12MWT23	12MWT36	12MWT38	12MWT42	12MWT28
Sample Number	12GWT1203	12GWT1603	12GWT1703	12GWT1803	12GWT2003	12GWT2203	12GWT2303	12GWT3603	12GWT3803	12GWT4203	12GWT2803
Sample Code	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Sample Date	5/19/2005	5/22/2005	5/22/2005	5/22/2005	5/22/2005	5/21/2005	5/21/2005	5/22/2005	5/19/2005	5/22/2005	5/23/2005
Energetics (ug/L)											
1,3,5-TRINITROBENZENE	0.269 U	2.4 J	0.74 J	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
1,3-DINITROBENZENE	0.269 U	0.25 U	0.266 U	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
2,4,6-TRINITROTOLUENE	0.32 J	10	2.2	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
2,4-DINITROTOLUENE	0.269 U	0.32 J	0.3 J	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
2,6-DINITROTOLUENE	0.269 U	1.9	1.2	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
2-AMINO-4,6-DINITROTOLUENE	4.2 J	120 J	27 J	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
2-NITROTOLUENE	0.269 U	0.25 U	0.266 U	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
3-NITROTOLUENE	0.269 U	0.25 U	0.266 U	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
4-AMINO-2,6-DINITROTOLUENE	4.2	210	41	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
4-NITROTOLUENE	0.269 U	0.25 U	0.266 U	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
HMX	98	450	110 J	0.92	0.258 U	3.7	0.275 U	5.7	0.64 J	25	0.271 U
NITROBENZENE	0.269 U	0.25 U	0.266 U	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
RDX	390	6500	2000	24	4.2	26	0.275 U	35	59	17	0.271 U
TETRYL	0.269 U	0.25 U	0.266 U	0.252 U	0.258 U	0.255 U	0.275 U	0.271 U	0.252 U	0.26 U	0.271 U
Field Parameters											
DISSOLVED OXYGEN - METER (MG/L)	1.47	4.27	8.54	0.38	0.47	5.84	1.73	2.98	2.87	2.47	1.63
OXIDATION REDUCTION POTENTIAL (MV)	189.7	246.5	249.9	14.9	365	290.6	498.5	232.6	420	398.2	237.4
PH (S.U.)	6.05	4.27	4.72	4.58	4.84	5.65	2.93	6	3.7	5	6
SPECIFIC CONDUCTANCE (MS/CM)	0.79	0.337	0.621	1.457	1.783	0.172	5.05	0.464	0.297	0.346	1.05
TEMPERATURE (C)	22.38	16.89	15.88	14.9	17.33	13.54	17.46	16.67	15.02	15.26	14.49
TURBIDITY (NTU)	6.8	31	29	40	3.8	73	12	0	1.4	5	4.72

* It is suspected that the analytical results for explosives in Round 3 at well 12MWT32 were accidently switched with the results for Round 3 at well 12MWT16. As a result, the analytical results for 12MWT32 have been switched with the results for 12MWT16.

APPENDIX D.2

SWMU 12
ROUND 3
SUMMARY OF SURFACE WATER
ANALYTICAL RESULTS

TABLE D-1
SUMMARY OF ANALYTIC RESULTS
SWMU 12 (MINE FILL A) ROUND 3 SURFACE WATER
NSWC CRANE
CRANE, INDIANA

Classification	SITE	SITE	SITE	SITE	SITE	SITE	SITE	SITE	UPGRAD
Phase	03	03	03	03	03	03	02	02	03
Location	12SW/SD09	12SW/SD11	12SW/SD14	12SW/SD24	12SW/SD27	12SW/SD27	12SW/SD31	12SW/SD34	12SW/SD25
Sample Number	12SW0903	12SW1103	12SW1403	12SW2403	12SW2703	12SW2703-D	12SW3102	12SW3402	12SW2503
Sample Code	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	DUP	NORMAL	NORMAL	NORMAL
Sample Date	5/20/2005	5/20/2005	5/20/2005	5/20/2005	5/20/2005	5/20/2005	5/20/2005	5/20/2005	5/20/2005
Energetics (ug/L)									
1,3,5-TRINITROBENZENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.75 J	0.271 U	0.248 U
1,3-DINITROBENZENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
2,4,6-TRINITROTOLUENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	240	0.271 U	0.248 U
2,4-DINITROTOLUENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 J	0.271 U	0.248 U
2,6-DINITROTOLUENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
2-AMINO-4,6-DINITROTOLUENE	0.26 J	0.278 U	0.62 J	0.25 U	0.25 U	0.248 U	16 J	0.271 U	0.248 U
2-NITROTOLUENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
3-NITROTOLUENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
4-AMINO-2,6-DINITROTOLUENE	0.68	0.278 U	2	0.41 J	0.25 U	0.248 U	51	0.51 J	0.248 U
4-NITROTOLUENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
HMX	5	2	9.7 J	0.25 U	0.25 U	0.248 U	7.4	35	0.248 U
NITROBENZENE	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
RDX	12	4.5	25	0.46 J	0.28 J	0.26 J	34	99	0.248 U
TETRYL	0.248 U	0.278 U	0.25 U	0.25 U	0.25 U	0.248 U	0.252 U	0.271 U	0.248 U
Field Parameters (ug/L)									
DISSOLVED OXYGEN - METER (MG/L)	9.65	9.21	7.98	9.88	10.02		9.63	8.61	10.27
OXIDATION REDUCTION POTENTIAL (MV)	193	109	187	187	172		138	177	173
PH (S.U.)	7.01	6.63	7.36	7.16	6.77		7.42	7.58	6.88
SPECIFIC CONDUCTANCE (MS/CM)	0.117	0.116	0.32	0.144	0.087		0.184	0.462	0.082
TEMPERATURE (C)	15.3	14.57	17.33	15.08	14.18		15.8	16.28	14.17
TURBIDITY (NTU)	21	19	800	17	30		40	130	16

APPENDIX E

SWMU 12
ROUND 2
POTENTIOMETRIC SURFACE MAPS

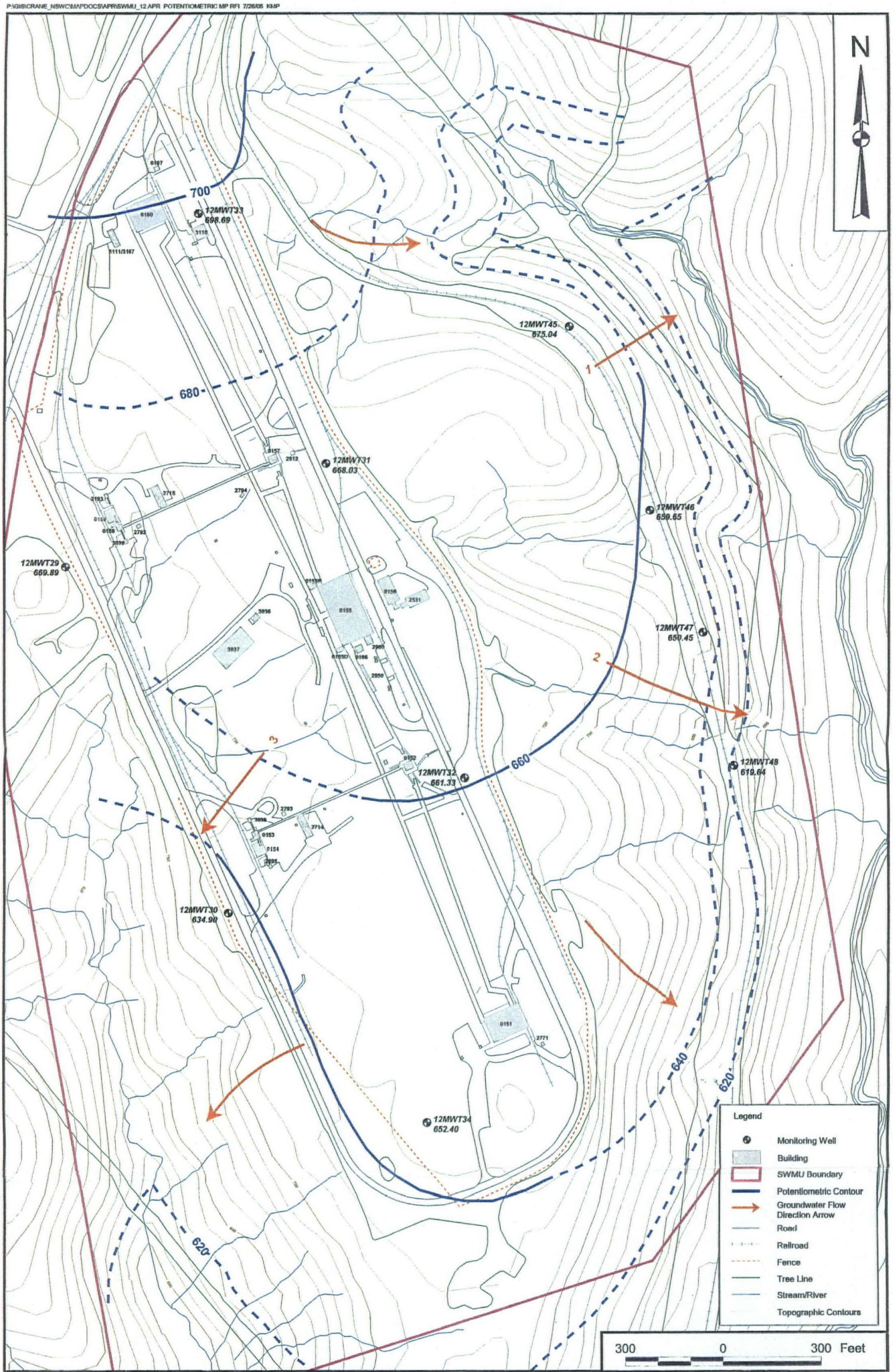
DRAWN BY	DATE
C. FOSTER	02/16/05
CHECKED BY	DATE
RAC	5/4/05
	DATE
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR THE UPPER PENNSYLVANIAN WATER-BEARING ZONE - JANUARY 18, 2005
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

CONTRACT NO.	
6878	
OWNER NO.	
CTO 0357	
APPROVED BY	DATE
RAC	5/4/05
DRAWING NO.	REV.
FIGURE 4 - 10	0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SWMU_12.APR POTENTIOMETRIC MP RFI 7/26/05 KMP

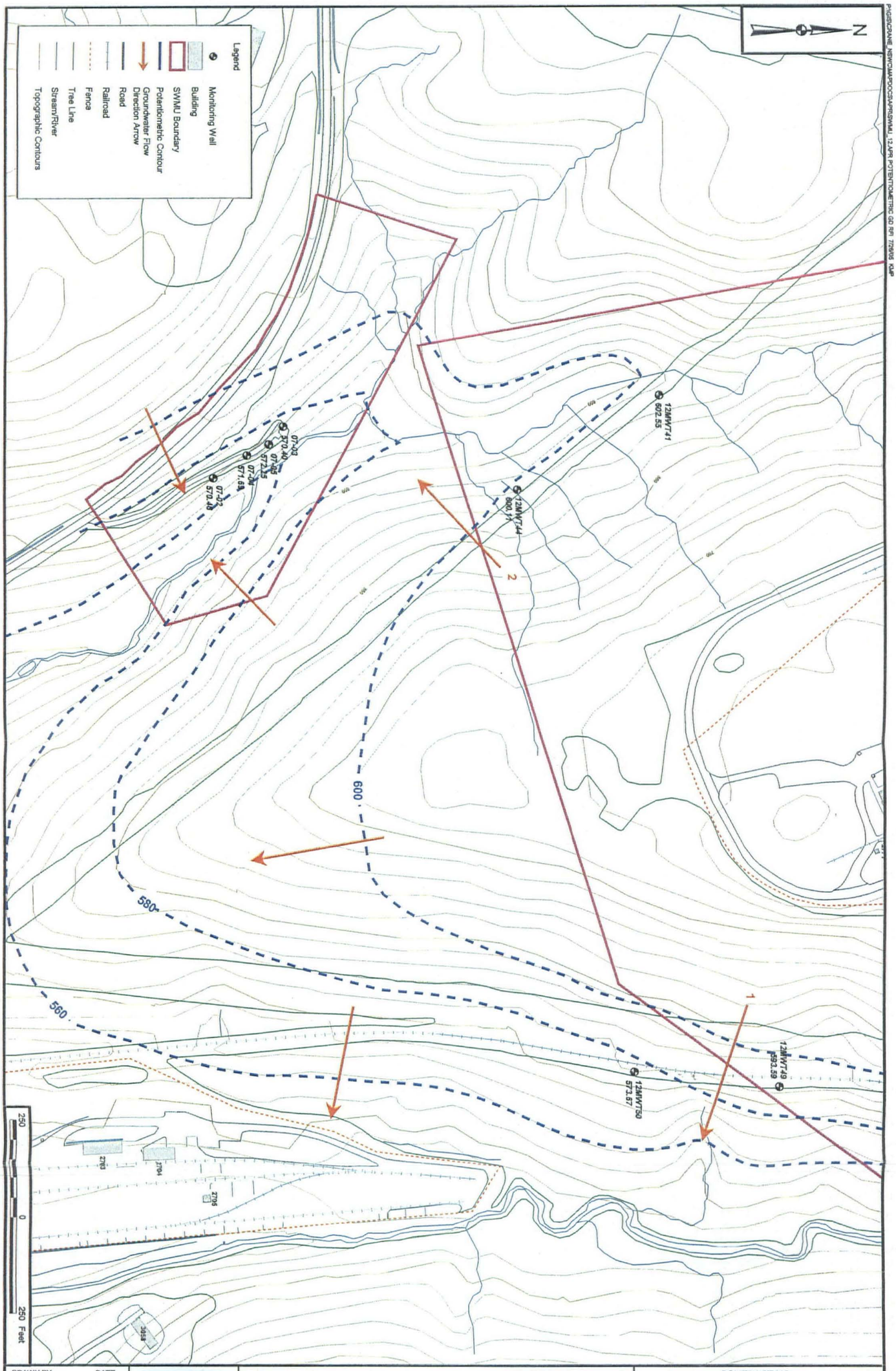


DRAWN BY	DATE
C. FOSTER	4/28/05
CHECKED BY	DATE
J. SCHUBERT	4/28/05
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR THE MIDDLE PENNSYLVANIAN WATER-BEARING ZONE - JANUARY 18, 2005
SWMU 12 MINE FILL A
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER 6878	
APPROVED BY —	DATE —
APPROVED BY —	DATE —
DRAWING NO. FIGURE 4 - 11	REV 0



DRAWN BY	DATE
C. FOSTER	4/28/05
CHECKED BY	DATE
J. SCHUBERT	4/28/05
COST/SCHED-AREA	
SCALE	
AS NOTED	

NAVFAC

POTENTIOMETRIC SURFACE MAP FOR THE GLEN DEAN LIMESTONE (MISSISSIPPIAN) AQUIFER
SWMU 12 MINE FILL A
NSWC CRANE
CRANE, INDIANA

CONTRACT NO. 6878	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 4 - 12	REV 0

TABLE 3-1

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
UPPER PENNSYLVANIAN WATER BEARING ZONE
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT42								
SAMPLING ROUND	1	2	3	4	5	6	7	8	9
DATE	09/28/04	02/19/05	05/22/05						
PARAMETER									
Energetics (ug/L)									
1,3,5-TRINITROBENZENE	0.266 U	0.245 U	0.26 U						
1,3-DINITROBENZENE	0.266 U	0.245 U	0.26 U						
2,4,6-TRINITROTOLUENE	0.266 U	0.245 U	0.26 U						
2,4-DIAMINO-6-NITROTOLUENE	0.266 U	0.245 U	0.26 U						
2,4-DINITROTOLUENE	0.266 U	0.245 U	0.26 U						
2,6-DIAMINO-4-NITROTOLUENE	0.266 U	0.245 U	0.26 U						
2,6-DINITROTOLUENE	0.266 U	0.245 U	0.26 U						
2-AMINO-4,6-DINITROTOLUENE	0.266 U	0.245 U	0.26 U						
2-NITROTOLUENE	0.266 U	0.245 U	0.26 U						
3,5-DINITROANILINE	0.266 U	0.245 U	0.26 U						
3-NITROTOLUENE	0.266 U	0.245 U							
4,4'-TN-AZOXY	0.532 U	0.49 U							
4-AMINO-2,6-DINITROTOLUENE	0.266 U	0.245 U							
4-NITROTOLUENE	0.266 U	0.245 U							
DNX	0.266 U	0.245 U							
HMX	18	27	25						
MNX	0.266 U	0.245 U	0.26 U						
NITROBENZENE	0.266 U	0.245 U	17						
RDX	11	19	0.26 U						
TETRYL	0.266 U	0.245 U							
TNX	0.266 U	0.245 U							
Field Parameters (as indicated)									
DISSOLVED OXYGEN (mg/L)	0.18	1.25							
OXIDATION REDUCTION POTENTIAL (MV)	523	279.9							
PH (S.U.)	4	4.24							
SPECIFIC CONDUCTANCE (MS/CM)	0.625	0.303							
TEMPERATURE (°C)	17.5	11.27							
TURBIDITY (NTU)	1.01	0.55							
Miscellaneous Parameters (mg/L)									
AMMONIA-N	0.005 U	0.01 UJ							
NITRITE/NITRATE-N	0.4	0.21							

U - Indicates that the chemical was not detected at the numerical detection limit (sample-specific detection limit) noted.
Non-detected results from the laboratory are reported in this manner.
This qualifier is also added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.
UJ - Indicates that the chemical was not detected; however, the detection limit (sample-specific detection limit) is considered to be estimated based on problems encountered during laboratory analysis.
The associated numerical detection limit is regarded as inaccurate or imprecise.
J - Indicates that the chemical was detected; however, the associated numerical result is not a precise representation of the concentration that is actually present in the sample. The laboratory reported concentration is considered to be an of the true concentration.
R – Indicates that the chemical may or may not be present. The positive analytical result reported by the laboratory is considered to be unreliable and unusable. This qualifier is applied in cases of gross technical deficiencies.
Note: It is suspected that the analytical results for explosives in Round 3 at well 12MWT32 were switched with the results for Round 3 at well 12MWT32. As a result, the analytical results for 12MWT16 have been switched with the results for 12MWT32 in Table 3-2.

TABLE 3-2

DESCRIPTIVE STATISTICS FOR
SWMU 12 (MINE FILL A) ROUND 3 GROUNDWATER IN THE UPPER PENNSYLVANIAN ZONE
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Energetics (ug/L)							
1,3,5-TRINITROBENZENE	4/15	0.74 J	99	0.248 - 0.275	7.90	29.3	12GWT1103
1,3-DINITROBENZENE	2/15	7.4	7.5	0.248 - 0.275	1.11	7.45	12GWT1103
2,4,6-TRINITROTOLUENE	5/15	0.32 J	140	0.248 - 0.275	17.6	52.5	12GWT0603
2,4-DINITROTOLUENE	2/15	0.3 J	0.32 J	0.248 - 0.275	0.154	0.310	12GWT1603
2,6-DINITROTOLUENE	4/15	1.2	12	0.248 - 0.275	1.84	6.53	12GWT0603
2-AMINO-4,6-DINITROTOLUENE	6/15	4 J	120 J	0.248 - 0.275	18.4	45.9	12GWT1603
4-AMINO-2,6-DINITROTOLUENE	6/15	4.2	210	0.248 - 0.275	24.3	60.5	12GWT1603
HMX	12/15	0.64 J	450	0.258 - 0.275	107	133	12GWT1603
RDX	13/15	4.2	6500	0.264 - 0.275	1237	1428	12GWT1603
Field Parameters							
DISSOLVED OXYGEN - METER (MG/L)	15/15	0.38	8.54	---	2.57	2.57	12GWT1703
OXIDATION REDUCTION POTENTIAL (MV)	15/15	14.9	498.5	---	287	287	12GWT2303
PH (S.U.)	15/15	2.93	6.07	---	4.67	4.67	12GWT0303
SPECIFIC CONDUCTANCE (MS/CM)	15/15	0.172	5.05	---	0.929	0.929	12GWT2303
TEMPERATURE (C)	15/15	13.54	22.38	---	16.1	16.1	12GWT1203
TURBIDITY (NTU)	15/15	0	290	---	33.2	33.2	12GWT0303

Note: It is suspected that the analytical results for explosives in Round 3 at well 12MWT16 were accidently switched with the results for Round 3 at well 12MWT32. As a result, the analytical results for 12MWT16 have been switched with the results for 12MWT32 and are reflected in the Puz descriptive statistics.

TABLE 3-3

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS, AND MISCELLANEOUS PARAMETERS
FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
MIDDLE PENNSYLVANIAN WATER BEARING ZONE
NWSC CRANE
CRANE, INDIANA

LOCATION	12MWT30									12MWT31									12MWT32								
SAMPLING ROUND	1	02	03	4	5	6	7	8	9	1	02	03	4	5	6	7	8	9	1	02	03	4	5	6	7	8	9
DATE	No Sample	No Sample	05/21/05							09/27/04	02/08/05	05/22/05							09/28/04	02/08/05	05/22/05						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
1,3-DINITROBENZENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
2,4,6-TRINITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
2,4-DIAMINO-6-NITROTOLUENE										0.27 U	0.275 U								0.248 U	0.242 U							
2,4-DINITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
2,6-DIAMINO-4-NITROTOLUENE										0.27 U	0.275 U								0.248 U	0.242 U							
2,6-DINITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
2-AMINO-4,6-DINITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
2-NITROTOLUENE			3.2 J							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
3,5-DINITROANILINE										0.27 U	0.275 U								0.248 U	0.242 U							
3-NITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
4,4'-TN-AZOXY										0.532 U	0.55 U								0.495 U	0.485 U							
4-AMINO-2,6-DINITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
4-NITROTOLUENE			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
DNX										0.27 U	0.275 U								0.248 U	0.242 U							
HMX			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
MNX										0.27 U	0.275 U								0.248 U	0.242 U							
RDX			2.78 U							0.27 U	0.275 U	0.258 U							0.248 U	0.242 U	0.245 U						
TNX										0.27 U	0.275 U								0.248 U	0.242 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)										6.45	1.16	3.77							11.72	1.06	0						
OXIDATION REDUCTION POTENTIAL (MV)										301.9	70.7	335							121.2	-7.1	41						
PH (S.U.)										7.05	8.09	7.58							6.57	6.7	6.2						
SPECIFIC CONDUCTANCE (MS/CM)										0.507	0.431	0.374							1.257	1.355	1.324						
TEMPERATURE (°C)										16.87	10.99	18.04							14.28	11.67	19.18						
TURBIDITY (NTU)										25	75	25							315	360	50						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N										0.37 J	0.45								1	1.7							
NITRITE/NITRATE-N										0.05 U	0.05 U								0.025 U	0.05 U							

TABLE 3-3

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS, AND MISCELLANEOUS PARAMETERS
FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 3 IN THE
MIDDLE PENNSYLVANIAN WATER BEARING ZONE
NWSC CRANE
CRANE, INDIANA

LOCATION	12MWT46								
SAMPLING ROUND	1	02	03	4	5	6	7	8	9
DATE	11/13/04	03/03/05	No Sample						
PARAMETER									
Energetics (ug/L)									
1,3,5-TRINITROBENZENE	0.255 U	0.26 U							
1,3-DINITROBENZENE	0.255 U	0.26 U							
2,4,6-TRINITROTOLUENE	0.255 U	0.26 U							
2,4-DIAMINO-6-NITROTOLUENE	0.255 U	0.26 U							
2,4-DINITROTOLUENE	0.255 U	0.26 U							
2,6-DIAMINO-4-NITROTOLUENE	0.255 U	0.26 U							
2,6-DINITROTOLUENE	0.255 U	0.26 U							
2-AMINO-4,6-DINITROTOLUENE	0.255 U	0.26 U							
2-NITROTOLUENE	0.255 U	0.26 U							
3,5-DINITROANILINE	0.255 U	0.26 U							
3-NITROTOLUENE	0.255 U	0.26 U							
4,4'-TN-AZOXY	0.51 U	0.52 U							
4-AMINO-2,6-DINITROTOLUENE	0.255 U	0.26 U							
4-NITROTOLUENE	0.255 U	0.26 U							
DNX	0.255 U	0.26 U							
HMX	0.255 U	0.26 U							
MNX	0.255 U	0.26 U							
RDX	0.255 U	0.26 U							
TNX	0.255 U	0.26 U							
Field Parameters (as indicated)									
DISSOLVED OXYGEN (mg/L)	5.42	0.64							
OXIDATION REDUCTION POTENTIAL (MV)	101	-10							
PH (S.U.)	5.68	6.02							
SPECIFIC CONDUCTANCE (MS/CM)	0.382	0.296							
TEMPERATURE (°C)	14.99	12.99							
TURBIDITY (NTU)	23	4.61							
Miscellaneous Parameters (mg/L)									
AMMONIA-N	1.8 J	0.82							
NITRITE/NITRATE-N	0.025 U	0.05 U							

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.

Note: It is suspected that the analytical results for explosives in Round 3 at well 12MWT32 were switched with the results for Round 3 at well 12MWT16. As a result, the reported analytical results for 12MWT32 have been switched with th results for 12MWT16 in Table 3-1.

TABLE 3-4

DESCRIPTIVE STATISTICS FOR
SWMU 12 (MINE FILL A) ROUND 3 GROUNDWATER IN THE MIDDLE PENNSYLVANIAN ZONE
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Energetics (ug/L)							
2-NITROTOLUENE	1/3	3.2 J	3.2 J	0.245 - 0.258	1.15	3.20	12GWT3001
Field Parameters							
DISSOLVED OXYGEN - METER (MG/L)	2/2	0	3.77	---	1.89	1.89	12GWT3103
OXIDATION REDUCTION POTENTIAL (MV)	2/2	41	335	---	188	188	12GWT3103
PH (S.U.)	2/2	6.2	7.58	---	6.89	6.89	12GWT3103
SPECIFIC CONDUCTANCE (MS/CM)	2/2	0.374	1.324	---	0.849	0.849	12GWT3203
TEMPERATURE (C)	2/2	18.04	19.18	---	18.6	18.6	12GWT3203
TURBIDITY (NTU)	2/2	25	50	---	37.5	37.5	12GWT3203

Note: It is suspected that the analytical results for explosives in Round 3 at well 12MWT32 were accidently switched with the results for Round 3 at well 12MWT16. As a result, the analytical results for 12MWT32 have been switched with the results for 12MWT16 and are reflected in the Pmz descriptive statistics.

TABLE 3-5

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS, AND MISCELLANEOUS PARAMETERS FOR SWMU 12 GROUNDWATER
ROUNDS 1 THROUGH 4
MISSISSIPPIAN GLEN DEAN AQUIFER
NSWC CRANE
CRANE, INDIANA

LOCATION	12MWT41								
SAMPLING ROUND	1	02	03	4	5	6	7	8	9
DATE	11/10/04	02/19/05	05/23/05						
PARAMETER									
Energetics (ug/L)									
1,3,5-TRINITROBENZENE	0.266 U	0.255 U	0.26 U						
1,3-DINITROBENZENE	0.266 U	0.255 U	0.26 U						
2,4,6-TRINITROTOLUENE	0.266 U	0.255 U	0.26 U						
2,4-DIAMINO-6-NITROTOLUENE	0.266 U	0.255 U							
2,4-DINITROTOLUENE	0.266 U	0.255 U	0.26 U						
2,6-DIAMINO-4-NITROTOLUENE	0.266 U	0.255 U							
2,6-DINITROTOLUENE	0.266 U	0.255 U	0.26 U						
2-AMINO-4,6-DINITROTOLUENE	0.266 U	0.255 U	0.26 U						
2-NITROTOLUENE	0.266 U	0.255 U	0.26 U						
3,5-DINITROANILINE	0.266 U	0.255 U							
3-NITROTOLUENE	0.266 U	0.255 U	0.26 U						
4,4'-TN-AZOXY	0.532 U	0.51 U							
4-AMINO-2,6-DINITROTOLUENE	0.266 U	0.255 U	0.26 U						
4-NITROTOLUENE	0.266 U	0.255 U	0.26 U						
DNX	0.266 U	0.255 U							
HMX	0.266 U	0.255 U	0.26 U						
MNX	0.266 U	0.255 U							
RDX	0.266 U	0.255 U	0.26 U						
TNX	0.266 U	0.255 U							
Field Parameters (as indicated)									
DISSOLVED OXYGEN (mg/L)	2.8	1.26	0.59						
OXIDATION REDUCTION POTENTIAL (MV)	71	-39	23.8						
PH (S.U.)	6.85	6.78	6						
SPECIFIC CONDUCTANCE (MS/CM)	0.922	0.754	0.579						
TEMPERATURE (°C)	14.12	10.02	13.77						
TURBIDITY (NTU)	4	3.6	7.6						
Miscellaneous Parameters (mg/L)									
AMMONIA-N	0.16 J	0.46 J							
NITRITE/NITRATE-N	0.025 U	0.05 U							

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 concentrat 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 a present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

TABLE 3-6

DESCRIPTIVE STATISTICS FOR
SWMU 12 (MINE FILL A) ROUND 3 GROUNDWATER IN THE MISSISSIPPIAN GLEN DEAN ZONE
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Field Parameters							
DISSOLVED OXYGEN - METER (MG/L)	1/1	0.59	0.59	---	0.590	0.590	12GWT4103
OXIDATION REDUCTION POTENTIAL (MV)	1/1	23.8	23.8	---	23.8	23.8	12GWT4103
PH (S.U.)	1/1	6	6	---	6.00	6.00	12GWT4103
SPECIFIC CONDUCTANCE (MS/CM)	1/1	0.579	0.579	---	0.579	0.579	12GWT4103
TEMPERATURE (C)	1/1	13.77	13.77	---	13.8	13.8	12GWT4103
TURBIDITY (NTU)	1/1	7.6	7.6	---	7.60	7.60	12GWT4103

TABLE 3-7

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 SURFACE WATER
ROUNDS 1 THROUGH 3
NSWC CRANE
CRANE, INDIANA

LOCATION	12SW/SD09									12SW/SD11									12SW/SD14								
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	10/27/04	3/6/05	5/20/2005							10/12/04	3/5/05	5/20/2005							11/1/04	3/7/05	5/20/2005						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
1,3-DINITROBENZENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
2,4,6-TRINITROTOLUENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
2,4-DIAMINO-6-NITROTOLUENE	0.264 U	0.258 U								0.24 UJ	0.24 U								0.24 U	0.248 U							
2,4-DINITROTOLUENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
2,6-DIAMINO-4-NITROTOLUENE	0.264 U	0.258 U								0.24 UJ	0.24 U								0.24 U	0.248 U							
2,6-DINITROTOLUENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
2-AMINO-4,6-DINITROTOLUENE	0.264 U	0.258 U	0.26 J							0.24 UJ	0.24 U	0.278 U							2.1 J	0.65 J	0.62 J						
2-NITROTOLUENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
3,5-DINITROANILINE	0.264 U	0.258 U								0.24 UJ	0.24 U								0.24 U	0.248 U							
3-NITROTOLUENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.71 J	0.248 U	0.25 U						
4,4'-TN-AZOXY	0.528 U	0.515 U								0.48 UJ	0.48 U								0.48 U	0.495 U							
4-AMINO-2,6-DINITROTOLUENE	0.61	0.36 J	0.68							0.24 UJ	0.24 U	0.278 U							5.6	1.3	2						
4-NITROTOLUENE	0.264 U	0.258 U	0.248 U							0.24 UJ	0.24 U	0.278 U							0.24 U	0.248 U	0.25 U						
DNX	0.264 U	0.258 U								0.24 UJ	0.24 U								0.24 U	0.248 U							
HMX	6.4	5.1	5							2.4 J	1.3	2							4.5	14	9.7 J						
MNX	0.52 J	0.258 U								0.24 UJ	0.24 U								0.24 U	0.41 J							
RDX	19	8.3	12							5.6 J	1.9	4.5							12	55	25						
TNX	0.264 U	0.258 U								0.24 UJ	0.24 U								0.24 U	0.248 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	10.28	4.64	9.65							1.19	2.45	9.21							10.26	4.33	7.98						
OXIDATION REDUCTION POTENTIAL (MV	67.7	189	193							169.6	76	109							52.3	241	187						
PH (S.U.)	7.41	6.59	7.01							6.98	6.63	6.63							7.69	5.99	7.36						
SPECIFIC CONDUCTANCE (MS/CM)	0.299	0.095	0.117							0.427	0.107	0.116							0.86	0.301	0.32						
TEMPERATURE (°C)	15.72	2.86	15.3							12.13	4.89	14.57							15.07	8.6	17.33						
TURBIDITY (NTU)	17.1	2.7	21							82.6	5.56	19							137	59	800						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.03 J	0.005 U								4.2 J	0.005 U								0.24 J	0.07							
NITRITE/NITRATE-N	1.9	0.37 J								0.025 U	0.025 UJ								3.8	1.2							

TABLE 3-7

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 SURFACE WATER
ROUNDS 1 THROUGH 3
NSWC CRANE
CRANE, INDIANA

LOCATION	12SW/SD24									12SW/SD25									12SW/SD27								
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	10/27/04	3/5/05	5/20/2005							10/11/04	3/5/05	5/20/2005							10/12/04	3/5/05	5/20/2005						
PARAMETER																											
Energetics (ug/L)																											
1,3,5-TRINITROBENZENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
1,3-DINITROBENZENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
2,4,6-TRINITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
2,4-DIAMINO-6-NITROTOLUENE	0.248 U	0.252 U								0.258 U	0.26 U								0.242 U	0.25 U							
2,4-DINITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
2,6-DIAMINO-4-NITROTOLUENE	0.248 U	0.252 U								0.258 U	0.26 U								0.242 U	0.25 U							
2,6-DINITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
2-AMINO-4,6-DINITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
2-NITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
3,5-DINITROANILINE	0.248 U	0.252 U								0.258 U	0.26 U								0.242 U	0.25 U							
3-NITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
4,4'-TN-AZOXY	0.495 U	0.505 U								0.515 U	0.52 U								0.485 U	0.5 U							
4-AMINO-2,6-DINITROTOLUENE	0.56	0.252 J	0.41 J							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
4-NITROTOLUENE	0.248 U	0.252 U	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
DNX	0.248 U	0.252 U								0.258 U	0.26 U								0.242 U	0.25 U							
HMX	0.55	0.28 J	0.25 U							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.25 U						
MNX	0.248 U	0.252 U								0.258 U	0.26 U								0.242 U	0.25 U							
RDX	0.8	0.39 J	0.46 J							0.258 U	0.26 U	0.248 U							0.242 U	0.25 U	0.28 J						
TNX	0.248 U	0.252 U								0.258 U	0.26 U								0.242 U	0.25 U							
Field Parameters (as indicated)																											
DISSOLVED OXYGEN (mg/L)	11.74	2.79	9.88							8.89	2.97	10.27							7.44	1.95	10.02						
OXIDATION REDUCTION POTENTIAL (MV	61.8	126	187							260.5	116	173							266.2	113	172						
PH (S.U.)	7.55	7.1	7.16							6.92	7.13	6.88							6.81	6.76	6.77						
SPECIFIC CONDUCTANCE (MS/CM)	0.271	0.14	0.144							0.282	0.078	0.082							0.267	0.092	0.087						
TEMPERATURE (°C)	15.66	5.59	15.08							12.58	5.25	14.17							13.55	5.21	14.18						
TURBIDITY (NTU)	18.3	3.1	17							2.4	3.76	16								9.15	30						
Miscellaneous Parameters (mg/L)																											
AMMONIA-N	0.021 J	0.005 U								0.005 UJ	0.005 U								0.18 J	0.005 U							
NITRITE/NITRATE-N	0.1	0.025 UJ								0.025 U	0.025 UJ								0.025 U	0.025 UJ							

TABLE 3-7

SUMMARY OF CHEMICALS DETECTED, FIELD PARAMETERS,
AND MISCELLANEOUS PARAMETERS FOR SWMU 12 SURFACE WATER
ROUNDS 1 THROUGH 3
NSWC CRANE
CRANE, INDIANA

LOCATION	12SW/SD31									12SW/SD34								
SAMPLING ROUND	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
DATE	No Sample	3/5/05	5/20/05							No Sample	3/6/05	5/20/05						
PARAMETER																		
Energetics (ug/L)																		
1,3,5-TRINITROBENZENE		0.96 J	0.75 J								0.271 U	0.271 U						
1,3-DINITROBENZENE		0.258 U	0.25 U								0.271 U	0.271 U						
2,4,6-TRINITROTOLUENE		79	240								0.271 U	0.271 U						
2,4-DIAMINO-6-NITROTOLUENE		1.6 J									0.271 U							
2,4-DINITROTOLUENE		0.36 J	0.25 J								0.271 U	0.271 U						
2,6-DIAMINO-4-NITROTOLUENE		0.258 U									0.271 U							
2,6-DINITROTOLUENE		0.258 U	0.25 U								0.271 U	0.271 U						
2-AMINO-4,6-DINITROTOLUENE		11 J	16 J								0.8 J	0.271 U						
2-NITROTOLUENE		0.258 U	0.25 U								0.271 U	0.271 U						
3,5-DINITROANILINE		1.2									0.271 U							
3-NITROTOLUENE		0.258 U	0.25 U								0.271 U	0.271 U						
4,4'-TN-AZOXY		0.515 U									0.542 U							
4-AMINO-2,6-DINITROTOLUENE		24	51								1.7	0.51 J						
4-NITROTOLUENE		0.258 U	0.25 U								0.271 U	0.271 U						
DNX		0.258 U									0.271 U							
HMX		4.2	7.4								98	35						
MNX		0.258 U									1.9							
RDX		20	34								140	99						
TNX		0.258 U									0.271 U							
Field Parameters (as indicated)																		
DISSOLVED OXYGEN (mg/L)		3.55	9.63								3.52	8.61						
OXIDATION REDUCTION POTENTIAL (MV		98	138								141	177						
PH (S.U.)		7.46	7.42								7.18	7.58						
SPECIFIC CONDUCTANCE (MS/CM)		0.081	0.18								0.404	0.462						
TEMPERATURE (°C)		7.35	15.8								10.04	16.28						
TURBIDITY (NTU)		40	40								130	130						
Miscellaneous Parameters (mg/L)																		
AMMONIA-N		0.14									0.08							
NITRITE/NITRATE-N		0.51 J									0.81							

Data Validation Qualifiers:

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 a

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.

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.

TABLE 3-8

DESCRIPTIVE STATISTICS FOR
SWMU 12 (MINE FILL A) ROUND 3 SURFACE WATER
NSWC CRANE
CRANE, INDIANA

Parameter	Frequency of Detection	Minimum Concentration	Maximum Concentration	Range of Nondetects	Mean Concentration	Average of Positive Detects	Sample of Maximum Detect
Energetics (ug/L)							
1,3,5-TRINITROBENZENE	1/7	0.75 J	0.75 J	0.248 - 0.278	0.218	0.750	12SW3102
2,4,6-TRINITROTOLUENE	1/7	240	240	0.248 - 0.278	34.4	240	12SW3102
2,4-DINITROTOLUENE	1/7	0.252 J	0.252 J	0.248 - 0.278	0.147	0.252	12SW3102
2-AMINO-4,6-DINITROTOLUENE	3/7	0.26 J	16 J	0.25 - 0.278	2.49	5.63	12SW3102
4-AMINO-2,6-DINITROTOLUENE	5/7	0.41 J	51	0.25 - 0.278	7.84	10.9	12SW3102
HMX	5/7	2	35	0.25	8.48	11.8	12SW3402
RDX	7/7	0.28 J	99	---	25.0	25.0	12SW3402
Field Parameters							
DISSOLVED OXYGEN - METER (MG/L)	7/7	7.98	10.02	---	9.28	9.28	12SW2703
OXIDATION REDUCTION POTENTIAL (MV)	7/7	109	193	---	166	166	12SW0903
PH (S.U.)	7/7	6.63	7.58	---	7.13	7.13	12SW3402
SPECIFIC CONDUCTANCE (MS/CM)	7/7	0.087	0.462	---	0.204	0.204	12SW3402
TEMPERATURE (C)	7/7	14.18	17.33	---	15.5	15.5	12SW1403
TURBIDITY (NTU)	7/7	17	800	---	151	151	12SW1403