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Stream Monitoring Third Quarterly Report

Unnamed Tributary to Little Neshaminy Creek

Area A Sites Naval Air Warfare Center (NAWC) Warminster, Pennsylvania

Naval Air Warfare Center
Warminster, Pennsylvania

Northern Division
Naval Facilities Engineering Command
Contract No. N62472-90-D-1298
Contract Task Order 0252

June 2000

TETRA TECH NUS, INC.

STREAM MONITORING
THIRD QUARTERLY REPORT
FOR
UNNAMED TRIBUTARY TO LITTLE NESHAMINY CREEK
AREA A SITES
NAVAL AIR WARFARE CENTER
WARMINSTER, PENNSYLVANIA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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TABLE OF CONTENTS

SECTION		PAGE
1.0	**INTRODUCTION**	**1-1**
1.1	OBJECTIVES	1-1
2.0	**BACKGROUND INFORMATION**	**2-1**
2.1	FACILITY BACKGROUND	2-1
2.2	SITE BACKGROUND	2-5
3.0	**FIELD SAMPLING AND ANALYSIS**	**3-1**
3.1	SAMPLING OBJECTIVES	3-1
3.2	THIRD QUARTERLY MONITORING	3-1
3.2.1	Surface Water Sampling	3-3
3.2.2	Sediment Sampling	3-3
3.2.3	Surface Soil Sampling	3-3
3.2.4	Stream Flow Monitoring	3-4
4.0	**SAMPLING RESULTS**	**4-1**
4.1	ANALYTICAL RESULTS	4-1
4.1.1	Surface Water Results	4-1
4.1.2	Sediment Results	4-3
4.1.3	Surface Soil Results	4-3
5.0	**CONCLUSIONS AND RECOMMENDATIONS**	**5-1**

FIGURES

2-1	**Site Location Map**	**2-2**
2-2	**Approximate Location of Areas of Concern**	**2-3**
2-3	**Area A Map**	**2-4**
3-1	**Third Quarter Monitoring Sample Location Map**	**3-2**

TABLES

3-1	**Stream Flow Monitoring Results**	**3-5**
4-1	**Surface Water and Sediment Data**	**4-5**
4-2	**Grain-size Results**	**4-15**
4-3	**Surface Soil Results**	**4-16**

APPENDICES

A	**Survey Data**	**A-1**
B	**Stream Monitoring Results – Field Parameters**	**B-1**
C	**Stream Flow Calculations**	**C-1**
D	**Sample Logs**	**D-1**
E	**Data Packages**	**E-1**

1.0 INTRODUCTION

This Stream Monitoring Third Quarterly Report has been prepared by Tetra Tech NUS, Incorporated (TtNUS) under Contract Task Order (CTO) 252 for the Northern Division (NORTHDIV) Naval Facilities Engineering Command (NAVFAC) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-90-D-1298. The work was conducted in accordance with the Stream Monitoring Work Plan prepared by TtNUS in August 1999. The work was performed as part of the Installation Restoration Program (IRP) being implemented by the Navy at the former Naval Air Warfare Center (NAWC) Warminster, Pennsylvania. The work is also in support of actions being taken by the Navy under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

1.1 OBJECTIVES

The objective of the stream monitoring program is to provide a baseline and then 3 years of long-term monitoring data to determine the impact, if any, of the Navy operations on the unnamed tributary to Little Neshaminy Creek. Specifically, the Navy will evaluate the results of the monitoring program to determine the need for additional monitoring and/or the scope of additional remedial actions within the area.

The scope of the work to be conducted under this plan consists of the collection and evaluation of surface water, sediment, and biological (benthic macroinvertebrate) samples from an unnamed tributary to Little Neshaminy Creek. The study area is located within and adjacent to the northern boundary of NAWC. The stream is located near three former Navy disposal sites that have been studied through the remedial investigation (RI) process and have been the subject of removal actions overseen by the Navy.

2.0 BACKGROUND

2.1 FACILITY BACKGROUND

The former NAWC Warminster is located in Warminster Township, Bucks County, Pennsylvania. The facility lies in a populated suburban area surrounded by private homes, various commercial/industrial activities, and a golf course. Figure 2-1 shows the general facility location. The facility, approximately 820 acres in size, is being parceled off and transferred to the private sector. Four areas of study (Areas A, B, C, and D) have been identified within the original facility. These areas were identified based on groupings of suspected disposal sites, contamination, geographic boundaries, common sources and receptors, and facility characteristics. Figure 2-2 presents these four major areas of concern. The focus of the biomonitoring program is an unnamed tributary to Little Neshaminy Creek located within Area A.

Area A is located in the northwestern corner of NAWC, between Jacksonville Road and the off-base railroad tracks west of the base. This area contains Sites 1, 2, and 3. Figure 2-3 depicts the approximate locations of these sites.

Site 1 is located at the northwestern border of NAWC. This site was reportedly operated as a burn pit from 1948 to 1950. Various waste materials such as paints, oils, asphalt, roofing material, solvents, scrap metal, and unspecified chemicals were reportedly burned within this pit. Historical aerial photographs indicate that this area may also have been used for the placement of fill material.

Site 2 is located southeast of and adjacent to Site 1. This site reportedly received sludge material from the industrial wastewater treatment facility from 1965 to 1970. It is reported that the sludge material was buried within this area.

Site 3 is located immediately northwest of Jacksonville Road. This site was reportedly used as a burn pit from 1955 to 1965. It has been reported that the pit was used to burn solvents, paints, roofing material, and other unspecified chemicals. Historical information suggests that the pit was backfilled and regraded with soils from the base upon closure. The area now consists of a gravel and asphalt parking lot.

Area A soils have been sampled under several RIs and numerous supplemental investigations. The most comprehensive sampling investigations conducted in the area were performed under

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CHECKED BY DATE	SITE LOCATION MAP FORMER NAWC WARMINSTER WARMINSTER, PENNSYLVANIA	APPROVED BY DATE 6/29/99	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE 1 in.=2000 ft.		DRAWING NO. FIGURE 2-1	REV. 0

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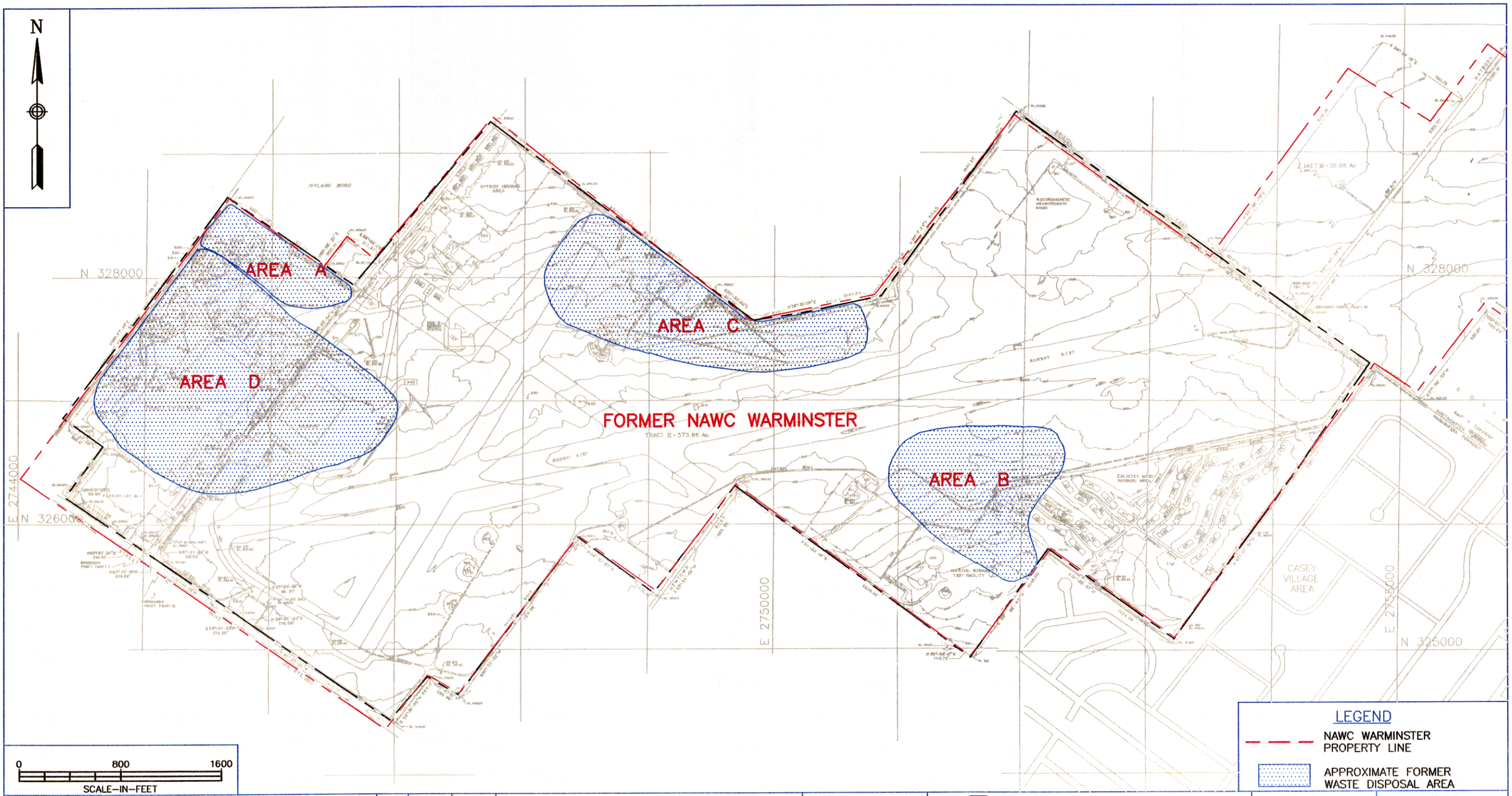

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COST/SCHED-AREA
SCALE AS SHOWN

Tetra Tech NUS, Inc.

APPROXIMATE LOCATION OF AREAS OF CONCERN
FORMER NAWC, WARMINSTER
WARMINSTER, PENNSYLVANIA

CONTRACT NO. N62472-96-D-1258 ORDER NO. CTO 0252
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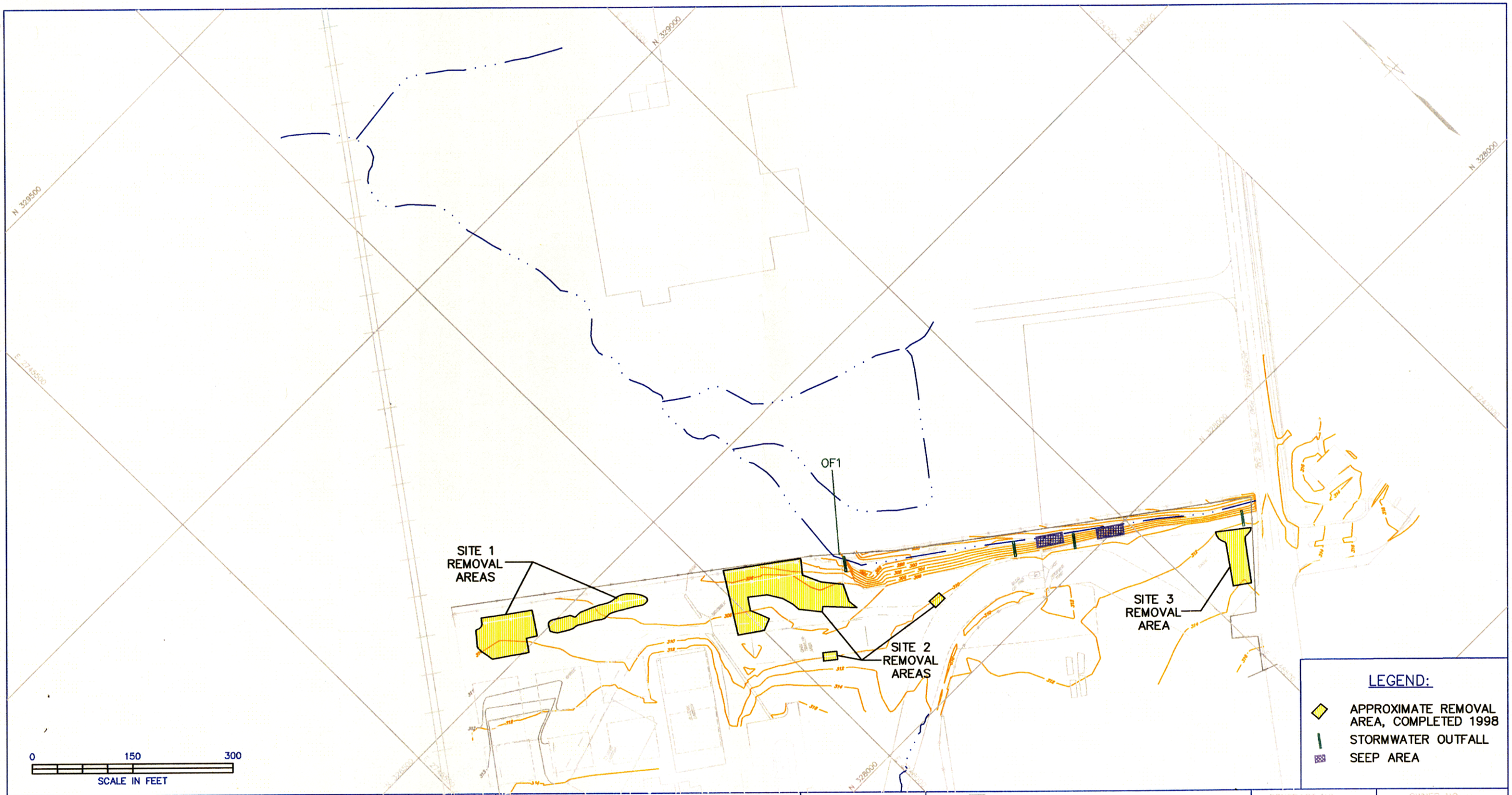

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Tetra Tech NUS, Inc.

AREA A
UNNAMED TRIBUTARY TO LITTLE NESHAMINY CREEK
STUDY AREA
NAWC, WARMINSTER, PA

CONTRACT NO. N62472-90-D-1298
OWNER NO. 6883
APPROVED BY DATE
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the Phase III RI [Draft Phase III RI, Media Other Than Groundwater, Brown & Root Environmental (B&RE), 1996]. Supplemental sampling investigations that were completed after the Phase III RI were summarized and reported in a series of letter reports (Results from Additional Site 1 Soil Investigation, July 10, 1998 B&RE; Results from Additional Site 2 Soil Investigations, July 21, 1998 TtNUS; Supplemental Subsurface Soils at Site 3, July 23, 1998 B&RE; Results from Additional Site 2 Subsurface Soil Investigation, July 28, 1998 B&RE; Preliminary Results from Verification and Supplemental Sampling Area A Site 2, October 29, 1998 TtNUS; Characterization Sampling Results Area A Site 1B, November 12, 1998 TtNUS) issued by the Navy and reviewed by the BRAC Closure Team (BCT).

The results of the RIs and supplemental investigations were evaluated by the Navy and formed the basis for removal actions completed by the Navy. Removal action alternatives were evaluated and presented in a Removal Evaluation Report (Draft Removal Site Evaluation for Area A Soils, April 1998, B&RE) and further refined in a subsequent evaluation and revised excavation letter report issued in September 1998 (Alternatives 4 and 5 Draft Removal Evaluation Report – Area A Soils, August 4, 1998 TtNUS and Area A Removal Action – Addendum to Excavation Approach, September 10, 1998 TtNUS).

The Navy completed removal actions in 1998. In general, the actions consisted of the excavation and off-site disposal of contaminated soils. Two excavations were conducted at Site 1. These excavations extended to bedrock and continued laterally until visual and analytical evidence indicated that no additional contamination existed. Site 2 removal actions consisted of three excavations. The largest was immediately adjacent to the northern property line and immediately upgradient of the unnamed tributary that flows near this boundary. Both surface and subsurface soils were removed from this area based on potential risks to human health and the environment. Excavations were extended at depth and laterally until visual and analytical evidence indicated that no contamination in excess of clean-up goals remained. Similarly, Site 3 removal actions consisted of the removal of surface soils adjacent to Jacksonville Road. This excavation was also extended until evidence confirmed that the target clean-up levels had been attained. The Site 3 excavation extended to about 30 feet from the unnamed tributary to Little Neshaminy Creek at Jacksonville Road.

2.2 SITE BACKGROUND

An unnamed tributary to Little Neshaminy Creek is located north of Area A (Figure 2-3). This stream originates from a stormwater culvert under Jacksonville Road and flows from the southeast to the northwest before turning north, away from NAWC Warminster. Between the

base boundary and Bristol Road, the stream flows north under Mearns Road through pastures and small woodlots to its confluence with Little Neshaminy Creek. Surface water drainage from portions of the airfield and hangar area discharges from a culvert where the stream originates. Surface water runoff from Area A and adjacent areas also enter this stream. A major stormwater discharge culvert (OF1 on Figure 2-3) is located at the point where the stream turns to the north and exits the NAWC property.

The stream adjacent to Area A is a small urban headwater reach that appears to be perennial. The portion of the stream within the NAWC property is channeled with a very high (10 to 12 feet) and steeply sloped (4:1 to 5:1) southern bank. Sites 2 and 3 are located immediately above this southern bank, and approximately one-third to one-half of the area is paved with asphalt paving material. The stream channel in this area averages about 4 feet in width and 1/2 foot in depth. Several small pool areas with depths up to 1 to 2 feet exist within this stretch. In general, the streambed is rocky and gravelly. The deeper, slower moving pools contain a layer of finer sediment.

Flooding as a result of heavy rains produced by Hurricane Floyd in September 1999 (after the first quarterly sampling) created physical changes to the stream channel. The streambed was scoured and a new channel created within the streambed in the upper reaches of the study area. In addition, gravel from riprap along the edge of Site 3 was washed into the stream and found downstream at Station 13. Stream sediments, which were predominantly silts and fine sands prior to the flood, were replaced with coarser grained sands and gravel.

As a result of the flood damage and erosion at Jacksonville Road, Warminster Township regraded the stream banks and placed additional riprap and/or gabions along the bank immediately downstream of Jacksonville Road.

In addition to the major stormwater discharge (OF1) noted at the property boundary, three other surface water stormwater discharge pipes exist in the upper reaches of the stream adjacent to Sites 2 and 3 (see Figure 2-3). Flow from these pipes is limited to the collection of stormwater. The major discharge pipe, OF1, contains flow most of the year. Historical aerial photographs indicate that another unnamed tributary existed in this area of NAWC, flowing from the south to the north, and discharged in the approximate area of OF1. It is believed, from reviewing these photographs and other historical documents, that the stream was enclosed and now discharges through OF1.

Several seep areas have been identified in addition to the stormwater discharge pipes located on the southern bank of the stream. These seep areas are noted on Figure 2-3. The upper or easternmost seep was evident but not flowing during a March 1999 field inspection. The other two seeps were notable and appeared to flow into the stream over a relatively wide sheet type of discharge rather than a well-defined discharge point. These areas were defined by the presence of wet soils, orange to rusty discoloring of the soils, and the presence of wet soil-type plant species.

Three sampling events were performed in the unnamed tributary to Little Neshaminy Creek during the completion of the RI phases. In general, the surface water and sediment sample analytical results revealed low-level contamination with metals and polycyclic aromatic hydrocarbons (PAHs). The source of the contamination, especially PAHs was not well defined.

A screening-level ecological risk assessment (ERA) was performed as part of the Phase III RI. Surface water and sediment analytical results were compared to conservative Benchmark Toxicity Values to estimate the potential ecological risks associated with the contaminant concentrations. The ERA concluded that surface water contamination presented a low to moderate potential for adverse ecological impacts. Sediment contamination was estimated to present a moderate to high potential for adverse impacts. The ERA recommended further site-specific data collection and analysis to define potential ecological impacts. The EPA Biological Technical Assistance Group (BTAG) concurred with this recommendation and suggested the implementation of a long-term chemical and benthic macroinvertebrate monitoring program at the site.

The first quarterly sampling event was performed in September 1999. That first sampling event consisted of the collection and analysis of surface water, sediment, seep soil, and macroinvertebrate samples. The results of that first quarterly sampling event are presented in the Stream Monitoring First Quarterly Report (November 1999, TtNUS). The second quarterly sampling event was conducted in November 1999. The results of that second quarterly event are presented in the Stream Monitoring Second Quarterly Report (February 2000, TtNUS). The third quarterly sampling event was performed in February 2000 and consisted of sampling the same stream and seep locations. No macroinvertebrate sampling was conducted. The results of the third quarter sampling event are presented in this report.

3.0 FIELD SAMPLING AND ANALYSIS

3.1 SAMPLING OBJECTIVES

The sampling objectives of this program are as follows:

- Establish baseline chemical and benthic macroinvertebrate conditions of the unnamed tributary to Little Neshaminy Creek.
- Collect analytical and biological data over time to determine if the stream conditions vary over the established period of monitoring.
- Collect analytical and biological data to determine the cause, if present, of impacts to the stream community.
- Collect analytical and biological data to determine the source, if present, of contamination.

3.2 THIRD QUARTERLY MONITORING

TtNUS collected surface water and sediment samples along the unnamed tributary to the Neshaminy Creek adjacent to Area A sites 2 and 3 and the discharge area for several surface water runoff pipes from the property. Samples were collected at 13 previously identified and surveyed reference locations (ST-01 through ST-13) along the unnamed tributary (Figure 3-1). Appendix A presents survey data for these locations. In addition, two surface soil samples (SS-01-03Q and SS-02-03Q) were collected from leachate outbreaks at or near the tributary (Figure 3-1). Sampling was performed on February 22 and February 23, 2000. Details of sampling procedures may be found in the Stream Monitoring Work Plan prepared by TtNUS in August 1999. Macroinvertebrate samples were not scheduled for collection during the third quarter.

Heavy rainfall generated by Hurricane Floyd in September 1999 (after the first quarterly monitoring) caused flooding which created physical changes to the stream channel and streambed. The impacts of the flooding, including changes to stream channel width and depth, flow rates, and sediment materials were discussed in the Stream Monitoring Second Quarterly Report (February 2000, TtNUS).

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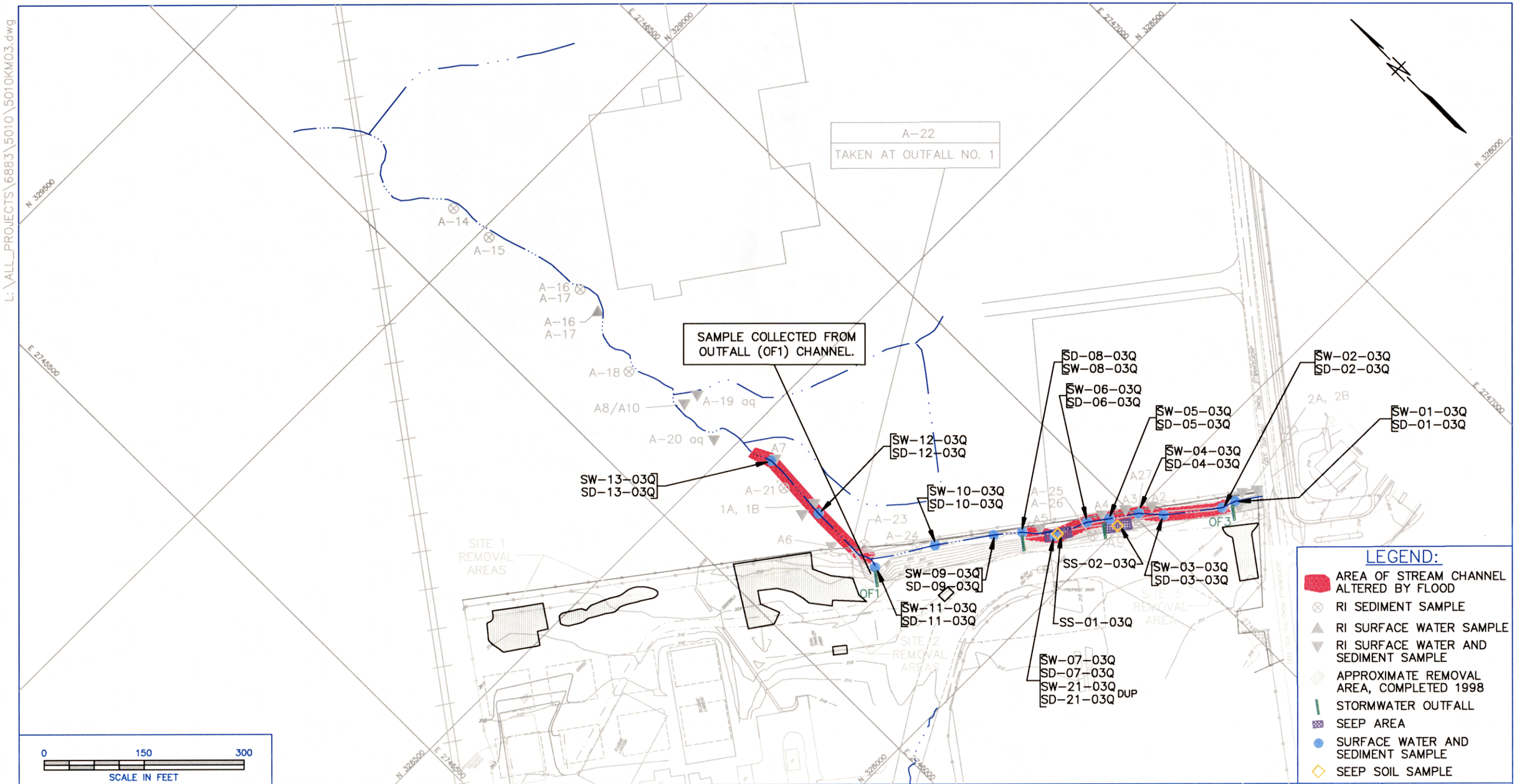

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4	5/23/00	SAMPLE ID CHANGED FROM 2Q TO 3Q.	LDL			
3	2/2/00	CHANNEL LOCATION UPDATED	LDL			
2	11/17/99	SAMPLE LOCATIONS REVISED PER FIELD COORDINATES.	LDL			
1						

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COST/SCHED-AREA
SCALE 1" = 150'

Tetra Tech NUS, Inc.

AREA A
SECOND QUARTER MONITORING SAMPLING LOCATONS
UNNAMED TRIBUTARY TO LITTLE NESHAMINY CREEK
NAWC, WARMINSTER, PA

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3.2.1 Surface Water Sampling

Surface water samples were collected from each of the 13 reference locations on the unnamed tributary. Sample bottles were filled at a mid-depth point in the main stream channel at each sampling location. The farthest downstream location (ST-13) was collected first with subsequent samples proceeding upstream to ST-01 which was collected last. This technique limits the influence of sediment and water disturbance on the downstream sample. At each sample location, water quality parameters including temperature, pH, conductivity, turbidity, dissolved oxygen and salinity were recorded (Appendix B). In addition, stream flow was calculated for each sample station (see Section 3.2.4 and Appendix C for additional information). All surface water samples were analyzed for PAHs, TAL (target analyte list) metals, low concentration mercury and total organic carbon (TOC). Results are discussed in Section 4.0. Sample log sheets for each location are presented in Appendix D.

3.2.2 Sediment Sampling

Sediment samples were collected from the 13 reference locations on the unnamed tributary. Sediment from the top 0.2 feet of the stream channel was collected using a stainless steel trowel for transfer of the sediment into the sample container. The sediment samples were collected after the surface water samples to limit potential impact of sediments on the surface waters. Sediment samples were also collected to limit the amount of rock, gravel, and vegetative material sent to the laboratory for analysis. Samples were analyzed for PAHs, TAL metals, low concentration mercury, TOC, and grain size. Results are discussed in Section 4.0. Sample log sheets for each location are presented in Appendix D.

Bottom sediments that were predominantly fine sands and silt prior to the flood event, were found to be coarser-grained sands and gravels during the second quarter monitoring. Sediments observed during the third quarter were also predominantly coarser-grained sands and gravels, although traces of silt were observed at several locations. Results are discussed in Section 4.0 and grain-size data are presented in Appendix E.

3.2.3 Surface Soil Sampling

Surface soils were collected from the locations of two previously observed leachate outbreaks. One outbreak was observed along the toe of Site 2 within approximately 3 feet of the unnamed tributary. This sample (SS-01-03Q) was collected at the location of the seep closest to the tributary. The other outbreak was observed at the bank of the unnamed tributary where the

sample (SS-02-03Q) was collected. The surface soils were collected from the top 0.5 feet from these locations. Soil samples were collected to limit the amount of rocks, gravel, and vegetative material. The samples were analyzed for PAHs, TAL metals, low concentration mercury, TOC, and grain size. Results are discussed in Section 4.0. Sample log sheets for each location are presented in Appendix D.

3.2.4 Stream Flow Monitoring

Stream depth and width measurements were taken and recorded during at each sampling station. Stream flow measurements (velocity) were also collected and recorded. Stream flow measurements were obtained using a portable in-stream flow monitoring and recording device manufactured specifically for low-flow streams. Results for each location are presented in Table 3-1. Stream cross-sections and calculations may be found in Appendix C.

Heavy rainfall generated by Hurricane Floyd in September 1999 (after the first quarterly monitoring) caused flooding which created physical changes to the stream channel and streambed. The impacts of the flooding, including changes to stream channel width and depth and flow rates were discussed in the Stream Monitoring Second Quarterly Report (February 2000, TtNUS).

During the third round of monitoring, flow rates increased at all sampling stations. Station ST-12 showed the most significant increase (see Table 3-1 and Appendix B). Stream width at this location also showed the greatest increase. The high flow rates were most likely due to snow melt and a rainfall event (1.2 inches 48 to 72 hours prior to sampling).

TABLE 3-1
STREAM FLOW MONITORING RESULTS
THIRD QUARTERLY MONITORING
NAWC WARMINSTER, PENNSYLVANIA

LOCATION	STREAM WIDTH (ft)	STREAM DEPTH (ft)	CROSS-SECTION AREA (ft^2)	VELOCITY (ft/sec)	FLOW RATE (cfs)
ST-01	5.94	0.20	1.20	2.94	3.53
ST-02	4.65	0.28	1.30	1.13	1.47
ST-03	4.75	0.55	2.61	1.35	3.53
ST-04	7.13	0.20	1.43	1.95	2.78
ST-05	5.30	0.30	1.59	1.95	3.10
ST-06	4.10	0.30	1.23	1.83	2.25
ST-07	4.78	0.29	1.39	2.19	3.04
ST-08	9.0	0.30	2.70	0.93	2.50
ST-09	5.50	0.88	4.84	0.20	0.97
ST-10	6.80	0.20	1.36	1.86	2.53
ST-11	5.20	0.41	2.13	0.93	1.98
ST-12	17.10	0.20	3.42	2.56	8.76
ST-13	6.71	0.25	1.68	1.86	3.10

cfs = cubic feet per second
Cross-section area = Width X Depth
Flow Rate = Cross-section area X Velocity

4.0 SAMPLING RESULTS

Section 3.0 details the number, types, and locations or samples collected during the third quarter monitoring program.

4.1 ANALYTICAL RESULTS

During the third quarterly sampling, aqueous and sediment samples were collected from the 13 reference stations (ST-01 through ST-13). Figure 3-1 shows the sampling stations and associated sample identification number.

Aqueous samples (SW-01-03Q through SW-13-03Q) were analyzed for TAL metals, low concentration mercury, PAHs, total organic carbon (TOC), and hardness. In addition, field parameters (flow rate, temperature, pH, specific conductivity, dissolved oxygen, turbidity, and salinity) were recorded for each location. Sediment samples (SD-01-03Q through SD-13-03Q) were analyzed for TAL metals, low concentration mercury, PAHs, TOC, and grain size. Two surface soil samples (SS-01-03Q and SS-02-03Q) were also collected from seep areas and analyzed for TAL metals, low concentration mercury, PAHs, TOC, and grain size. Duplicate samples to location ST-07 were also collected and identified as SW-21-03Q and SD-21-03Q.

Table 4-1 presents the analytical data for each quarterly sampling for each stream sample location. Results exceeding ecological screening values are bolded in the tables. Table 4-2 presents surface soil results in relation to site background. Appendix E presents completed data validation packages for all results.

4.1.1 Surface Water Results

Results for surface water samples were compared to first and second quarter results as well as ecological screening values, where appropriate.

4.1.1.1 Field Parameters

Stream measurements and flow rates were discussed previously (Section 3.2.4). In addition to flow rates, temperature, pH, specific conductivity (SC), dissolved oxygen (DO), turbidity, and salinity readings were obtained in the field. Results for all rounds of sampling may be found in Appendix B. These water quality parameters provide indications of potential impacts on aquatic species and their habitats. Stream temperature regulates biological activity and is an important

factor in evaluating the productivity of surface water and the type of organisms present. Temperature may also have a direct bearing on the significance of other water-quality parameters. Small changes in water chemistry (e.g., temperature, pH, or DO) can adversely affect fish populations and their habitats. Fish have optimum ranges of tolerance to these physical factors as well as to various chemicals. For cold-water fish such as trout, DO concentrations should fall ideally between 4 and 6 mg/l. pH is a general indicator of the degree of acidity and alkalinity of water, and reflects the carbon dioxide content and the presence of organic acids and pollution. Higher pH values generally reflect greater amounts of carbonates, bicarbonates, and associated salts in streams. Specific conductance (or electrical conductivity) is a measure of the total dissolved solids (TDS) in water which relates to the total amount of minerals dissolved in water.

Results from the third quarter showed a decrease in temperature (expected with decreasing ambient temperatures), stable turbidity levels, and an upward trend for pH and DO. DO levels at ST-11, although greater than those recorded during the second sampling event, were the lowest recorded at any location for this event. SC showed a generally downward trend, the exception being at location ST-11 that had a slightly higher SC reading. Salinity was 0.0 percent at all locations with the exception of location ST-11 (0.02%) and locations downstream of ST-11 (0.01% at ST-12 and ST-13). ST-11 is the location at the outfall receiving runoff from the parking area. The increase in salinity as well as impacts on other field parameters observed at this location are probably related to the parking area runoff which contains salt and other materials which could impact water quality. Appendix B presents results of field parameters for each sampling event.

4.1.1.2 Chemical Analysis

Results from the third quarter sampling were compared to first and second quarter results. In general, results for surface water samples showed correlation with first and second quarter results. Contaminants exceeding AWQCs were barium and manganese in the majority of locations. Other metals exceeding AWQCs were lead in SW-08 and SW-11 and iron in SW-11. SW-11 continued to show the highest levels of contaminants when compared to the other locations.

No PAHs were detected in any of the surface water samples. The PAHs observed at SW-04 during the first quarter were not present in the second or third quarter samples.

With the exceptions noted above, contaminants were detected at approximately the same levels as the first and second quarter at most locations. There also appears to be only minor differences between most of the surface water sampling locations, although location SW-11

shows the highest levels of contamination. Table 4-1 presents the data for the quarterly sampling events. Appendix E presents the data validation packages for the third quarter.

4.1.2 Sediment Results

Results from the third quarter sampling indicate changes in the extent of metals contamination in the sediment samples. Levels of metals increased at locations ST-05, ST-06, and ST-12. Metals concentrations decreased at locations ST-07 and ST-11. ST-11 had previously contained the highest levels of metals in the previous sampling events. Levels from the third quarter at this location show metals at similar levels to ST-05, ST-06, ST-12, and ST-13. In general, these locations have several compounds, such as copper, lead, nickel, silver, and zinc, exceeding ecological screening values. In addition, mercury exceeds the ecological screening value at ST-11, although mercury concentrations have decreased during each sampling event.

Although levels of PAHs exceed ecological screening values in all the sediment samples, changes in the distribution of these compounds were observed in the third quarter. Station ST-11, which had the highest levels of PAHs in the first two sampling events, showed a significant decrease in PAH levels. Concentrations of PAHs at this location were at approximately those of the other locations. Location ST-08 also continued to show a decreasing trend in PAH levels. It should be noted that sediments at these locations (ST-08 and ST-11) have changed from predominantly sand to predominantly gravel over the course of the monitoring program. Decreasing PAH and metals levels may be due to the changes in the sediments. The highest levels of PAHs were detected at stations ST-07, ST-10, ST-13. PAH levels increased from the second quarter results at these three locations. Table 4-1 presents the data for the quarterly sampling events. Table 4-2 presents grain size data for the quarterly sampling events. Appendix E presents the data validation packages for the third quarter.

4.1.3 Surface Soil Results

Surface soil samples obtained from areas of historical leachate outbreaks were generally within background levels with the exception of cadmium (17.8 mg/kg at SS-02), cobalt (62.2 mg/kg at SS-02), copper (226 mg/kg at SS-02), nickel (249 mg/kg at SS-02), silver (6.8 mg/kg at SS-01 and 21.9 mg/kg at SS-02), thallium (1.6 mg/kg at SS-02), vanadium (91.5 mg/kg at SS-02), zinc (117 mg/kg at SS-01 and 11,600 mg/kg at SS-02), and PAHs in SS-02. In general, levels of metals in SS-01 decreased from the second to the third quarter the most notable being zinc which decreased from 23,300 J mg/kg to 117 mg/kg. The levels of PAHs in SS-01 have remained at approximately the same levels in all three sampling events. The levels of metals in SS-02;

however, showed a significant increase in the third quarter. Cadmium, copper, cobalt, nickel, thallium, vanadium, and zinc all showed levels greater than background. The only metal in SS-02 that showed a significant decrease was lead (439 mg/kg in the second quarter and 79.8 mg/kg in the third quarter). PAH levels in SS-02 decreased to levels approaching, but still exceeding, background. The PAH levels recorded in the third quarter were the lowest of any of the sampling events. Table 4-3 presents the surface soil data for all sampling events. Appendix E presents the data validation packages for the third quarter.

Table
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-01						SW-02					
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		09/15/99		11/23/99		2/23/00	
		Chronic Screening												
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	350	B	41	UL	41	U	**1050**		41	UL	41	U
Antimony	2	NA	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	34.2	B	**67.4**	L	63.9	B	42.3	B	**69.2**	L	59.7	B
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.37	UL	0.37	UL	0.37	U
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL
Calcium	NA	NA	5180	B	21800		16800		8980	J	25300		16000	
Chromium	81	74/11	6.2		5.4	U	5.4	U	5.4	U	5.4	U	5.4	U
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U
Copper	34	9	10.7	B	3.8	UL	3.8	U	9.1	B	3.8	UL	3.8	U
Iron	NA	1000	683		55.5	B	40	U	**1800**	J	93.4	B	40	U
Lead	46.7	2.5	**78.8**		2.7	U	2.7	U	**119**		2.7	U	2.7	U
Magnesium	NA	NA	2030	K	6820		6680		3040	J	7900		6390	
Manganese	NA	80	32	B	8.8	L	9.3	B	**86.4**	J	14.8	L	9.8	B
Mercury	0.15	0.012	0.01		0.00087		0.00079		**0.0142**		0.00100		0.00094	
Nickel	20.9	52.0	6.3	UL	6.3	U	6.3	U	6.3	UL	6.3	U	6.3	U
Potassium	NA	NA	1040	B	1190		1020	B	1090	B	1330		923	B
Selenium	NA	5	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
Silver	1	NA	3.7	UJ	3.7	U	3.7	U	4	B	3.7	U	3.7	U
Sodium	NA	NA	3110	K	15900		10400		4730	J	17900		9930	K
Thallium	NA	NA	4.4	U	4.4	UL	4.4	U	4.4	U	4.4	UL	4.4	U
Vanadium	NA	19	2.8	B	2.8	UL	2.8	U	5.7	B	2.8	UL	2.8	U
Zinc	150	120	47.1		23.4	B	20.6	B	82.1		24.2	B	18	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Hardness as CaCO3			21.3		82		69.5		34.9		96		66.3	
Total Organic Carbon			5		1.5	B	1.5		7.7		1.6	B	1.3	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L				ug/L		ug/L			
Acenaphthene	16	24	NA		0.5	U	0.5	U	NA		0.5	U	0.5	U
Acenaphthylene	44	24	NA		1	U	1	U	NA		1	U	1	U
Anthracene	85.3	24	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U
Benz(a)anthracene	261	0.014	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	NA		0.1	U	0.1	U	NA		0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	NA		0.1	U	0.1	U	NA		0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U
Chrysene	384	0.014	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	NA		0.1	U	0.1	U	NA		0.1	U	0.1	U
Fluoranthene	600	3.9	NA		0.1	U	0.1	U	NA		0.1	U	0.1	U
Fluorene	19	3.9	NA		0.1	U	0.1	U	NA		0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U
Naphthalene	160	24	NA		0.5	U	0.5	U	NA		0.5	U	0.5	U
Phenanthrene	240	24	NA		0.05	UR	0.05	U	NA		0.05	UR	0.05	U
Pyrene	665	24	NA		0.05	U	0.05	U	NA		0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-03						SW-04					
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		09/15/99		11/23/99		2/23/00	
		Chronic Screening												
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	138	B	41	UL	69.8	B	**773**		81.6	L	45.9	B
Antimony	2	NA	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U	3.2	B
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	100	B	**68.3**	L	65.9	B	58.9	B	**100**	L	**73.6**	K
Beryllium	NA	5.1	0.65	B	0.37	UL	0.37	U	1.1	B	0.37	UL	0.37	U
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL
Calcium	NA	NA	29100	J	25600		17600		12900		30400		20000	
Chromium	81	74/11	15.4		5.4	U	5.4	U	19.6		5.8		5.4	U
Cobalt	NA	3	12.6	B	5.2	U	5.2	U	12	B	5.2	U	5.2	U
Copper	34	9	13	B	3.8	UL	6.8	B	20.5	B	4.8	L	6.1	B
Iron	NA	1000	136	B	119	B	233	B	**1430**		**1120**		132	B
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	**56.9**		2.7	U	2.7	U
Magnesium	NA	NA	11200	J	8130		7120		5320	K	9690		7970	
Manganese	NA	80	32.3	B	41.7		21.5	B	78.9		**134**		28.9	K
Mercury	0.15	0.012	0.0017		0.00066		0.00071		0.0112		0.00160		0.00091	
Nickel	20.9	52.0	16.5	B	6.3	U	6.3	U	18	B	7.7		6.3	U
Potassium	NA	NA	2130	J	1180		1040	B	1820	J	1540		1330	
Selenium	NA	5	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
Silver	1	NA	7.2	B	3.7	U	3.7	U	3.7	UJ	4.5	K	3.7	U
Sodium	NA	NA	17600	J	16400		10800		7180	K	18700		12000	
Thallium	NA	NA	4.4	U	4.4	UL	4.4	U	4.4	U	4.4	UL	4.4	U
Vanadium	NA	19	12.8	B	2.8	UL	2.8	U	19.7	B	5.1	B	2.8	U
Zinc	150	120	32.4	B	21.8	B	26	B	52.6		25.6	B	17.9	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Hardness as CaCO3			119		97		73.2		54.2		116		82.8	
Total Organic Carbon			3.1		2	B	1.9		9		2.3	B	1.3	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L				ug/L		ug/L			
Acenaphthene	16	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	85.3	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benz(a)anthracene	261	0.014	0.05	U	0.05	U	0.05	U	**0.056**		0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.06		0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	0.1	U	0.1	U	0.1	U	0.11		0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chrysene	384	0.014	0.05	U	0.05	U	0.05	U	**0.085**		0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	0.025	U	0.1	U	0.1	U	0.03	U	0.1	U	0.1	U
Fluoranthene	600	3.9	0.1	U	0.1	U	0.1	U	0.2		0.1	U	0.1	U
Fluorene	19	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	**0.065**		0.05	U	0.05	U
Naphthalene	160	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.086		0.05	UR	0.05	U
Pyrene	665	24	0.05	U	0.05	U	0.05	U	0.13		0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-05						SW-06					
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		09/14/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	41	U	46	B	52.9	B	41	U	41	UL	51	B
Antimony	2	NA	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	87.3	B	**101**		63.5	B	102	B	**95.9**		**71.6**	
Beryllium	NA	5.1	0.37	UL	0.61	B	0.51	B	0.37	UL	0.46	B	0.37	U
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL
Calcium	NA	NA	27700	J	29200		16100		31600	J	29000		20900	
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	5.4		5.4	U	5.4	U
Cobalt	NA	3	5.2	U	**6.7**		5.2	U	5.2	U	5.2	U	5.2	U
Copper	34	9	3.8	U	3.8	UL	5.3	B	6.5	B	3.8	UL	3.8	U
Iron	NA	1000	149	B	**1100**	L	110	B	97.1	B	206	B	142	B
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U
Magnesium	NA	NA	10300	J	9560		6500		11800	J	9720		8240	
Manganese	NA	80	46.8	J	**348**	L	22.4	B	53	J	**86.9**	L	30.3	
Mercury	0.15	0.012	0.0021		0.00410		0.0011		0.0009		0.00045		0.00110	
Nickel	20.9	52.0	6.3	UL	8.3	B	6.3	U	6.3	UL	7.9	B	6.3	U
Potassium	NA	NA	1630	J	1360	L	944	B	1830	J	1300	L	1270	L
Selenium	NA	5	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
Silver	1	NA	5.2	B	8.6	B	3.7	U	3.7	UJ	8.3	B	3.7	U
Sodium	NA	NA	16700	J	19300		9910	K	19300	J	19700		12100	
Thallium	NA	NA	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	UL
Vanadium	NA	19	2.8	U	6.7	L	4.2	B	4	B	2.8	UL	2.8	U
Zinc	150	120	12.8	B	19.5	B	17	B	15.3	B	13.6	B	28.6	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Hardness as CaCO3			111		NA		66.9		128		NA		86.2	
Total Organic Carbon			2.9		1.8	B	1.4		3.6		1.8	B	1.8	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L				ug/L		ug/L			
Acenaphthene	16	24	NA		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acenaphthylene	44	24	NA		1	U	1	U	1	U	1	U	1	U
Anthracene	85.3	24	NA		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benz(a)anthracene	261	0.014	NA		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	NA		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	NA		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	NA		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	NA		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chrysene	384	0.014	NA		**0.052**		0.05	U	0.05	U	0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	NA		0.1	U	0.1	U	0.025	U	0.1	U	0.1	U
Fluoranthene	600	3.9	NA		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Fluorene	19	3.9	NA		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	NA		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Naphthalene	160	24	NA		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Phenanthrene	240	24	NA		0.05	UR	0.05	U	0.05	U	0.05	UR	0.05	U
Pyrene	665	24	NA		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-07						SW-08					
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		09/14/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	41	U	41	UL	70	B	140	B	41	UL	206	B
Antimony	2	NA	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	83.2	B	87.6		**67.4**		98.5	B	**88.2**		**83.4**	
Beryllium	NA	5.1	0.37	UL	0.46	B	0.37	U	0.37	UL	0.46	B	0.54	B
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL
Calcium	NA	NA	26500		25900		19150		32200	J	27300		22100	
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	5.4	U	5.4	U	5.4	U
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U
Copper	34	9	3.8	U	3.8	UL	3.8	U	3.8	U	3.8	UL	4.1	
Iron	NA	1000	258	J	321	B	332	B	553	J	443	L	599	
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	**3.2**		2.7	U	**5.8**	K
Magnesium	NA	NA	9845	J	8765		7650		11700	J	9220		9040	
Manganese	NA	80	77.5	J	**144**	L	64		**158**	J	**232**	L	**102**	
Mercury	0.15	0.012	0.0015		0.00045		0.00135		0.0017		0.00069		0.00180	
Nickel	20.9	52.0	6.3	UL	6.3	UL	6.3	U	6.7	B	7.1	B	6.3	U
Potassium	NA	NA	1425	J	1225	L	926	L	1630	J	1290	L	1230	L
Selenium	NA	5	2.1	U	2.1	U	2.1	B	2.1	U	2.1	U	4	B
Silver	1	NA	3.7	UJ	7.9	B	3.7	U	3.7	UJ	6.3	B	3.7	U
Sodium	NA	NA	15450	J	17550		11250		19700	J	18200		13300	
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	4.4	U	4.4	U	4.4	UL
Vanadium	NA	19	2.8	U	2.8	UL	2.8	U	5.4	B	2.8	UL	4.3	B
Zinc	150	120	19.7	B	17	B	34	B	22.9	B	22.6	B	49.1	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Hardness as CaCO3			107		NA		79.4		129		NA		92.3	
Total Organic Carbon			3.1		2.2	B	1.6		3		2.2	B	1.9	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L				ug/L		ug/L			
Acenaphthene	16	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	85.3	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benz(a)anthracene	261	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chrysene	384	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	0.03	U	0.1	U	0.1	U	0.025	U	0.1	U	0.1	U
Fluoranthene	600	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Fluorene	19	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Naphthalene	160	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	0.05	UR	0.05	U
Pyrene	665	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-09						SW-10					
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		09/15/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	149	B	53.2	B	76.9	B	262	B	41	UL	65.3	B
Antimony	2	NA	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	97.6	B	**85.7**		**75.4**		121	B	**89.1**		**75.8**	
Beryllium	NA	5.1	0.49	B	0.37	UL	0.37	U	0.81	B	0.37	UL	0.37	U
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL	0.43	UL
Calcium	NA	NA	29800	J	27000		20200		31300		28200		21400	
Chromium	81	74/11	11.6		5.4	U	5.4	U	16.2		5.4	U	5.4	U
Cobalt	NA	3	9.6	B	5.2	U	5.2	U	11.4	B	5.2	U	5.2	U
Copper	34	9	11.4	B	3.8	UL	3.8	U	19.7	B	3.8	UL	3.8	U
Iron	NA	1000	418	J	439	L	240	B	**1550**		405	L	229	B
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	**4.4**		2.7	U	2.7	U
Magnesium	NA	NA	11100	J	9070		9160		12000		9680		9060	
Manganese	NA	80	**164**	J	**251**	L	62.9		**208**		**243**	L	70.9	
Mercury	0.15	0.012	0.006		0.00081		0.00150		0.01		0.00073		0.0026	
Nickel	20.9	52.0	16.5	B	6.3	UL	6.3	U	16.9	B	6.3	UL	6.3	U
Potassium	NA	NA	1920	J	1180	L	1360	L	2190	J	1260	L	1080	L
Selenium	NA	5	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
Silver	1	NA	4.9	B	5.9	B	3.7	U	3.7	UJ	9	B	4.2	B
Sodium	NA	NA	18700	J	18000		13600		19500		18500		13700	
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	4.4	U	4.4	U	4.4	UL
Vanadium	NA	19	11.5	B	2.8	UL	2.8	U	14.4	B	2.8	UL	2.8	U
Zinc	150	120	30.5	B	26.4	B	31.3	B	30.3	B	30.2	B	33	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Hardness as CaCO3			120		NA		88.1		127		NA		94	
Total Organic Carbon			2.5		2.3	B	1.8		2.3		2.3	B	1.3	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L				ug/L		ug/L			
Acenaphthene	16	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	85.3	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benz(a)anthracene	261	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chrysene	384	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	0.025	U	0.1	U	0.1	U	0.03	U	0.03	U	0.1	U
Fluoranthene	600	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Fluorene	19	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Naphthalene	160	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	0.05	U	0.05	U
Pyrene	665	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
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Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-11						SW-12					
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		09/15/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	71.3	B	51.4	B	211	B	41	U	41	UL	41	U
Antimony	2	NA	2.6	U	11.1	B	2.6	U	2.6	U	4.4	B	2.6	U
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	**199**	J	**178**		**130**		112	B	**92.1**		**75.4**	
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.37	UL	0.37	UL	0.37	U
Cadmium	1.2	2.2	0.43	UL	**2.8**	L	0.43	UL	1		1.2	L	0.43	UL
Calcium	NA	NA	58300	J	44000		47700		36600	J	27600		24700	
Chromium	81	74/11	5.4	U	6.9	B	5.4	U	5.4	U	5.4	U	5.4	U
Cobalt	NA	3	5.4	B	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U
Copper	34	9	6.8	B	3.8	UL	5		5.9	B	3.8	UL	3.8	U
Iron	NA	1000	**3190**	J	**2720**	L	**1150**		**1380**	J	461	L	199	B
Lead	46.7	2.5	**4.1**		**12.7**		**7**		2.7	U	**3.3**	K	2.7	U
Magnesium	NA	NA	23800	J	17500		19500		14000	J	10000		10500	
Manganese	NA	80	**746**	J	**856**	L	**462**		**244**	J	**226**	L	**122**	
Mercury	0.15	0.012	0.004		0.00590		0.00360		0.002		0.00031		0.0017	
Nickel	20.9	52.0	6.7	B	9.5	B	6.3	U	6.3	UL	6.3	UL	6.3	U
Potassium	NA	NA	2400	J	2020	L	1810	L	1570	J	1360	L	987	L
Selenium	NA	5	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
Silver	1	NA	6.8	B	9.3	B	3.7	U	3.7	UJ	5.9	B	3.7	U
Sodium	NA	NA	49100	J	34400		41900		27100	J	18800		18400	
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	4.4	U	4.4	U	4.4	UL
Vanadium	NA	19	2.8	U	5	L	4.4	B	2.8	U	3.3	L	2.8	U
Zinc	150	120	34	B	**352**		44.5	B	78.4		**149**		32.2	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Hardness as CaCO3			244		NA		199		149		NA		105	
Total Organic Carbon			3.3		4.1	B	1.9		4.5		3	B	2.1	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L				ug/L		ug/L			
Acenaphthene	16	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	1	U	1	U
Anthracene	85.3	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benz(a)anthracene	261	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chrysene	384	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	0.025	U	0.03	U	0.1	U	0.025	U	0.03	U	0.1	U
Fluoranthene	600	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Fluorene	19	3.9	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Naphthalene	160	24	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Phenanthrene	240	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Pyrene	665	24	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
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Bold Values exceed ecological screening levels

T 1

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-13					
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00	
		Chronic Screening						
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**	
Aluminum	NA	87	41	U	54.3	B	41	U
Antimony	2	NA	2.6	U	4.6	B	2.6	U
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U
Barium	NA	3.9	90	B	**115**		**76.7**	
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U
Cadmium	1.2	2.2	0.43	U	1.5	L	0.43	UL
Calcium	NA	NA	32400	J	32400		28100	
Chromium	81	74/11	5.4	U	5.4	U	5.4	U
Cobalt	NA	3	5.2	U	5.2	U	5.2	U
Copper	34	9	3.8	U	3.8	UL	4.1	
Iron	NA	1000	270	J	571	L	178	B
Lead	46.7	2.5	2.7	U	**5.1**	K	2.7	U
Magnesium	NA	NA	12400	J	11900		10800	
Manganese	NA	80	**139**	J	**240**	L	**112**	
Mercury	0.15	0.012	0.001		0.00360		0.00130	
Nickel	20.9	52.0	6.3	UL	6.3	UL	6.3	U
Potassium	NA	NA	1360	J	1450	L	1110	L
Selenium	NA	5	2.1	U	2.1	U	2.1	U
Silver	1	NA	3.7	UJ	9.7	B	3.7	U
Sodium	NA	NA	23400	J	22300		18800	
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL
Vanadium	NA	19	2.8	U	2.8	UL	2.8	U
Zinc	150	120	12.1	B	**177**		37.5	B
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L	
Hardness as CaCO3			132		NA		114	
Total Organic Carbon			3.9		2.7	B	1.6	
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L			
Acenaphthene	16	24	0.5	U	0.5	U	0.5	U
Acenaphthylene	44	24	1	U	1	U	1	U
Anthracene	85.3	24	0.05	U	0.05	U	0.05	U
Benz(a)anthracene	261	0.014	0.05	U	0.05	U	0.05	U
Benzo(a)pyrene	430	0.014	0.05	U	0.05	U	0.05	U
Benzo(b)fluoranthene	430	0.014	0.1	U	0.1	U	0.1	U
Benzo(g,h,i)perylene	430	0.014	0.1	U	0.1	U	0.1	U
Benzo(k)fluoranthene	430	0.014	0.05	U	0.05	U	0.05	U
Chrysene	384	0.014	0.05	U	0.05	U	0.05	U
Dibenz(a,h)anthracene	63.4	0.014	0.025	U	0.03	U	0.1	U
Fluoranthene	600	3.9	0.1	U	0.1	U	0.1	U
Fluorene	19	3.9	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	430	0.014	0.05	U	0.05	U	0.05	U
Naphthalene	160	24	0.5	U	0.5	U	0.5	U
Phenanthrene	240	24	0.05	U	0.05	U	0.05	U
Pyrene	665	24	0.05	U	0.05	U	0.05	U

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
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Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-01						SD-02					
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		09/15/99		11/23/99		2/23/00	
		Chronic Screening												
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	7900		11300		11500		NA		11800		12200	
Antimony	2	NA	**5.1**	K	0.6	B	0.66	B	NA		0.54	B	0.83	B
Arsenic	8.2	8.1	0.36	UL	3.2		4.7		NA		3		3.3	
Barium	NA	3.9	85.8		98.5		95		NA		104		116	
Beryllium	NA	5.1	0.95	J	1.4	K	1.6	K	NA		1.2	J	1.7	K
Cadmium	1.2	2.2	0.85	UL	0.43	UL	0.35	UL	NA		0.04	UL	0.38	UL
Calcium	NA	NA	24100		17000		10200		NA		11600		14800	
Chromium	81	74/11	**494**		34.9		40.4		NA		29.5		37.4	
Cobalt	NA	3	9.2	K	11.9	K	10.6		NA		10.3	K	11	
Copper	34	9	**65.8**		28.7		29.8		NA		26.2		**36**	
Iron	NA	1000	67200		30600		35600		NA		29700		35900	
Lead	46.7	2.5	**69.1**		**127**	J	41.6		NA		29.7	J	**59.1**	
Magnesium	NA	NA	9480		11400		9900		NA		8520		10300	
Manganese	NA	80	6220		607	J	524		NA		693	J	770	
Mercury	0.15	0.012	0.0087	L	0.03910		0.00600	J	0.0277	L	0.01260		0.02600	J
Nickel	20.9	52.0	17.9	L	**21.8**		**21.6**		NA		19.5		**22.4**	
Potassium	NA	NA	2020	K	3690	J	3390		NA		2680	J	3320	
Selenium	NA	5	4.2	U	2.1	UR	2.9		NA		2.1	UR	1.9	U
Silver	1	NA	**3.5**	K	**1.5**	J	**8.3**		NA		**1.6**	J	**8.4**	
Sodium	NA	NA	322	B	404	J	457	K	NA		421	J	1180	
Thallium	NA	NA	8.7	U	0.44	UL	0.36	U	NA		0.5	J	0.39	U
Vanadium	NA	19	264		44.1	L	50.6		NA		41.2	L	48.3	
Zinc	150	120	132		109	L	123		NA		78	L	99.2	
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA		NA		NA		NA	
Total Organic Carbon			13400		3690		6360		3070		5060		10800	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg				ug/kg					
Acenaphthene	16	24	95	UJ	210	U	100	U	190	U	200	U	230	U
Acenaphthylene	44	24	190	UJ	420	U	200	U	380	U	400	U	450	U
Anthracene	85.3	24	29	J	20	U	59		**220**		**130**		**180**	
Benz(a)anthracene	261	0.014	200	J	**1000**		**630**		**1000**		**1000**		**1700**	
Benzo(a)pyrene	430	0.014	220	J	**900**		**580**		**950**		**910**		**1100**	
Benzo(b)fluoranthene	430	0.014	200	J	**880**		**520**		**970**		**860**		**1000**	
Benzo(g,h,i)perylene	430	0.014	120	J	**760**		**550**		**680**		**750**		**1100**	
Benzo(k)fluoranthene	430	0.014	54	J	**430**		300		**550**		390		**550**	
Chrysene	384	0.014	190	J	**850**		**520**		**900**		**910**		**1200**	
Dibenz(a,h)anthracene	63.4	0.014	19	UJ	**74**		24		34	J	61		**67**	
Fluoranthene	600	3.9	410	J	**1700**		**1000**		**2600**		**1900**		**2700**	
Fluorene	19	3.9	19	UJ	42	U	20	U	**90**		40	U	**67**	
Indeno(1,2,3-cd)pyrene	430	0.014	130	J	**520**		350		**490**		**520**		**660**	
Naphthalene	160	24	95	UJ	210	U	100	U	190	U	200	U	230	U
Phenanthrene	240	24	160	J	**460**		**320**		**1000**		**730**		**840**	
Pyrene	665	24	290	J	**1100**		**690**		**1600**		**1300**		**1700**	

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

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Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-03						SD-04					
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		09/15/99		11/23/99		2/23/00	
		Chronic Screening												
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	NA		6330		9040		7760		9130		11000	
Antimony	2	NA	NA		0.28	UL	0.38	B	0.53	K	2.2	B	0.33	B
Arsenic	8.2	8.1	NA		1.5		0.38	U	2.8	L	1.6		1.2	
Barium	NA	3.9	NA		62.7		77.9		85.1		96.1		87.5	
Beryllium	NA	5.1	NA		0.8	J	2.1		1.3	J	1.2	J	1.4	K
Cadmium	1.2	2.2	NA		0.05	UL	0.46	UL	0.05	UL	0.47	UL	0.37	UL
Calcium	NA	NA	NA		29200		27800		12200		20900		10300	
Chromium	81	74/11	NA		24.6		31.2		28.1		**231**		30.4	
Cobalt	NA	3	NA		7.9	K	10		10.1	K	11.6	K	10.6	
Copper	34	9	NA		**37.3**		26.3		**46**		21.7		27	
Iron	NA	1000	NA		26300		40700		28000		41500		32300	
Lead	46.7	2.5	NA		42.8	J	19.5		**52.7**		45.3	J	33.4	
Magnesium	NA	NA	NA		19300		16400		8550		11100		8530	
Manganese	NA	80	NA		568	J	1030		737		3020	J	594	
Mercury	0.15	0.012	0.0336	L	0.00770		0.00870	J	0.017	L	0.00740		0.00800	J
Nickel	20.9	52.0	NA		19		17.9		19	L	17.4		**21**	
Potassium	NA	NA	NA		1800	J	3440		1830		2130	J	2940	
Selenium	NA	5	NA		2.2	UR	2.2	U	2.6	U	2.3	UR	1.8	U
Silver	1	NA	NA		**1.1**	J	**8.6**		1.6	B	**2.3**	J	**7.6**	
Sodium	NA	NA	NA		277	J	398	K	1270		507	J	655	K
Thallium	NA	NA	NA		0.47	UL	0.47	U	0.55	U	0.48	UL	0.5	
Vanadium	NA	19	NA		31.1	L	39.8		34.2		142	L	40	
Zinc	150	120	NA		67.3	L	79.3		**230**		99.7	L	100	
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA		NA		NA		NA	
Total Organic Carbon			8670		3950		2830		6230		4960		3440	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg				ug/kg		ug/kg			
Acenaphthene	16	24	110	U	200	U	110	U	110	UJ	190	U	97	U
Acenaphthylene	44	24	210	U	390	U	210	U	220	UJ	370	U	190	U
Anthracene	85.3	24	**91**		20	U	79		36	J	20	U	43	
Benz(a)anthracene	261	0.014	**440**		**1200**		**990**		**350**	J	**1300**		**450**	
Benzo(a)pyrene	430	0.014	**430**		**920**		**720**		320	J	**930**		390	
Benzo(b)fluoranthene	430	0.014	370		**920**		**760**		380	J	**910**		410	
Benzo(g,h,i)perylene	430	0.014	400		**670**		**720**		300	J	**760**		400	
Benzo(k)fluoranthene	430	0.014	200		**500**		410		190	J	**430**		250	
Chrysene	384	0.014	360		**1100**		**720**		320	J	**990**		**400**	
Dibenz(a,h)anthracene	63.4	0.014	21		46		46		22	UJ	50		20	
Fluoranthene	600	3.9	**870**		**3000**		**1300**		**640**	J	**2600**		**830**	
Fluorene	19	3.9	21	U	39	U	**68**		22	UJ	**45**		19	U
Indeno(1,2,3-cd)pyrene	430	0.014	230		**470**		**450**		190	J	**530**		230	
Naphthalene	160	24	110	U	200	U	110	U	110	UJ	190	U	97	U
Phenanthrene	240	24	**360**		**860**		**420**		180	J	**820**		**260**	
Pyrene	665	24	**700**		**1900**		**960**		410	J	**1600**		530	

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-05						SD-06					
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		09/14/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	7110		9180		7840		7440		8390		8330	J
Antimony	2	NA	0.73	J	0.47	B	0.89	B	1.1	J	0.73	B	0.62	L
Arsenic	8.2	8.1	5.3	L	5	J	1.9		0.73	L	1.3	J	2	L
Barium	NA	3.9	73	J	103	K	110		104	J	89.2	K	95.8	J
Beryllium	NA	5.1	1.1	J	1.8	J	1.9	K	1.1	J	0.99	J	1.8	
Cadmium	1.2	2.2	0.05	UL	0.04	UL	0.38	UL	0.95	UL	0.04	UL	0.17	UL
Calcium	NA	NA	15300	J	13300		22800		10200	J	7780		31400	
Chromium	81	74/11	34.8	J	30.6	J	55.7		30.5	J	44	J	50.3	J
Cobalt	NA	3	10.1	K	11.1		11.7		8.6	K	8.8		10.8	J
Copper	34	9	30.3	J	19.6	L	**47.2**		32	J	19.7		**67.7**	J
Iron	NA	1000	26100	J	30400		42200		52100	J	25000		34400	J
Lead	46.7	2.5	**199**		**129**	J	**71.9**		**50.3**		28.7	J	**89.4**	J
Magnesium	NA	NA	11100	J	9270		12100		7640	J	7240		20600	
Manganese	NA	80	676	J	1040		941		1040	J	814		1130	J
Mercury	0.15	0.012	0.0115	L	0.00910		0.02100	J	**0.188**	L	0.01720		0.01050	J
Nickel	20.9	52.0	17.2	L	19.7	J	**34**		**21.2**	L	17.8	J	**23.3**	J
Potassium	NA	NA	1960	J	2310		2140		1980	J	2370		2060	J
Selenium	NA	5	4.7	UR	4.1	UR	2	U	4.7	UR	3.8	UR	0.89	B
Silver	1	NA	1.4	B	2.3	B	**10**		2.8	B	1.9	B	**6.5**	J
Sodium	NA	NA	818	J	1080	L	453	K	678	J	1260		404	K
Thallium	NA	NA	0.49	U	0.43	UL	0		0.49	U	0.4	UL	0.34	UL
Vanadium	NA	19	39.3		44.2		48		44.2	K	39.8		57.6	L
Zinc	150	120	125		136	J	**187**		142		88.8	J	**520**	J
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA		NA		NA		NA	
Total Organic Carbon			5770		5430		3990		11000		5020		3300	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg				ug/kg		ug/kg			
Acenaphthene	16	24	110	U	210	U	210	U	110	U	200	U	99	U
Acenaphthylene	44	24	210	U	420	U	410	U	210	U	400	U	200	U
Anthracene	85.3	24	**95**		20	U	**240**		32		**180**		79	
Benz(a)anthracene	261	0.014	11	U	**1100**		**890**		260		**840**		**510**	
Benzo(a)pyrene	430	0.014	**870**		**990**		**590**		240		**740**		**470**	
Benzo(b)fluoranthene	430	0.014	**800**		**890**		**630**		200		**680**		**430**	
Benzo(g,h,i)perylene	430	0.014	**660**		**770**		**530**		240		**560**		**590**	
Benzo(k)fluoranthene	430	0.014	**500**		**460**		380		56		390		220	
Chrysene	384	0.014	**940**		**1000**		**720**		260		**760**		**520**	
Dibenz(a,h)anthracene	63.4	0.014	18	J	47		23	J	14	J	44		20	J
Fluoranthene	600	3.9	**2100**		**1900**		**2300**		580		**1900**		**1200**	
Fluorene	19	3.9	**21**	U	42	U	**170**		21	U	**58**		**64**	
Indeno(1,2,3-cd)pyrene	430	0.014	380		**520**		340		130		390		250	
Naphthalene	160	24	110	U	210	U	210	U	110	U	200	U	99	U
Phenanthrene	240	24	**430**		**620**		**1100**		230		**790**		**590**	
Pyrene	665	24	**1600**		**1400**		**1400**		400		**1300**		660	

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AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-07						SD-08					
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		09/14/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	6530		7135		9715	J	6890		10400		10800	J
Antimony	2	NA	1.8	K	1.0	B	1	L	1.9	J	1	B	0.37	L
Arsenic	8.2	8.1	5.5	L	7.8	K	4	L	2.5	L	2.7	J	3.3	L
Barium	NA	3.9	84		95	K	82.9	J	78.4	J	93.7	K	809	J
Beryllium	NA	5.1	1	J	1.05	J	1.6		0.9	J	1.8	J	2.2	
Cadmium	1.2	2.2	0.05	UL	0.45	UL	0.2	UL	0.32	J	0.05	UL	0.21	UL
Calcium	NA	NA	12700		8500		17350		6050	J	11300		16000	
Chromium	81	74/11	29.8		44	J	31	J	**84.1**	J	50.4	J	32	J
Cobalt	NA	3	10.4	K	9.75		11.4	J	7.8	K	10.4		14.7	J
Copper	34	9	**65.3**		**53.4**		26.6	J	23.3	J	**50.4**		**35.5**	J
Iron	NA	1000	38200		32700		36850	J	17500	J	33300		36000	J
Lead	46.7	2.5	**61.3**		42.1	J	35.1	J	**118**		41.8	J	**47.4**	J
Magnesium	NA	NA	9550		7545		12445		5290	J	8610		13000	
Manganese	NA	80	755		1059		624.5	J	335	J	841		3300	J
Mercury	0.15	0.012	0.0128	L	0.01575		0.0127	J	0.0591	L	0.02060		0.01700	J
Nickel	20.9	52.0	**23.7**	L	**22.15**	J	20.7	J	16	L	20.5	J	20	J
Potassium	NA	NA	2090		1965		2695	J	1570	J	3100		2620	J
Selenium	NA	5	4.5	U	4.25	UR	0.99	UL	2.6	UR	4.9	UR	0.58	B
Silver	1	NA	1.7	B	2.15	B	8.5	J	1.3	B	2.3	B	**9.1**	J
Sodium	NA	NA	534	K	383	L	546.5	K	678	J	314	L	426	K
Thallium	NA	NA	0.47	U	0	UL	0.41	UL	0.54	U	0.51	UL	0.42	UL
Vanadium	NA	19	37.4		44.8		44.4	L	30.9		58.8		39.4	L
Zinc	150	120	127		**247**	J	97.7	J	146		87.1	J	129	J
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA		NA		NA		NA	
Total Organic Carbon			5260		5185		4195		15100		4570		4940	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg				ug/kg		ug/kg			
Acenaphthene	16	24	100	UJ	110	U	1000	U	1100	U	210	U	110	U
Acenaphthylene	44	24	200	UJ	210	U	2100	U	2200	U	420	U	210	U
Anthracene	85.3	24	68	J	10	U	**1250**		**680**		20	U	56	
Benz(a)anthracene	261	0.014	**310**	J	**785**		**4550**		**3700**		**990**		**400**	
Benzo(a)pyrene	430	0.014	340	J	**690**		**2000**		**2600**		**810**		360	
Benzo(b)fluoranthene	430	0.014	340	J	**660**		**2400**		**3200**		**790**		320	
Benzo(g,h,i)perylene	430	0.014	265	J	**605**		**1700**		**2700**		**600**		320	
Benzo(k)fluoranthene	430	0.014	120	J	340		**1250**		**1700**		300		150	
Chrysene	384	0.014	355	J	**920**		**3000**		**4000**		**870**		**390**	
Dibenz(a,h)anthracene	63.4	0.014	52		52		**112**	J	**110**	J	**73**		26	
Fluoranthene	600	3.9	**820**	J	**1075**		**12000**		**7900**		**1900**		**870**	
Fluorene	19	3.9	**26.5**	J	11	J	**685**		220	U	42	U	21	U
Indeno(1,2,3-cd)pyrene	430	0.014	110	J	380		**1195**		**1600**		**440**		200	
Naphthalene	160	24	100	UJ	110	U	1000	U	1100	U	210	U	110	U
Phenanthrene	240	24	**370**	J	**360**		**7050**		**3200**		**570**		**300**	
Pyrene	665	24	620	J	**900**		**6050**		**6900**		**1300**		480	

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-09						SD-10					
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		09/15/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	9500		8430		11800	J	6900		7020		10700	J
Antimony	2	NA	1	J	1.3	B	0.4	L	0.84	K	0.56	B	0.43	L
Arsenic	8.2	8.1	2.4	L	3.2	J	2.5	L	3.1	L	2.5	J	4	L
Barium	NA	3.9	72	J	93.2	K	78.9	J	159		67.5	K	82.8	J
Beryllium	NA	5.1	1.1	J	1.3	J	1.3		0.81	J	0.86	J	1.1	
Cadmium	1.2	2.2	0.05	UL	0.04	UL	0.16	UL	0.46	J	0.05	UL	0.18	UL
Calcium	NA	NA	28300	J	11600		21000		9160		15000		13900	
Chromium	81	74/11	43.3	J	57.9	J	30	J	41.6		27.1	J	27.1	J
Cobalt	NA	3	8.3	K	10.6		10.2	J	9.7	K	8.3		10.3	J
Copper	34	9	21.3	J	25.1		22.6	J	**46.8**		22.3		25.9	J
Iron	NA	1000	23700	J	30000		28400	J	24700		22900		27200	J
Lead	46.7	2.5	**83.1**		**57.2**	J	31.6	J	**106**		26.5	J	27.4	J
Magnesium	NA	NA	18900	J	7770		15100		6890		8440		11800	
Manganese	NA	80	399	J	1180		621	J	654		614		529	J
Mercury	0.15	0.012	0.0321	L	0.00660		0.01900	J	0.018	L	0.02470		0.01200	J
Nickel	20.9	52.0	15.2	L	17.4	J	19.5	J	20.8	L	15.5	J	**21.7**	J
Potassium	NA	NA	2530	J	2250		3170	J	1370		2120		3340	J
Selenium	NA	5	2.4	UR	4.2	UR	0.79	UL	2.6	U	2.2	UR	0.17	UL
Silver	1	NA	1.1	B	2.3	B	**6.2**	J	1.1	B	2	B	6.4	J
Sodium	NA	NA	1830	J	395	L	2150		622	K	375	L	1750	
Thallium	NA	NA	0.51	U	0.44	UL	0.33	UL	0.54	U	0.46	UL	0.36	UL
Vanadium	NA	19	40.1		55.2		42.9	L	33.4		33.5		47.3	L
Zinc	150	120	101		120	J	105	J	**176**		94.8	J	84.1	J
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA		NA		NA		NA	
Total Organic Carbon			9000		3720		7360		7640		2810		6510	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg				ug/kg		ug/kg			
Acenaphthene	16	24	110	U	210	U	100	U	100	UJ	200	U	1200	U
Acenaphthylene	44	24	210	U	420	U	200	U	200	UJ	400	U	2400	U
Anthracene	85.3	24	40		**180**		**88**		58	J	**260**		**1500**	
Benz(a)anthracene	261	0.014	200		**940**		**490**		**420**	J	**1100**		**6000**	
Benzo(a)pyrene	430	0.014	210		**790**		**440**		390	J	**990**		**3700**	
Benzo(b)fluoranthene	430	0.014	180		**720**		400		**510**	J	**930**		**4200**	
Benzo(g,h,i)perylene	430	0.014	100		**570**		**470**		370	J	**670**		**3900**	
Benzo(k)fluoranthene	430	0.014	54		250		210		220	J	**470**		**1900**	
Chrysene	384	0.014	210		**810**		**500**		**440**	J	**1100**		**4500**	
Dibenz(a,h)anthracene	63.4	0.014	21	U	**69**		20	U	20	UJ	**74**		**180**	J
Fluoranthene	600	3.9	480		**2000**		**990**		**850**	J	**2600**		**7900**	
Fluorene	19	3.9	21	U	42	U	20	U	20	UJ	**89**		240	U
Indeno(1,2,3-cd)pyrene	430	0.014	99		420		210		240	J	**500**		**2100**	
Naphthalene	160	24	110	U	210	U	100	U	100	UJ	200	U	1200	U
Phenanthrene	240	24	210		**690**		**440**		**380**	J	**1100**		**1800**	
Pyrene	665	24	370		**1300**		660		**750**	J	**1700**		**7900**	

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-11						SD-12					
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		09/15/99		11/22/99		2/22/00	
		Chronic Screening												
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	7700		11600		8770	J	NA		7170		9390	J
Antimony	2	NA	1.1	J	**5**	J	0.72	L	NA		0.75	B	0.47	L
Arsenic	8.2	8.1	3.1	L	**8.5**	J	2.6	L	NA		2.7	J	1.9	L
Barium	NA	3.9	143	J	236	K	151	J	NA		80	K	85.6	J
Beryllium	NA	5.1	0.96	J	2.5	J	1.4		NA		1	J	1.6	
Cadmium	1.2	2.2	**2.9**	J	**2.9**	J	**1.4**	L	NA		0.05	UL	0.04	UL
Calcium	NA	NA	6510	J	21000		12500		NA		19700		8990	
Chromium	81	74/11	57.3	J	**140**	J	40.7	J	NA		36.6	J	32.7	J
Cobalt	NA	3	6.5	K	14.3		10.6	J	NA		9		12.3	J
Copper	34	9	**44**	J	**150**		**89.4**	J	NA		26.1		**37.4**	J
Iron	NA	1000	20800	J	43200		27700	J	NA		25300		24300	J
Lead	46.7	2.5	**188**		**1180**	J	**72.6**	J	NA		**47.6**	J	**88.4**	J
Magnesium	NA	NA	4770	J	13200		9650		NA		10500		8200	
Manganese	NA	80	578	J	1060		1440	J	NA		908		726	J
Mercury	0.15	0.012	**0.195**	L	**0.16500**		**0.130**	J	0.0684	L	0.02610		0.03100	J
Nickel	20.9	52.0	12.5	L	51.8	J	**25.5**	J	NA		18.2	J	**22**	J
Potassium	NA	NA	1450	J	2500		2220	J	NA		1970		2430	J
Selenium	NA	5	2.3	UR	5	UR	0.21	UL	NA		2.3	UR	0.21	UL
Silver	1	NA	1.7	B	3.2	B	**7.4**	J	NA		1.7	B	**6.4**	J
Sodium	NA	NA	801	J	1410	L	972	K	NA		922	L	926	K
Thallium	NA	NA	0.47	U	0.53	UL	0.45	UL	NA		0.49	UL	0.44	UL
Vanadium	NA	19	34		60.7		53.9	L	NA		53.7		36.5	L
Zinc	150	120	**704**		**888**	J	**293**	J	NA		120	J	**228**	J
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA		NA		NA		NA	
Total Organic Carbon			19500		10700		8840		3760		6510		5270	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg				ug/kg		ug/kg			
Acenaphthene	16	24	1700	U	4100	U	410	U	490	U	220	U	100	U
Acenaphthylene	44	24	3300	U	8200	U	820	U	980	U	430	U	210	U
Anthracene	85.3	24	**2000**		**4200**		**260**		**800**		20	U	84	
Benz(a)anthracene	261	0.014	**6800**		**9300**		**1400**		**2000**		**870**		**770**	
Benzo(a)pyrene	430	0.014	**5700**		**9500**		**1200**		**2000**		**900**		**720**	
Benzo(b)fluoranthene	430	0.014	**6500**		**8300**		**1300**		**2100**		**820**		**650**	
Benzo(g,h,i)perylene	430	0.014	**4400**		**6400**		**1100**		**1300**		**640**		**770**	
Benzo(k)fluoranthene	430	0.014	**2900**		**3400**		**710**		**1200**		**450**		380	
Chrysene	384	0.014	**7600**		**9300**		**1400**		**2200**		**920**		**780**	
Dibenz(a,h)anthracene	63.4	0.014	**240**	J	**1700**		45	J	**200**		59		26	
Fluoranthene	600	3.9	**20000**		**25000**		**2800**		**5600**		**2000**		**1300**	
Fluorene	19	3.9	330	U	**2000**		**120**		**390**		43	U	21	U
Indeno(1,2,3-cd)pyrene	430	0.014	**2800**		**5000**		**630**		**970**		**470**		390	
Naphthalene	160	24	1700	U	4100	U	410	U	490	U	220	U	100	U
Phenanthrene	240	24	**8900**		**16000**		**1400**		**3700**		**810**		**500**	
Pyrene	665	24	**17000**		**23000**		**2600**		**5200**		**1600**		**1100**	

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

Table 4-1
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-13					
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00	
		Chronic Screening						
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**	
Aluminum	NA	87	NA		5950		8810	J
Antimony	2	NA	NA		0.68	B	0.67	L
Arsenic	8.2	8.1	NA		4.7	K	3.4	L
Barium	NA	3.9	NA		126	K	127	J
Beryllium	NA	5.1	NA		1.1	J	1.2	
Cadmium	1.2	2.2	NA		**3**	J	0.73	L
Calcium	NA	NA	NA		2800		8980	
Chromium	81	74/11	NA		22	J	39	J
Cobalt	NA	3	NA		7.3		11	J
Copper	34	9	NA		33.1		**40.5**	J
Iron	NA	1000	NA		18600		24400	J
Lead	46.7	2.5	NA		**51.1**	J	**76.1**	J
Magnesium	NA	NA	NA		3220		7920	
Manganese	NA	80	NA		1970		1370	J
Mercury	0.15	0.012	0.0375	L	0.08300		0.073	J
Nickel	20.9	52.0	NA		16.8	J	**23.4**	J
Potassium	NA	NA	NA		1070	L	2120	J
Selenium	NA	5	NA		2.5	UR	0.35	B
Silver	1	NA	NA		2.2	B	**6.4**	J
Sodium	NA	NA	NA		776	L	675	K
Thallium	NA	NA	NA		0.52	UL	0.45	UL
Vanadium	NA	19	NA		28.3		40.5	L
Zinc	150	120	NA		**396**	J	**286**	J
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg	
Hardness as CaCO3			NA		NA		NA	
Total Organic Carbon			3610		7190		9100	
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg			
Acenaphthene	16	24	110	U	210	U	690	U
Acenaphthylene	44	24	210	U	420	U	1400	U
Anthracene	85.3	24	**120**		**200**		**600**	
Benz(a)anthracene	261	0.014	**640**		**760**		**3200**	
Benzo(a)pyrene	430	0.014	**640**		**740**		**2500**	
Benzo(b)fluoranthene	430	0.014	**670**		**790**		**3000**	
Benzo(g,h,i)perylene	430	0.014	**680**		**670**		**2100**	
Benzo(k)fluoranthene	430	0.014	360		230		**1600**	
Chrysene	384	0.014	**670**		**880**		**3300**	
Dibenz(a,h)anthracene	63.4	0.014	34		34	J	**110**	J
Fluoranthene	600	3.9	**1300**		**1900**		**7800**	
Fluorene	19	3.9	21	U	**54**		**330**	
Indeno(1,2,3-cd)pyrene	430	0.014	420		**470**		**1400**	
Naphthalene	160	24	110	U	210	U	690	U
Phenanthrene	240	24	**590**		**770**		**3500**	
Pyrene	665	24	**1100**		**1600**		**5900**	

J - Estimated value; U - Non-detected; B - Result not considered present; K - Result biased high; L - Result biased low
AWQC - Ambient Water Quality Criteria
Bold Values exceed ecological screening levels

TABLE 4-2
GRAIN-SIZE RESULTS
NAWC WARMINSTER

LOCATION	GRAIN-SIZE DESCRIPTION			
	QTR. 1	QTR. 2	QTR.3	QTR.4
ST-01	Well-graded gravel with sand	Well-graded gravel with sand	Well-graded gravel with sand	
ST-02	Well-graded sand with gravel	Poorly-graded sand with silt and gravel	Silty gravel with sand	
ST-03	Well-graded sand with silt and gravel	Well-graded gravel with sand	Well-graded gravel with sand	
ST-04	Well-graded sand with gravel	Well-graded gravel with sand	Well-graded gravel with sand	
ST-05	Well-graded sand with silt and gravel	Well-graded gravel with sand	Well-graded gravel with sand	
ST-06	Well-graded sand with gravel	Well-graded gravel with sand	Well-graded gravel with sand	
ST-07	Well-graded sand with silt and gravel	Well-graded gravel with sand	Well-graded gravel with sand	
ST-08	Silty sand	Well-graded sand with silt and gravel	Well-graded gravel with sand	
ST-09	Well-graded sand with silt and gravel	Well-graded gravel with sand	Well-graded gravel with sand	
ST-10	Poorly-graded sand with silt and gravel	Well-graded sand with gravel	Well-graded gravel with sand	
ST-11	Poorly-graded sand with silt and gravel	Well-graded sand with gravel	Well-graded gravel with sand	
ST-12	Poorly-graded sand with gravel	Well-graded sand with silt and gravel	Poorly-graded sand with gravel	
ST-13	Well-graded sand with silt and gravel	Silty sand with gravel	Poorly-graded sand with gravel	

TABLE 4-3
SURFACE SOIL SAMPLING RESULTS
NAWC WARMINSTER

	Background Data				Surface Soil Sampling Results							
	Freq. of	Range of Positive Detection		Mean of	SS-01				SS-02			
Substance	Detection	Min.	Max.	All Data	QTR. 1	QTR. 2	QTR. 3	QTR. 4	QTR. 1	QTR. 2	QTR. 3	QTR. 4
METALS (mg/kg)												
aluminum	31/31	4780	18100	13400	8240	7040 J	7400		12200	8080	13800	
antimony	1/22	13.6	13.6	3.75	0.81 K	3.3 B	1 B		1.6 K	1.4 B	6.1	
arsenic	27/31	0.28	12.1	3.88	3.2 L	9.3 J	2.6		4.6 L	3.6	5	
barium	27/29	34.1	225	61.6	246	546 J	127		153	113	245	
beryllium	27/31	0.31	1.7	0.806	0.66 B	0.87 J	0.91 K		1.2 J	0.87 L	1.3 K	
cadmium	0/31	-			0.82 J	8.9 J	0.45 UL		0.53 J	0.28 J	17.8	
calcium	25/29	240	1910	664	3740	13000 J	42900		3010	17100	6710	
chromium	31/31	7.9	35.3	19.4	34.4	86.1 J	24.2		28.5	32	37.8	
cobalt	27/30	1.6	22.1	8.9	25.1 K	46.3 J	6.3		7.6 K	6.2 K	62.2	
copper	29/31	3.6	30.6	11.8	15.3	54.8 J	33.2		53.6	46.9	226	
iron	31/31	6980	410500	33100	23700	73100 J	36800		26000	30100	70100	
lead	31/31	1.6	96.5	11.7	39.4	51.2 J	71		97.5	439 J	79.8	
magnesium	27/31	518	4960	1980	1920	5210 J	26500		2840	11400	5280	
manganese	31/31	30.9	2010	424	6000	9860 J	1040		372	352 J	2080	
mercury	1/28	0.37	0.37	0.0436	0.29 L	0.35 J	3.98 J		0.192 L	0.0456	0.01 J	
nickel	20/27	4.1	21.7	10.5	47.9	113 J	13.8		14.6 L	12.8	249	
potassium	27/29	89.1	3050	706	608 J	677 J	1520		1030 J	997 J	1600	
selenium	0/20	-			0.71 B	ND	2.2 U		ND	ND	0.53 U	
silver	0/17	-			3.6 B	6.8 J	6.8		6 K	2.7 J	21.9	
sodium	5/20	55.2	86.7	102	171 B	301 J	282 K		218 B	281 J	234 K	
thallium	3/31	0.37	0.42	0.378	ND	ND	0.46 U		ND	ND	1.6	
vanadium	31/31	15.4	45	29.7	30.6	66.5 J	38.7		48.4	38.6 L	91.6	
zinc	27/29	9	60	27.7	850	23300 J	117		117	130 L	11600	
PAHs (ug/kg)												
acenaphthene	0/11	-			ND	ND	110 U		ND	ND	95 U	
acenaphthylene	0/11	-			ND	ND	220 U		ND	ND	190 U	
anthracene	0/11	-			ND	ND	32		65 J	300	26	
benz(a)anthracene	0/11	-			130 J	110 J	390		380 J	1300	200	
benzo(a)pyrene	0/11	-			200 J	130 J	330		420 J	1200	230	
benzo(b)fluoranthene	1/11	58	58	185	190 J	130 J	270		380 J	1300	230	
benzo(g,h,i)perylene	0/11	-			170 J	110 J	340		270 J	1100	260	
benzo(k)fluoranthene	1/11	46	46	184	71 J	94 J	160		170 J	670	130	
chrysene	1/11	51	51	185	230 J	99 J	340		400 J	1400	200	
dibenz(a,h)anthracene	0/11	-			11 J	ND	14 J		ND	67	18 J	
fluoranthene	1/11	92	92	188	350 J	260 J	620		830 J	3300	480	
fluorene	0/11	-			ND	ND	22 U		32 J	97	19 U	
indeno(1,2,3-cd)pyrene	0/11	-			120 J	79 J	190		250 J	720	160	
naphthalene					ND	ND	110 U		ND	ND	95 U	
phenanthrene	1/11	51	51	185	150 J	87 J	11 U		380 J	1500	220	
pyrene					260 J	230 J	600		700 J	2800	430	
TOC (mg/kg)					19100	55100 J	3990		7300	12000	38300	

B - Positive result is considered an artifiact of blank contamination and should not be considered present

L - Positive result is biased low as a result of validation noncompliances

J - Positive result is considered estimated as a result of validation noncompliances

K - Positive result is biased high as a result of technical noncompliances

Frequency of detection refers to number of times compound was detected among all samples versus total number of samples.

Number of samples may vary based on the number of usable results.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Third quarter results were compared to first and second quarter results. It should be noted that the first quarter was conducted while the region was in severe drought conditions and the stream channel was subject to significant changes due to a severe flooding event between the first and second sampling. Variations observed in field water quality parameters is primarily due to the impacts of the flood event in September 1999 and/or seasonal changes, or in the case of ST-11, due to the location of the sample. This location is impacted by runoff from a parking area that could influence salinity, pH, and other field parameters.

Several changes were observed in the third quarter sampling in the metals and PAH concentrations, particularly in the stream sediments (see Section 4.1 for details). During the third quarter there were no locations that showed significantly higher levels of contamination when compared to the other monitoring points. In the previous rounds, location ST-11 showed higher levels of contamination than the other sample locations. The levels of contamination in locations downstream of the seep areas and outfalls tend to be within the same range for this round. This may be due to the increased flow rates observed during the third quarter that may have distributed sediments in a more homogeneous manner.

Based on the results of the third quarter sampling event, no changes to the sampling procedures are recommended.

Macroinvertebrate sampling was only conducted during the first quarterly sampling event; therefore, there is inadequate data to evaluate trends and present conclusions. No changes to the sampling program are recommended. The next sampling round is scheduled for June 2000 and will be for chemical analyses and macroinvertebrate sampling.

Appendix A

Survey Data

Job Number / 9-8144 Tetra Tech

C.L.E.A.N. Irons Location

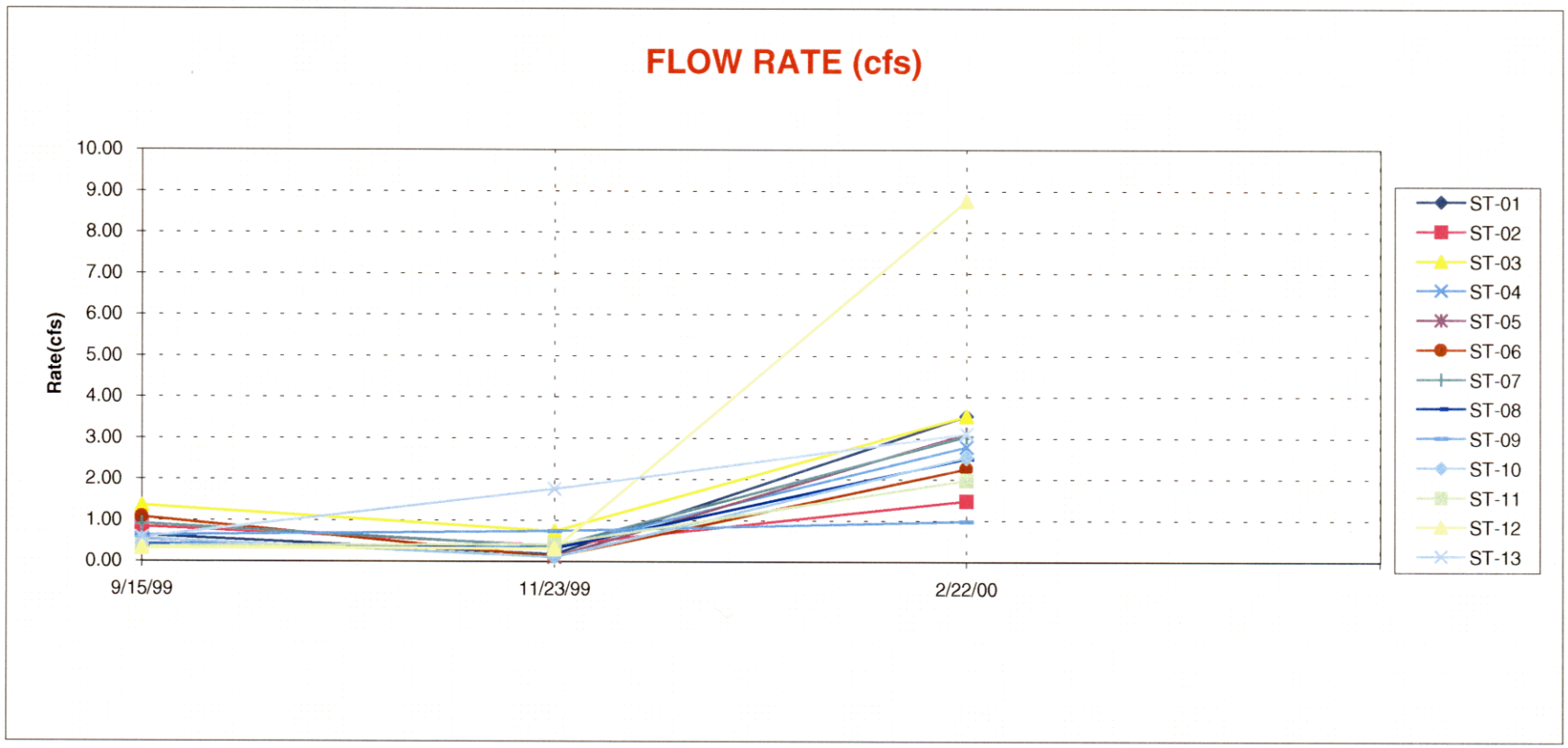
Iron #	NORTHING	EASTING
Iron(1)	327,904.6945	2,746,623.4928
Iron(2)	327,911.7293	2,746,602.5731
Iron(3)	327,966.6498	2,746,531.9856
Iron(4)	327,995.0506	2,746,507.6208
Iron(5)	328,020.5948	2,746,470.2593
Iron(6)	328,040.9440	2,746,442.8313
Iron(7)	328,060.4397	2,746,393.5344
Iron(8)	328,099.4571	2,746,363.0882
Iron(9)	328,126.7726	2,746,329.6965
Iron(10)	328,178.5301	2,746,256.4672
Iron(11)	328,218.7371	2,746,168.9253
Iron(12)	328,337.1570	2,746,166.5844

Appendix B

Stream Monitoring – Field Parameters

Flow Rate (cfs)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00
ST-01	0.62	0.17	3.53
ST-02	0.84	0.38	1.47
ST-03	1.35	0.73	3.53
ST-04	0.42	0.33	2.78
ST-05	0.53	0.11	3.10
ST-06	1.07	0.11	2.25
ST-07	0.91	0.36	3.04
ST-08	0.38	0.31	2.50
ST-09	0.62	0.73	0.97
ST-10	0.54	0.10	2.53
ST-11	0.36	0.41	1.98
ST-12	0.32	0.31	8.76
ST-13	0.57	1.76	3.1



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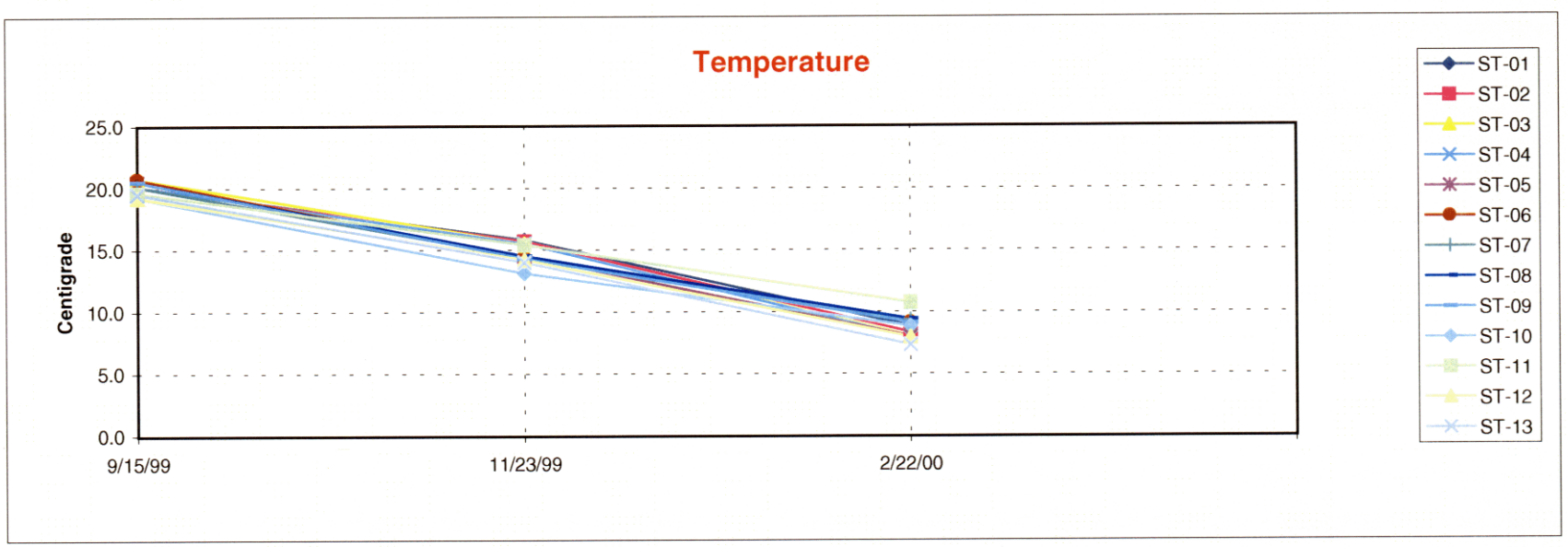
Temperature (C)
NAWC Warminster Surface Water Sample Results

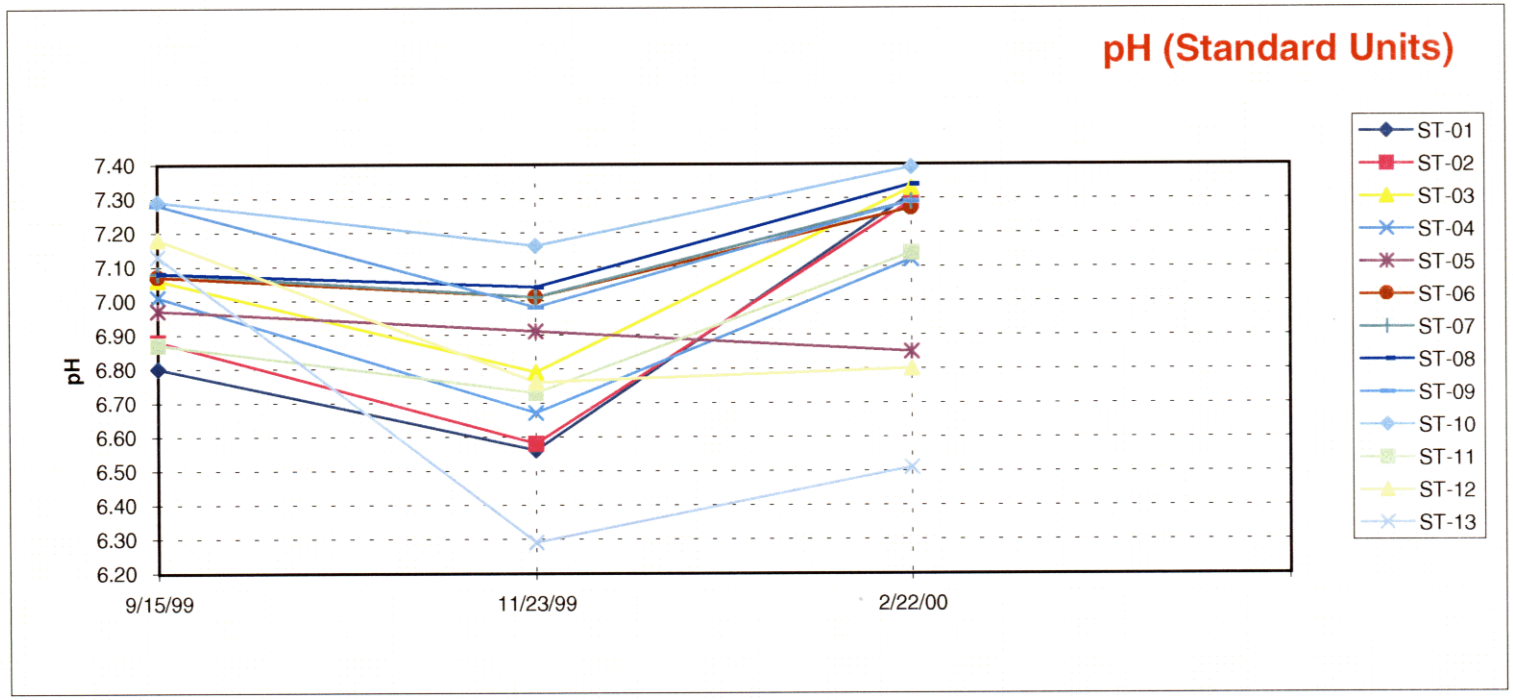
Location	9/15/99	11/23/99	2/22/00
ST-01	20.1	15.8	8.8
ST-02	20.1	15.7	8.3
ST-03	20.7	15.5	8.0
ST-04	20.1	15.5	7.9
ST-05	20.5	14.5	8.0
ST-06	20.7	14.4	9.1
ST-07	20.1	14.4	9.3
ST-08	20.5	14.5	9.4
ST-09	20.5	14.3	9.1
ST-10	19.2	13.1	8.8
ST-11	19.6	15.4	10.7
ST-12	19.2	14.2	7.9
ST-13	19.5	14.0	7.3



pH
NAWC Warminster Surface Water Sample Results

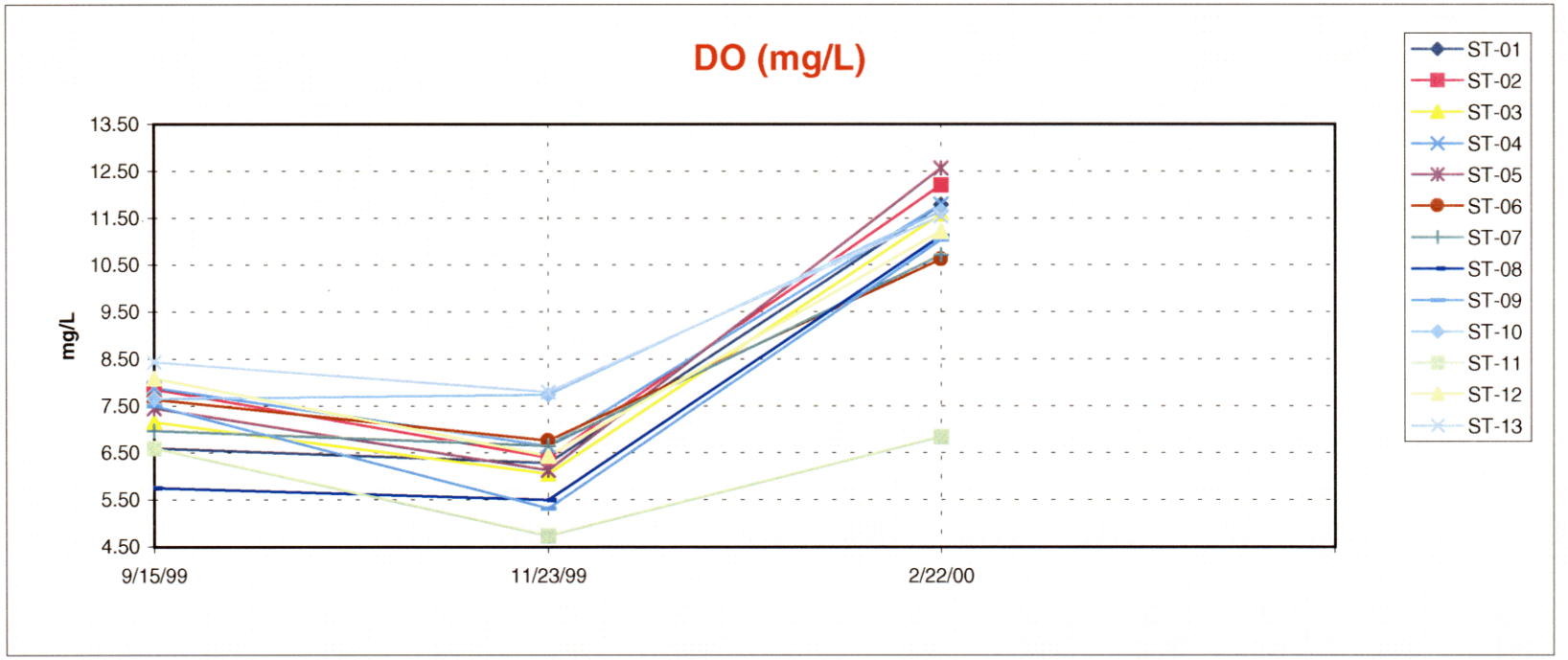
pH

Location	9/15/99	11/23/99	2/22/00
ST-01	6.80	6.56	7.31
ST-02	6.88	6.58	7.29
ST-03	7.06	6.79	7.33
ST-04	7.01	6.67	7.12
ST-05	6.97	6.91	6.85
ST-06	7.07	7.01	7.27
ST-07	7.08	7.01	7.29
ST-08	7.08	7.04	7.34
ST-09	7.28	6.98	7.29
ST-10	7.29	7.16	7.39
ST-11	6.87	6.73	7.14
ST-12	7.18	6.76	6.80
ST-13	7.13	6.29	6.51



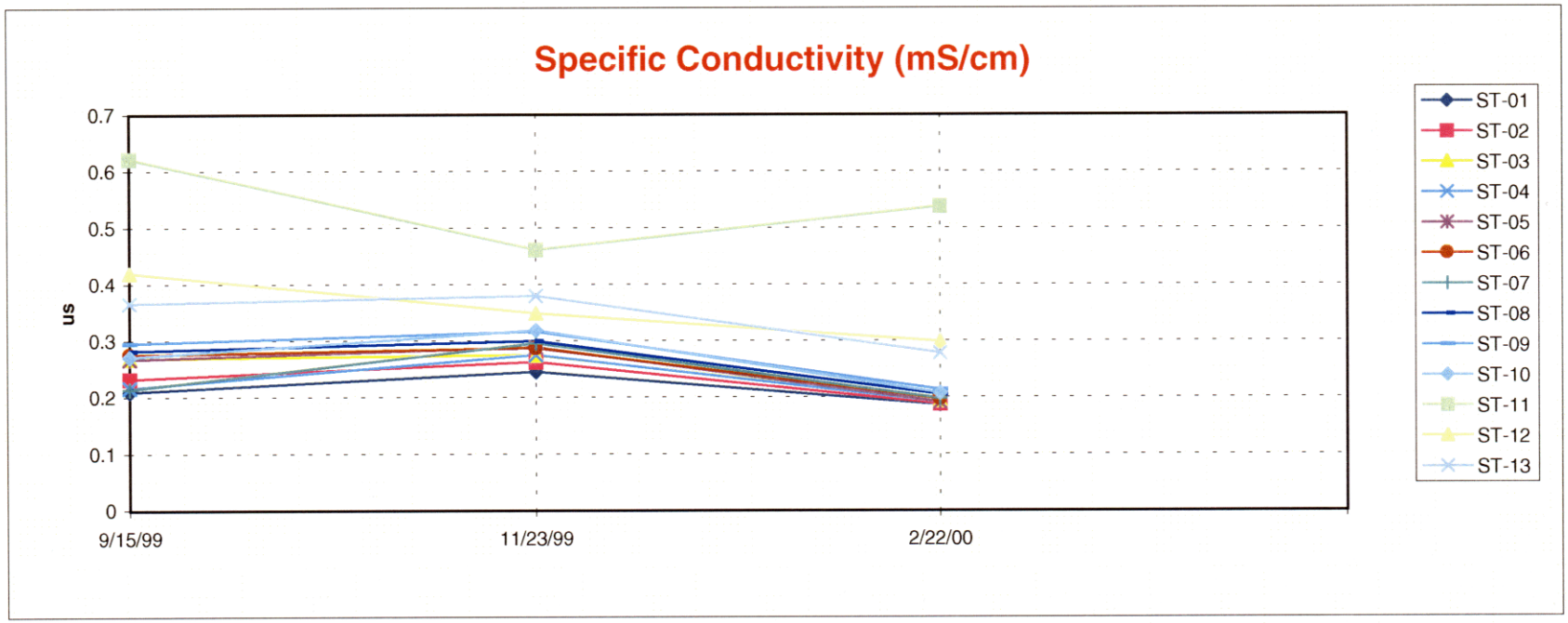
Dissolved Oxygen (mg/L)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00
ST-01	6.60	6.29	11.79
ST-02	7.85	6.40	12.20
ST-03	7.15	6.05	11.58
ST-04	7.89	6.65	11.80
ST-05	7.45	6.13	12.57
ST-06	7.63	6.76	10.62
ST-07	6.98	6.65	10.72
ST-08	5.76	5.50	11.12
ST-09	7.51	5.33	11.04
ST-10	7.65	7.74	11.65
ST-11	6.60	4.74	6.85
ST-12	8.09	6.44	11.22
ST-13	8.44	7.80	11.55



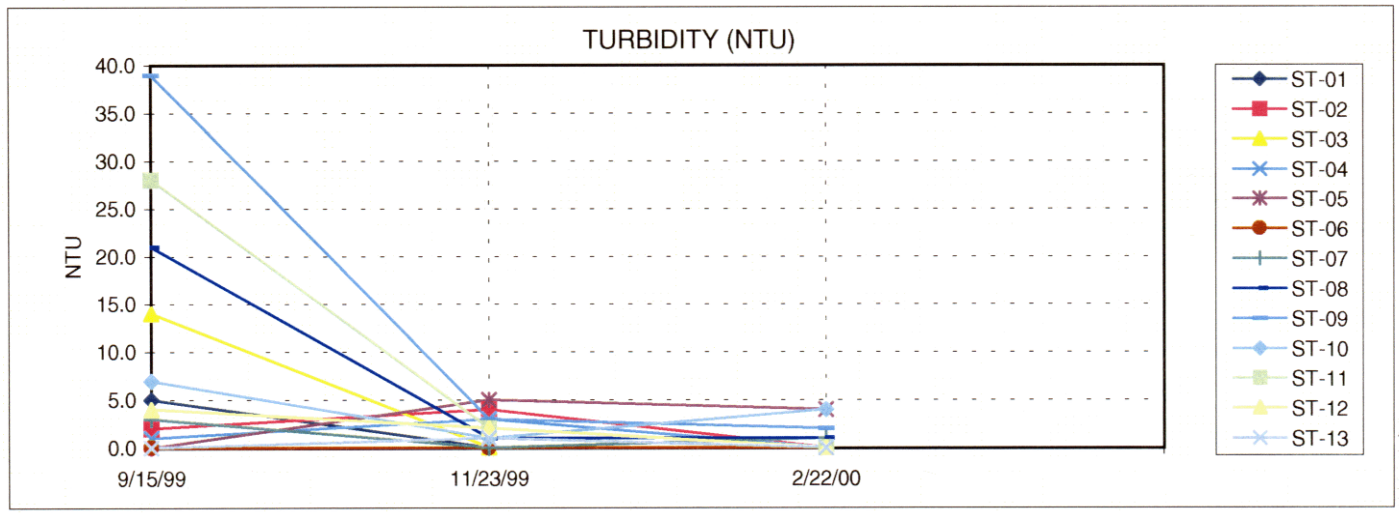
Specific Conductivity (mS/cm)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00
ST-01	0.209	0.245	0.186
ST-02	0.232	0.262	0.188
ST-03	0.268	0.274	0.193
ST-04	0.216	0.275	0.191
ST-05	0.267	0.288	0.191
ST-06	0.275	0.287	0.196
ST-07	0.214	0.295	0.197
ST-08	0.282	0.299	0.204
ST-09	0.295	0.316	0.213
ST-10	0.271	0.318	0.207
ST-11	0.622	0.460	0.537
ST-12	0.419	0.348	0.298
ST-13	0.366	0.379	0.278



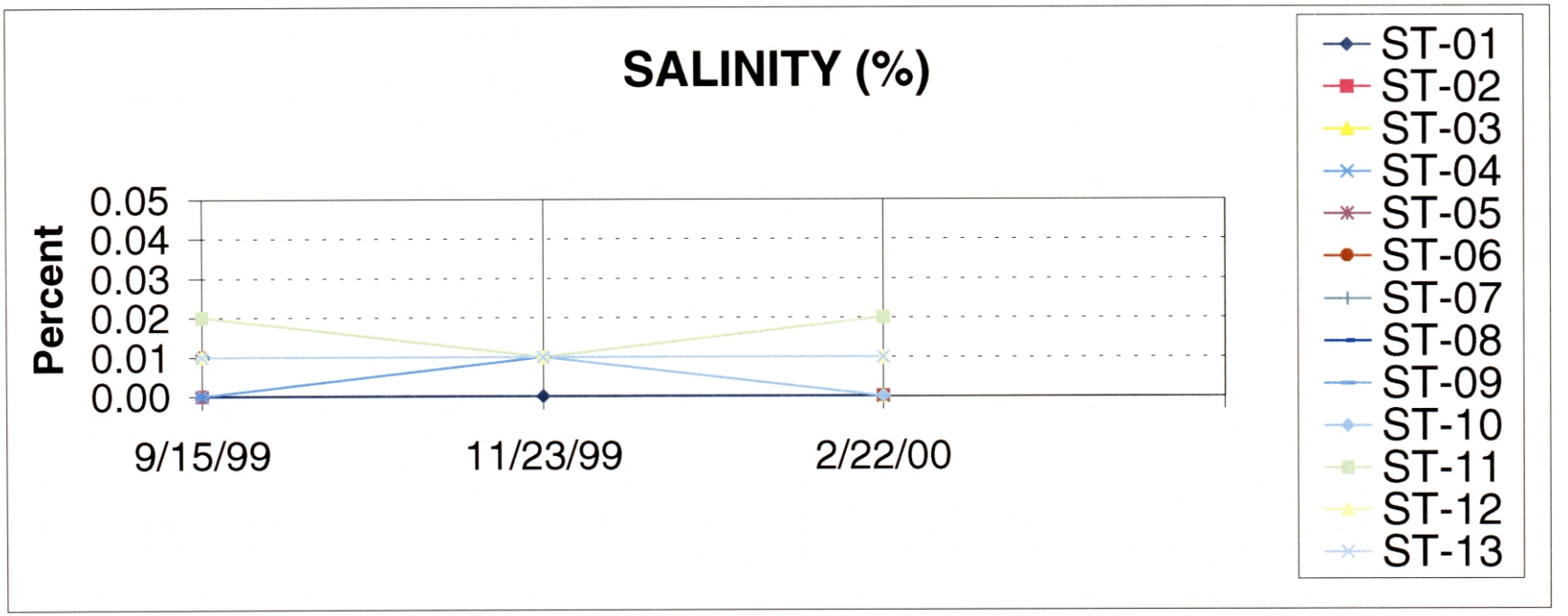
TURBIDITY (NTU)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00
ST-01	5.0	0.0	0.0
ST-02	2.0	4.0	0.0
ST-03	14.0	0.0	0.0
ST-04	1.0	3.0	0.0
ST-05	0.0	5.0	4.0
ST-06	0.0	0.0	0.0
ST-07	3.0	0.0	1.0
ST-08	21.0	1.0	1.0
ST-09	39.0	3.0	2.0
ST-10	7.0	1.0	4.0
ST-11	28.0	2.0	0.0
ST-12	4.0	2.0	0.0
ST-13	0.0	1.0	0.0



SALINITY (%)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00
ST-01	0.00	0.00	0.00
ST-02	0.00	0.01	0.00
ST-03	0.01	0.01	0.00
ST-04	0.00	0.01	0.00
ST-05	0.01	0.01	0.00
ST-06	0.01	0.01	0.00
ST-07	0.00	0.01	0.00
ST-08	0.01	0.01	0.00
ST-09	0.00	0.01	0.00
ST-10	0.01	0.01	0.00
ST-11	0.02	0.01	0.02
ST-12	0.01	0.01	0.01
ST-13	0.01	0.01	0.01



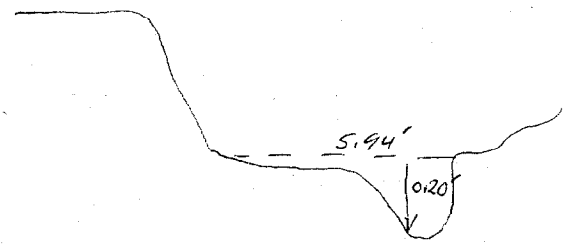
Appendix C

Stream Flow Calculations

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station No 01 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 2.94 ft/sec

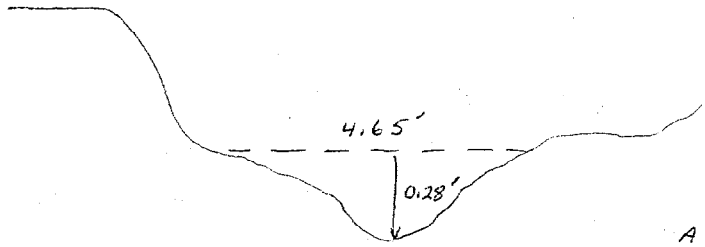
Cross sectional Area = 5.94' wide x 0.20' Deep = 1.20 sq/ft

Average Flow Rate = 1.20 sq/ft x 2.94 ft/sec = 3.53 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station No. 02 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.13 ft/sec

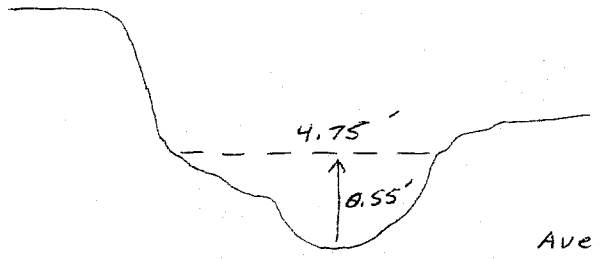
Cross Sectional Area = 4.65' wide x 0.28' Deep = 1.30 sq/ft

Average Flow Rate = 1.30 sq ft x 1.13 ft/sec = 1.47 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station No 03 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.35 ft/sec

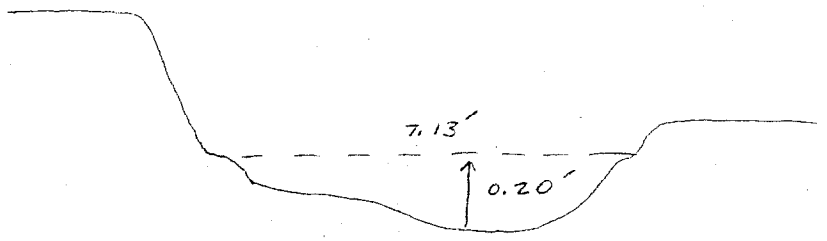
Cross Sectional Area = 4.75' wide x 0.55' Deep = 2.61 sq/ft

Average Flow Rate = 2.61 sq/ft x 1.35 ft/sec = 3.53 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station No 04 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.95 ft/sec

Cross Sectional Area = 7.13' wide x 0.20' Deep = 1.43 sq/ft

Average Flow Rate = 1.43 sq/ft x 1.95 ft/sec = 2.78 CFS

CALCULATION WORKSHEET

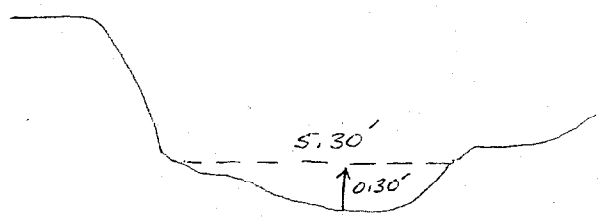
PAGE _____ OF _____

CLIENT	JOB NUMBER
NAWC Warminster	6883

SUBJECT: Station No 05 Average Flow Rate

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.95 ft/sec

Cross Sectional Area = 5.30' wide x 0.30' Deep = 1.59 sq/ft

Average Flow Rate = 1.59 sq/ft x 1.95 ft/sec = 3.10 CFS

CALCULATION WORKSHEET

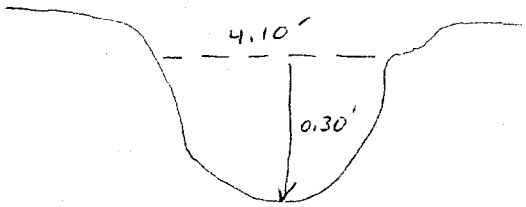
PAGE _____ OF _____

CLIENT	JOB NUMBER
NAWC Warminster	6883

SUBJECT: Station No 06 Average Flow Rate

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.83 ft/sec

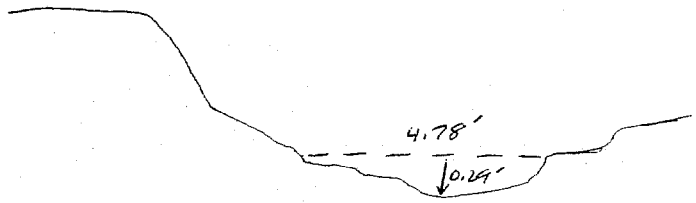
Cross Sectional Area = 4.10' wide x 0.30' deep = 1.23 sq ft

Average Flow Rate = 1.23 sq/ft x 1.83 ft/sec = 2.25 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station No 07 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 2.19 ft/sec

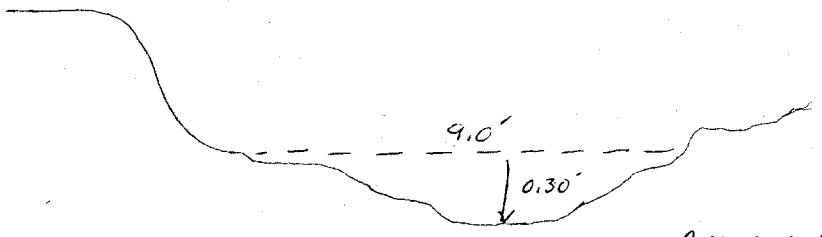
Cross Sectional Area = 4.78' wide x 0.29' Deep = 1.39 sq/ft

Average Flow Rate = 1.39 sq/ft x 2.19 ft/sec = 3.04 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station No 08 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



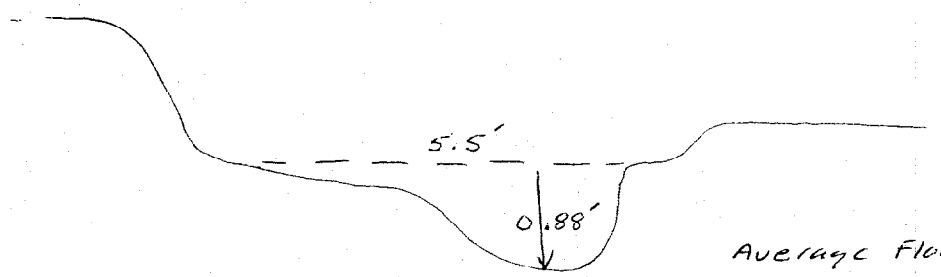
Average Flow Rate = 0.93 ft/sec

Cross Sectional Area = 9.0' wide x 0.30' Deep = 2.7 sq/ft

Average Flow Rate = 2.7 sq/ft x 0.93 ft/sec = 2.5 CFS

CALCULATION WORKSHEET

CLIENT		JOB NUMBER	
NAWC - Warminster		6883	
SUBJECT			
Station 9 Average Flow Calculation			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 0.2

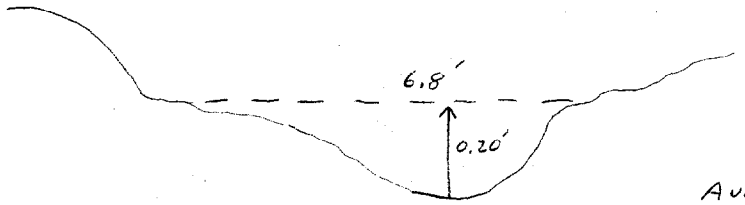
Cross Sectional Area = 5.5' wide x 0.88' deep = 4.84 sq/ft

Average Flow Rate = 4.84 sq/ft x 0.2 ft/sec = 0.97 CFS.

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station 10 Average Flow Rate			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.86 Ft/sec

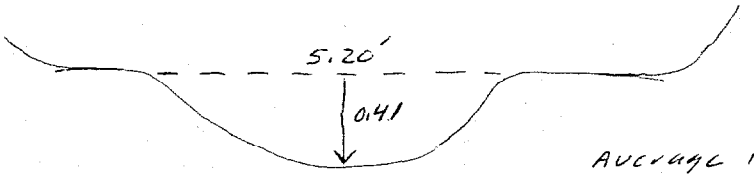
Cross Sectional Area = 6.8' wide x 0.20' Deep = 1.36 sq/ft

Average Flow Rate = 1.36 sq/ft x 1.86 ft/sec = 2.53 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster		6883	
SUBJECT			
Station 11 Flow Rate Calculation			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 0.93 ft/sec

Cross Sectional Area = 5.20' wide x 0.41' Deep = 2.13 ft/sq

Flow Rate Calculation = 2.13 ft/sq x 0.93 ft/sec = 1.98 CFS

CALCULATION WORKSHEET

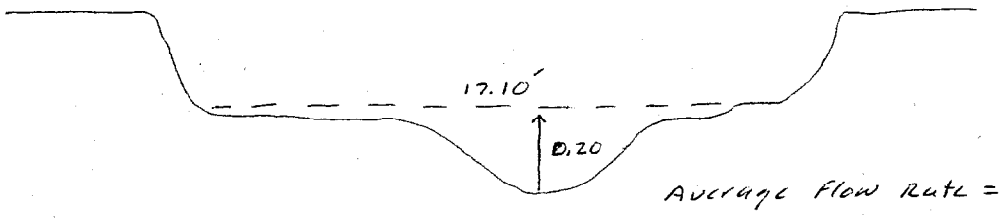
PAGE _____ OF _____

CLIENT	JOB NUMBER
NAWC Warminster	6883

SUBJECT: Station 12 Average Flow Calculation

BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 2.56 ft/s

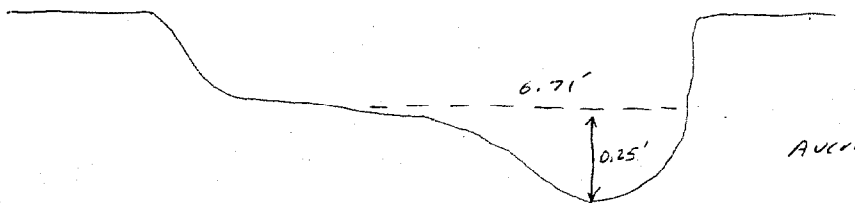
Cross Sectional Area = 17.10' wide x 0.20' Deep = 3.42 sq/ft

Flow Rate Calculation = 3.42 sq/ft x 2.56 ft/sec = 8.76 CFS

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
NAWC Warminster			
SUBJECT			
Station 13 Average Flow Calculation			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Average Flow Rate = 1.86/FT/S

Cross Sectional Area = 6.71' wide x 0.25' Deep = 1.68 sq/ft

Average flow Rate = 1.68 sq/ft x 1.86 ft/sec = 3.10 CFS

Appendix D

Sample Logs

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-09-03Q
Sample Location:
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date: 2/22/00	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1125 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown to Gray	Poorly sorted sand to gravel with trace of silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

The stream bottom had small amounts of algae

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-09-03A
Sample Location: station-09
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00 Time: 1120 Depth: — Method: Sample Bottl/wear	clear	7.29	.213	9.1	2	11.04	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-08-03Q
Sample Location: station -08
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/22/00 Time: 1205 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown, Red Brown to Gray	Poorly sorted sand with some silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

Algae was noted on the stream Bottom

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-08-03Q
Sample Location: Station-08
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00 Time: 1200 Depth: — Method: Sample Bottle/Wade	Clear	7.34	.204	9.4	1	11.12	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with No odor

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-07-03Q
Sample Location: Station -07
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/22/00 Time: 1230 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Red brown to Gray	Poorly sorted sand and Gravel with trace silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above Background were noted

Duplicate sample was collected

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.: SD-21-03Q Assigned time 1345

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-07-03Q
Sample Location: station-07
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00 Time: 1220 Depth: — Method: sample Bottleware	clear	7.29	.197	9.3	1	10.72	0.00	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The sample was clear with no odors

Duplicate sample was collected

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.: SW-07-03Q with Assigned time = 1340

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-06-03Q
Sample Location: Station-06
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/22/00 Time: 1315 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0 - 4"	Brown, Red Brown to Gray.	Poorly sorted gravel to gravely sand

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

No Algae was noted on the stream Bottom

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.:
Sample Location: Station - 06
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00 Time: 1305 Depth: — Method: Sample Bottle water	clear	7.27	.196	9.1	0	10.62	0.00	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The sample was clear with No odors

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-05-03Q
Sample Location: Station-05
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/23/00 Time: 0901 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown to Gray	Poorly sorted sand and gravel with some silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

A trace amount of Algae was noted on the stream bed

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-05-03Q
Sample Location: Station-05
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/23/00								
Time: 0858								
Depth: —								
Method: Sample Bottle water	clear	6.85	.191	8.0	4	12.57	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The sample was clear with no odors

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-04-03Q
Sample Location: Station -04
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 3/23/00 Time: 0918 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0 - 4"	Brown, Red Brown to Gray	Poorly sorted sands and Gravels

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-04-03Q
Sample Location: Station-03
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/23/00 Time: 0918 Depth: — Method: Sample Bottle ware	Clear	7.12	0.191	7.9	0	11.80	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with No odors

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-03-03Q
Sample Location: Station-03
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 3/23/00 Time: 0945 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown Red Brown to Gray	Poorly Sorted sand and gravel with some silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

No Algae was noted on the stream bottom

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-03-03Q
Sample Location: Station-03
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/23/00								
Time: 0940								
Depth: —								
Method: Sample Bottleware	Clear	7.33	.193	8.0	0	11.58	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MAP:

The sample location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-02-03Q
Sample Location: Station-02
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/23/00 Time: 1015 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown to Gray	Sandy Clay to Sandy Silt with Gravel

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

No Algae was noted on the stream bottom

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-02-03Q
Sample Location: Station-02
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 3/23/00								
Time: 1010								
Depth: —								
Method: Sample Bottleware	Clear	7.29	.188	8.3	0	12.20	0.00	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MAP:

The sample location was previously surveyed

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-01-03Q
Sample Location: Station -01
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/23/00 Time: 1045 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown, Red Brown to Gray	Poorly sorted sand to gravel with trace silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above Background were noted

No Algae was observed on the stream Bottom

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-01-03Q
Sample Location: Station-01
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/23/00								
Time: 1040								
Depth: —								
Method: Sample Bottleward	clear	7.31	.186	8.8	0	11.79	0.00	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MAP:

Sample location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SS-02-03Q
Sample Location: SS-02
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:	0-6"	Brown to Black	Silty clay with A large Amount of Organic Material
Method: S.S. Trowel			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

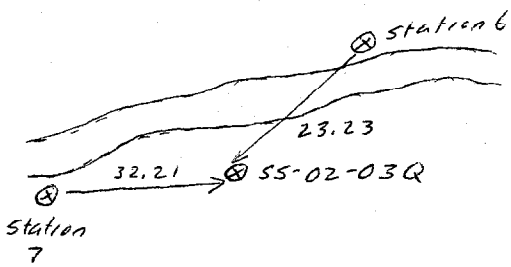
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

The sample was from a leachate outbreak on the southern bank of the unnamed tributary

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SS-01-03Q
Sample Location: SS-01
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/23/00 Time: 1115 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-6"	Orange Brown to Gray	Sandy silt to clayey sand

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

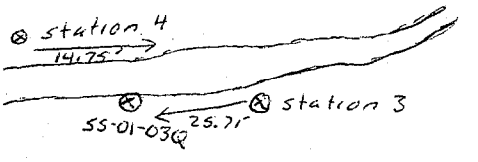
SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

The sample was from a leachate outbreak on the southern bank of the unnamed tributary

MAP:



Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-13-03Q
Sample Location: Station-13
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/22/00 Time: 0915 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0 - 4"	Brown to Gray	Poorly sorted sand wet with trace sand

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

The stream bed has a fine grained sand on the channel bottom with no PID readings above background

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-13-03Q
Sample Location: Station-13
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/27/00 Time: 0906 Depth: — Method: Bottle ware	clear	6.51	.278	7.3	0	11.55	0.01	—

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MAP:

Locations were previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-12-03Q
Sample Location: Station-12
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date: 2/22/00	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0935 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Brown to Red Brown	Poorly sorted sand and Gravel with trace silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above Background were noted

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-12-030
Sample Location: Station No 12
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00 Time: 0930 Depth: Method: Sample Bottleware	clear	6.80	.298	7.9	0	11.22	0.01	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MAP:

Locations were previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-11-03Q
Sample Location: station-11
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/22/00 Time: 1015 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Gray to Brown	Poorly sorted silty sands

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above Background

MS/MSD was collected

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-11-03Q
Sample Location: Station -11
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00								
Time: 1010								
Depth: —								
Method: Sample Bottle/wand	clear	7.14	.537	10.7	0	6.85	0.02	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The water was clear with no odors

MS/MSD was collected

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO 253

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: SD-10-03Q
Sample Location: Station 10
Sampled By: SP/ CM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 2/22/00 Time: 1105 Method: S.S. Trowel Monitor Reading (ppm): 0.0	0-4"	Reddish Brown to Gray	Poorly sorted sandy gravel

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH/Metals	8 oz Clear Glass Widemouth	1	
TOC	4 oz Clear Glass Widemouth	1	
Ultra Clean Mercury	60 ml Clear Glass Widemouth	1	
Grain Size	16 oz Clear Glass Widemouth	1	

OBSERVATIONS / NOTES:

No PID readings above background were noted

Algae was observed on the stream channel bottom

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO 253

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

Sample ID No.: SW-10-03Q
Sample Location: Station-10
Sampled By: SP/CM
C.O.C. No.:

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

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Date: 2/22/00 Time: 1100 Depth: — Method: Sample Bottleware	Clear	7.39	1207	8.8	4	11.65	0.00	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	Liter Amber Glass	1
TOC	H2SO4	250 ml Poly	1
Total Metals except Hg and Hardness	HNO3	500 ml poly	1
Ultra Clean Mercury	4 C	500 ml Clear Glass	1

OBSERVATIONS / NOTES:

The sample was clear with no odors

MAP:

Sample Location was previously surveyed

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Appendix E

Data Packages

Tetra Tech NUS, Inc. **INTERNAL CORRESPONDENCE**

PHIL-14161

TO:	**GARTH GLENN**	**DATE:**	**May 8, 2000**
FROM:	**JAMES LUCCHESE**	**COPIES:**	**FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS**
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. SW0503

SAMPLES: **6/Aqueous**

RB-022300	SW-03-03Q
SW-01-03Q	SW-04-03Q
SW-02-03Q	SW-05-03Q

9/Solid

SD-01-03Q	SD-05-03Q
SD-02-03Q	SS-01-03Q
SD-03-03Q	SS-02-03Q
SD-04-03Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, SDG SW0503, consists of 5 aqueous environmental samples (designated SW), one rinsate blank (designated RB-), and 7 solid environmental samples (designated SD- AND SS-). All samples were analyzed for total metals.

The samples were collected by Tetra Tech NUS, Inc. on February 23, 2000 and analyzed by Ceimic Corporation.

All analyses were conducted using the Contract Laboratory Program (CLP) Method ILM04.0 analytical and reporting protocols.

SUMMARY

All analytes were successfully analyzed in all samples. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, calibration data, ICP interference check standard (ICS) performance, laboratory and field quality control blank results, laboratory quality control sample (LCS) recoveries, matrix spike recoveries, laboratory duplicate results, serial dilutions, and analyte quantitation.

Sample aliquots for matrix spike and matrix spike duplicate (MS/MSD) analyses are designated by the field crew with a frequency of one per twenty samples of similar matrix. No MS/MSD samples were submitted with this sample set. Hence, the associated sample data could not be evaluated for these parameters.

Areas of concern with respect to data quality are listed on the following page.

MINOR PROBLEMS

- The following analytes were detected as contaminants in the laboratory method at the maximum concentrations indicated:

Compound	Maximum Concentration		Action Level (Water)		Action Level (Soil)	
Aluminum	119	µg/L	595	µg/L	59.5	mg/kg
Antimony	3	µg/L	15	µg/L	1.5	mg/kg
Barium	13.6	µg/L	68	µg/L	6.8	mg/kg
Beryllium	0.7	µg/L	3.5	µg/L	0.35	mg/kg
Calcium	122.9	µg/L	614.5	µg/L	61.5	mg/kg
Copper	5.3	µg/L	26.5	µg/L	2.7	mg/kg
Iron	53.6	µg/L	268	µg/L	26.8	mg/kg
Manganese	5.1	µg/L	25.5	µg/L	2.6	mg/kg
Nickel	9.9	µg/L	49.5	µg/L	5.0	mg/kg
Potassium	223.7	µg/L	1118.5	µg/L	111.9	mg/kg
Selenium	4.2	µg/L	21	µg/L	2.1	mg/kg
Silver	5.5	µg/L	27.5	µg/L	2.8	mg/kg
Sodium	112	µg/L	560	µg/L	NA	NA
Sodium	11.7	mg/kg	NA		58.5	mg/kg
Vanadium	3.5	µg/L	17.5	µg/L	1.8	mg/kg
Zinc	10.8	µg/L	54	µg/L	NA	NA
Zinc	2.330	mg/kg	NA		11.7	mg/kg

Samples affected: Soil action level applies to all soil samples and water action level applies to all aqueous samples and the rinsate blank.

Adjustments were made for the sample aliquot size, percent solids, and dilution factors. Results reported for aluminum, antimony, barium, beryllium, calcium, copper, iron, manganese, sodium, vanadium, and zinc at concentrations within the action level are qualified (B) and are considered to be false positives (artifacts of blank contamination). No actions were required for nickel, selenium, and silver because all associated results were either non-detected or exceeded the respective action level.

- Relative to the concentration of beryllium, the interfering analyte iron was present in soil samples at levels comparable to those observed in the ICS analysis Solution A, the latter of which exhibited a false positive detection for beryllium. In samples where the estimated interference is less than the magnitude of the positive result but greater than 10 percent of the sample concentration, beryllium results are qualified (K), biased high due to interference.

- The Contract Required Detection Limit (CRDL) standard recovery for the water matrix exceeded the 110% upper quality control (QC) limit for barium, manganese, and sodium. All affected positive values less than 2 x CRDL were qualified as biased high, (K), except for values that were previously qualified (B). The percent recovery (%R) for cadmium was below the 90% lower QC limit. All positive values less than 2 x CRDL and non-detects were qualified as biased low, (L/UL).

- The CRDL standard recovery for the soil matrix exceeded the 110% upper QC limit for sodium. All positive values less than 2 x CRDL were qualified as biased high, (K). The %R for cadmium was below the 90% lower QC limit. All positive values less than 2 x CRDL and non-detects were qualified as biased low, (L/UL).

EXECUTIVE SUMMARY

Laboratory Performance: ICS interference occurred for beryllium in the soil matrix. The CRDL standard exceeded the upper QC limit for barium, manganese and sodium. The CRDL standard was below the lower QC limit for cadmium. Aluminum, antimony, barium, beryllium, calcium, copper, iron, manganese, sodium, vanadium, and zinc were detected in laboratory blanks.

The data for these analyses were reviewed with reference to the EPA "National Functional Guidelines for Inorganic Data Review", February 1994 revision, as amended for use within EPA Region 3, and the Naval Facilities Engineering Support Center (NFESC) guidelines entitled "Naval Installation Restoration Laboratory Quality Assurance Guide" (Interim Document; February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS, Inc.

James Lucchese
CLEAN Data Validator

Tetra Tech NUS, Inc.

Russell Sloboda
CLEAN Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

Qualified Analytical Results

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-01-03Q			SD-02-03Q			SD-03-03Q			SD-04-03Q		
Laboratory ID:	200120-10			200120-08			200120-06			200120-04		
Sample Date:	02/23/00			02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL		
Percent Moisture	21.3			19.4			22.0			13.9		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**mg/kg**			**mg/kg**			**mg/kg**			**mg/kg**		
Aluminum	11500			12200			9040			11000		
Antimony	0.66	B	A	0.83	B	A	0.38	B	A	0.33	B	A
Arsenic	4.7			3.3			0.38	U		1.2		
Barium	95			116			77.9			87.5		
Beryllium	1.6	K	K	1.7	K	K	2.1			1.4	K	K
Cadmium	0.35	UL	C	0.38	UL	C	0.46	UL	C	0.37	UL	C
Calcium	10200			14800			27800			10300		
Chromium	40.4			37.4			31.2			30.4		
Cobalt	10.6			11			10			10.6		
Copper	29.8			36			26.3			27		
Iron	35600			35900			40700			32300		
Lead	41.6			59.1			19.5			33.4		
Magnesium	9900			10300			16400			8530		
Manganese	524			770			1030			594		
Nickel	21.6			22.4			17.9			21		
Potassium	3390			3320			3440			2940		
Selenium	2.9			1.9	U		2.2	U		1.8	U	
Silver	8.3			8.4			8.6			7.6		
Sodium	457	K	C	1180			398	K	C	655	K	C
Thallium	0.36	U		0.39	U		0.47	U		0.5		
Vanadium	50.6			48.3			39.8			40		
Zinc	123			99.2			79.3			100		

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-05-03Q			SS-01-03Q			SS-02-03Q		
Laboratory ID:	200120-02			200120-11			200120-12		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	20.5			29.3			68.9		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**mg/kg**			**mg/kg**			**mg/kg**		
Aluminum	7840			7400			13800		
Antimony	0.89	B	A	1	B	A	6.1		
Arsenic	1.9			2.6			5		
Barium	110			127			245		
Beryllium	1.9	K	K	0.91	K	K	1.3	K	K
Cadmium	0.38	UL	C	0.45	UL	C	17.8		
Calcium	22800			42900			6710		
Chromium	55.7			24.2			37.8		
Cobalt	11.7			6.3			62.2		
Copper	47.2			33.2			226		
Iron	42200			36800			70100		
Lead	71.9			71			79.8		
Magnesium	12100			26500			5280		
Manganese	941			1040			2080		
Nickel	33.5			13.8			249		
Potassium	2140			1520			1600		
Selenium	1.8	U		2.2	U		0.53	U	
Silver	9.7			6.8			21.9		
Sodium	453	K	C	282	K	C	234	K	C
Thallium	0.44			0.46	U		1.6		
Vanadium	47.5			38.7			91.6		
Zinc	187			117			11600		

Data Qualifiers:
K -- Positive result is considered biased high due to exceedance of technical quality control criteria.
U -- Value is a non-detected result as reported by the laboratory.
UL -- Non-detected result is considered biased low due to exceedance of technical quality control criteria.

Database source file: C:\PROJECTS\WARM_DV_200120\WA0120S.DBF data retrieved on: 04/27/00

Appendix A
Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	RB-022300			SW-01-03Q			SW-02-03Q		
Laboratory ID:	200120-13			200120-09			200120-07		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ug/L**			**ug/L**			**ug/L**		
Aluminum	41	U		41	U		41	U	
Antimony	2.6	U		2.6	U		2.6	U	
Arsenic	3.6	U		3.6	U		3.6	U	
Barium	4.5	U		63.9	B	A	59.7	B	A
Beryllium	0.51	B	A	0.37	U		0.37	U	
Cadmium	0.43	UL	C	0.43	UL	C	0.43	UL	C
Calcium	181	B	A	16800			16000		
Chromium	5.4	U		5.4	U		5.4	U	
Cobalt	5.2	U		5.2	U		5.2	U	
Copper	3.8	U		3.8	U		3.8	U	
Iron	40	U		40	U		40	U	
Lead	2.7	U		2.7	U		2.7	U	
Magnesium	119	U		6680			6390		
Manganese	3	U		9.3	B	A	9.8	B	A
Nickel	6.3	U		6.3	U		6.3	U	
Potassium	222	U		1020	B	A	923	B	A
Selenium	2.1	U		2.1	U		2.1	U	
Silver	3.7	U		3.7	U		3.7	U	
Sodium	156	B	A	10400			9930	K	C
Thallium	4.4	U		4.4	U		4.4	U	
Vanadium	2.8	U		2.8	U		2.8	U	
Zinc	16.2	B	A	20.6	B	A	18	B	A

Appendix A
Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	SW-03-03Q			SW-04-03Q			SW-05-03Q		
Laboratory ID:	200120-05			200120-03			200120-01		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ug/L**			**ug/L**			**ug/L**		
Aluminum	69.8	B	A	45.9	B	A	52.9	B	A
Antimony	2.6	U		3.2	B	A	2.6	U	
Arsenic	3.6	U		3.6	U		3.6	U	
Barium	65.9	B	A	73.6	K	C	63.5	B	A
Beryllium	0.37	U		0.37	U		0.51	B	A
Cadmium	0.43	UL	C	0.43	UL	C	0.43	UL	C
Calcium	17600			20000			16100		
Chromium	5.4	U		5.4	U		5.4	U	
Cobalt	5.2	U		5.2	U		5.2	U	
Copper	6.8	B	A	6.1	B	A	5.3	B	A
Iron	233	B	A	132	B	A	110	B	A
Lead	2.7	U		2.7	U		2.7	U	
Magnesium	7120			7970			6500		
Manganese	21.5	B	A	28.9	K	C	22.4	B	A
Nickel	6.3	U		6.3	U		6.3	U	
Potassium	1040	B	A	1330			944	B	A
Selenium	2.1	U		2.1	U		2.1	U	
Silver	3.7	U		3.7	U		3.7	U	
Sodium	10800			12000			9910	K	C
Thallium	4.4	U		4.4	U		4.4	U	
Vanadium	2.8	U		2.8	U		4.2	B	A
Zinc	26	B	A	17.9	B	A	17	B	A

Data Qualifiers:

B -- Positive result is considered to be an artifact of blank contamination, and should not be considered present.

K -- Positive result is considered biased high due to exceedance of technical quality control criteria.

U -- Value is a non-detected result as reported by the laboratory.

UL -- Non-detected result is considered biased low due to exceedance of technical quality control criteria.

Database source file: C:\PROJECTS\WARM_DV_200120\WA0120A.DBF data retrieved on: 04/24/00

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., %RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS – GFAA MSA's r < 0.995
K = ICP Interference – include ICSAB %R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., baseline drifting)
P = Uncertainty Near Detection Limit (< 2 x IDL for inorganics and < CRQL for organics)
Q = Other Problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pesticide/PCB % Difference Between Columns for Positive Results
V = Non-linear Calibrations, Tuning r < 0.995 (correlation coefficient)

APPENDIX B

Results as Reported by the Laboratory

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-05-03Q

:o tract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

a :ix (soil/water): WATER Lab Sample ID: 200120-01

evel (low/med): LOW Date Received: 2/24/00

›lids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	52.9	B		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	63.5	B		P
7440-41-7	Beryllium	0.51	B		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	16100			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	5.3	B		P
7439-89-6	Iron	110			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	6500			P
7439-96-5	Manganese	22.4			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	944	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	9910			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	4.2	B		P
7440-66-6	Zinc	17.0	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

C lor After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-05-03Q

ontract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

atrix (soil/water): SOIL Lab Sample ID: 200120-02

evel (low/med): LOW Date Received: 2/24/00

Solids: 79.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7840			P
7440-36-0	Antimony	0.89	B		P
7440-38-2	Arsenic	1.9			P
7440-39-3	Barium	110			P
7440-41-7	Beryllium	1.9			P
7440-43-9	Cadmium	0.38	U		P
7440-70-2	Calcium	22800			P
7440-47-3	Chromium	55.7			P
7440-48-4	Cobalt	11.7			P
7440-50-8	Copper	47.2			P
7439-89-6	Iron	42200			P
7439-92-1	Lead	71.9			P
7439-95-4	Magnesium	12100			P
7439-96-5	Manganese	941			P
7440-02-0	Nickel	33.5			P
7440-09-7	Potassium	2140			P
7782-49-2	Selenium	1.8	U		P
7440-22-4	Silver	9.7			P
7440-23-5	Sodium	453			P
7440-28-0	Thallium	0.44	B		P
7440-62-2	Vanadium	47.5			P
7440-66-6	Zinc	187			P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

Form I - IN

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-04-03Q

o ract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

at ix (soil/water): WATER Lab Sample ID: 200120-03

evel (low/med): LOW Date Received: 2/24/00

S lids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	45.9	B		P
7440-36-0	Antimony	3.2	B		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	73.6	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	20000			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	6.1	B		P
7439-89-6	Iron	132			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	7970			P
7439-96-5	Manganese	28.9			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1330	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	12000			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	17.9	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-04-03Q

ntract: NAWC Warminster

b Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

trix (soil/water): SOIL Lab Sample ID: 200120-04

vel (low/med): LOW Date Received: 2/24/00

Solids: 86.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11000			P
7440-36-0	Antimony	0.33	B		P
7440-38-2	Arsenic	1.2			P
7440-39-3	Barium	87.5			P
7440-41-7	Beryllium	1.4			P
7440-43-9	Cadmium	0.37	U		P
7440-70-2	Calcium	10300			P
7440-47-3	Chromium	30.4			P
7440-48-4	Cobalt	10.6			P
7440-50-8	Copper	27.0			P
7439-89-6	Iron	32300			P
7439-92-1	Lead	33.4			P
7439-95-4	Magnesium	8530			P
7439-96-5	Manganese	594			P
7440-02-0	Nickel	21.0			P
7440-09-7	Potassium	2940			P
7782-49-2	Selenium	1.8	U		P
7440-22-4	Silver	7.6			P
7440-23-5	Sodium	655			P
7440-28-0	Thallium	0.50	B		P
7440-62-2	Vanadium	40.0			P
7440-66-6	Zinc	100			P

olor Before: BROWN Clarity Before: Texture: COARSE

olor After: YELLOW Clarity After: Artifacts:

omments:

Form I - IN

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-03-03Q

c tract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

a rix (soil/water): WATER Lab Sample ID: 200120-05

evel (low/med): LOW Date Received: 2/24/00

olids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	69.8	B		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	65.9	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	17600			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	6.8	B		P
7439-89-6	Iron	233			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	7120			P
7439-96-5	Manganese	21.5			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1040	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	10800			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	26.0			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-03-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

Matrix (soil/water): SOIL Lab Sample ID: 200120-06

Level (low/med): LOW Date Received: 2/24/00

Solids: 78.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9040			P
7440-36-0	Antimony	0.38	B		P
7440-38-2	Arsenic	0.38	U		P
7440-39-3	Barium	77.9			P
7440-41-7	Beryllium	2.1			P
7440-43-9	Cadmium	0.46	U		P
7440-70-2	Calcium	27800			P
7440-47-3	Chromium	31.2			P
7440-48-4	Cobalt	10.0			P
7440-50-8	Copper	26.3			P
7439-89-6	Iron	40700			P
7439-92-1	Lead	19.5			P
7439-95-4	Magnesium	16400			P
7439-96-5	Manganese	1030			P
7440-02-0	Nickel	17.9			P
7440-09-7	Potassium	3440			P
7782-49-2	Selenium	2.2	U		P
7440-22-4	Silver	8.6			P
7440-23-5	Sodium	398	B		P
7440-28-0	Thallium	0.47	U		P
7440-62-2	Vanadium	39.8			P
7440-66-6	Zinc	79.3			P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SW-02-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

Matrix (soil/water): WATER Lab Sample ID: 200120-07

Level (low/med): LOW Date Received: 2/24/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.0	U		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	59.7	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	16000			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	40.0	U		P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	6390			P
7439-96-5	Manganese	9.8	B		P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	923	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	9930			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	18.0	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-02-03Q

ontract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

atrix (soil/water): SOIL Lab Sample ID: 200120-08

evel (low/med): LOW Date Received: 2/24/00

Solids: 80.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12200			P
7440-36-0	Antimony	0.83	B		P
7440-38-2	Arsenic	3.3			P
7440-39-3	Barium	116			P
7440-41-7	Beryllium	1.7			P
7440-43-9	Cadmium	0.38	U		P
7440-70-2	Calcium	14800			P
7440-47-3	Chromium	37.4			P
7440-48-4	Cobalt	11.0			P
7440-50-8	Copper	36.0			P
7439-89-6	Iron	35900			P
7439-92-1	Lead	59.1			P
7439-95-4	Magnesium	10300			P
7439-96-5	Manganese	770			P
7440-02-0	Nickel	22.4			P
7440-09-7	Potassium	3320			P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	8.4			P
7440-23-5	Sodium	1180			P
7440-28-0	Thallium	0.39	U		P
7440-62-2	Vanadium	48.3			P
7440-66-6	Zinc	99.2			P

olor Before: BROWN Clarity Before: Texture: COARSE

olor After: YELLOW Clarity After: Artifacts:

omments:

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-01-03Q

o: tract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

a: ix (soil/water): WATER Lab Sample ID: 200120-09

evel (low/med): LOW Date Received: 2/24/00

S lids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.0	U		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	63.9	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	16800			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	40.0	U		P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	6680			P
7439-96-5	Manganese	9.3	B		P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1020	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	10400			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	20.6			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

C lor After: COLORLESS Clarity After: CLEAR Artifacts:

C mments:

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-01-03Q

ontract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

atrix (soil/water): SOIL Lab Sample ID: 200120-10

evel (low/med): LOW Date Received: 2/24/00

Solids: 78.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11500			P
7440-36-0	Antimony	0.66	B		P
7440-38-2	Arsenic	4.7			P
7440-39-3	Barium	95.0			P
7440-41-7	Beryllium	1.6			P
7440-43-9	Cadmium	0.35	U		P
7440-70-2	Calcium	10200			P
7440-47-3	Chromium	40.4			P
7440-48-4	Cobalt	10.6			P
7440-50-8	Copper	29.8			P
7439-89-6	Iron	35600			P
7439-92-1	Lead	41.6			P
7439-95-4	Magnesium	9900			P
7439-96-5	Manganese	524			P
7440-02-0	Nickel	21.6			P
7440-09-7	Potassium	3390			P
7782-49-2	Selenium	2.9	B		P
7440-22-4	Silver	8.3			P
7440-23-5	Sodium	457			P
7440-28-0	Thallium	0.36	U		P
7440-62-2	Vanadium	50.6			P
7440-66-6	Zinc	123			P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SS-01-03Q

ract: NAWC Warminster

Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

t ix (soil/water): SOIL Lab Sample ID: 200120-11

vel (low/med): LOW Date Received: 2/24/00

S lids: 70.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7400			P
7440-36-0	Antimony	1.0	B		P
7440-38-2	Arsenic	2.6			P
7440-39-3	Barium	127			P
7440-41-7	Beryllium	0.91			P
7440-43-9	Cadmium	0.45	U		P
7440-70-2	Calcium	42900			P
7440-47-3	Chromium	24.2			P
7440-48-4	Cobalt	6.3			P
7440-50-8	Copper	33.2			P
7439-89-6	Iron	36800			P
7439-92-1	Lead	71.0			P
7439-95-4	Magnesium	26500			P
7439-96-5	Manganese	1040			P
7440-02-0	Nickel	13.8			P
7440-09-7	Potassium	1520			P
7782-49-2	Selenium	2.2	U		P
7440-22-4	Silver	6.8			P
7440-23-5	Sodium	282	B		P
7440-28-0	Thallium	0.46	U		P
7440-62-2	Vanadium	38.7			P
7440-66-6	Zinc	117			P

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SS-02-03Q

ntract: NAWC Warminster

b Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

trix (soil/water): SOIL Lab Sample ID: 200120-12

vel (low/med): LOW Date Received: 2/24/00

Solids: 31.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	13800			P
7440-36-0	Antimony	6.1	B		P
7440-38-2	Arsenic	5.0			P
7440-39-3	Barium	245			P
7440-41-7	Beryllium	1.3			P
7440-43-9	Cadmium	17.8			P
7440-70-2	Calcium	6710			P
7440-47-3	Chromium	37.8			P
7440-48-4	Cobalt	62.2			P
7440-50-8	Copper	226			P
7439-89-6	Iron	70100			P
7439-92-1	Lead	79.8			P
7439-95-4	Magnesium	5280			P
7439-96-5	Manganese	2080			P
7440-02-0	Nickel	249			P
7440-09-7	Potassium	1600			P
7782-49-2	Selenium	0.53	U		P
7440-22-4	Silver	21.9			P
7440-23-5	Sodium	234	B		P
7440-28-0	Thallium	1.6	B		P
7440-62-2	Vanadium	91.6			P
7440-66-6	Zinc	11600			P

olor Before: BROWN Clarity Before: Texture: MEDIUM

olor After: YELLOW Clarity After: Artifacts:

omments:

Form I - IN

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
RB-022300

o tract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

a ix (soil/water): WATER Lab Sample ID: 200120-13

evel (low/med): LOW Date Received: 2/24/00

lids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.0	U		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	4.5	U		P
7440-41-7	Beryllium	0.51	B		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	181	B		P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	40.0	U		P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	119	U		P
7439-96-5	Manganese	3.0	U		P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	222	U		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	156	B		P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	16.2	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

APPENDIX C

Support Documentation

Ceimic

TOTAL METALS
- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Contract: NAWC Warminster SDG No.: SW0503

Lab Code: CEIMIC Case No.: 200120 SAS No.:

SDG No.: SW846

Sample No.	Lab Sample ID.
SW-05-03Q	200120-01
SD-05-03Q	200120-02
SW-04-03Q	200120-03
SD-04-03Q	200120-04
SW-03-03Q	200120-05
SD-03-03Q	200120-06
SW-02-03Q	200120-07
SD-02-03Q	200120-08
SW-01-03Q	200120-09
SD-01-03Q	200120-10
SS-01-03Q	200120-11
SS-02-03Q	200120-12
RB-022300	200120-13

Were ICP interelement corrections applied? Yes/No YES

Were ICP background corrections applied? Yes/No YES

If yes-were raw data generated before application of background corrections? Yes/No NO

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Donald Tortorelli Name: DONALD TORTORELLI

Date: 3/15/00 Title: INORGANIC LAB MGR.

Inorganic SDG Narrative

Client Case ID: NAWC Warminster, PA
Ceimic Project No.: 200120
SDG No.: SW0503

The following samples were received at Ceimic Corporation on February 24, 2000:

SW-05-03Q	SD-05-03Q	SW-04-03Q
SD-04-03Q	SW-03-03Q	SD-03-03Q
SW-02-03Q	SD-02-03Q	SW-01-03Q
SD-01-03Q	SS-01-03Q	SS-02-03Q
RB-022300		

The above samples were digested and analyzed for total metals using SW846 methods 3005A/3050A/6010B in accordance with the CLP Inorganic Statement of Work (SOW) ILM04.0.

Comments on Data Package:

QA/QC Samples:

Inorganic Ventures CICV-1, CICV-2, and CICV-3 were used for the ICV and LCSW samples for the ICP metals. CPI CAL-3, CAL-5 and CAL-8 were used for the CCV sample for the ICP metals. Environmental Resource Associates standard (lot#241) was used for the LCSS samples. Inorganic Ventures CLPP-ICS-A and CLPP-ICS-B were used for the ICSA and ICSAB samples.

Observations:

All elements except mercury were determined using inductively coupled plasma (ICP) emission spectroscopy.

A "U" flag in the C column on the sample result forms (Form I-IN) indicates that the concentration of that analyte in the sample is undetected at the method detection limit (MDL). For the sample concentration reported between the Pracical Quantitation Limit (PQL) and the instrument MDL, a "B" flag is shown in the C column on the Form I-IN.

Deviations from Contract:

None.

End of case Narrative.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Donald Tortorelli

Donald Tortorelli
Inorganic Laboratory Manager

3/15/00

Date

Chain of Custody

Original Chain of Custody goes to Laboratory

200120

0219

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.: 6°C, 6°C, 5°C

Cooler #: 1-3

Samplers (please print): Seth Pelepko, Charles Meyer

Analyses

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	1 Liter Amber PAH	pH	500ml Poly HNO3 TAL Metals Except Hg Hardness	pH	250 Poly H2SO4 TOC	pH	8oz Clear Wide-Mouth PAH TAL Metals except Hg	pH	40oz Clear with TOC	pH		pH		pH	Remarks
01	2/23/00	0858	Grab	SW-05-03Q	SW	4	2		1		1										
02	2/23/00	0901	Grab	SD-05-03Q	SD	2							1		1						
03	2/23/00	0918	Grab	SW-04-03Q	SW	4	2		1		1										
04	2/23/00	0922	Grab	SD-04-03Q	SD	2							1		1						
05	2/23/00	0940	Grab	SW-03-03Q	SW	4	2		1		1										
06	2/23/00	0945	Grab	SD-03-03Q	SD	2							1		1						
07	2/23/00	1010	Grab	SW-02-03Q	SW	4	2		1		1										
08	2/23/00	1015	Grab	SD-02-03Q	SD	2							1		1						
09	2/23/00	1040	Grab	SW-01-03Q	SW	4	2		1		1										
10	2/23/00	1045	Grab	SD-01-03Q	SD	2							1		1						

Celmic Project #: 200120

Storage Location: 2,3

Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
Charles Meyer	2/23/00 1700		
		Received by Celmic (signature): Karen Williamson	2/24/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810817875294

= Lab Use Only

Chain of Custody

Original Chain of Custody goes to Laboratory

0213

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.: 6°C, 6°C, 5°C

Cooler #: 1-3

Samplers (please print): Seth Pelepko, Charles Meyer

Analyses

Lab ID	Date	Time	Comp. Grab	Sample Identification	Sample Matrix	No. of Containers	8oz Clear Wm PAH TAL Metals except Hg	pH	40z Clear Wm TOC	pH	1 Liter Amber PAH	pH	500 ml Poly HNO3 TAL Metals except Hg Hardness	pH	250 ml Poly H2SO4 TOC	pH		pH		pH	Remarks
11	2/23/00	1115	Grab	SS-01-03Q	Sol	2	1		1												
12	2/23/00	1125	Grab	SS-02-03Q	Sol	2	1		1												
13	2/23/00	1350	Grab	RB-022300	Aq	4					2		1		1						

Ceimic Project #: 200120

Storage Location: 2,3

Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
Charles Meyer	2/23/00 1700		
		Received by Ceimic (signature): Karen Williamson	2/24/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810 817 875 294

TOTAL METALS
- 2b -
CRDL STANDARD FOR AA AND ICP

:ontract: NAWC Warminster

:ab Code: CEIMIC Case No.: 200120 SAS No.: SDG No.: SW0503

A CRDL Standard Source: SCP SCIENCE

CP CRDL Standard Source: CPI

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP					
				Initial			Final		
	True	Found	%R	True	Found	%R	Found	%R	
Aluminum				640.0	692.52	108.2	724.73	113.2	K
Antimony				20.0	20.50	102.5	21.92	109.6	
Arsenic				20.0	19.93	99.7	18.97	94.8	
Barium				10.0	14.72	147.2	10.85	108.5	K o
Beryllium				10.0	10.22	102.2	10.22	102.2	
Cadmium				10.0	8.43	84.3	8.18	81.8	
Calcium				2000.0	2321.70	116.1	2386.50	119.3	K no
Chromium				60.0	60.54	100.9	60.54	100.9	
Cobalt				30.0	28.72	95.7	30.99	103.3	
Copper				50.0	52.44	104.9	50.94	101.9	
Iron				160.0	202.27	126.4	362.70	226.7	K non
Lead				10.0	9.79	97.9	9.11	91.1	
Magnesium				880.0	939.03	106.7	921.36	104.7	
Manganese				10.0	14.01	140.1	16.84	168.4	K one
Nickel				90.0	90.55	100.6	92.90	103.2	
Potassium				1370.0	1273.60	93.0	1301.60	95.0	
Selenium				20.0	21.56	107.8	18.40	92.0	
Silver				20.0	20.51	102.6	22.39	111.9	K none
Sodium				480.0	542.37	113.0	573.99	119.6	K +
Thallium				20.0	20.89	104.4	17.81	89.1	%
Vanadium				20.0	20.44	102.2	19.77	98.8	
Zinc				30.0	27.35	91.2	52.51	175.0	K no

No results within affected range
for Al, Ca, Fe, Ag, Zn

Ceimic

TOTAL METALS
- 2b -
CRDL STANDARD FOR AA AND ICP

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG No.: SW0503

AA CRDL Standard Source: SCP SCIENCE

ICP CRDL Standard Source: CPI

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP					
				Initial			Final		
	True	Found	%R	True	Found	%R	Found	%R	
Cadmium				10.0	8.49	84.9	8.88	88.8	L/UL
Selenium				20.0	21.86	109.3	23.91	119.6	K

Six

none

TOTAL METALS
- 3 -
BLANKS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum	41.0	U	119.0	B	41.0	U	41.0	U	82.900	B	P
Antimony	2.6	U	2.6	U	2.6	U	3.0	B	2.600	U	P
Arsenic	3.6	U	3.6	U	3.6	U	3.6	U	3.600	U	P
Barium	13.6	B	4.7	B	6.6	B	4.7	B	4.500	U	P
Beryllium	0.7	B	0.4	U	0.7	B	0.4	U	0.370	U	P
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.430	U	P
Calcium	55.0	U	86.7	B	122.9	B	57.7	B	55.000	U	P
Chromium	5.4	U	5.4	U	5.4	U	5.4	U	5.400	U	P
Cobalt	5.2	U	5.2	U	5.2	U	5.2	U	5.200	U	P
Copper	5.3	B	3.8	B	4.6	B	5.3	B	3.800	U	P
Iron	40.0	U	53.6	B	40.0	U	40.0	U	40.000	U	P
Lead	2.7	U	2.7	U	2.7	U	2.7	U	2.700	U	P
Magnesium	119.0	U	119.0	U	119.0	U	119.0	U	119.000	U	P
Manganese	5.1	B	3.0	U	4.7	B	3.3	B	3.000	U	P
Nickel	9.9	B	6.3	U	7.5	B	6.3	U	6.300	U	P
Potassium	222.0	U	222.0	U	222.0	U	222.0	U	222.000	U	P
Selenium	2.1	U	2.1	U	2.1	U	2.1	U	-2.660	B	P
Silver	3.7	U	3.7	U	5.5	B	3.7	U	3.700	U	P
Sodium	60.3	B	57.0	U	76.7	B	90.2	B	112.000	B	P
Thallium	4.4	U	4.4	U	4.4	U	4.4	U	4.400	U	P
Vanadium	3.5	B	2.8	U	2.8	U	2.8	U	2.800	U	P
Zinc	5.5	U	5.5	U	5.5	U	5.5	U	10.800	B	P

	MAX (ug/L)	AL (ug/L)
Al	119	595
Sb	3	15
Ba	13.6	68
Be	0.7	3.5
Ca	122.9	614.5
Cu	5.3	26.5
Fe	53.6	268.0
Mn	5.1	25.5
Ni	9.9	49.5
Se	4.2	21.0
Ag	5.5	27.5
Na	112	~~560~~ ⇒ 786 (From RB)
V	3.5	17.5
Zn	10.8	~~54.0~~ ⇒ 81 (From RB)

Form III - IN

TOTAL METALS
- 3 -
BLANKS

:c tract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

r paration Blank Matrix (soil/water): SOIL

reparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum			80.9	B					4.100	U	P
Antimony			2.6	U					0.260	U	P
Arsenic			3.6	U					0.360	U	P
Barium			4.5	U					0.450	U	P
Beryllium			0.5	B					0.037	U	P
Cadmium			0.4	U					0.043	U	P
Calcium			72.2	B					10.800	B	P
Chromium			5.4	U					0.540	U	P
Cobalt			5.2	U					0.520	U	P
Copper			3.8	U					0.456	B	P
Iron			40.0	U					4.400	B	P
Lead			2.7	U					0.270	U	P
Magnesium			119.0	U					11.900	U	P
Manganese			3.0	U					0.300	U	P
Nickel			7.0	B					0.703	B	P
Potassium			223.7	B					22.200	U	P
Selenium			2.1	U					0.210	U	P
Silver			3.7	B					0.370	U	P
Sodium			78.5	B					11.700	B	P
Thallium			4.4	U					0.440	U	P
Vanadium			2.8	U					0.280	U	P
Zinc			5.5	U					2.330		P

	MAX (mg/kg)	AL (mg/kg)	Dry
Al	8.09	40.45 →	none
Be	0.05	0.25 →	
Ca	10.8	54	
Cu	0.456	2.28	
Fe	4.4	22	
Ni	0.703	3.515	
K	22.37	111.85 →	
Ag	0.37	1.85 →	
Na	11.7	58.5	
Zn	2.330	11.65	

TOTAL METALS
- 3 -
BLANKS

:ontract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

reparation Blank Matrix (soil/water): WATER

reparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U			P
Selenium	4.2	B	2.1	U	2.1	U	3.1	B			P

TOTAL METALS

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

ICP ID Number: TJA61 ICP ICS Source: INOR-VNT

Concentration Units): ug/L

Analyte	True Sol.A	True Sol.AB	Initial Found Sol.A	Initial Found Sol.AB	Initial Found %R	Final Found Sol.A	Final Found Sol.AB	Final Found %R
Aluminum	500000	500000	479880	521430.0	104.3	479360	522800.0	104.6
Antimony		600	1	584.1	97.3	2	577.2	96.2
Arsenic		100	-3	93.6	93.6	-1	92.0	92.0
Barium		500	8	489.1	97.8	8	491.8	98.4
Beryllium		500	K 1	504.0	100.8	1	492.5	98.5
Cadmium		50	5	47.1	94.3	3	42.7	85.4
Calcium	500000	500000	463710	512390.0	102.5	458330	500430.0	100.1
Chromium		500	3	482.2	96.4	1	480.0	96.0
Cobalt		500	-4	468.8	93.8	-4	459.0	91.8
Copper		500	-4	489.9	98.0	-2	484.3	96.8
Iron	200000	200000	180360	198210.0	99.1	179350	194970.0	97.5
Lead		50	-2	45.2	90.5	-1	43.0	86.0
Magnesium	500000	500000	468770	509320.0	101.9	462740	503210.0	100.6
Manganese		500	5	476.7	95.3	5	470.5	94.1
Nickel		1000	-5	927.6	92.8	-5	906.0	90.6
Potassium		2000	84	2137.2	106.9	-87	2081.3	104.1
Selenium		50	1	51.7	103.4	-3	47.7	95.4
Silver		200	-2	207.6	103.8	-2	207.1	103.6
Sodium		2000	-28	2158.4	107.9	-23	2123.2	106.2
Thallium		100	5	90.7	90.7	5	92.8	92.8
Vanadium		500	13	501.8	100.4	15	503.3	100.7
Zinc		1000	-6	956.7	95.7	5	958.1	95.8

For Beryllium in soil: some estimated interferences are greater than 10% of the instrument reading so qualify values as "K"

ug/L Estimated Interference = $\frac{MAX[Fe]_{0sim} \frac{\%\,Solids}{100} \times g \times \left(\frac{1}{0.1} \cdot IFs_{soil}\right)}{[Fe]_{ICS}} \times$ ICS Reading

TOTAL METALS

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

ICP ID Number: TJA61E Trace ICP ICS Source: INOR-VNT

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Cadmium		50	4	47.3	94.5	5	50.4	100.7
Selenium		50	-1	55.0	109.9	2	53.0	105.9

TOTAL METALS
-10-
METHOD DETECTION LIMITS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

ICP ID Number: TJA61 ICP Date: 11/01/99

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wave-length	Back-ground	CRDL (ug/L)	MDL (ug/L)	M
Aluminum	308.22		200.0	41.0	P
Barium	493.40		200.0	4.5	P
Beryllium	313.10		5.0	0.4	P
Calcium	370.60		5000.0	55.0	P
Chromium	267.70		10.0	5.4	P
Cobalt	228.62		50.0	5.2	P
Copper	324.75		25.0	3.8	P
Iron	259.90		100.0	40.0	P
Magnesium	383.20		5000.0	119.0	P
Manganese	257.61		15.0	3.0	P
Nickel	231.60		40.0	6.3	P
Potassium	766.40		5000.0	222.0	P
Sodium	588.90		5000.0	57.0	P
Vanadium	292.40		50.0	2.8	P
Zinc	213.80		20.0	5.5	P

Comments

TOTAL METALS
-10-
METHOD DETECTION LIMITS

ontract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

CP ID Number: TJA61E Trace ICP Date: 11/01/99

lame AA ID Number:

urnace AA ID Number:

Analyte	Wave-length	Back-ground	CRDL (ug/L)	MDL (ug/L)	M
Antimony	206.84		60.0	2.6	P
Arsenic	189.04		10.0	3.6	P
Cadmium	226.50		5.0	0.4	P
Lead	220.35		3.0	2.7	P
Selenium	196.02		5.0	2.1	P
Silver	328.07		10.0	3.7	P
Thallium	190.86		10.0	4.4	P

Comments

TOTAL METALS
- 13 -
PREPARATION LOG

c tract: NAWC Warminster

ab Code: CEIMIC Case No.: 200120 SAS No.: SDG NO.: SW0503

e iod P

Sample No.	Preparation Date	Weight (grams)	Volume (mL)
PBS	03/13/00	1.00	100
LCSS	03/13/00	1.00	100
SD-05-03Q	03/13/00	1.43	100
SD-04-03Q	03/13/00	1.36	100
SD-03-03Q	03/13/00	1.21	100
SD-02-03Q	03/13/00	1.39	100
SD-01-03Q	03/13/00	1.55	100
SS-01-03Q	03/13/00	1.35	100
SS-02-03Q	03/13/00	1.27	100

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14233

TO:	GARTH GLENN	DATE:	May 31, 2000
FROM:	JAMES LUCCHESE	COPIES:	FILE

SUBJECT: INORGANIC DATA VALIDATION – TAL METALS
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. SW0803

SAMPLES:

10/Aqueous

RB-022200	SW-10-03Q
SW-06-03Q	SW-11-03Q
SW-07-03Q	SW-12-03Q
SW-08-03Q	SW-13-03Q
SW-09-03Q	SW-21-03Q

9/Solid

SD-06-03Q	SD-10-03Q	SD-21-03Q
SD-07-03Q	SD-11-03Q	
SD-08-03Q	SD-12-03Q	
SD-09-03Q	SD-13-03Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, SDG SW0803, consists of 9 aqueous environmental samples, (designated SW), one rinsate blank (designated RB-) and 9 solid environmental samples, (designated SD-). All samples were analyzed for total metals. Two field duplicate pairs (SW-07-03Q/SW-21-03Q, and SD-07-03Q/SD-21-03Q) were included in this sample set.

The samples were collected by Tetra Tech NUS, Inc. on February 22, 2000 and analyzed by Ceimic Corporation.

All analyses were conducted using the Contract Laboratory Program (CLP) Method ILM04.0 analytical and reporting protocols.

SUMMARY

All analytes were successfully analyzed in all samples. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, calibration data, ICP interference check standard (ICS) performance, laboratory and field quality control blank results, laboratory quality control sample (LCS) recoveries, matrix spike recoveries, laboratory duplicate results, serial dilution results, and analyte quantitation.

Areas of concern with respect to data quality are listed on the following page.

MINOR PROBLEMS

- The following analytes were detected as contaminants in the laboratory method and/or field quality control blanks at the maximum concentrations indicated:

Compound	Maximum Concentration		Action Level (Water)		Action Level (Soil)	
Aluminum	72.1	µg/L	360.5	µg/L	36.1	mg/kg
Barium	13.1	µg/L	65.5	µg/L	6.6	mg/kg
Beryllium	0.5	µg/L	2.5	µg/L	0.25	mg/kg
Calcium	1005.8	µg/L	5029	µg/L	502.9	mg/kg
Chromium	6.1	µg/L	32.5	µg/L	3.3	mg/kg
Cobalt	6.7	µg/L	33.5	µg/L	3.4	mg/kg
Iron	78.5	µg/L	392.5	µg/L	39.3	mg/kg
Manganese	6.6	µg/L	33	µg/L	3.3	mg/kg
Selenium	4.7	µg/L	23.5	µg/L	2.4	mg/kg
Silver	6.3	µg/L	31.5	µg/L	3.2	mg/kg
Sodium	174	µg/L	870	µg/L	87	mg/kg
Vanadium	5.9	µg/L	29.5	µg/L	3.0	mg/kg
Zinc	13.4	µg/L	67	µg/L	NA	
Zinc	1.43	µg/L	NA	µg/L	7.2	mg/kg

Samples affected: Soil action level applies to all soil samples and water action level applies to all aqueous samples and the rinsate blank.

Adjustments were made for the sample aliquot size, percent solids, and dilution factors. Results reported for aluminum, barium, beryllium, calcium, iron, manganese, selenium, silver, sodium, vanadium, and zinc at concentrations within the action level are qualified (B) and are considered to be false positives (artifacts of blank contamination). No actions were required for chromium and cobalt because all associated results were either non-detected or exceeded the respective action level.

- The Relative Percent Difference (RPD) for laboratory duplicates with values greater than five times the Contract Required Detection Limit (CRDL) exceeded the ±35% quality control (QC) limit for aluminum, barium, chromium, cobalt, copper, iron, lead, manganese, silver, and zinc in the soil matrix. The RPD for laboratory duplicates with values less than five times the CRDL exceeded the ±2 x CRDL QC range for nickel and potassium. Affected positive and non-detected values were qualified estimated, (J/UJ).

- Matrix spike/matrix spike duplicate percent recoveries (%R) in the soil matrix were below the 75% lower QC limit for antimony, arsenic, barium, cadmium, selenium, silver, thallium, and vanadium. Affected positive and non-detected values were qualified biased low, (L/UL), except for barium and silver which were previously qualified as estimated, (J/UJ), due to laboratory duplicate analysis. Chromium and nickel had a %R in the matrix spike that was above the 125% upper QC limit and a %R in the matrix spike duplicate that was below the 75% lower QC limit. All affected positive and non-detected values were previously qualified estimated, (J/UJ), due to exceedence of the QC limits in the laboratory duplicates.

- In the soil matrix the percent difference (%D) in the ICP serial dilutions for lead exceeded the QC limit of ±10%. Positive and non-detected values are qualified as estimated, (J/UJ), due to exceedence of QC limits in the serial dilution analysis.

- The laboratory control sample (LCS) for cobalt in the soil matrix exceeded the upper QC limit established by Environmental Monitoring System Laboratory in Las Vegas (EMSL/LV). Positive results are qualified estimated, (J) due to exceedence of QC limits in the LCS and because of laboratory duplicate analysis.

- The CRDL standard recovery exceeded the 110% upper QC limit for lead. All positive values less than 2 x CRDL were qualified as biased high, (K). The %R values for cadmium, potassium, and thallium were below the 90% lower QC limit. All positive values less than 2 x CRDL and non-detects were qualified as biased low, (L/UL).

EXECUTIVE SUMMARY

Laboratory Performance: Laboratory duplicates for the soil matrix had RPD values that were out of range for aluminum, barium, chromium, cobalt, copper, iron, lead, manganese, nickel, potassium, silver, and zinc. Aluminum, barium, beryllium, calcium, iron, manganese, selenium, silver, sodium, vanadium, and zinc were detected in the laboratory blanks. Two metals exhibited high recoveries and three exhibited low recoveries in the CRDL standard analysis.

Other Problems Affecting Data Quality: Several soil MS percent recoveries were below or above QC limits. The ICP serial dilution percent difference exceeded the QC limit for lead.

The data for these analyses were reviewed with reference to the EPA "National Functional Guidelines for Inorganic Data Review", February 1994 revision, as amended for use within EPA Region 3, and the Naval Facilities Engineering Support Center (NFESC) guidelines entitled "Naval Installation Restoration Laboratory Quality Assurance Guide" (Interim Document; February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS, Inc.

James Lucchese
CLEAN Data Validator

Tetra Tech NUS, Inc.

Russell Sloboda
CLEAN Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

Qualified Analytical Results

Appendix A
Analytical Results for Water Samples
CTO252, Warminster, PA

Sample ID:	RB-022200			SW-06-03Q			SW-07-03Q			SW-08-03Q		
Laboratory ID:	200115-09			200115-05			200115-03			200115-01		
Sample Date:	02/22/00			02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ug/L**			**ug/L**			**ug/L**			**ug/L**		
Aluminum	41	U		51	B	A	65.3	B	A	206	B	A
Antimony	2.6	U		2.6	U		2.6	U		2.6	U	
Arsenic	3.6	U		3.6	U		3.6	U		3.6	U	
Barium	4.5	U		71.6			62.8	B	A	83.4		
Beryllium	0.37	U		0.37	U		0.37	U		0.54	B	A
Cadmium	0.43	UL	C	0.43	UL	C	0.43	UL	C	0.43	UL	C
Calcium	469	B	A	20900			17100			22100		
Chromium	5.4	U		5.4	U		5.4	U		5.4	U	
Cobalt	5.2	U		5.2	U		5.2	U		5.2	U	
Copper	3.8	U		3.8	U		3.8	U		4.1		
Iron	40	U		142	B	A	297	B	A	599		
Lead	2.7	U		2.7	U		2.7	U		5.8	K	C
Magnesium	119	U		8240			7430			9040		
Manganese	3	U		30.3	B	A	63.3			102		
Nickel	6.3	U		6.3	U		6.3	U		6.3	U	
Potassium	222	UL	C	1270	L	C	861	L	C	1230	L	C
Selenium	3.1	B	A	2.1	U		2.1	U		4	B	A
Silver	3.7	U		3.7	U		3.7	U		3.7	U	
Sodium	226	B	A	12100			10900			13300		
Thallium	4.4	UL	C	4.4	UL	C	4.4	UL	C	4.4	UL	C
Vanadium	2.8	U		2.8	U		2.8	U		4.3	B	A
Zinc	22.4	B	A	28.6	B	A	32.2	B	A	49.1	B	A

Appendix A
Analytical Results for Water Samples
CTO252, Warminster, PA

Sample ID:	SW-09-03Q			SW-10-03Q			SW-11-03Q			SW-12-03Q		
Laboratory ID:	200115-18			200115-16			200115-15			200115-12		
Sample Date:	02/22/00			02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ug/L**			**ug/L**			**ug/L**			**ug/L**		
Aluminum	76.9	B	A	65.3	B	A	211	B	A	41	U	
Antimony	2.6	U		2.6	U		2.6	U		2.6	U	
Arsenic	3.6	U		3.6	U		3.6	U		3.6	U	
Barium	75.4			75.8			130			75.4		
Beryllium	0.37	U		0.37	U		0.37	U		0.37	U	
Cadmium	0.43	UL	C	0.43	UL	C	0.43	UL	C	0.43	UL	C
Calcium	20200			21400			47700			24700		
Chromium	5.4	U		5.4	U		5.4	U		5.4	U	
Cobalt	5.2	U		5.2	U		5.2	U		5.2	U	
Copper	3.8	U		3.8	U		5			3.8	U	
Iron	240	B	A	229	B	A	1150			199	B	A
Lead	2.7	U		2.7	U		7	K	C	2.7	U	
Magnesium	9160			9060			19500			10500		
Manganese	62.9			70.9			462			122		
Nickel	6.3	U		6.3	U		6.3	U		6.3	U	
Potassium	1360	L	C	1080	L	C	1810	L	C	987	L	C
Selenium	2.1	U		2.1	U		2.1	U		2.1	U	
Silver	3.7	U		4.2	B	A	3.7	U		3.7	U	
Sodium	13600			13700			41900			18400		
Thallium	4.4	UL	C	4.4	UL	C	4.4	UL	C	4.4	UL	C
Vanadium	2.8	U		2.8	U		4.4	B	A	2.8	U	
Zinc	31.3	B	A	33	B	A	44.5	B	A	32.2	B	A

Analytical Results for Water Samples
CTO252, Warminster, PA

Sample ID:	SW-13-03Q			SW-21-03Q		
Laboratory ID:	200115-10			200115-07		
Sample Date:	02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ug/L**			**ug/L**		
Aluminum	41	U		74.1	B	A
Antimony	2.6	U		2.6	U	
Arsenic	3.6	U		3.6	U	
Barium	76.7			67.4		
Beryllium	0.37	U		0.37	U	
Cadmium	0.43	UL	C	0.43	UL	C
Calcium	28100			21200		
Chromium	5.4	U		5.4	U	
Cobalt	5.2	U		5.2	U	
Copper	4.1			3.8	U	
Iron	178	B	A	367	B	A
Lead	2.7	U		2.7	U	
Magnesium	10800			7870		
Manganese	112			64.8		
Nickel	6.3	U		6.3	U	
Potassium	1110	L	C	991	L	C
Selenium	2.1	U		2.1	B	A
Silver	3.7	U		3.7	U	
Sodium	18800			11600		
Thallium	4.4	UL	C	4.4	UL	C
Vanadium	2.8	U		2.8	U	
Zinc	37.5	B	A	34.8	B	A

Data Qualifiers:

B -- Positive result is considered to be an artifact of blank contamination, and should not be considered present.

K -- Positive result is considered biased high due to exceedance of technical quality control criteria.

L -- Positive result is considered biased low due to exceedance of technical quality control criteria.

U -- Value is a non-detected result as reported by the laboratory.

UL -- Non-detected result is considered biased low due to exceedance of technical quality control criteria.

Database source file: C:\PROJECTS\WARM_DV_200120\WA0115A.DBF data retrieved on: 04/24/00

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-06-03Q			SD-07-03Q			SD-08-03Q		
Laboratory ID:	200115-06			200115-04			200115-02		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	17.2			18.7			21.8		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**mg/kg**			**mg/kg**			**mg/kg**		
Aluminum	8330	J	F	10200	J	F	10800	J	F
Antimony	0.62	L	D	0.49	L	D	0.37	L	D
Arsenic	2	L	D	4.7	L	D	3.3	L	D
Barium	95.8	J	DF	77.6	J	DF	809	J	DF
Beryllium	1.8			1.4			2.2		
Cadmium	0.17	UL	CD	0.2	UL	CD	0.21	UL	CD
Calcium	31400			24300			16000		
Chromium	50.3	J	DF	30.1	J	DF	32	J	DF
Cobalt	10.8	J	EF	12.1	J	EF	14.7	J	EF
Copper	67.7	J	F	22	J	F	35.5	J	F
Iron	34400	J	F	35500	J	F	36000	J	F
Lead	89.4	J	FI	24.4	J	FI	47.4	J	FI
Magnesium	20600			15800			13000		
Manganese	1130	J	F	677	J	F	3300	J	F
Nickel	23.3	J	DF	20.4	J	DF	20	J	DF
Potassium	2060	J	F	2950	J	F	2620	J	F
Selenium	0.89	B	A	0.99	UL	D	0.58	B	A
Silver	6.5	J	DF	7.3	J	DF	9.1	J	DF
Sodium	404			718			426		
Thallium	0.34	UL	CD	0.41	UL	CD	0.42	UL	CD
Vanadium	57.6	L	D	47.3	L	D	39.4	L	D
Zinc	520	J	F	94.4	J	F	129	J	F

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-09-03Q			SD-10-03Q			SD-11-03Q		
Laboratory ID:	200115-19			200115-17			200115-14		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	22.1			16.6			20.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**mg/kg**			**mg/kg**			**mg/kg**		
Aluminum	11800	J	F	10700	J	F	8770	J	F
Antimony	0.4	L	D	0.43	L	D	0.72	L	D
Arsenic	2.5	L	D	4	L	D	2.6	L	D
Barium	78.9	J	DF	82.8	J	DF	151	J	DF
Beryllium	1.3			1.1			1.4		
Cadmium	0.16	UL	CD	0.18	UL	CD	1.4	L	D
Calcium	21000			13900			12500		
Chromium	30	J	DF	27.1	J	DF	40.7	J	DF
Cobalt	10.2	J	EF	10.3	J	EF	10.6	J	EF
Copper	22.6	J	F	25.9	J	F	89.4	J	F
Iron	28400	J	F	27200	J	F	27700	J	F
Lead	31.6	J	FI	27.4	J	FI	72.6	J	FI
Magnesium	15100			11800			9650		
Manganese	621	J	F	529	J	F	1440	J	F
Nickel	19.5	J	DF	21.7	J	DF	25.5	J	DF
Potassium	3170	J	F	3340	J	F	2220	J	F
Selenium	0.79	UL	D	0.17	UL	D	0.21	UL	D
Silver	6.2	J	DF	6.4	J	DF	7.4	J	DF
Sodium	2150			1750			972		
Thallium	0.33	UL	CD	0.36	UL	CD	0.45	UL	CD
Vanadium	42.9	L	D	47.3	L	D	53.9	L	D
Zinc	105	J	F	84.1	J	F	293	J	F

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-12-03Q			SD-13-03Q			SD-21-03Q		
Laboratory ID:	200115-13			200115-11			200115-08		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	23.8			27.3			21.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**mg/kg**			**mg/kg**			**mg/kg**		
Aluminum	9390	J	F	8810	J	F	9230	J	F
Antimony	0.47	L	D	0.67	L	D	0.52	L	D
Arsenic	1.9	L	D	3.4	L	D	2.2	L	D
Barium	85.6	J	DF	127	J	DF	88.1	J	DF
Beryllium	1.6			1.2			1.8		
Cadmium	0.04	UL	CD	0.73	L	CD	0.18	UL	CD
Calcium	8990			8980			10400		
Chromium	32.7	J	DF	39	J	DF	31.9	J	DF
Cobalt	12.3	J	EF	11	J	EF	10.7	J	EF
Copper	37.4	J	F	40.5	J	F	31.1	J	F
Iron	24300	J	F	24400	J	F	38200	J	F
Lead	88.4	J	FI	76.1	J	FI	45.7	J	FI
Magnesium	8200			7920			9090		
Manganese	726	J	F	1370	J	F	572	J	F
Nickel	22	J	DF	23.4	J	DF	21	J	DF
Potassium	2430	J	F	2120	J	F	2440	J	F
Selenium	0.21	UL	D	0.35	B	A	0.88	UL	D
Silver	6.4	J	DF	6.4	J	DF	9.6	J	DF
Sodium	926			675			375		
Thallium	0.44	UL	CD	0.45	UL	CD	0.37	UL	CD
Vanadium	36.5	L	D	40.5	L	D	41.4	L	D
Zinc	228	J	F	286	J	F	101	J	F

Data Qualifiers:

B -- Positive result is considered to be an artifact of blank contamination, and should not be considered present.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

K -- Positive result is considered biased high due to exceedance of technical quality control criteria.

L -- Positive result is considered biased low due to exceedance of technical quality control criteria.

UL -- Non-detected result is considered biased low due to exceedance of technical quality control criteria.

Database source file: C:\PROJECTS\WARM_DV_200120\WA0115S.DBF data retrieved on: 04/27/00

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., %RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS – GFAA MSA's r < 0.995
K = ICP Interference – include ICSAB %R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., baseline drifting)
P = Uncertainty Near Detection Limit (< 2 x IDL for inorganics and < CRQL for organics)
Q = Other Problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pesticide/PCB % Difference Between Columns for Positive Results
V = Non-linear Calibrations, Tuning r < 0.995 (correlation coefficient)

APPENDIX B

Results as Reported by the Laboratory

Ceimic

TOTAL METALS
- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Contract: NAWC Warminster SDG No.: SW0803

Lab Code: CEIMIC Case No.: 200115 SAS No.:

SOW No.: SW846

Sample No.	Lab Sample ID.
SW-08-03Q	200115-01
SD-08-03Q	200115-02
SW-07-03Q	200115-03
SD-07-03Q	200115-04
SW-06-03Q	200115-05
SD-06-03Q	200115-06
SW-21-03Q	200115-07
SD-21-03Q	200115-08
RB-022200	200115-09
SW-13-03Q	200115-10
SD-13-03Q	200115-11
SW-12-03Q	200115-12
SD-12-03Q	200115-13
SD-11-03Q	200115-14
SD-11-03QS	200115-14S
SD-11-03QSD	200115-14SD
SW-11-03Q	200115-15

Were ICP interelement corrections applied? Yes/No YES

Were ICP background corrections applied? Yes/No YES

If yes-were raw data generated before application of background corrections? Yes/No NO

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

0043

Signature: Donald Tortorelli Name: DONALD TORTORELLI

Date: 3/15/00 Title: INORGANIC LAB MGR.

Ceimic

TOTAL METALS
- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Contract: NAWC Warminster SDG No.: SW0803

Lab Code: CEIMIC Case No.: 200115 SAS No.:

SOW No.: SW846

Sample No.	Lab Sample ID.
SW-11-03QS	200115-15S
SW-11-03QSD	200115-15SD
SW-10-03Q	200115-16
SD-10-03Q	200115-17
SW-09-03Q	200115-18
SD-09-03Q	200115-19

Were ICP interelement corrections applied? Yes/No YES

Were ICP background corrections applied? Yes/No YES

If yes-were raw data generated before application of background corrections? Yes/No NO

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Donald Tortorelli Name: DONALD TORTORELLI 0044

Date: 3/15/00 Title: INORGANIC LAB MGR.

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SW-08-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-01

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	206			P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	83.4	B		P
7440-41-7	Beryllium	0.54	B		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	22100			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	4.1	B		P
7439-89-6	Iron	599			P
7439-92-1	Lead	5.8			P
7439-95-4	Magnesium	9040			P
7439-96-5	Manganese	102			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1230	B		P
7782-49-2	Selenium	4.0	B		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	13300			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	4.3	B		P
7440-66-6	Zinc	49.1			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-08-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-02

Level (low/med): LOW Date Received: 2/23/00

Solids: 78.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10800		*	P
7440-36-0	Antimony	0.37	B	N	P
7440-38-2	Arsenic	3.3		N*	P
7440-39-3	Barium	809		*	P
7440-41-7	Beryllium	2.2		*	P
7440-43-9	Cadmium	0.21	U	N	P
7440-70-2	Calcium	16000			P
7440-47-3	Chromium	32.0		N*	P
7440-48-4	Cobalt	14.7		*	P
7440-50-8	Copper	35.5		*	P
7439-89-6	Iron	36000		*	P
7439-92-1	Lead	47.4		*E	P
7439-95-4	Magnesium	13000			P
7439-96-5	Manganese	3300		*	P
7440-02-0	Nickel	20.0		N*	P
7440-09-7	Potassium	2620		*	P
7782-49-2	Selenium	0.58		N	P
7440-22-4	Silver	9.1		*	P
7440-23-5	Sodium	426	B	*	P
7440-28-0	Thallium	0.42	U	N	P
7440-62-2	Vanadium	39.4		N	P
7440-66-6	Zinc	129		*	P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

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Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-07-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-03

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	65.3	B		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	62.8	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	17100			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	297			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	7430			P
7439-96-5	Manganese	63.3			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	861	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	10900			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	32.2			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

0047

Comments:

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-07-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-04

Level (low/med): LOW Date Received: 2/23/00

% Solids: 81.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10200		*	P
7440-36-0	Antimony	0.49	B	N	P
7440-38-2	Arsenic	4.7		N*	P
7440-39-3	Barium	77.6		*	P
7440-41-7	Beryllium	1.4		*	P
7440-43-9	Cadmium	0.20	U	N	P
7440-70-2	Calcium	24300			P
7440-47-3	Chromium	30.1		N*	P
7440-48-4	Cobalt	12.1		*	P
7440-50-8	Copper	22.0		*	P
7439-89-6	Iron	35500		*	P
7439-92-1	Lead	24.4		*E	P
7439-95-4	Magnesium	15800			P
7439-96-5	Manganese	677		*	P
7440-02-0	Nickel	20.4		N*	P
7440-09-7	Potassium	2950		*	P
7782-49-2	Selenium	0.99	U	N	P
7440-22-4	Silver	7.3		*	P
7440-23-5	Sodium	718		*	P
7440-28-0	Thallium	0.41	U	N	P
7440-62-2	Vanadium	47.3		N	P
7440-66-6	Zinc	94.4		*	P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts: 0048

Comments:

Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-06-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-05

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	51.0	B		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	71.6	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	20900			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	142			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	8240			P
7439-96-5	Manganese	30.3			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1270	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	12100			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	28.6			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SD-06-03Q

C ntract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

M trix (soil/water): SOIL Lab Sample ID: 200115-06

Level (low/med): LOW Date Received: 2/23/00

% Solids: 82.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8330		*	P
7440-36-0	Antimony	0.62	B	N	P
7440-38-2	Arsenic	2.0		N*	P
7440-39-3	Barium	95.8		*	P
7440-41-7	Beryllium	1.8		*	P
7440-43-9	Cadmium	0.17	U	N	P
7440-70-2	Calcium	31400			P
7440-47-3	Chromium	50.3		N*	P
7440-48-4	Cobalt	10.8		*	P
7440-50-8	Copper	67.7		*	P
7439-89-6	Iron	34400		*	P
7439-92-1	Lead	89.4		*E	P
7439-95-4	Magnesium	20600			P
7439-96-5	Manganese	1130		*	P
7440-02-0	Nickel	23.3		N*	P
7440-09-7	Potassium	2060		*	P
7782-49-2	Selenium	0.89	B	N	P
7440-22-4	Silver	6.5		*	P
7440-23-5	Sodium	404		*	P
7440-28-0	Thallium	0.34	U	N	P
7440-62-2	Vanadium	57.6		N	P
7440-66-6	Zinc	520		*	P

olor Before: BROWN Clarity Before: Texture: COARSE

olor After: YELLOW Clarity After: Artifacts:

0050

Comments:

Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-21-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-07

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M	RPD
7429-90-5	Aluminum	74.1	B		P	12.62
7440-36-0	Antimony	2.6	U		P	
7440-38-2	Arsenic	3.6	U		P	
7440-39-3	Barium	67.4	B		P	7.07
7440-41-7	Beryllium	0.37	U		P	
7440-43-9	Cadmium	0.43	U		P	
7440-70-2	Calcium	21200			P	21.41
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	5.2	U		P	
7440-50-8	Copper	3.8	U		P	
7439-89-6	Iron	367			P	21.08
7439-92-1	Lead	2.7	U		P	
7439-95-4	Magnesium	7870			P	5.95
7439-96-5	Manganese	64.8			P	2.34
7440-02-0	Nickel	6.3	U		P	
7440-09-7	Potassium	991	B		P	14.04
7782-49-2	Selenium	2.1	B		P	
7440-22-4	Silver	3.7	U		P	
7440-23-5	Sodium	11600			P	6.22
7440-28-0	Thallium	4.4	U		P	
7440-62-2	Vanadium	2.8	U		P	
7440-66-6	Zinc	34.8			P	7.76

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

7051

Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SD-21-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-08

Level (low/med): LOW Date Received: 2/23/00

% Solids: 79.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	RPD
7429-90-5	Aluminum	9230		*	P	9.98
7440-36-0	Antimony	0.52	B	N	P	
7440-38-2	Arsenic	2.2		N*	P	72.46
7440-39-3	Barium	88.1		*	P	12.67
7440-41-7	Beryllium	1.8		*	P	25.00
7440-43-9	Cadmium	0.18	U	N	P	
7440-70-2	Calcium	10400			P	80.11
7440-47-3	Chromium	31.9		N*	P	5.81
7440-48-4	Cobalt	10.7		*	P	12.28
7440-50-8	Copper	31.1		*	P	34.27
7439-89-6	Iron	38200		*	P	7.33
7439-92-1	Lead	45.7		*E	P	60.77
7439-95-4	Magnesium	9090			P	53.92
7439-96-5	Manganese	572		*	P	16.81
7440-02-0	Nickel	21.0		N*	P	2.90
7440-09-7	Potassium	2440		*	P	18.92
7782-49-2	Selenium	0.88	U	N	P	
7440-22-4	Silver	9.6		*	P	27.22
7440-23-5	Sodium	375	B	*	P	62.76
7440-28-0	Thallium	0.37	U	N	P	
7440-62-2	Vanadium	41.4		N	P	13.30
7440-66-6	Zinc	101		*	P	6.96

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

0052

Comments:

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
RB-022200

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-09

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.0	U		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	4.5	U		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	469	B		P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	40.0	U		P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	119	U		P
7439-96-5	Manganese	3.0	U		P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	222	U		P
7782-49-2	Selenium	3.1	B		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	226	B		P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	22.4			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

0053

Comments:

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SW-13-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-10

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.0	U		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	76.7	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	28100			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	4.1	B		P
7439-89-6	Iron	178			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	10800			P
7439-96-5	Manganese	112			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1110	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	18800			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	37.5			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

0054

Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SD-13-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-11

Level (low/med): LOW Date Received: 2/23/00

% Solids: 72.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8810		*	P
7440-36-0	Antimony	0.67	B	N	P
7440-38-2	Arsenic	3.4		N*	P
7440-39-3	Barium	127		*	P
7440-41-7	Beryllium	1.2		*	P
7440-43-9	Cadmium	0.73		N	P
7440-70-2	Calcium	8980			P
7440-47-3	Chromium	39.0		N*	P
7440-48-4	Cobalt	11.0		*	P
7440-50-8	Copper	40.5		*	P
7439-89-6	Iron	24400		*	P
7439-92-1	Lead	76.1		*E	P
7439-95-4	Magnesium	7920			P
7439-96-5	Manganese	1370		*	P
7440-02-0	Nickel	23.4		N*	P
7440-09-7	Potassium	2120		*	P
7782-49-2	Selenium	0.35	B	N	P
7440-22-4	Silver	6.4		*	P
7440-23-5	Sodium	675		*	P
7440-28-0	Thallium	0.45	U	N	P
7440-62-2	Vanadium	40.5		N	P
7440-66-6	Zinc	286		*	P

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

0055

Comments:

ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SW-12-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-12

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.0	U		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	75.4	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	24700			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	199			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	10500			P
7439-96-5	Manganese	122			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	987	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	18400			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	32.2			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

0056

Comments:

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-12-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-13

Level (low/med): LOW Date Received: 2/23/00

% Solids: 76.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9390		*	P
7440-36-0	Antimony	0.47	B	N	P
7440-38-2	Arsenic	1.9		N*	P
7440-39-3	Barium	85.6		*	P
7440-41-7	Beryllium	1.6		*	P
7440-43-9	Cadmium	0.04	U	N	P
7440-70-2	Calcium	8990			P
7440-47-3	Chromium	32.7		N*	P
7440-48-4	Cobalt	12.3		*	P
7440-50-8	Copper	37.4		*	P
7439-89-6	Iron	24300		*	P
7439-92-1	Lead	88.4		*E	P
7439-95-4	Magnesium	8200			P
7439-96-5	Manganese	726		*	P
7440-02-0	Nickel	22.0		N*	P
7440-09-7	Potassium	2430		*	P
7782-49-2	Selenium	0.21	U	N	P
7440-22-4	Silver	6.4		*	P
7440-23-5	Sodium	926		*	P
7440-28-0	Thallium	0.44	U	N	P
7440-62-2	Vanadium	36.5		N	P
7440-66-6	Zinc	228		*	P

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SD-11-03Q

ontract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

trix (soil/water): SOIL Lab Sample ID: 200115-14

Level (low/med): LOW Date Received: 2/23/00

Solids: 80.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8770		*	P
7440-36-0	Antimony	0.72	B	N	P
7440-38-2	Arsenic	2.6		N*	P
7440-39-3	Barium	151		*	P
7440-41-7	Beryllium	1.4		*	P
7440-43-9	Cadmium	1.4		N	P
7440-70-2	Calcium	12500			P
7440-47-3	Chromium	40.7		N*	P
7440-48-4	Cobalt	10.6		*	P
7440-50-8	Copper	89.4		*	P
7439-89-6	Iron	27700		*	P
7439-92-1	Lead	72.6		*E	P
7439-95-4	Magnesium	9650			P
7439-96-5	Manganese	1440		*	P
7440-02-0	Nickel	25.5		N*	P
7440-09-7	Potassium	2220		*	P
7782-49-2	Selenium	0.21	U	N	P
7440-22-4	Silver	7.4		*	P
7440-23-5	Sodium	972		*	P
7440-28-0	Thallium	0.45	U	N	P
7440-62-2	Vanadium	53.9		N	P
7440-66-6	Zinc	293		*	P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

58

Ceimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SW-11-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-15

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	211			P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	130	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	47700			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	5.0	B		P
7439-89-6	Iron	1150			P
7439-92-1	Lead	7.0			P
7439-95-4	Magnesium	19500			P
7439-96-5	Manganese	462			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1810	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	41900			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	4.4	B		P
7440-66-6	Zinc	44.5			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

Form I - IN

C imic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SW-10-03Q

C ntract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Ma rix (soil/water): WATER Lab Sample ID: 200115-16

Level (low/med): LOW Date Received: 2/23/00

% olids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	65.3	B		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	75.8	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	21400			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	229			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	9060			P
7439-96-5	Manganese	70.9			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1080	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	4.2	B		P
7440-23-5	Sodium	13700			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	33.0			P

C lor Before: COLORLESS Clarity Before: CLEAR Texture:

C lor After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SD-10-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-17

Level (low/med): LOW Date Received: 2/23/00

% Solids: 83.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700		*	P
7440-36-0	Antimony	0.43	B	N	P
7440-38-2	Arsenic	4.0		N*	P
7440-39-3	Barium	82.8		*	P
7440-41-7	Beryllium	1.1		*	P
7440-43-9	Cadmium	0.18	U	N	P
7440-70-2	Calcium	13900			P
7440-47-3	Chromium	27.1		N*	P
7440-48-4	Cobalt	10.3		*	P
7440-50-8	Copper	25.9		*	P
7439-89-6	Iron	27200		*	P
7439-92-1	Lead	27.4		*E	P
7439-95-4	Magnesium	11800			P
7439-96-5	Manganese	529		*	P
7440-02-0	Nickel	21.7		N*	P
7440-09-7	Potassium	3340		*	P
7782-49-2	Selenium	0.17	U	N	P
7440-22-4	Silver	6.4		*	P
7440-23-5	Sodium	1750		*	P
7440-28-0	Thallium	0.36	U	N	P
7440-62-2	Vanadium	47.3		N	P
7440-66-6	Zinc	84.1		*	P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

0031

Comments:

eimic

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
SW-09-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): WATER Lab Sample ID: 200115-18

Level (low/med): LOW Date Received: 2/23/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	76.9	B		P
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-39-3	Barium	75.4	B		P
7440-41-7	Beryllium	0.37	U		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	20200			P
7440-47-3	Chromium	5.4	U		P
7440-48-4	Cobalt	5.2	U		P
7440-50-8	Copper	3.8	U		P
7439-89-6	Iron	240			P
7439-92-1	Lead	2.7	U		P
7439-95-4	Magnesium	9160			P
7439-96-5	Manganese	62.9			P
7440-02-0	Nickel	6.3	U		P
7440-09-7	Potassium	1360	B		P
7782-49-2	Selenium	2.1	U		P
7440-22-4	Silver	3.7	U		P
7440-23-5	Sodium	13600			P
7440-28-0	Thallium	4.4	U		P
7440-62-2	Vanadium	2.8	U		P
7440-66-6	Zinc	31.3			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

0062

Comments:

Ceimic

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

SD-09-03Q

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Lab Sample ID: 200115-19

Level (low/med): LOW Date Received: 2/23/00

% Solids: 77.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11800		*	P
7440-36-0	Antimony	0.40	B	N	P
7440-38-2	Arsenic	2.5		N*	P
7440-39-3	Barium	78.9		*	P
7440-41-7	Beryllium	1.3		*	P
7440-43-9	Cadmium	0.16	U	N	P
7440-70-2	Calcium	21000			P
7440-47-3	Chromium	30.0		N*	P
7440-48-4	Cobalt	10.2		*	P
7440-50-8	Copper	22.6		*	P
7439-89-6	Iron	28400		*	P
7439-92-1	Lead	31.6		*E	P
7439-95-4	Magnesium	15100			P
7439-96-5	Manganese	621		*	P
7440-02-0	Nickel	19.5		N*	P
7440-09-7	Potassium	3170		*	P
7782-49-2	Selenium	0.79	U	N	P
7440-22-4	Silver	6.2		*	P
7440-23-5	Sodium	2150		*	P
7440-28-0	Thallium	0.33	U	N	P
7440-62-2	Vanadium	42.9		N	P
7440-66-6	Zinc	105		*	P

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

0063

Comments:

Inorganic SDG Narrative

Client Case ID: NAWC Warminster, PA
Ceimic Project No.: 200115
SDG No.: SW0803

The following samples were received at Ceimic Corporation on February 23, 2000:

SW-08-03Q	SD-08-03Q	SW-07-03Q
SD-07-03Q	SW-06-03Q	SD-06-03Q
SW-21-03Q	SD-21-03Q	RB-022200
SW-13-03Q	SD-13-03Q	SW-12-03Q
SD-12-03Q	SD-11-03Q (MS/MSD)	SW-11-03Q (MS/MSD)
SW-10-03Q	SD-10-03Q	SW-09-03Q
SD-09-03Q		

The above samples were digested and analyzed for total metals using SW846 methods 3005A/3050A/6010B in accordance with the Inorganic Statement of Work (SOW) ILM04.0.

Comments on Data Package:

QA/QC Samples:

Inorganic Ventures CICV-1, CICV-2, and CICV-3 were used for the ICV and LCSW samples for the ICP metals. CPI CAL-3, CAL-5 and CAL-8 were used for the CCV sample for the ICP metals. Environmental Resource Associates standard (lot#241) was used for the LCSS samples. Inorganic Ventures CLPP-ICS-A and CLPP-ICS-B were used for the ICSA and ICSAB samples.

Observations:

All elements except mercury were determined using inductively coupled plasma (ICP) emission spectroscopy.

A "U" flag in the C column on the sample result forms (Form I-IN) indicates that the concentration of that analyte in the sample is undetected at the method detection limit (MDL). For the sample concentration reported between the Pracical Quantitation Limit (PQL) and the instrument MDL, a "B" flag is shown in the C column on the Form I-IN.

Deviations from Contract:

None.

End of case Narrative.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Donald Tortorelli

Donald Tortorelli
Inorganic Laboratory Manager

3/15/00

Date

Chain of Custody

Original Chain of Custody goes to Laboratory

(13)

0971

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.

Cooler #

Samplers (please print): Seth Pelepko, Charles Meyer

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	1 Liter Amber PAH	pH	500 ml Poly HNO3 TAL Metals except Hg Hardness	pH	250 poly H2SO4 TOC	pH	8 oz Clear WM PAH TAL Metals except Hg	pH	40 oz Clear WM TOC	pH		pH		pH	Remarks
10	2/22/00	0906	Grab	SW-13-03Q	SW	4	2		1		1										
11	2/22/00	0915	Grab	SD-13-03Q	SD	2							1		1						
12	2/22/00	0930	Grab	SW-12-03Q	SW	4	2		1		1										
13	2/22/00	0935	Grab	SD-12-03Q	SD	2							1		1						
14	2/22/00	1015	Grab	SD-11-03Q	SD	4							2		2						DO MS/MSD
15	2/22/00	1010	Grab	SW-11-03Q	SW	12	6		3		3										
16	2/22/00	1100	Grab	SW-10-03Q	SW	4	2		1		1										
17	2/22/00	1105	Grab	SD-10-03Q	SD	2							1		1						
18	2/22/00	1120	Grab	SW-09-03Q	SW	4	2		1		1										
19	2/22/00	1125	Grab	SD-09-03Q	SD	2							1		1						

Ceimic Project #: 200115

Storage Location: 13

Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
[signature]	2/22/00 1900		
Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
Relinquished by (signature)	Date/Time	Received by Ceimic (signature)	Date/Time
		Tom Williamson	2/23/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810817875206

= Lab Use Only

Ceimic Corporation, 10 Dean Knauss Drive, Narragansett, RI 02882 - Tel: (401) 782-8900, Fax: (401) 782-8905

Chain of Custody

Original Chain of Custody goes to Laboratory (13)

0972

Page 2 of 2

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.:

Samplers (please print): Seth Pelepko Charles Meyer

Cooler #: 1-4

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	1 liter Amber PAH	pH	500 ml Poly HNO3 TAL Metals except Hg Hardness	pH	250 Poly H2SO4 TOC	pH	8 oz Clear W/M PAH, TAL Metals except Hg	pH	40 oz Clear W/M TOC	pH		pH		pH	Remarks
01	2/22/00	1200	Grab	SW-08-03Q	SW	4	2		1		1										
02	2/22/00	1205	Grab	SD-08-03Q	SD	2							1		1						
03	2/22/00	1220	Grab	SW-07-03Q	SW	4	2		1		1										
04	2/22/00	1230	Grab	SD-07-03Q	SD	2							1		1						
05	2/22/00	1305	Grab	SW-06-03Q	SW	4	2		1		1										
06	2/22/00	1315	Grab	SD-06-03Q	SD	2							1		1						
07	2/22/00	1340	Grab	SW-21-03Q	SW	4	2		1		1										
08	2/22/00	1345	Grab	SD-21-03Q	SD	2							1		1						
09	2/22/00	1650	Grab	RB-022200	AQ	4	2		1		1										

Ceimic Project #: 200115

Storage Location: CCD 13

Relinquished by (signature): [signature] Date/Time: 2/22/00 1900

Received by (signature): Date/Time:

Relinquished by (signature): Date/Time:

Received by (signature): Date/Time:

Relinquished by (signature): Date/Time:

Received by Ceimic (signature): Karen Williamson Date/Time: 2/23/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810817875206

Ceimic Corporation, 10 Dellhaus Dr., Nanticoke, Inset 10288 Tel: (401) 782-8000 Fax: (401) 782-8005

TOTAL METALS
- 2b -
CRDL STANDARD FOR AA AND ICP

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG No.: SW0803

AA CRDL Standard Source: SCP SCIENCE

ICP CRDL Standard Source: CPI

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP					
				Initial			Final		
	True	Found	%R	True	Found	%R	Found	%R	
Aluminum	*			640.0	684.27	106.9	751.05	117.4	K*
Antimony				20.0	19.49	97.4	20.62	103.1	
Arsenic				20.0	17.55	87.8	19.89	99.4	
Barium				10.0	10.95	109.5	10.11	101.1	
Beryllium				10.0	10.11	101.1	9.75	97.5	
Cadmium				10.0	8.99	89.9	9.05	90.5	
Chromium				60.0	54.89	91.5	59.24	98.7	
Cobalt				30.0	32.51	108.4	32.51	108.4	
Copper				50.0	46.64	93.3	47.48	95.0	
Lead				10.0	11.62	116.2	10.70	107.0	K
Magnesium				880.0	873.41	99.3	979.03	111.3	
Manganese	*			10.0	11.36	113.6	16.12	161.2	K*
Nickel				90.0	85.19	94.7	87.95	97.7	
Potassium				1370.0	1096.20	80.0	1257.80	91.8	L/UC
Selenium				20.0	21.43	107.2	21.51	107.6	
Silver	*			20.0	20.58	102.9	23.34	116.7	K
Sodium	*			480.0	495.20	103.2	562.40	117.2	K
Thallium				20.0	20.00	100.0	16.79	83.9	L/UC
Zinc				30.0	32.60	108.7	33.47	111.6	

* results all > affected range or no results in range except those questioned by blank

007

Ceimic

TOTAL METALS
- 2b -
CRDL STANDARD FOR AA AND ICP

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG No.: SW0803

AA CRDL Standard Source: SCP SCIENCE

ICP CRDL Standard Source: CPI

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Calcium				2000.0	2564.80	128.2	3629.50	181.5 K
Iron				160.0	200.31	125.2	562.99	351.9 K
Silver				20.0	20.51	102.6	22.39	111.9
Vanadium				20.0	18.84	94.2	19.77	98.8

0073

TOTAL METALS
- 2b -
CRDL STANDARD FOR AA AND ICP

C ntract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG No.: SW0803

A CRDL Standard Source: SCP SCIENCE

ICP CRDL Standard Source: CPI

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP					
				Initial			Final		
	True	Found	%R	True	Found	%R	Found	%R	
Cadmium				10.0	8.49	84.9	8.88	88.8	ug/L
Selenium	X			20.0	21.86	109.3	23.91	119.6	ug/L

no results in affected range

TOTAL METALS
- 3 -
BLANKS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum	50.8	B	50.8	B	41.0	U	41.0	U	63.600	B	P
Antimony	2.6	U	2.6	U	2.6	U	2.6	U	2.600	U	P
Arsenic	3.6	U	3.6	U	-4.5	B	3.6	U	3.600	U	P
Barium	7.6	B	6.3	B	6.3	B	13.1	B	4.500	U	P
Beryllium	0.4	U	0.5	B	0.4	U	0.5	B	0.370	U	P
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.430	U	P
Chromium	5.4	U	6.1	B	5.4	U	5.4	U	5.400	U	P
Cobalt	6.7	B	5.2	U	5.9	B	6.7	B	5.200	U	P
Copper	3.8	U	3.8	U	3.8	U	-4.9	B	3.800	U	P
Lead	2.7	U	2.7	U	2.7	U	2.7	U	2.700	U	P
Magnesium	119.0	U	119.0	U	119.0	U	119.0	U	119.000	U	P
Manganese	3.3	B	3.0	U	3.0	U	5.2	B	3.780	B	P
Nickel	6.3	U	6.3	U	6.3	U	6.3	U	6.300	U	P
Potassium	222.0	U	222.0	U	222.0	U	222.0	U	222.000	U	P
Selenium	4.7	B	2.1	U	2.1	U	2.1	U	2.100	U	P
Silver	3.7	U	3.7	U	3.7	U	6.1	B	3.700	U	P
Sodium	57.0	U	148.8	B	103.7	B	124.6	B	174.000	B	P
Thallium	4.4	U	4.4	U	4.4	U	4.4	U	4.400	U	P
Zinc	5.5	U	5.5	U	5.5	U	5.5	U	13.400	B	P

	MAX (ug/L)	AL		max (ug/L)	AL
Al	63.6	318	Ca	741.6	3708
As	-4.5	(-)22.5	Fe	78.5	392.5
Ba	13.1	65.5	V	5.9	29.5
Be	0.5	2.5			
Cr	6.1	32.5			
Co	6.7	33.5			
Cu	-4.9	(-)24.5			
Mn	5.2	26			
Se	4.7	23.5			
Ag	6.1	30.5			
Na	174	~~870~~ 1130 (From KB)			

JJ 5/5/00

2. For neg:

	CRDL (ug/L)		max
As	10	>	|-4.5|
Cu	25	>	|-4.9|

3

Form III - IN

0075

Ceimic

TOTAL METALS
- 3 -
BLANKS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum			41.0	U	72.1	B			4.100	U	P
Antimony			2.6	U	2.6	U			0.260	U	P
Arsenic			3.6	U	-3.9	B			-0.466	B	P
Barium			4.6	B	4.5	U			0.450	U	P
Beryllium			0.4	U	0.4	U			0.037	U	P
Cadmium			0.4	U	0.4	U			0.043	U	P
Chromium			5.4	U	5.4	U			0.540	U	P
Cobalt			5.2	U	5.2	U			0.520	U	P
Copper			3.8	U	3.8	U			0.380	U	P
Lead			2.7	U	2.7	U			0.270	U	P
Magnesium			119.0	U	119.0	U			11.900	U	P
Manganese			6.6	B	3.8	B			0.378	B	P
Nickel			6.3	U	6.3	U			0.630	U	P
Potassium			-253.0	B	222.0	U			-22.837	B	P
Selenium			3.4	B	2.1	U			0.210	U	P
Silver			6.3	B	6.2	B			0.370	U	P
Sodium			59.4	B	57.0	U			25.000	B	P
Thallium			4.4	U	4.4	U			0.440	U	P
Zinc			5.5	U	5.5	U			1.430	B	P

	max (mg/Kg)	AL
Al	7.21	36.05
As	-0.39	(-) 1.95
Ba	0.46	2.30
Mn	0.66	3.30
K	-25.3	(-) 126.5
Se	0.34	1.70 → B
Ag	+0.63	3.15
Na	~~0.94~~ 25	~~29.70~~ 125
Zn	~~0.113~~ 1.430	~~9.715~~
Ca	100.58	502.90
Fe	5.26	26.30

× 0.1 × ~~1~~ = Max

× ~~1~~ = Max

max (mg/Kg) × 10 → ug/L

AL (mg/Kg) × 10 → ug/L

JL 5/5/00

Max → Table

↓

A.L. × 5 → Table

Form III - IN

0076

TOTAL METALS
- 3 -
BLANKS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Calcium	383.6	B	545.4	B	511.5	B	741.6	B	545.000	B	P
Iron	40.0	U	78.5	B	40.0	U	40.0	U	64.900	B	P
Silver	3.7	U	3.7	U	5.5	B	3.7	U			P
Vanadium	2.8	U	5.9	B	2.8	U	2.8	U	3.400	B	P

Reanalysis of Blank

	MAX	AL	Al Soil
Ca	1005.8 ug/L	5029.0 ug/L	502.9 mg/kg
Fe	78.5 ug/L	382.5 ug/L	39.8
Ag	6.37		
V	5.9	29.5	3.0
Al	72.1	360.5	36.1
Ba	13.1		
Mn	6.6		
Se	4.7?		
Na	174	870	
Zn	14.30		

0077

TOTAL METALS
- 3 -
BLANKS

Contract: NAWC Warminster

La Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Calcium			1005.8	B	579.6	B			80.100	B	P
Iron			52.6	B	40.0	U			4.450	B	P
Silver			3.7	B							P
Vanadium			2.8	U	2.8	U			0.280	U	P

TOTAL METALS
- 3 -
BLANKS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C		Preparation Blank	C		M
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U					P
Selenium	4.2	B	2.1	U	2.1	U	3.1	B					P

Ceimic

TOTAL METALS

- 5a -

SPIKE SAMPLE RECOVERY

SAMPLE NO.

SD-11-03QS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS SDG NO.: SW0803

Matrix (soil/water): SOIL → only applies to SOLID SAMPLES Level (low/med): LOW

% Solids for Sample: 80.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M	
Aluminum		13100.3531		8770		176.06	2457.8		P	
Antimony	75 - 125	14.3556		0.723	B	44.01	31.0	N	P	L, UL
Arsenic	75 - 125	4.9414		2.60		3.52	66.4	N	P	L, UL
Barium	75 - 125	314.5247		151		176.06	93.1		P	
Beryllium	75 - 125	6.2967		1.38		4.40	111.8		P	
Cadmium	75 - 125	3.0913		1.39		4.40	38.7	N	P	L, UL
Calcium		26244.7203		12500		176.06	7816.2		P	
Chromium	75 - 125	92.2447		40.7		17.61	293.0	N	P	* J/UJ
Cobalt	75 - 125	61.7535		10.6		44.01	116.2		P	
Copper		118.3363		89.4		22.01	131.4		P	
Iron		29504.4037		27700		88.03	2019.6		P	
Lead		165.5634		72.6		1.76	5279.7		P	
Magnesium		15463.0294		9650		176.06	3299.8		P	
Manganese		1158.5388		1440		44.01	-629.4		P	
Nickel	75 - 125	86.9393		25.5		44.01	139.6	N	P	* J/UJ
Potassium		3971.8313		2220		176.06	996.5		P	
Selenium	75 - 125	0.4925		0.213	U	0.88	56.0	N	P	L, UL
Silver	75 - 125	12.5555		7.40		4.40	117.2		P	
Sodium		1520.0705		972		176.06	311.5		P	
Thallium	75 - 125	2.8473		0.447	U	4.40	64.7	N	P	L, UL
Vanadium	75 - 125	77.2667		53.9		44.01	53.0	N	P	L, UL
Zinc		589.4367		293		44.01	674.3		P	

* one high, one low

Comments:

0083

Ceimic

TOTAL METALS

- 5a -

SPIKE SAMPLE RECOVERY

SAMPLE NO.

SD-11-03QSD

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS SDG NO.: SW0803

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 80.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M	
Aluminum		7381.5627		8770		156.25	-890.7		P	
Antimony	75 - 125	15.5078		0.723	B	39.06	37.8		P	L, UL
Arsenic	75 - 125	3.9997		2.60		3.13	44.7		P	L, UL
Barium	75 - 125	218.3438		151		156.25	43.3		P	L, UL
Beryllium	75 - 125	4.6563		1.38		3.91	84.0		P	
Cadmium	75 - 125	3.4400		1.39		3.91	52.6		P	L, UL
Calcium		22007.8132		12500		156.25	6095.4		P	
Chromium		44.1672		40.7		15.63	22.5		P	~~L, UL~~
Cobalt	75 - 125	42.9102		10.6		39.06	82.7		P	J/4
Copper		42.5523		89.4		19.53	-240.0		P	
Iron		17689.8443		27700		78.13	-12847.1		P	
Lead		51.6523		72.6		1.56	-1341.3		P	
Magnesium		14291.4067		9650		156.25	2968.2		P	
Manganese		550.9844		1440		39.06	-2264.5		P	*
Nickel	75 - 125	50.7438		25.5		39.06	64.7		P	~~L, UL~~
Potassium		1662.2657		2220		156.25	-355.3		P	
Selenium	75 - 125	0.2616	B	0.213	U	0.78	33.5		P	L, UL
Silver	75 - 125	7.3143		7.40		3.91	-2.1		P	L, UL
Sodium		856.8750		972		156.25	-73.4		P	
Thallium	75 - 125	3.2378		0.447	U	3.91	82.9		P	
Vanadium	75 - 125	66.7078		53.9		39.06	32.7		P	L, UL
Zinc		222.2969		293		39.06	-180.1		P	

no for Ac

* one high, one low

omments:

0034

TOTAL METALS
- 6 -
DUPLICATES

SAMPLE NO.

SD-11-03QSD

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Level (low/med): LOW

Solids for Sample: 80.0 % Solids for Duplicate: 80.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		13100		7380		55.8	*	P
Antimony		14.4		15.5		7.7		P
Arsenic		4.94		4.00		21.1	*	P
Barium		315		218		36.1	*	P
Beryllium		6.30		4.66		30.0	*	P
Cadmium		3.09		3.44		10.7		P
Calcium		26200		22000		17.6		P
Chromium		92.2		44.2		70.5	*	P
Cobalt		61.8		42.9		36.0	*	P
Copper		118		42.6		94.2	*	P
Iron		29500		17700		50.1	*	P
Lead		166		51.7		104.8	*	P
Magnesium		15500		14300		7.9		P
Manganese		1160		551		71.1	*	P
Nickel		86.9		50.7		52.6	*	P
Potassium		3970		1660		82.0	*	P
Selenium		0.49		0.26	B	61.2		P
Silver		12.6		7.31		52.8	*	P
Sodium		1520		857		55.8	*	P
Thallium		2.85		3.24		12.8		P
Vanadium		77.3		66.7		14.7		P
Zinc		589		222		80.5	*	P

ok

±35% CRDL

*Al 5 x 200 = 1000 ug/L x 0.1 = 100 mg/kg

*Ba 5 x 200 x 0.1 = 100 mg/kg *

Be 5 x 5 x 0.1 = 2.5 mg/kg

Cd 5 x 5 x 0.1 = 2.5 mg/kg

Ca 5 x 5000 x 0.1 = 2500 mg/kg

*Cr 5 x 10 x 0.1 = 5 mg/kg

*Co = 25 mg/kg

*Cu 12.5

*Fe = 50

*Pb = 1.5

Mn = 2500

*Mn = 7.5 mg/kg

*Ag = 5 mg/kg

V = 25 mg/kg

*Zn = 10 mg/kg

*= > ±35% (RPD)

Sb 5 x 60 x 0.1 = 30 mg/kg ⇒ ± 120 mg/kg (2 x CRDL x 0.1)

As 5 x 10 x 0.1 = 25 mg/kg ⇒ ± 2.0 mg/kg

Ni 5 x 40 x 0.1 = 100 mg/kg ⇒ ± 8 mg/kg

K 5 x 5000 x 0.1 = 2500 mg/kg ⇒ ± 1,000 mg/kg

Se 5 x 5 x 0.1 = 2.5 mg/kg ⇒ ± 1.0 mg/kg

Na 5 x 5000 x 0.1 = 2500 mg/kg ⇒ ± 1,000 mg/kg

Tl 5 x 10 x 0.1 = 5.0 mg/kg ⇒ ± 2.0 mg/kg

0089

Ceimic

TOTAL METALS

-7-

LABORATORY CONTROL SAMPLE

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Solid LCS Source: ERA LCSS 241

Aqueous LCS Source: INOR-VNT, CPI

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum	10000.0	9711.40	97.1	5250.0	5286.0		3150.0	5670.0	100.7
Antimony	500.0	490.35	98.1	33.0	20.6		12.2	50.5	62.5
Arsenic	200.0	195.24	97.6	93.9	92.1		66.7	119.3	98.1
Barium	10000.0	9339.50	93.4	330.0	328.4		221.1	405.9	99.5
Beryllium	250.0	236.96	94.8	42.7	45.0		34.2	47.8	105.5
Cadmium	100.0	90.08	90.1	97.2	87.2		73.9	105.0	89.7
Chromium	1000.0	970.67	97.1	46.0	50.3		36.8	51.5	109.3
Cobalt	2500.0	2423.90	97.0	120.0	132.2		93.6	124.8	110.2
Copper	1250.0	1137.70	91.0	147.0	150.0		110.3	163.2	102.1
Lead	200.0	191.36	95.7	135.0	125.1		106.7	155.3	92.6
Magnesium	25000.0	24377.00	97.5	2340.0	2421.6		1638.0	2433.6	103.5
Manganese	2500.0	2398.00	95.9	166.0	171.1		136.1	172.6	103.1
Nickel	2500.0	2420.30	96.8	138.0	155.9		93.8	157.3	113.0
Potassium	25000.0	23242.00	93.0	1480.0	1422.2		947.2	2012.8	96.1
Selenium	200.0	207.46	103.7	96.0	98.5		56.4	123.8	102.6
Silver				86.7	89.6		68.5	103.2	103.4
Sodium	25000.0	24180.00	96.7	845.0	808.3		616.9	904.2	95.7
Thallium	200.0	186.06	93.0	45.7	46.2		35.2	58.0	101.0
Zinc	2500.0	2331.20	93.2	75.0	77.0		59.3	81.8	102.6

absolute criteria

Found vs. Low/Hi.

LCS

0091

TOTAL METALS
- 9 -
ICP SERIAL DILUTIONS

SAMPLE NO.

SD-11-03QL

Contract: NAWC Warminster

ab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum	86329.00		87375.00		1.2		P
Antimony	7.11	B	13.00	U	100.0	+	P
Arsenic	25.61		18.00	U	100.0	+	P
Barium	1482.30		1495.75		0.9		P
Beryllium	13.54		14.40	B	6.4		P
Cadmium	13.64		15.96	B	17.0	+	P
Calcium	122840.00		133200.00		8.4		P
Chromium	400.03		409.50		2.4		P
Cobalt	104.22		114.55	B	9.9		P
Copper	879.92		899.95		2.3		P
Iron	272830.00		283280.00		3.8		P
Lead	714.49		793.55		11.1	E	P J
Magnesium	94991.00		96825.00		1.9		P
Manganese	14126.00		14544.50		3.0		P
Nickel	250.70		262.20		4.6		P
Potassium	21819.00		21643.00	B	0.8		P
Selenium	2.10	U	10.50	U			P
Silver	72.79		106.32		46.1	+	P
Sodium	9560.30		9803.00	B	2.5		P
Thallium	4.40	U	22.00	U			P
Vanadium	530.55		550.15		3.7		P
Zinc	2879.60		3001.35		4.2		P

+ Sb 50× 2.6 (MDL/IDL) = 130.0 > 7.11 Initial result is less than 50×IDL ∴ No action.

+ As 50×3.6 = 180 > 25.61 " " " " " " " No action

+ Cd 50×0.4 = 20 > 13.64

+ Ag 50×3.7 = 180.5 > 72.79

Pb 50×2.7 = 132.5 < 714.49 → J

TOTAL METALS
-10-
METHOD DETECTION LIMITS

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

ICP ID Number: TJA61 ICP Date: 11/01/99

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wave-length	Back-ground	CRDL (ug/L)	MDL (ug/L)	M
Aluminum	308.22		200.0	41.0	P
Barium	493.40		200.0	4.5	P
Beryllium	313.10		5.0	0.4	P
Calcium	370.60		5000.0	55.0	P
Chromium	267.70		10.0	5.4	P
Cobalt	228.62		50.0	5.2	P
Copper	324.75		25.0	3.8	P
Iron	259.90		100.0	40.0	P
Magnesium	383.20		5000.0	119.0	P
Manganese	257.61		15.0	3.0	P
Nickel	231.60		40.0	6.3	P
Potassium	766.40		5000.0	222.0	P
Sodium	588.90		5000.0	57.0	P
Vanadium	292.40		50.0	2.8	P
Zinc	213.80		20.0	5.5	P

Comments

TOTAL METALS
-10-
METHOD DETECTION LIMITS

(ntract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

: P ID Number: TJA61E Trace ICP Date: 11/01/99

Flame AA ID Number:

F rnace AA ID Number:

Analyte	Wave-length	Back-ground	CRDL (ug/L)	MDL (ug/L)	M
Antimony	206.84		60.0	2.6	P
Arsenic	189.04		10.0	3.6	P
Cadmium	226.50		5.0	0.4	P
Lead	220.35		3.0	2.7	P
Selenium	196.02		5.0	2.1	P
Silver	328.07		10.0	3.7	P
Thallium	190.86		10.0	4.4	P

C mments

TOTAL METALS
- 13 -
PREPARATION LOG

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Method P

Sample No.	Preparation Date	Weight (grams)	Volume (mL)
PBS	03/13/00	1.00	100
LCSS	03/13/00	1.00	100
SD-08-03Q	03/13/00	1.34	100
SD-07-03Q	03/13/00	1.31	100
SD-06-03Q	03/13/00	1.56	100
SD-21-03Q	03/13/00	1.51	100
SD-13-03Q	03/13/00	1.36	100
SD-12-03Q	03/13/00	1.31	100
SD-11-03Q	03/13/00	1.23	100
SD-11-03QS	03/13/00	1.42	100
SD-11-03QSD	03/13/00	1.60	100
SD-10-03Q	03/13/00	1.45	100
SD-09-03Q	03/13/00	1.70	100

100 − % moist = % solid

raw data

$$\left(\frac{\mu g}{L}\right) \times \frac{0.1L}{1.34g} \times \frac{100}{(\%\ \text{solid})} = \text{equiv soil val mg/kg (dry)}$$

or water QC result

$$(\text{soil value}) \times \left(\frac{\%\ \text{solid}}{100}\right) \times \frac{1.34g}{0.1L} = \text{equiv water value}$$

should match the raw data

0104

TOTAL METALS
- 13 -
PREPARATION LOG

Contract: NAWC Warminster

Lab Code: CEIMIC Case No.: 200115 SAS No.: SDG NO.: SW0803

Method P

Sample No.	Preparation Date	Initial Volume	Volume (mL)
PBW	03/13/00		100
LCSW	03/13/00		100
SW-08-03Q	03/13/00		100
SW-07-03Q	03/13/00		100
SW-06-03Q	03/13/00		100
SW-21-03Q	03/13/00		100
RB-022200	03/13/00		100
SW-13-03Q	03/13/00		100
SW-12-03Q	03/13/00		100
SW-11-03Q	03/13/00		100
SW-11-03QS	03/13/00		100
SW-11-03QSD	03/13/00		100
SW-10-03Q	03/13/00		100
SW-09-03Q	03/13/00		100

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14160

TO: GARTH GLENN

DATE: May 8, 2000

FROM: JAMES LUCCHESE

COPIES: FILE

SUBJECT: ORGANIC DATA VALIDATION – POLYNUCLEAR AROMATIC HYDROCARBONS
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. SW0503

SAMPLES: **6/Aqueous**

RB-022300	SW-03-03Q
SW-01-03Q	SW-04-03Q
SW-02-03Q	SW-05-03Q

7/Solid

SD-01-03Q	SD-05-03Q
SD-02-03Q	SS-01-03Q
SD-03-03Q	SS-02-03Q
SD-04-03Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, SDG SW0803, consists of 5 aqueous environmental samples, (designated SW), one rinsate blank (designated RB-) and 7 solid environmental samples, (designated SD- and SS-). All samples were analyzed for polynuclear aromatic hydrocarbons (PAHs).

The samples were collected by Tetra Tech NUS, Inc. on February 23, 2000 and analyzed by Ceimic Corporation.

All analyses were conducted following SW846 Method 8310.

SUMMARY

All analytes were successfully analyzed in all samples. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, calibration data, laboratory and field quality control blank results, surrogate spike recoveries, compound identification, and compound quantitation.

Sample aliquots for matrix spike and matrix spike duplicate (MS/MSD) analyses are designated by the field crew with a frequency of one per twenty samples of similar matrix. No MS/MSD samples were submitted with this sample set. Hence, the associated sample data could not be evaluated for these parameters.

Areas of concern with respect to data quality are listed on the following page.

MINOR PROBLEMS

- Positive results at concentration levels less than the sample quantitation limit have been qualified (J), estimated.

EXECUTIVE SUMMARY

Laboratory Performance: Surrogate spike recoveries for carbazole in the soil matrix exceeded the upper QC limit due to the presence of carbazole in the sample.

Other Factors Affecting Data Quality: Surrogate spike recoveries for p-Terphenyl-d14 in the soil matrix were zero due to masking of the surrogate in the matrix. No actions were required as a result of these problems.

The data for these analyses were reviewed with reference to the EPA "National Functional Guidelines for Organic Data Review", September 1994 revision, as amended for use within EPA Region 3, and the Naval Facilities Engineering Support Center (NFESC) guidelines entitled "Naval Installation Restoration Laboratory Quality Assurance Guide" (Interim Document; February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS, Inc.

James Lucchese
CLEAN Data Validator

Tetra Tech NUS, Inc.

Russell Sloboda
CLEAN Data Validation Quality Assurance Officer

Attachments:

1. **Appendix A - Qualified Analytical Results**
2. **Appendix B - Results as Reported by the Laboratory**
3. **Appendix C - Support Documentation**

APPENDIX A

Qualified Analytical Results

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-01-03Q			SD-02-03Q			SD-03-03Q		
Laboratory ID:	200120-10			200120-08			200120-06		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	18.0			27.0			22.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/kg**			**ug/kg**			**ug/kg**		
1-Methylnapthalene	100	U		230	U		110	U	
2-Methylnapthalene	100	U		230	U		110	U	
Acenaphthene	100	U		230	U		110	U	
Acenaphthylene	200	U		450	U		210	U	
Anthracene	59			180			79		
Benz(a)anthracene	630			1700			990		
Benzo(a)pyrene	580			1100			720		
Benzo(b)fluoranthene	520			1000			760		
Benzo(g,h,i)perylene	550			1100			720		
Benzo(k)fluoranthene	300			550			410		
Chrysene	520			1200			720		
Dibenz(a,h)anthracene	24			67			46		
Fluoranthene	1000			2700			1300		
Fluorene	20	U		67			68		
Indeno(1,2,3-cd)pyrene	350			660			450		
Naphthalene	100	U		230	U		110	U	
Phenanthrene	320			840			420		
Pyrene	690			1700			960		

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-04-03Q			SD-05-03Q			SS-01-03Q		
Laboratory ID:	200120-04			200120-02			200120-11		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	15.0			20.0			25.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/kg**			**ug/kg**			**ug/kg**		
1-Methylnapthalene	97	U		210	U		110	U	
2-Methylnapthalene	97	U		210	U		110	U	
Acenaphthene	97	U		210	U		110	U	
Acenaphthylene	190	U		410	U		220	U	
Anthracene	43			240			32		
Benz(a)anthracene	450			890			390		
Benzo(a)pyrene	390			590			330		
Benzo(b)fluoranthene	410			630			270		
Benzo(g,h,i)perylene	400			530			340		
Benzo(k)fluoranthene	250			380			160		
Chrysene	400			720			340		
Dibenz(a,h)anthracene	20			23	J	P	14	J	P
Fluoranthene	830			2300			620		
Fluorene	19	U		170			22	U	
Indeno(1,2,3-cd)pyrene	230			340			190		
Naphthalene	97	U		210	U		110	U	
Phenanthrene	260			1100			11	U	
Pyrene	530			1400			600		

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SS-02-03Q		
Laboratory ID:	200120-12		
Sample Date:	02/23/00		
QC Sample Type:	NORMAL		
Percent Moisture	13.0		
	RESULT	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/kg**		
1-Methylnapthalene	95	U	
2-Methylnapthalene	95	U	
Acenaphthene	95	U	
Acenaphthylene	190	U	
Anthracene	26		
Benz(a)anthracene	200		
Benzo(a)pyrene	230		
Benzo(b)fluoranthene	230		
Benzo(g,h,i)perylene	260		
Benzo(k)fluoranthene	130		
Chrysene	200		
Dibenz(a,h)anthracene	18	J	P
Fluoranthene	480		
Fluorene	19	U	
Indeno(1,2,3-cd)pyrene	160		
Naphthalene	95	U	
Phenanthrene	220		
Pyrene	430		

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL)

U -- Value is a non-detected result as reported by the laboratory.

Database source file: C:\PROJECTS\WARM_DV_200120\WA0120PAS.DBF data retrieved on: 04/27/00

Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	RB-022300			SW-01-03Q			SW-02-03Q		
Laboratory ID:	200120-13			200120-09			200120-07		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/L**			**ug/L**			**ug/L**		
1-Methylnapthalene	0.5	U		0.5	U		0.5	U	
2-Methylnapthalene	0.5	U		0.5	U		0.5	U	
Acenaphthene	0.5	U		0.5	U		0.5	U	
Acenaphthylene	1	U		1	U		1	U	
Anthracene	0.05	U		0.05	U		0.05	U	
Benz(a)anthracene	0.05	U		0.05	U		0.05	U	
Benzo(a)pyrene	0.05	U		0.05	U		0.05	U	
Benzo(b)fluoranthene	0.1	U		0.1	U		0.1	U	
Benzo(g,h,i)perylene	0.1	U		0.1	U		0.1	U	
Benzo(k)fluoranthene	0.05	U		0.05	U		0.05	U	
Chrysene	0.05	U		0.05	U		0.05	U	
Dibenz(a,h)anthracene	0.1	U		0.1	U		0.1	U	
Fluoranthene	0.1	U		0.1	U		0.1	U	
Fluorene	0.1	U		0.1	U		0.1	U	
Indeno(1,2,3-cd)pyrene	0.05	U		0.05	U		0.05	U	
Naphthalene	0.5	U		0.5	U		0.5	U	
Phenanthrene	0.05	U		0.05	U		0.05	U	
Pyrene	0.05	U		0.05	U		0.05	U	

Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	SW-03-03Q			SW-04-03Q			SW-05-03Q		
Laboratory ID:	200120-05			200120-03			200120-01		
Sample Date:	02/23/00			02/23/00			02/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/L**			**ug/L**			**ug/L**		
1-Methylnapthalene	0.5	U		0.5	U		0.5	U	
2-Methylnapthalene	0.5	U		0.5	U		0.5	U	
Acenaphthene	0.5	U		0.5	U		0.5	U	
Acenaphthylene	1	U		1	U		1	U	
Anthracene	0.05	U		0.05	U		0.05	U	
Benz(a)anthracene	0.05	U		0.05	U		0.05	U	
Benzo(a)pyrene	0.05	U		0.05	U		0.05	U	
Benzo(b)fluoranthene	0.1	U		0.1	U		0.1	U	
Benzo(g,h,i)perylene	0.1	U		0.1	U		0.1	U	
Benzo(k)fluoranthene	0.05	U		0.05	U		0.05	U	
Chrysene	0.05	U		0.05	U		0.05	U	
Dibenz(a,h)anthracene	0.1	U		0.1	U		0.1	U	
Fluoranthene	0.1	U		0.1	U		0.1	U	
Fluorene	0.1	U		0.1	U		0.1	U	
Indeno(1,2,3-cd)pyrene	0.05	U		0.05	U		0.05	U	
Naphthalene	0.5	U		0.5	U		0.5	U	
Phenanthrene	0.05	U		0.05	U		0.05	U	
Pyrene	0.05	U		0.05	U		0.05	U	

Data Qualifiers:
U -- Value is a non-detected result as reported by the laboratory.

Database source file: C:\PROJECTS\WARM_DV_200120\0120PAW.DBF data retrieved on: 04/24/00

Qualifier Codes:

A = **Lab Blank Contamination**
B = **Field Blank Contamination**
C = **Calibration (i.e., %RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance**
D = **MS/MSD Noncompliance**
E = **LCS/LCSD Noncompliance**
F = **Lab Duplicate Imprecision**
G = **Field Duplicate Imprecision**
H = **Holding Time Exceedance**
I = **ICP Serial Dilution Noncompliance**
J = **GFAA PDS – GFAA MSA's r < 0.995**
K = **ICP Interference – include ICSAB %R's**
L = **Instrument Calibration Range Exceedance**
M = **Sample Preservation**
N = **Internal Standard Noncompliance**
O = **Poor Instrument Performance (i.e., baseline drifting)**
P = **Uncertainty Near Detection Limit (< 2 x IDL for inorganics and < CRQL for organics)**
Q = **Other Problems (can encompass a number of issues)**
R = **Surrogates Recovery Noncompliance**
S = **Pesticide/PCB Resolution**
T = **% Breakdown Noncompliance for DDT and Endrin**
U = **Pesticide/PCB % Difference Between Columns for Positive Results**
V = **Non-linear Calibrations, Tuning r < 0.995 (correlation coefficient)**

APPENDIX B

Results as Reported by the Laboratory

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

lient: Tetra Tech NUS

Client Sample ID: SW-05-03Q

ate Sampled: 02/23/00

Date Sample Received: 2/24/00

latrix: Aqueous

Laboratory ID: 200120-01

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0228-B1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: $\mu g/L$ (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
cenaphthylene	ND	1.0
-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
cenaphthene	ND	0.50
luorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
luoranthene	ND	0.10
yrene	ND	0.050
Benzo(a)anthracene	ND	0.050
hrysene	ND	0.050
enzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
enzo(a)pyrene	ND	0.050
ibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

urrogate Compound	Recovery(%)	QC Limits(%)*
arbazole	100	25 - 157
p-Terphenyl-d14	110	25 - 157

for advisory purposes only

Reported by: TS

Approved by: HL

013

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-05-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 80

Laboratory ID: 200120-02

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 10

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	210
Acenaphthylene	ND	410
1-Methylnapthalene	ND	210
2-Methylnapthalene	ND	210
Acenaphthene	ND	210
Fluorene	170	41
Phenanthrene	1100	21
Anthracene	240	21
Fluoranthene	2300	41
Pyrene	1400	21
Benzo(a)anthracene	890	21
Chrysene	720	21
Benzo(b)fluoranthene	630	41
Benzo(k)fluoranthene	380	21
Benzo(a)pyrene	590	21
Dibenzo(a,h)anthracene	23J	41
Benzo(g,h,i)perylene	530	41
Indeno(1,2,3-cd)pyrene	340	21

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	180	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only

CO= Coeluted

Reported by: TS

Approved by: HC

014

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-04-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Aqueous

Laboratory ID: 200120-03

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0228-B1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	98	25 - 157
o-Terphenyl-d14	100	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: KC

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-04-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 85

Laboratory ID: 200120-04

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	97
Acenaphthylene	ND	190
1-Methylnapthalene	ND	97
2-Methylnapthalene	ND	97
Acenaphthene	ND	97
Fluorene	ND	19
Phenanthrene	260	9.7
Anthracene	43	9.7
Fluoranthene	830	19
Pyrene	530	9.7
Benzo(a)anthracene	450	9.7
Chrysene	400	9.7
Benzo(b)fluoranthene	410	19
Benzo(k)fluoranthene	250	9.7
Benzo(a)pyrene	390	9.7
Dibenzo(a,h)anthracene	20	19
Benzo(g,h,i)perylene	400	19
Indeno(1,2,3-cd)pyrene	230	9.7

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	151	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only CO= Coeluted

Reported by: TS

Approved by: HL

016

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-03-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Aqueous

Laboratory ID: 200120-05

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0228-B1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: $\mu g/L$ (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	99	25 - 157
p-Terphenyl-d14	100	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: HL

017

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-03-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 78

Laboratory ID: 200120-06

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	110
Acenaphthylene	ND	210
1-Methylnapthalene	ND	110
2-Methylnapthalene	ND	110
Acenaphthene	ND	110
Fluorene	68	21
Phenanthrene	420	11
Anthracene	79	11
Fluoranthene	1300	21
Pyrene	960	11
Benzo(a)anthracene	990	11
Chrysene	720	11
Benzo(b)fluoranthene	760	21
Benzo(k)fluoranthene	410	11
Benzo(a)pyrene	720	11
Dibenzo(a,h)anthracene	46	21
Benzo(g,h,i)perylene	720	21
Indeno(1,2,3-cd)pyrene	450	11

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	159	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only CO = Co-eluted

Reported by: TS

Approved by: HL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-02-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Aqueous

Laboratory ID: 200120-07

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0228-B1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
2-Methylnapthalene	ND	0.50
1-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	99	25 - 157
o-Terphenyl-d14	100	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: HL

019

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-02-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 73

Laboratory ID: 200120-08

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 10

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	230
Acenaphthylene	ND	450
1-Methylnapthalene	ND	230
2-Methylnapthalene	ND	230
Acenaphthene	ND	230
Fluorene	67	45
Phenanthrene	840	23
Anthracene	180	23
Fluoranthene	2700	45
Pyrene	1700	23
Benzo(a)anthracene	1700	23
Chrysene	1200	23
Benzo(b)fluoranthene	1000	45
Benzo(k)fluoranthene	550	23
Benzo(a)pyrene	1100	23
Dibenzo(a,h)anthracene	67	45
Benzo(g,h,i)perylene	1100	45
Indeno(1,2,3-cd)pyrene	660	23

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	224	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only

CO= Coeluted

Reported by: TS

Approved by: HL

020

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-01-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Aqueous

Laboratory ID: 200120-09

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0228-B1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	97	25 - 157
p-Terphenyl-d14	99	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: 021

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-01-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 82

Laboratory ID: 200120-10

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	100
Acenaphthylene	ND	200
1-Methylnapthalene	ND	100
2-Methylnapthalene	ND	100
Acenaphthene	ND	100
Fluorene	ND	20
Phenanthrene	320	10
Anthracene	59	10
Fluoranthene	1000	20
Pyrene	690	10
Benzo(a)anthracene	630	10
Chrysene	520	10
Benzo(b)fluoranthene	520	20
Benzo(k)fluoranthene	300	10
Benzo(a)pyrene	580	10
Dibenzo(a,h)anthracene	24	20
Benzo(g,h,i)perylene	550	20
Indeno(1,2,3-cd)pyrene	350	10

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	169	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only

CO= Coelured

Reported by: TG

Approved by: KL

022

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SS-01-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 75

Laboratory ID: 200120-11

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	110
Acenaphthylene	ND	220
1-Methylnapthalene	ND	110
2-Methylnapthalene	ND	110
Acenaphthene	ND	110
Fluorene	ND	22
Phenanthrene	200	11
Anthracene	32	11
Fluoranthene	620	22
Pyrene	600	11
Benzo(a)anthracene	390	11
Chrysene	340	11
Benzo(b)fluoranthene	270	22
Benzo(k)fluoranthene	160	11
Benzo(a)pyrene	330	11
Dibenzo(a,h)anthracene	14J	22
Benzo(g,h,i)perylene	340	22
Indeno(1,2,3-cd)pyrene	190	11

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	101	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only

CO=Coeluted

Reported by: TS

Approved by: KL

023

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SS-02-03Q

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Soil

Percent Solids: 87

Laboratory ID: 200120-12

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0302-B4

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	95
Acenaphthylene	ND	190
1-Methylnapthalene	ND	95
2-Methylnapthalene	ND	95
Acenaphthene	ND	95
Fluorene	ND	19
Phenanthrene	220	9.5
Anthracene	26	9.5
Fluoranthene	480	19
Pyrene	430	9.5
Benzo(a)anthracene	200	9.5
Chrysene	200	9.5
Benzo(b)fluoranthene	230	19
Benzo(k)fluoranthene	130	9.5
Benzo(a)pyrene	230	9.5
Dibenzo(a,h)anthracene	18J	19
Benzo(g,h,i)perylene	260	19
Indeno(1,2,3-cd)pyrene	160	9.5

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	118	22 - 167
p-Terphenyl-d14	CO	22 - 167

* for advisory purposes only

CO= Coeluted

TS

Reported by: _____

Approved by: HL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: RB-022300

Date Sampled: 02/23/00

Date Sample Received: 2/24/00

Matrix: Aqueous

Laboratory ID: 200120-13

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0228-B1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	120	25 - 157
-Terphenyl-d14	100	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: KL

025

APPENDIX C

Support Documentation

SDG Narrative

The enclosed data package is in response to Tetra Tech NUS, NAWC Warminster Project, Project No. CTO252, SDG No. SW0503. Under this SDG there are 13 PAH analyses for 6 aqueous and 7 soil samples which were received at Ceimic Corporation on February 24, 2000.

This data package includes the analyses for the following sample from SDG No. SW0503:

(1) Client ID	Ceimic ID	Analysis
SW-05-03Q	200120-01	PAH
SD-05-03Q	200120-02	PAH
SW-04-03Q	200120-03	PAH
SD-04-03Q	200120-04	PAH
SW-03-03Q	200120-05	PAH
SD-03-03Q	200120-06	PAH
SW-02-03Q	200120-07	PAH
SD-02-03Q	200120-08	PAH
SW-01-03Q	200120-09	PAH
SD-01-03Q	200120-10	PAH
SS-01-03Q	200120-11	PAH
SS-02-03Q	200120-12	PAH
RB-022300	200120-13	PAH

The submitted data covers the analyses of the PAH fraction and its associated blanks and QA/QC. CEIMIC would like to highlight the following points pertaining to the analyses performed for this case:

(2) Sample Receipt

All samples were received intact and properly preserved.

The cooler temperatures upon receipt are annotated on the Chain of Custodies and on the Ceimic Sample Receiving Checklist.

(3) Instrumentation and Column Identification

The following instruments were used for the analyses:

GC Analysis

A. PAH

HPLC_1: PAH (8310) LC1: Waters Millennium HPLC using 15.0 cm x 4.6 mm LC-PAH column.

(4) Sample Information

A. PAH Fraction Method 8310

All sample extracts were analyzed by HPLC/Photodiode Array Detection (PDA). The PDA provides the ultraviolet (UV) spectra of chromatographic peaks in order to compare them with the standard spectra of target analytes thereby providing the ability to positively confirm the presence of target analytes using spectral matching. PAH's are confirmed when the UV spectrum of a chromatographic peak that elutes in the retention time window of a PAH match the UV spectrum of the corresponding PAH. The UV spectra of PAH's detected in the sample were compared to the reference spectra of PAH standards stored in the library computer. The matching spectra are printed out and provided in the data package directly behind each sample quantitation report. Only positively matching spectra are provided for confirmation. Chromatographic peaks eluting in the retention time window of PAH's are not positively identified if the spectra do not match. Therefore non-matching spectra are not provided in the data package.

There was no matrix spike and matrix spike duplicate.

Terphenyl surrogate in the soil samples was masked by matrix and carbazole surrogate coeluted with carbazole in the sample.

Deviation from the SOW

None other than specified above.

End of SDG Narrative

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in computer-readable data submitted on diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Neil Pothier

Neil Pothier, Laboratory Manager

March 20, 2000

Date

Chain of Custody

Original Chain of Custody goes to Laboratory

200120

0219

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.: 6°C, 6°C, 5°C

Cooler #: 1-3

Samplers (please print): Seth Pulepko, Charles Meyer

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	1 Liter Amber PAH	pH	500ml Poly HNO3 TAL Metals except Hg Hardness	pH	250 Poly H2SO4 TOC	pH	8oz Clear w/dil HCl PAH TAL Metals except Hg	pH	40oz Clear w/H TOC	pH		pH		pH	Remarks
01	2/23/00	0858	Grab	SW-05-03Q	SW	4	2		1		1										
02	2/23/00	0901	Grab	SD-05-03Q	SD	2							1		1						
03	2/23/00	0918	Grab	SW-04-03Q	SW	4	2		1		1										
04	2/23/00	0922	Grab	SD-04-03Q	SD	2							1		1						
05	2/23/00	0940	Grab	SW-03-03Q	SW	4	2		1		1										
06	2/23/00	0945	Grab	SD-03-03Q	SD	2							1		1						
07	2/23/00	1010	Grab	SW-02-03Q	SW	4	2		1		1										
08	2/23/00	1015	Grab	SD-02-03Q	SD	2							1		1						
09	2/23/00	1040	Grab	SW-01-03Q	SW	4	2		1		1										
10	2/23/00	1045	Grab	SD-01-03Q	SD	2							1		1						

Ceimic Project #: 200120

Storage Location: 2,3

Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
Charles Meyer	2/23/00 1700		
		Received by Ceimic (signature): Karen Williamson	2/24/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810817875244

= Lab Use Only

Ceimic Corporation, 10 Dean Knauss Drive, Narragansett, RI 02882 - Tel: (401) 782-8900, Fax: (401) 782-8905

Chain of Custody

Original Chain of Custody goes to Laboratory

0213

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.: 6°C, 6°C, 5°C

Samplers (please print): Seth Pelepko, Charles Meyer

Cooler #: 1-3

Analyses

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	8oz Clear Wide PAH TAL Metals except Hg	pH	40z Clear Wide TOC	pH	1 Liter Amber PAH	pH	500 ml Poly HNO_3 TAL Metals except Hg Hardness	pH	250 ml Poly H_2SO_4 TOC	pH		pH		pH	Remarks
11	2/23/00	1115	Grab	SS-01-03Q	Sol	2	1		1												
12	2/23/00	1125	Grab	SS-02-03Q	Sol	2	1		1												
13	2/23/00	1350	Grab	RB-022300	Aq	4					2		1		1						

Celmic Project # 200120

Storage Location: 2,3

Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
Charles Meyer	2/23/00 1700		
Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
Relinquished by (signature)	Date/Time	Received by Celmic (signature)	Date/Time
		Karen Williamson	2/24/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810 817 875 294

= Lab Use Only

LABORATORY CONTROL SAMPLE SUMMARY
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Ceimic Project: 200120

Client: Tetra Tech NUS

Date Sample Extracted: 02/28/00

Blank Spike ID: PA0228-LCS1

Date Sample Analyzed: 03/11/00

Matrix: Aqueous

Associated Method Blank: PA0228-B1

Concentration in: μg/L (ppb)

Spike Compound	Spike Added	Blank Spike Result	Blank Spike Recovery(%)	QC Limits(%)*
Naphthalene	2.00	1.8	89	43 - 125
Acenaphthylene	4.00	3.3	82	49 - 125
1-Methylnapthalene	2.00	2.1	100	43 - 125
2-Methylnapthalene	2.00	1.7	87	43 - 125
Acenaphthene	2.00	1.8	89	43 - 130
Fluorene	0.40	0.35	88	53 - 125
Phenanthrene	0.20	0.18	91	52 - 129
Anthracene	0.20	0.15	73	54 - 125
Fluoranthene	0.40	0.36	89	42 - 125
Pyrene	0.20	0.21	100	55 - 125
Benzo(a)anthracene	0.20	0.18	90	39 - 135
Chrysene	0.20	0.19	96	59 - 134
Benzo(b)fluoranthene	0.40	0.38	95	31 - 137
Benzo(k)fluoranthene	0.20	0.19	94	60 - 129
Benzo(a)pyrene	0.20	0.13	66	52 - 125
Dibenzo(a,h)anthracene	0.40	0.37	91	51 - 125
Benzo(g,h,i)perylene	0.40	0.34	86	53 - 125
Indeno(1,2,3-cd)pyrene	0.20	0.17	86	55 - 125

* for advisory purposes only

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	98	25 - 157
p-Terphenyl-d14	100	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: HL

027

LABORATORY CONTROL SAMPLE SUMMARY
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Ceimic Project: 200120

Client: Tetra Tech NUS

Date Sample Extracted: 03/02/00

lank Spike ID: PA0302-LCS4

Date Sample Analyzed: 03/11/00

Matrix: Soil

Associated Method Blank: PA0302-B4

Concentration in: μg/Kg (ppb)+

pike Compound	Spike Added	Blank Spike Result	Blank Spike Recovery(%)	QC Limits(%)*
naphthalene	67.0	54	81	33 - 135
Acenaphthylene	130	97	75	39 - 135
Methylnapthalene	67.0	60	89	33 - 135
Methylnapthalene	67.0	57	86	33 - 135
Acenaphthene	67.0	62	93	33 - 140
luorene	13.0	14	100	43 - 135
enanthrene	6.70	8.0	120	42 - 139
Anthracene	6.70	3.8	57	44 - 135
Fluoranthene	13.0	11	87	32 - 135
yrene	6.70	5.6	83	45 - 135
enzo(a)anthracene	6.70	5.7	84	29 - 145
Chrysene	6.70	6.1	91	49 - 144
enzo(b)fluoranthene	13.0	13	98	25 - 147
enzo(k)fluoranthene	6.70	6.2	92	50 - 139
Benzo(a)pyrene	6.70	3.5	53	42 - 135
Dibenzo(a,h)anthracene	13.0	13	98	41 - 135
enzo(g,h,i)perylene	13.0	13	98	43 - 135
ndeno(1,2,3-cd)pyrene	6.70	6.1	91	45 - 135

for advisory purposes only
Dry weight basis.

Surrogate Spike Recovery

rrogate Compound	Recovery(%)	QC Limits(%)*
arbazole	100	22 - 167
Terphenyl-d14	100	22 - 167

* for advisory purposes only

eported by: TS

Approved by: AL

028

METHOD BLANK
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Blank ID: PA0228-B1

Matrix: Aqueous

Ceimic Project: 200120

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	95	25 - 157
p-Terphenyl-d14	96	25 - 157

* for advisory purposes only

Reported by: TS

Approved by: R

030

METHOD BLANK
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

lank ID: PA0302-B4

Matrix: Soil

Ceimic Project: 200120

Date Sample Extracted: 03/02/00

Date Sample Analyzed: 03/11/00

Concentration in: μg/Kg (ppb)

arget Analyte	Sample Concentration	Quantitation Limit
aphthalene	ND	17
Acenaphthylene	ND	33
1-Methylnapthalene	ND	17
Methylnapthalene	ND	17
enaphthene	ND	17
Fluorene	ND	3.3
henanthrene	ND	1.7
nthracene	ND	1.7
Fluoranthene	ND	3.3
Pyrene	ND	1.7
enzo(a)anthracene	ND	1.7
hrysene	ND	1.7
Benzo(b)fluoranthene	ND	3.3
enzo(k)fluoranthene	ND	1.7
enzo(a)pyrene	ND	1.7
Dibenzo(a,h)anthracene	ND	3.3
enzo(g,h,i)perylene	ND	3.3
deno(1,2,3-cd)pyrene	ND	1.7

ND = Not detected
Dry weight basis.

Surrogate Spike Recovery

rrogate Compound	Recovery(%)	QC Limits(%)*
arbazole	110	22 - 167
Terphenyl-d14	100	22 - 167

* for advisory purposes only

eported by: TS

Approved by: HL

031

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14191

TO:	GARTH GLENN	DATE:	May 19, 2000
FROM:	JAMES LUCCHESE	COPIES:	FILE

SUBJECT: **ORGANIC DATA VALIDATION – POLYNUCLEAR AROMATIC HYDROCARBONS CTO252, NAWC WARMINSTER, PENNSYLVANIA SDG NO. SW0803**

SAMPLES:

10/Aqueous

RB-022200	SW-10-03Q
SW-06-03Q	SW-11-03Q
SW-07-03Q	SW-12-03Q
SW-08-03Q	SW-13-03Q
SW-09-03Q	SW-21-03Q

9/Solid

SD-06-03Q	SD-10-03Q	SD-21-03Q
SD-07-03Q	SD-11-03Q	
SD-08-03Q	SD-12-03Q	
SD-09-03Q	SD-13-03Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, SDG SW0803, consists of 9 aqueous environmental samples, (designated SW), one rinsate blank (designated RB-), and 9 solid environmental samples (designated SD-). All samples were analyzed for polynuclear aromatic hydrocarbons (PAHs). Two field duplicate pairs (SW-07-03Q/SW-21-03Q, and SD-07-03Q/SD-21-03Q) were included in this sample set.

The samples were collected by Tetra Tech NUS, Inc. on February 22, 2000 and analyzed by Ceimic Corporation.

All analyses were conducted following SW846 Method 8310.

SUMMARY

All analytes were successfully analyzed in all samples. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, calibration data, laboratory and field quality control blank results, surrogate spike recoveries, matrix spike/matrix spike duplicate results, compound identification, and compound quantitation.

Areas of concern with respect to data quality are listed on the following page.

MINOR PROBLEMS

- Positive results at concentration levels less than the sample quantitation limit have been qualified (J), estimated.

EXECUTIVE SUMMARY

Laboratory Performance: Surrogate spike recoveries for carbazole in the soil matrix exceeded the upper QC limit due to the presence of carbazole in the sample.

Other Factors Affecting Data Quality: Surrogate spike recoveries for p-Terphenyl-d14 in the soil matrix were zero for all samples due to masking of the surrogate in the matrix. No actions were required as a result of these problems.

The data for these analyses were reviewed with reference to the EPA "National Functional Guidelines for Organic Data Review", September 1994 revision, as amended for use within EPA Region 3, and the Naval Facilities Engineering Support Center (NFESC) guidelines entitled "Naval Installation Restoration Laboratory Quality Assurance Guide" (Interim Document; February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS, Inc.

James Lucchese
CLEAN Data Validator

Tetra Tech NUS, Inc.

Russell Sloboda
CLEAN Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

Qualified Analytical Results

Appendix A
Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	RB-022200			SW-06-03Q			SW-07-03Q		
Laboratory ID:	200115-09			200115-05			200115-03		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/L**			**ug/L**			**ug/L**		
1-Methylnapthalene	0.5	U		0.5	U		0.5	U	
2-Methylnapthalene	0.5	U		0.5	U		0.5	U	
Acenaphthene	0.5	U		0.5	U		0.5	U	
Acenaphthylene	1	U		1	U		1	U	
Anthracene	0.05	U		0.05	U		0.05	U	
Benz(a)anthracene	0.05	U		0.05	U		0.05	U	
Benzo(a)pyrene	0.05	U		0.05	U		0.05	U	
Benzo(b)fluoranthene	0.1	U		0.1	U		0.1	U	
Benzo(g,h,i)perylene	0.1	U		0.1	U		0.1	U	
Benzo(k)fluoranthene	0.05	U		0.05	U		0.05	U	
Chrysene	0.05	U		0.05	U		0.05	U	
Dibenz(a,h)anthracene	0.1	U		0.1	U		0.1	U	
Fluoranthene	0.1	U		0.1	U		0.1	U	
Fluorene	0.1	U		0.1	U		0.1	U	
Indeno(1,2,3-cd)pyrene	0.05	U		0.05	U		0.05	U	
Naphthalene	0.5	U		0.5	U		0.5	U	
Phenanthrene	0.05	U		0.05	U		0.05	U	
Pyrene	0.05	U		0.05	U		0.05	U	

Appendix A
Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	SW-08-03Q			SW-09-03Q			SW-10-03Q		
Laboratory ID:	200115-01			200115-18			200115-16		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/L**			**ug/L**			**ug/L**		
1-Methylnapthalene	0.5	U		0.5	U		0.5	U	
2-Methylnapthalene	0.5	U		0.5	U		0.5	U	
Acenaphthene	0.5	U		0.5	U		0.5	U	
Acenaphthylene	1	U		1	U		1	U	
Anthracene	0.05	U		0.05	U		0.05	U	
Benz(a)anthracene	0.05	U		0.05	U		0.05	U	
Benzo(a)pyrene	0.05	U		0.05	U		0.05	U	
Benzo(b)fluoranthene	0.1	U		0.1	U		0.1	U	
Benzo(g,h,i)perylene	0.1	U		0.1	U		0.1	U	
Benzo(k)fluoranthene	0.05	U		0.05	U		0.05	U	
Chrysene	0.05	U		0.05	U		0.05	U	
Dibenz(a,h)anthracene	0.1	U		0.1	U		0.1	U	
Fluoranthene	0.1	U		0.1	U		0.1	U	
Fluorene	0.1	U		0.1	U		0.1	U	
Indeno(1,2,3-cd)pyrene	0.05	U		0.05	U		0.05	U	
Naphthalene	0.5	U		0.5	U		0.5	U	
Phenanthrene	0.05	U		0.05	U		0.05	U	
Pyrene	0.05	U		0.05	U		0.05	U	

Analytical Results for Water Samples
CTO252 Warminster, PA

Sample ID:	SW-11-03Q			SW-12-03Q			SW-13-03Q		
Laboratory ID:	200115-15			200115-12			200115-10		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/L**			**ug/L**			**ug/L**		
1-Methylnapthalene	0.5	U		0.5	U		0.5	U	
2-Methylnapthalene	0.5	U		0.5	U		0.5	U	
Acenaphthene	0.5	U		0.5	U		0.5	U	
Acenaphthylene	1	U		1	U		1	U	
Anthracene	0.05	U		0.05	U		0.05	U	
Benz(a)anthracene	0.05	U		0.05	U		0.05	U	
Benzo(a)pyrene	0.05	U		0.05	U		0.05	U	
Benzo(b)fluoranthene	0.1	U		0.1	U		0.1	U	
Benzo(g,h,i)perylene	0.1	U		0.1	U		0.1	U	
Benzo(k)fluoranthene	0.05	U		0.05	U		0.05	U	
Chrysene	0.05	U		0.05	U		0.05	U	
Dibenz(a,h)anthracene	0.1	U		0.1	U		0.1	U	
Fluoranthene	0.1	U		0.1	U		0.1	U	
Fluorene	0.1	U		0.1	U		0.1	U	
Indeno(1,2,3-cd)pyrene	0.05	U		0.05	U		0.05	U	
Naphthalene	0.5	U		0.5	U		0.5	U	
Phenanthrene	0.05	U		0.05	U		0.05	U	
Pyrene	0.05	U		0.05	U		0.05	U	

alyti Resu r W Sar s
CTO252 Warminster, PA

Sample ID:	SW-21-03Q		
Laboratory ID:	200115-07		
Sample Date:	02/22/00		
QC Sample Type:	NORMAL		
	RESULT	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/L**		
1-Methylnapthalene	0.5	U	
2-Methylnapthalene	0.5	U	
Acenaphthene	0.5	U	
Acenaphthylene	1	U	
Anthracene	0.05	U	
Benz(a)anthracene	0.05	U	
Benzo(a)pyrene	0.05	U	
Benzo(b)fluoranthene	0.1	U	
Benzo(g,h,i)perylene	0.1	U	
Benzo(k)fluoranthene	0.05	U	
Chrysene	0.05	U	
Dibenz(a,h)anthracene	0.1	U	
Fluoranthene	0.1	U	
Fluorene	0.1	U	
Indeno(1,2,3-cd)pyrene	0.05	U	
Naphthalene	0.5	U	
Phenanthrene	0.05	U	
Pyrene	0.05	U	

Data Qualifiers:
U -- Value is a non-detected result as reported by the laboratory.

Database source file: C:\PROJECTS\WARM_DV_200120\0115PAW.DBF data retrieved on: 04/24/00

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-06-03Q			SD-07-03Q			SD-08-03Q		
Laboratory ID:	200115-06			200115-04			200115-02		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	17.0			20.0			22.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/kg**			**ug/kg**			**ug/kg**		
1-Methylnapthalene	99	U		1000	U		110	U	
2-Methylnapthalene	99	U		1000	U		110	U	
Acenaphthene	99	U		1000	U		110	U	
Acenaphthylene	200	U		2100	U		210	U	
Anthracene	79			1300			56		
Benz(a)anthracene	510			5100			400		
Benzo(a)pyrene	470			2300			360		
Benzo(b)fluoranthene	430			2700			320		
Benzo(g,h,i)perylene	590			1900			320		
Benzo(k)fluoranthene	220			1400			150		
Chrysene	520			3400			390		
Dibenz(a,h)anthracene	20	J	P	150	J	P	26		
Fluoranthene	1200			13000			870		
Fluorene	64			680			21	U	
Indeno(1,2,3-cd)pyrene	250			1400			200		
Naphthalene	99	U		1000	U		110	U	
Phenanthrene	590			7200			300		
Pyrene	660			6800			480		

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-09-03Q			SD-10-03Q			SD-11-03Q		
Laboratory ID:	200115-19			200115-17			200115-14		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	18.0			17.0			19.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/kg**			**ug/kg**			**ug/kg**		
1-Methylnapthalene	100	U		1200	U		410	U	
2-Methylnapthalene	100	U		1200	U		410	U	
Acenaphthene	100	U		1200	U		410	U	
Acenaphthylene	200	U		2400	U		820	U	
Anthracene	88			1500			260		
Benz(a)anthracene	490			6000			1400		
Benzo(a)pyrene	440			3700			1200		
Benzo(b)fluoranthene	400			4200			1300		
Benzo(g,h,i)perylene	470			3900			1100		
Benzo(k)fluoranthene	210			1900			710		
Chrysene	500			4500			1400		
Dibenz(a,h)anthracene	20	U		180	J	P	45	J	P
Fluoranthene	990			7900			2800		
Fluorene	20	U		240	U		120		
Indeno(1,2,3-cd)pyrene	210			2100			630		
Naphthalene	100	U		1200	U		410	U	
Phenanthrene	440			1800			1400		
Pyrene	660			7900			2600		

Appendix A
Analytical Results for Soil Samples
CTO252 Warminster, PA

Sample ID:	SD-12-03Q			SD-13-03Q			SD-21-03Q		
Laboratory ID:	200115-13			200115-11			200115-08		
Sample Date:	02/22/00			02/22/00			02/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	21.0			28.0			18.0		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
POLYNUCLEAR AROMATIC HYDROCARBONS	**ug/kg**			**ug/kg**			**ug/kg**		
1-Methylnapthalene	100	U		690	U		1000	U	
2-Methylnapthalene	100	U		690	U		1000	U	
Acenaphthene	100	U		690	U		1000	U	
Acenaphthylene	210	U		1400	U		2000	U	
Anthracene	84			600			1200		
Benz(a)anthracene	770			3200			4000		
Benzo(a)pyrene	720			2500			1700		
Benzo(b)fluoranthene	650			3000			2100		
Benzo(g,h,i)perylene	770			2100			1500		
Benzo(k)fluoranthene	380			1600			1100		
Chrysene	780			3300			2600		
Dibenz(a,h)anthracene	26			110	J	P	73	J	P
Fluoranthene	1300			7800			11000		
Fluorene	21	U		330			690		
Indeno(1,2,3-cd)pyrene	390			1400			990		
Naphthalene	100	U		690	U		1000	U	
Phenanthrene	500			3500			6900		
Pyrene	1100			5900			5300		

Data Qualifiers:
J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).
U -- Value is a non-detected result as reported by the laboratory.

Database source file: C:\PROJECTS\WARM_DV_200120\WA0115PAS.DBF data retrieved on: 04/27/00

Qualifier Codes:

A = **Lab Blank Contamination**
B = **Field Blank Contamination**
C = **Calibration (i.e., %RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance**
D = **MS/MSD Noncompliance**
E = **LCS/LCSD Noncompliance**
F = **Lab Duplicate Imprecision**
G = **Field Duplicate Imprecision**
H = **Holding Time Exceedance**
I = **ICP Serial Dilution Noncompliance**
J = **GFAA PDS – GFAA MSA's r < 0.995**
K = **ICP Interference – include ICSAB %R's**
L = **Instrument Calibration Range Exceedance**
M = **Sample Preservation**
N = **Internal Standard Noncompliance**
O = **Poor Instrument Performance (i.e., baseline drifting)**
P = **Uncertainty Near Detection Limit (< 2 x IDL for inorganics and < CRQL for organics)**
Q = **Other Problems (can encompass a number of issues)**
R = **Surrogates Recovery Noncompliance**
S = **Pesticide/PCB Resolution**
T = **% Breakdown Noncompliance for DDT and Endrin**
U = **Pesticide/PCB % Difference Between Columns for Positive Results**
V = **Non-linear Calibrations, Tuning r < 0.995 (correlation coefficient)**

APPENDIX B

Results as Reported by the Laboratory

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

ient Sample ID: SW-08-03Q

Date Sampled: 02/22/00

ate Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-01

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

rget Analyte	Sample Concentration	Quantitation Limit
phthalene	ND	0.50
cenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
Methylnapthalene	ND	0.50
enaphthene	ND	0.50
Fluorene	ND	0.10
enanthrene	ND	0.050
thracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
nzo(a)anthracene	ND	0.050
rysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
nzo(k)fluoranthene	ND	0.050
nzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
nzo(g,h,i)perylene	ND	0.10
leno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	95	25 - 157
p-Terphenyl-d14	94	25 - 157

* or advisory purposes only

Reported by: TS

Approved by: JL

0013

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-08-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 78

Laboratory ID: 200115-02

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	110
Acenaphthylene	ND	210
1-Methylnapthalene	ND	110
2-Methylnapthalene	ND	110
Acenaphthene	ND	110
Fluorene	ND	21
Phenanthrene	300	11
Anthracene	56	11
Fluoranthene	870	21
Pyrene	480	11
Benzo(a)anthracene	400	11
Chrysene	390	11
Benzo(b)fluoranthene	320	21
Benzo(k)fluoranthene	150	11
Benzo(a)pyrene	360	11
Dibenzo(a,h)anthracene	26	21
Benzo(g,h,i)perylene	320	21
Indeno(1,2,3-cd)pyrene	200	11

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	134	22 - 167
p-Terphenyl-d14	0	22 - 167

* for advisory purposes only

Reported by: TS

Approved by: NL

0014

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

lient: Tetra Tech NUS

Client Sample ID: SW-07-03Q

ate Sampled: 02/22/00

Date Sample Received: 2/23/00

atrix: Aqueous

Laboratory ID: 200115-03

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
cenaphthylene	ND	1.0
-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
enaphthene	ND	0.50
uorene	ND	0.10
Phenanthrene	ND	0.050
nthracene	ND	0.050
uoranthene	ND	0.10
rene	ND	0.050
Benzo(a)anthracene	ND	0.050
rysene	ND	0.050
nzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
nzo(a)pyrene	ND	0.050
benzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

D = Not detected

Surrogate Spike Recovery

rrogate Compound	Recovery(%)	QC Limits(%)*
rbazole	110	25 - 157
p-Terphenyl-d14	110	25 - 157

or advisory purposes only

0015

ported by: TS

Approved by: WL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-07-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 80

Laboratory ID: 200115-04

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 50

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	1000
Acenaphthylene	ND	2100
1-Methylnapthalene	ND	1000
2-Methylnapthalene	ND	1000
Acenaphthene	ND	1000
Fluorene	680	210
Phenanthrene	7200	100
Anthracene	1300	100
Fluoranthene	13000	210
Pyrene	6800	100
Benzo(a)anthracene	5100	100
Chrysene	3400	100
Benzo(b)fluoranthene	2700	210
Benzo(k)fluoranthene	1400	100
Benzo(a)pyrene	2300	100
Dibenzo(a,h)anthracene	150J	210
Benzo(g,h,i)perylene	1900	210
Indeno(1,2,3-cd)pyrene	1400	100

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	476	22 - 167
p-Terphenyl-d14	0	22 - 167

* for advisory purposes only

Reported by: TS

Approved by: KR

0016

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

:lient: Tetra Tech NUS

Client Sample ID: SW-06-03Q

)ate Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-05

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: $\mu g/L$ (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
cenaphthylene	ND	1.0
-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
cenaphthene	ND	0.50
luorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
luoranthene	ND	0.10
yrene	ND	0.050
Benzo(a)anthracene	ND	0.050
hrysene	ND	0.050
enzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
enzo(a)pyrene	ND	0.050
ibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

D = Not detected

Surrogate Spike Recovery

urrogate Compound	Recovery(%)	QC Limits(%)*
arbazole	93	25 - 157
p-Terphenyl-d14	96	25 - 157

for advisory purposes only

0017

eported by: TS

Approved by: HL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-06-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 83

Laboratory ID: 200115-06

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	99
Acenaphthylene	ND	200
1-Methylnapthalene	ND	99
2-Methylnapthalene	ND	99
Acenaphthene	ND	99
Fluorene	64	20
Phenanthrene	590	9.9
Anthracene	79	9.9
Fluoranthene	1200	20
Pyrene	660	9.9
Benzo(a)anthracene	510	9.9
Chrysene	520	9.9
Benzo(b)fluoranthene	430	20
Benzo(k)fluoranthene	220	9.9
Benzo(a)pyrene	470	9.9
Dibenzo(a,h)anthracene	20J	20
Benzo(g,h,i)perylene	590	20
Indeno(1,2,3-cd)pyrene	250	9.9

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	209	22 - 167
p-Terphenyl-d14	0	22 - 167

* for advisory purposes only

TS KR

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

ient Sample ID: SW-21-03Q

Date Sampled: 02/22/00

ate Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-07

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

rget Analyte	Sample Concentration	Quantitation Limit
phthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2 Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
enanthrene	ND	0.050
thracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
nzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
nzo(k)fluoranthene	ND	0.050
nzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
nzo(g,h,i)perylene	ND	0.10
leno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	96	25 - 157
Terphenyl-d14	99	25 - 157

* for advisory purposes only

0019

Reported by: TS

Approved by: HL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-21-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 82

Laboratory ID: 200115-08

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 50

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit	RPD
Naphthalene	ND	1000	
Acenaphthylene	ND	2000	
1-Methylnapthalene	ND	1000	
2-Methylnapthalene	ND	1000	
Acenaphthene	ND	1000	
Fluorene	690	200	1.56
Phenanthrene	6900	100	4.26
Anthracene	1200	100	8.00
Fluoranthene	11000	200	16.67
Pyrene	5300	100	24.79
Benzo(a)anthracene	4000	100	24.18
Chrysene	2600	100	26.67
Benzo(b)fluoranthene	2100	200	25.00
Benzo(k)fluoranthene	1100	100	24.00
Benzo(a)pyrene	1700	100	30.00
Dibenzo(a,h)anthracene	73J	200	69.06
Benzo(g,h,i)perylene	1500	200	23.53
Indeno(1,2,3-cd)pyrene	990	100	34.31

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	1185	22 - 167
p-Terphenyl-d14	0	22 - 167

* for advisory purposes only

0020

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

lient: Tetra Tech NUS

Client Sample ID: RB-022200

ate Sampled: 02/22/00

Date Sample Received: 2/23/00

atrix: Aqueous

Laboratory ID: 200115-09

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
enaphthylene	ND	1.0
Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
enaphthene	ND	0.50
lorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
loranthene	ND	0.10
rene	ND	0.050
Benzo(a)anthracene	ND	0.050
rysene	ND	0.050
nzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
benzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	110	25 - 157
p-Terphenyl-d14	98	25 - 157

*For advisory purposes only

0021

Reported by: TS

Approved by: KL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-13-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-10

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	95	25 - 157
p-Terphenyl-d14	100	25 - 157

* for advisory purposes only

0022

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

lient: Tetra Tech NUS

Client Sample ID: SD-13-03Q

ate Sampled: 02/22/00

Date Sample Received: 2/23/00

atrix: Soil

Percent Solids: 72

Laboratory ID: 200115-11

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/15/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 30

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	690
cenaphthylene	ND	1400
Methylnapthalene	ND	690
2-Methylnapthalene	ND	690
cenaphthene	ND	690
uorene	330	140
Phenanthrene	3500	69
Anthracene	600	69
uoranthene	7800	140
yrene	5900	69
Benzo(a)anthracene	3200	69
rysene	3300	69
nzo(b)fluoranthene	3000	140
Benzo(k)fluoranthene	1600	69
nzo(a)pyrene	2500	69
benzo(a,h)anthracene	110J	140
Benzo(g,h,i)perylene	2100	140
Indeno(1,2,3-cd)pyrene	1400	69

D = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
arbazole	1089	22 - 167
p-Terphenyl-d14	0	22 - 167

or advisory purposes only

0023

eported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-12-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-12

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	98	25 - 157
p-Terphenyl-d14	100	25 - 157

* for advisory purposes only

0024

Reported by: TS

Approved by: HL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-12-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 79

Laboratory ID: 200115-13

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	100
Acenaphthylene	ND	210
1-Methylnapthalene	ND	100
2-Methylnapthalene	ND	100
Acenaphthene	ND	100
Fluorene	ND	21
Phenanthrene	500	10
Anthracene	84	10
Fluoranthene	1300	21
Pyrene	1100	10
Benzo(a)anthracene	770	10
Chrysene	780	10
Benzo(b)fluoranthene	650	21
Benzo(k)fluoranthene	380	10
Benzo(a)pyrene	720	10
Dibenzo(a,h)anthracene	26	21
Benzo(g,h,i)perylene	770	21
Indeno(1,2,3-cd)pyrene	390	10

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	223	22 - 167
p-Terphenyl-d14	0	22 - 167

*for advisory purposes only

0025

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-11-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 81

Laboratory ID: 200115-14

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 20

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	410
Acenaphthylene	ND	820
1-Methylnapthalene	ND	410
2-Methylnapthalene	ND	410
Acenaphthene	ND	410
Fluorene	120	82
Phenanthrene	1400	41
Anthracene	260	41
Fluoranthene	2800	82
Pyrene	2600	41
Benzo(a)anthracene	1400	41
Chrysene	1400	41
Benzo(b)fluoranthene	1300	82
Benzo(k)fluoranthene	710	41
Benzo(a)pyrene	1200	41
Dibenzo(a,h)anthracene	45J	82
Benzo(g,h,i)perylene	1100	82
Indeno(1,2,3-cd)pyrene	630	41

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	492	22 - 167
p-Terphenyl-d14	0	22 - 167

* for advisory purposes only

Reported by: TS

Approved by: [illegible]

0026

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

:lient: Tetra Tech NUS

Client Sample ID: SD-11-03Qms

ıate Sampled: 02/22/00

Date Sample Received: 2/23/00

Iatrix: Soil

Percent Solids: 81

Laboratory ID: 200115-14 MS

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 20

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	410
cenaphthylene	ND	820
-Methylnapthalene	ND	410
Methylnapthalene	ND	410
enaphthene	ND	410
uorene	230	82
Phenanthrene	2600	41
nthracene	570	41
uoranthene	5200	82
yrene	4700	41
Benzo(a)anthracene	2300	41
hrysene	2300	41
enzo(b)fluoranthene	2200	82
Benzo(k)fluoranthene	1300	41
enzo(a)pyrene	1900	41
ibenzo(a,h)anthracene	110	82
Benzo(g,h,i)perylene	1700	82
Indeno(1,2,3-cd)pyrene	1000	41

D = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	892	22 - 167
p-Terphenyl-d14	0	22 - 167

for advisory purposes only

0027

eported by: TS

Approved by: KL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-11-03Qmsd

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 81

Laboratory ID: 200115-14 MSD

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 20

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	410
Acenaphthylene	ND	820
1-Methylnapthalene	ND	410
2-Methylnapthalene	ND	410
Acenaphthene	ND	410
Fluorene	680	82
Phenanthrene	8200	41
Anthracene	2000	41
Fluoranthene	17000	82
Pyrene	15000	41
Benzo(a)anthracene	7700	41
Chrysene	6300	41
Benzo(b)fluoranthene	5200	82
Benzo(k)fluoranthene	2500	41
Benzo(a)pyrene	4900	41
Dibenzo(a,h)anthracene	300	82
Benzo(g,h,i)perylene	3800	82
Indeno(1,2,3-cd)pyrene	2600	41

ND = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	3220	22 - 167
p-Terphenyl-d14	0	22 - 167

* for advisory purposes only

03/28

Reported by: TS

Approved by: WL

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-11-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-15

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: $\mu g/L$ (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	85	25 - 157
p-Terphenyl-d14	90	25 - 157

* for advisory purposes only

0029

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-10-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-16

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	99	25 - 157
p-Terphenyl-d14	100	25 - 157

* for advisory purposes only

0030

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

'lient: Tetra Tech NUS

Client Sample ID: SD-10-03Q

'ate Sampled: 02/22/00

Date Sample Received: 2/23/00

Iatrix: Soil

Percent Solids: 83

Laboratory ID: 200115-17

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 60

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	1200
cenaphthylene	ND	2400
Methylnapthalene	ND	1200
2-Methylnapthalene	ND	1200
cenaphthene	ND	1200
uorene	ND	240
Phenanthrene	1800	120
Anthracene	1500	120
uoranthene	7900	240
yrene	7900	120
Benzo(a)anthracene	6000	120
rysene	4500	120
nzo(b)fluoranthene	4200	240
Benzo(k)fluoranthene	1900	120
nzo(a)pyrene	3700	120
benzo(a,h)anthracene	180J	240
Benzo(g,h,i)perylene	3900	240
Indeno(1,2,3-cd)pyrene	2100	120

D = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	750	22 - 167
p-Terphenyl-d14	0	22 - 167

or advisory purposes only

0031

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-09-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Laboratory ID: 200115-18

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	91	25 - 157
p-Terphenyl-d14	94	25 - 157

* for advisory purposes only

0032

Reported by: TS

Approved by: [illegible]

TARGET COMPOUND LIST (TCL)
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

:lient: Tetra Tech NUS

Client Sample ID: SD-09-03Q

)ate Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 82

Laboratory ID: 200115-19

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/12/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 5

Concentration in: μg/Kg (ppb)+

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	100
cenaphthylene	ND	200
Methylnapthalene	ND	100
2-Methylnapthalene	ND	100
cenaphthene	ND	100
luorene	ND	20
Phenanthrene	440	10
Anthracene	88	10
luoranthene	990	20
yrene	660	10
Benzo(a)anthracene	490	10
hrysene	500	10
enzo(b)fluoranthene	400	20
Benzo(k)fluoranthene	210	10
Benzo(a)pyrene	440	10
ibenzo(a,h)anthracene	ND	20
Benzo(g,h,i)perylene	470	20
Indeno(1,2,3-cd)pyrene	210	10

D = Not detected
+ Dry weight basis.

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
arbazole	220	22 - 167
p-Terphenyl-d14	0	22 - 167

for advisory purposes only

0033

Reported by: TS

Approved by: [illegible]

APPENDIX C

Support Documentation

SDG Narrative

The enclosed data package is in response to Tetra Tech NUS, NAWC Warminster Project, Project No. CTO252, SDG No. SW0803. Under this SDG there are 23 PAH analyses for 10 aqueous and 9 soil samples which were received at Ceimic Corporation on February 23, 2000.

This data package includes the analyses for the following sample from SDG No. SW0803:

(1)

Client ID	Ceimic ID	Analysis
SW-08-03Q	200115-01	PAH
SD-08-03Q	200115-02	PAH
SW-07-03Q	200115-03	PAH
SD-07-03Q	200115-04	PAH
SW-06-03Q	200115-05	PAH
SD-06-03Q	200115-06	PAH
SW-21-03Q	200115-07	PAH
SD-21-03Q	200115-08	PAH
RB-022200	200115-09	PAH
SW-13-03Q	200115-10	PAH
SD-13-03Q	200115-11	PAH
SW-12-03Q	200115-12	PAH
SD-12-03Q	200115-13	PAH
SD-11-03Q MS/MSD	200115-14 MS/MSD	PAH
SW-11-03Q MS/MSD	200115-15 MS/MSD	PAH
SW-10-03Q	200115-16	PAH
SD-10-03Q	200115-17	PAH
SW-09-03Q	200115-18	PAH
SD-09003Q	200115-19	PAH

The submitted data covers the analyses of the PAH fraction and its associated blanks and QA/QC. CEIMIC would like to highlight the following points pertaining to the analyses performed for this case:

(2) Sample Receipt

All samples were received intact and properly preserved.

The cooler temperatures upon receipt are annotated on the Chain of Custodies and on the Ceimic Sample Receiving Checklist.

(3) Instrumentation and Column Identification

The following instruments were used for the analyses:

GC Analysis

A. PAH

HPLC_1: PAH (8310) LC1: Waters Millennium HPLC using 15.0 cm x 4.6 mm LC-PAH column.

(4) Sample Information

A. PAH Fraction Method 8310

All sample extracts were analyzed by HPLC/Photodiode Array Detection (PDA). The PDA provides the ultraviolet (UV) spectra of chromatographic peaks in order to compare them with the standard spectra of target analytes thereby providing the ability to positively confirm the presence of target analytes using spectral matching. PAH's are confirmed when the UV spectrum of a chromatographic peak that elutes in the retention time window of a PAH match the UV spectrum of the corresponding PAH. The UV spectra of PAH's detected in the sample were compared to the reference spectra of PAH standards stored in the library computer. The matching spectra are printed out and provided in the data package directly behind each sample quantitation report. Only positively matching spectra are provided for confirmation. Chromatographic peaks eluting in the retention time window of PAH's are not positively identified if the spectra do not match. Therefore non-matching spectra are not provided in the data package.

Soil matrix spike and matrix spike duplicate recoveries of sample SD-11-03Q are outside the QC limits, due to matrix interference. The sample contains large amounts of target analytes and is apparently also nonhomogenious. The MS/MSD had to be analyzed at a 20X dilution. At this dilution, the concentration of the added matrix spike is below the detection limit. Also, surrogate recoveries are outside the QC limits because of coelution.

Terphenyl surrogate in the soil samples was masked by matrix and carbazole surrogate coeluted with carbazole in the sample. Aqueous sample surrogates were unaffected.

A new ICAL 0313B was needed. For samples analyzed on 03/14/00 the retention times were updated from the continuing calibration verification CCAL 0314A.

Naphthalene eluted a few seconds early in CCAL0310K. Naphthalene was not detected in any of the samples.

Deviation from the SOW

None other than specified above.

End of SDG Narrative

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in computer-readable data submitted on diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Neil Pothier, Laboratory Manager

March 17, 2000
Date

Chain of Custody

Original Chain of Custody goes to Laboratory

(13)

0971

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.

Cooler #

Samplers (please print): Seth Pelepko, Charles Meyer

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	1 Liter Amber PAH	pH	500ml Poly HNO3 TAL Metals except Hg Hardness	pH	250 poly H2SO4 TOC	pH	8oz clear WM PAH TAL Metals except Hg	pH	40z clear WM TOC	pH		pH		pH	Remarks
10	2/22/00	0906	Grab	SW-13-03Q	SW	4	2		1		1										
11	2/22/00	0915	Grab	SD-13-03Q	SD	2							1		1						
12	2/22/00	0930	Grab	SW-12-03Q	SW	4	2		1		1										
13	2/22/00	0935	Grab	SD-12-03Q	SD	2							1		1						
14	2/22/00	1015	Grab	SD-11-03Q	SD	4							2		2						DO MS/MSD
15	2/22/00	1010	Grab	SW-11-03Q	SW	12	6		3		3										
16	2/22/00	1100	Grab	SW-10-03Q	SW	4	2		1		1										
17	2/22/00	1105	Grab	SD-10-03Q	SD	2							1		1						
18	2/22/00	1120	Grab	SW-09-03Q	SW	4	2		1		1										
19	2/22/00	1125	Grab	SD-09-03Q	SD	2							1		1						

Ceimic Project # 200115

Storage Location 0000 13

Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
[signature]	2/22/00 1900		
		Received by Ceimic (signature): Lori Williamson	2/23/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810817875206

= Lab Use Only

Chain of Custody

Original Chain of Custody goes to Laboratory (13)

0972

Project # 6883 CTO 252

Project Name: NAWC Warminster

Cooler Temp.:

Cooler #: 1-4

Samplers (please print): Seth Pelepko Charles Meyer

Lab ID	Date	Time	Comp. / Grab	Sample Identification	Sample Matrix	No. of Containers	1 Liter Amber PAH	pH	500 ml Poly HNO3 TAL metals except Hg Hardness	pH	250 poly H2SO4 TOC	pH	8 oz Clear w/Hg PAH, TAL Metals except Hg	pH	40 oz Clear w/H TOC	pH		pH		pH	Remarks
01	2/22/00	1200	Grab	SW-08-03Q	SW	4	2		1		1										
02	2/22/00	1205	Grab	SD-08-03Q	SD	2							1		1						
03	2/22/00	1220	Grab	SW-07-03Q	SW	4	2		1		1										
04	2/22/00	1230	Grab	SD-07-03Q	SD	2							1		1						
05	2/22/00	1305	Grab	SW-06-03Q	SW	4	2		1		1										
06	2/22/00	1315	Grab	SD-06-03Q	SD	2							1		1						
07	2/22/00	1340	Grab	SW-21-03Q	SW	4	2		1		1										
08	2/22/00	1345	Grab	SD-21-03Q	SD	2							1		1						
09	2/22/00	1650	Grab	RB-022200	Aq	4	2		1		1										

Analyses

Celmic Project #	Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
200115	Charles Meyer	2/22/00 1900		
Storage Location: 13	Relinquished by (signature)	Date/Time	Received by (signature)	Date/Time
	Relinquished by (signature)	Date/Time	Received by Celmic (signature): Nancy Williamson	Date/Time: 2/23/00 10 AM

Remarks: Shipped via Federal Express Airbill No 810817875206

= Lab Use Only

Celmic Corporation, 10 Dean Knauss Drive, Narragansett, RI 02882 - Tel: (401) 782-8900, Fax: (401) 782-8905

LABORATORY CONTROL SAMPLE SUMMARY
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Ceimic Project: 200115

Client: Tetra Tech NUS

Date Sample Extracted: 02/28/00

Blank Spike ID: PA0228-LCS1

Date Sample Analyzed: 03/11/00

Matrix: Aqueous

Associated Method Blank: PA0228-BB1

Concentration in: μg/L (ppb)

Spike Compound	Spike Added	Blank Spike Result	Blank Spike Recovery(%)	QC Limits(%)*
Naphthalene	2.00	1.8	89	43 - 125
Acenaphthylene	4.00	3.3	82	49 - 125
1-Methylnapthalene	2.00	2.1	100	43 - 125
2-Methylnapthalene	2.00	1.7	87	43 - 125
Acenaphthene	2.00	1.8	89	43 - 130
Fluorene	0.40	0.35	88	53 - 125
Phenanthrene	0.20	0.18	91	52 - 129
Anthracene	0.20	0.15	73	54 - 125
Fluoranthene	0.40	0.36	89	42 - 125
Pyrene	0.20	0.21	100	55 - 125
Benzo(a)anthracene	0.20	0.18	90	39 - 135
Chrysene	0.20	0.19	96	59 - 134
Benzo(b)fluoranthene	0.40	0.38	95	31 - 137
Benzo(k)fluoranthene	0.20	0.19	94	60 - 129
Benzo(a)pyrene	0.20	0.13	66	52 - 125
Dibenzo(a,h)anthracene	0.40	0.37	91	51 - 125
Benzo(g,h,i)perylene	0.40	0.34	86	53 - 125
Indeno(1,2,3-cd)pyrene	0.20	0.17	86	55 - 125

* for advisory purposes only

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	98	25 - 157
p-Terphenyl-d14	100	25 - 157

* for advisory purposes only

0035

Reported by: TS

Approved by: [illegible]

LABORATORY CONTROL SAMPLE SUMMARY
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Ceimic Project: 200115

Client: Tetra Tech NUS

Date Sample Extracted: 03/01/00

lank Spike ID: PA0301-LCS5

Date Sample Analyzed: 03/11/00

Matrix: Soil

Associated Method Blank: PA0301-B5

Concentration in: μg/Kg (ppb)

pike Compound	Spike Added	Blank Spike Result	Blank Spike Recovery(%)	QC Limits(%)*
aphthalene	67.0	43	65	33 - 135
Acenaphthylene	130	84	65	39 - 135
Methylnapthalene	67.0	43	64	33 - 135
Methylnapthalene	67.0	42	62	33 - 135
Acenaphthene	67.0	44	65	33 - 140
luorene	13.0	8.6	66	43 - 135
enanthrene	6.70	4.8	72	42 - 139
Anthracene	6.70	3.9	58	44 - 135
Fluoranthene	13.0	10.0	77	32 - 135
yrene	6.70	6.2	93	45 - 135
enzo(a)anthracene	6.70	5.0	75	29 - 145
Chrysene	6.70	5.1	77	49 - 144
enzo(b)fluoranthene	13.0	11	82	25 - 147
enzo(k)fluoranthene	6.70	5.1	76	50 - 139
Benzo(a)pyrene	6.70	3.7	55	42 - 135
Dibenzo(a,h)anthracene	13.0	10	79	41 - 135
enzo(g,h,i)perylene	13.0	9.3	72	43 - 135
deno(1,2,3-cd)pyrene	6.70	5.0	70	45 - 135

* for advisory purposes only

Surrogate Spike Recovery

rrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	88	22 - 167
Terphenyl-d14	86	22 - 167

* for advisory purposes only

0036

eported by: TS

Approved by: H

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SD-11-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Soil

Percent Solids: 81

Matrix Spike ID: 200115-14 MS/MSD

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/14/00

Associated Method Blank: PA0301-B5

Final Extract Volume (mL):1.0

Dilution Factor: 20

Concentration in: µg/Kg (ppb)+

Spike Compound	Spike Added	Matrix Spike Recovery(%)	Matrix Spike Duplicate Recovery(%)	RPD(%)	QC Limits(%)* RPD	QC Limits(%)* Recovery
Naphthalene	1600	0	0	0.0	20	33 - 135
Acenaphthylene	3300	0	0	0.0	20	39 - 135
1-Methylnapthalene	1600	0	0	0.0	20	33 - 135
2-Methylnapthalene	1600	0	0	0.0	20	33 - 135
Acenaphthene	1600	0	0	0.0	20	33 - 140
Fluorene	330	35	172	99.1	20	43 - 135
Phenanthrene	160	794	4290	103.1	20	42 - 139
Anthracene	160	194	1100	112.0	20	44 - 135
Fluoranthene	330	724	4170	103.9	20	32 - 135
Pyrene	160	1330	7780	104.6	20	45 - 135
Benzo(a)anthracene	160	575	3980	108.7	20	29 - 145
Chrysene	160	563	3040	91.8	20	49 - 144
Benzo(b)fluoranthene	330	267	1180	81.1	20	25 - 147
Benzo(k)fluoranthene	160	355	1140	65.7	20	50 - 139
Benzo(a)pyrene	160	463	2290	86.0	20	42 - 135
Dibenzo(a,h)anthracene	330	21	76	88.6	20	41 - 135
Benzo(g,h,i)perylene	330	191	842	77.5	20	43 - 135
Indeno(1,2,3-cd)pyrene	160	257	1240	85.8	20	45 - 135

* for advisory purposes only
ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Matrix Spike Recovery(%)	Matrix Spike Duplicate Recovery(%)	QC Limits(%)*
Carbazole	892	3220	22 - 167
p-Terphenyl-d14	0	0	22 - 167

* for advisory purposes only

0037

Reported by: TS

Approved by: KL

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Client Sample ID: SW-11-03Q

Date Sampled: 02/22/00

Date Sample Received: 2/23/00

Matrix: Aqueous

Matrix Spike ID: 200115-15 MS/MSD

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Associated Method Blank: PA0228-BB1

Final Extract Volume (mL):1.0

Dilution Factor: 1

Concentration in: μg/L (ppb)

Spike Compound	Spike Added	Matrix Spike Recovery(%)	Matrix Spike Duplicate Recovery(%)	RPD(%)	QC Limits(%)* RPD	QC Limits(%)* Recovery
Naphthalene	2.00	19	78	120.3	20	43 - 125
Acenaphthylene	4.00	19	79	122.3	20	49 - 125
-Methylnapthalene	2.00	20	86	122.8	20	43 - 125
-Methylnapthalene	2.00	19	75	118.2	20	43 - 125
Acenaphthene	2.00	23	85	115.5	20	43 - 130
Fluorene	0.40	21	82	117.5	20	53 - 125
henanthrene	0.20	24	93	119.3	20	52 - 129
Anthracene	0.20	20	74	116.1	20	54 - 125
Fluoranthene	0.40	26	92	111.9	20	42 - 125
yrene	0.20	25	93	116.6	20	55 - 125
enzo(a)anthracene	0.20	30	93	115.3	20	39 - 135
Chrysene	0.20	29	97	109.2	20	59 - 134
enzo(b)fluoranthene	0.40	24	91	116.8	20	31 - 137
enzo(k)fluoranthene	0.20	24	86	113.8	20	60 - 129
Benzo(a)pyrene	0.20	20	77	118.7	20	52 - 125
Dibenzo(a,h)anthracene	0.40	22	85	116.6	20	51 - 125
enzo(g,h,i)perylene	0.40	27	94	111.9	20	53 - 125
ndeno(1,2,3-cd)pyrene	0.20	24	88	115.7	20	55 - 125

for advisory purposes only

Surrogate Spike Recovery

Surrogate Compound	Matrix Spike Recovery(%)	Matrix Spike Duplicate Recovery(%)	QC Limits(%)*
Carbazole	23	94	25 - 157
n-Terphenyl-d14	28	91	25 - 157

for advisory purposes only

0038

Reported by: TS

Approved by: [illegible]

METHOD BLANK
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Blank ID: PA0228-B1

Matrix: Aqueous

Ceimic Project: 200115

Date Sample Extracted: 02/28/00

Date Sample Analyzed: 03/11/00

Concentration in: $\mu g/L$ (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	0.50
Acenaphthylene	ND	1.0
1-Methylnapthalene	ND	0.50
2-Methylnapthalene	ND	0.50
Acenaphthene	ND	0.50
Fluorene	ND	0.10
Phenanthrene	ND	0.050
Anthracene	ND	0.050
Fluoranthene	ND	0.10
Pyrene	ND	0.050
Benzo(a)anthracene	ND	0.050
Chrysene	ND	0.050
Benzo(b)fluoranthene	ND	0.10
Benzo(k)fluoranthene	ND	0.050
Benzo(a)pyrene	ND	0.050
Dibenzo(a,h)anthracene	ND	0.10
Benzo(g,h,i)perylene	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	0.050

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	95	25 - 157
p-Terphenyl-d14	96	25 - 157

* for advisory purposes only

0040

Reported by: TS

Approved by: K

METHOD BLANK
POLYNUCLEAR AROMATIC HYDROCARBON
SW846 METHOD 8310

Client: Tetra Tech NUS

Blank ID: PA0301-B5

Matrix: Soil

Ceimic Project: 200115

Date Sample Extracted: 03/01/00

Date Sample Analyzed: 03/11/00

Concentration in: μg/Kg (ppb)

Target Analyte	Sample Concentration	Quantitation Limit
Naphthalene	ND	17
Acenaphthylene	ND	33
-Methylnapthalene	ND	17
-Methylnapthalene	ND	17
Acenaphthene	ND	17
Fluorene	ND	3.3
Phenanthrene	ND	1.7
Anthracene	ND	1.7
Fluoranthene	ND	3.3
Pyrene	ND	1.7
Benzo(a)anthracene	ND	1.7
Chrysene	ND	1.7
Benzo(b)fluoranthene	ND	3.3
Benzo(k)fluoranthene	ND	1.7
Benzo(a)pyrene	ND	1.7
Dibenzo(a,h)anthracene	ND	3.3
Benzo(g,h,i)perylene	ND	3.3
Indeno(1,2,3-cd)pyrene	ND	1.7

ND = Not detected

Surrogate Spike Recovery

Surrogate Compound	Recovery(%)	QC Limits(%)*
Carbazole	82	22 - 167
Terphenyl-d14	82	22 - 167

* for advisory purposes only

0041

Reported by: TS

Approved by: [illegible]

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14242

TO: GARTH GLENN **DATE:** June 2, 2000

FROM: JAMES LUCCHESE **COPIES:** FILE

SUBJECT: INORGANIC DATA VALIDATION – TOTAL MERCURY
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. BR087

SAMPLES:

6/Aqueous

RB-022300	SW-03-03Q
SW-01-03Q	SW-04-03Q
SW-02-03Q	SW-05-03Q

9/Solid

SD-01-03Q	SD-05-03Q
SD-02-03Q	SS-01-03Q
SD-03-03Q	SS-02-03Q
SD-04-03Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, LAB ID 00BR082, consists of 5 aqueous environmental samples, (designated SW), one rinsate blank (designated RB-) and 7 solid environmental samples, (designated SD-). All samples were analyzed for total mercury.

The samples were collected by Tetra Tech NUS, Inc. on February 23, 2000 and analyzed by Brooks Rand, Ltd. (BRL).

The analyses for total mercury in water were conducted using EPA Method 1631, Revision B. The analyses for total mercury in soil were conducted using the proprietary BRL Method BR-0002.

SUMMARY

All analytes were successfully analyzed in all samples. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, calibration data, laboratory and field quality control blank results, laboratory quality control sample (LCS) recoveries, matrix spike recoveries, laboratory duplicate results, and analyte quantitation.

Areas of concern with respect to data quality are listed on the following page.

MINOR PROBLEMS

- The holding time from date of collection to preparation for the soil samples exceeded the required 28 day period for mercury analysis by 14 to 16 days. Affected positive and nondetected results have been qualified estimated, (J/UJ), respectively.

- The Relative Percent Difference (RPD) for laboratory duplicates with values less than five times the Contract Required Detection Limit (CRDL) exceeded the ±2xCRDL quality control (QC) limit for mercury in the soil matrix. Affected positive results were qualified estimated, (J), due to this problem and other QC exceedences.

EXECUTIVE SUMMARY

Laboratory Performance: Holding times were exceeded for all soil samples.

Other Problems Affecting Data Quality: The laboratory duplicate RPD exceeded the QC limit.

The data for these analyses were reviewed with reference to the EPA "National Functional Guidelines for Inorganic Data Review", February 1994 revision, as amended for use within EPA Region 3, and the Naval Facilities Engineering Support Center (NFESC) guidelines entitled "Naval Installation Restoration Laboratory Quality Assurance Guide" (Interim Document; February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPjP)."

Tetra Tech NUS, Inc.

James Lucchese
CLEAN Data Validator

Tetra Tech NUS, Inc.

Russell Sloboda
CLEAN Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

Qualified Analytical Results

Appendix A
Analytical Results for Mercury Analysis of Aqueous Samples
CTO252 Warminster, PA

Sample ID:	RB022300			SW-01-03Q			SW-02-03Q			SW-03-03Q			SW-04-03Q			SW-05-03Q		
Laboratory ID:	00BR087-11			00BR087-09			00BR087-07			00BR087-05			00BR087-03			00BR087-01		
Sample Date:	2/23/00			2/23/00			2/23/00			2/23/00			2/23/00			2/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/L**			**ng/L**			**ng/L**			**ng/L**			**ng/L**			**ng/L**		
Mercury	0.2	U		0.79			0.94			0.71			0.91			1.1		

Data Qualifiers:

U -- Value is a non-detected result as reported by the laboratory.

Database source file: C:\PROJECTS\WARM_DV_200120\M_TTNUS02BWATERTTVERSION.DBF data retrieved on: 05/08/00

Appendix A
Analytical Results for Mercury Analysis of Sediment Samples
CTO252 Warminster, PA

Sample ID:	SD-01-03Q			SD-02-03Q			SD-03-03Q			SD-04-03Q		
Laboratory ID:	00BR087-10			00BR087-08			00BR087-06			00BR087-04		
Sample Date:	2/23/00			2/23/00			2/23/00			2/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL		
Percent Moisture	84.5			80.6			79.6			81.9		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/g**			**ng/g**			**ng/g**			**ng/g**		
Mercury	6	J	HF	26	J	HF	8.7	J	HF	8	J	HF

Appendix A

Analytical Results for Mercury Analysis of Sediment Samples

CTO252 Warminster, PA

Sample ID:	SD-05-03Q			SS-01-03Q			SS-02-03Q		
Laboratory ID:	00BR087-02			00BR087-12			00BR087-13		
Sample Date:	2/23/00			2/23/00			2/23/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL		
Percent Moisture	85.5			33.5			79.4		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/g**			**ng/g**			**ng/g**		
Mercury	21	J	HF	3980	J	HF	10	J	HF

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

Database source file: C:\PROJECTS\WARM_DV_200120\M_TTNUS02BSEDIMENT.DBF data retrieved on: 05/02/00

APPENDIX B

Results as Reported by the Laboratory

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKSRAND LTD

Contract: CLP-99-700-1288

SW-05-03G

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER

Lab Sample ID: 00BR087-01

Level (low/med): _____

Date Received: 02/24/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.1	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

SW-04-03

Lab Name: BROOKS RAND LTD Contract: GCBB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): ~~WATER~~ Lab Sample ID: 00BR087-03

Level (low/med): _____ Date Received: 02/24/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.91	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

SW-03-03GP

Lab Name: BROOKS RAND LTD Contract: GPB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR-087-05

Level (low/med): _____ Date Received: 02/24/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.71	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

SW-07-039

Lab Name: BROOKS RAND LTD. Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 0038087-07

Level (low/med): _____ Date Received: 02/24/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.94	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: ~~GCB-91-700-1298~~ SW-01-03

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR087-09

Level (low/med): _____ Date Received: 02/24/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.79	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: RB-022300

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR087-11

Level (low/med): _____ Date Received: 02/24/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.2	U		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: SD-05-039

Lab Name: BROOKS RAND LTD. Contract: GCDB-91-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR087 02

Level (low/med): _____ Date Received: 02/24/00

% Solids: 85.5

Concentration Units (ug/L or mg/kg dry weight): ug/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	20.7	B	*	
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298 SD-04-039

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR087-04

Level (low/med): _____ Date Received: 02/24/00

% Solids: 81.9

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	8.3	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1248 SD-03-039

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR087-06

Level (low/med): _____ Date Received: 02/24/00

% Solids: 79.6

Concentration Units (ug/L or mg/kg dry weight): mg/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	8.7	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: 9CDB-99-700-1298 SD-02-03P

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR087-08

Level (low/med): _____ Date Received: 02/24/00

% Solids: 80.6

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	25.9	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPL

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298 SD-01-03P

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.:

Matrix (soil/water): SOIL Lab Sample ID: 00B6087-10

Level (low/med): _____ Date Received: 02/24/00

% Solids: 84.5

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	6.3	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

SS-01-039

Lab Name: BROOKS RAND LTD.

Contract: 68D8-99-100-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL

Lab Sample ID: 00BR087-12

Level (low/med): _____

Date Received: 02/24/00

% Solids: 33.5

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel	3980			
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

SS-02-030

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR087-13

Level (low/med): _____ Date Received: 02/24/00

% Solids: 79.4

Concentration Units (ug/L or mg/kg dry weight): ug/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	9.8	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

APPENDIX C

Support Documentation

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

S7-05-030

Lab Name: BROOKS RAND LTD Contract: 68D13-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Level (low/med): _____

% Solids for Sample: 85.5 % Solids for Duplicate: 85.5

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury	175	20.7		3.8		138.0		
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

BROOKS RAND, LTD.

CASE NARRATIVE

Total Mercury in Water and Soil
for
Tetra Tech N.U.S.

Contract Task Order #:	252
Subcontract #:	GCDB-99-700-1298
BRL Tracking # s:	00BR082 & 087
BRL Project #:	TTI002
Project Name:	Warminster, PA.

All samples were received, stored, prepared and analyzed according to Brooks Rand, Ltd., Standard Operating Procedures (SOPs) and EPA Methodology.

Shipping and Receiving

Ten water samples and nine soil samples were received at 08:15 on 02/23/00. The samples arrived in a cooler with ice, at 3.7°C. The requested analysis was total mercury. The aqueous samples were preserved with BrCl and stored in a locked cabinet until further processing. The soil samples were stored in a locked freezer. All samples were assigned the tracking number 00BR082.

Six water samples and seven soil samples were received at 08:15 on 02/24/00. The samples arrived in a cooler with ice, at 3.7°C. The requested analysis was total mercury. The aqueous samples were preserved with BrCl and stored in a locked cabinet until further processing. The soil samples were stored in a locked freezer. All samples were assigned the tracking number 00BR087.

Storage and Preservation

The samples were preserved and stored in accordance with method requirements. The aqueous samples were analyzed within the 28 day holding time required in the statement of work. Results reported for the soil samples, were yielded outside the 28 day holding time but within the method required holding time as specified in BR-0002.

Mercury Analysis

The samples from the two shipments were analyzed in two analytical batches #00-084 for aqueous samples and #00-082 for soil samples.

Batch #00-084: Total mercury in water, EPA Method 1631, Revision B.
This batch includes all aqueous samples from the two shipments.

Preparation: The samples were prepared on 03/14/00. They were prepared following section 11.1.1.1 of EPA Method 1631, as specified in the sample preparation log. Section 11.1.1.1 of EPA Method 1631 involves the addition of 0.5mL of BrCl to a 100ml aliquot of sample.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was performed on 03/15/00.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix spike duplicate set was performed on sample SW-11-03Q and sample SW-05-03Q. EPA Method 1631 requires precision to be measured by MS/MSD as opposed to Method Duplicates. All method QA criteria were met and no qualification of the data was required. All field sample results have been blank corrected as required in the calculations section of EPA Method 1631.

Batch #00-082: Total mercury in soil, proprietary BRL Method BR-0002
This batch includes all soil samples from the two shipments.

Preparation: The samples were originally prepared on 03/22/00. They were prepared by refluxing in a 7:3 mixture of nitric acid and sulfuric acid, followed by the addition of BrCl. The samples were reprepared on 04/07/00 in response to a corrective action.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was first performed on 04/04/00. The reprepared samples were analyzed on 04/12/00 in response to a corrective action.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix duplicate set was performed on sample SD-11-03Q and on sample SD-05-03Q. The initial preparation and analysis of this batch yielded matrix spike recovery and duplicate precision outside the method criteria.One preparation blank gave a result above the method detection limit. As a result a corrective action was issued for repreparation and reanalysis of the samples as batch 00-082b. Repreparation and reanalysis yielded preparation blanks below the MDL. One matrix spike result fell outside the method criterion and the sample result has been assigned the qualifier "N". Measurement of duplicate precision again fell outside the method criterion, however the sample results fall below the CRDL, therefore qualification of the data is not strictly relevant. The data was reported without further corrective action from batch 00-082r. All field sample results have been blank corrected as required in the calculations section of EPA Method 1631, upon which this proprietory method is based. All field sample results have been dry weight corrected.

The Project required CRDLs of 12 ng/L for aqueous samples and 150 ng/g for soil samples, have been met.

Index of EDD Files:

M _TTNUS02b: Water sample data

M_TTNUS02b: Sediment sample data

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. In addition, I certify that to the best of my knowledge and belief, the data are reported as true and accurate. Release of the data contained in this data package has been authorized by the Laboratory Director or his designee as verified by the following signature.

Rebecca Wood

Rebecca Wood, Project Manager

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

PROJECT NO.: 6883 CTO 252

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelepko Charles Meyer

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	500ml Clear Glass Low Concentration Hg	20L Clear Glass WM Low Concentration Hg						REMARKS
05	2/23/00	0858		✓	SW-05-03Q	1	1							
05	2/23/00	0901		✓	SD-05-03Q	1		1						
04	2/23/00	0918		✓	SW-04-03Q	1	1							
04	2/23/00	0922		✓	SD-04-03Q	1		1						
03	2/23/00	0940		✓	SW-03-03Q	1	1							
03	2/23/00	0945		✓	SD-03-03Q	1		1						
02	2/23/00	1010		✓	SW-02-03Q	1	1							
02	2/23/00	1015		✓	SD-02-03Q	1		1						
01	2/23/00	1040		✓	SW-01-03Q	1	1							
01	2/23/00	1045		✓	SD-01-03Q	1		1						
RB	2/23/00	1350		✓	RB-022300	1	1							
SS-01	2/23/00	1115		✓	SS-01-03Q	1		1						
SS-02	2/23/00	1125		✓	SS-02-03Q	1		1						

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
Charles Meyer	2/23/00 1700				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
	02/24/00 0815	[illegible]			
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped via Federal Express Airbill No 810817875217	

(0498)

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

PROJECT NO.: CTO 252 6883

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelepko Charlie Meyer

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	500ml Clear Glass Low Concentration Hg	2oz Clear Wide mouth Low Concentration Hg						REMARKS
13	2/22/00	906		✓	SW-13-03Q	1	1							
13	2/22/00	0915		✓	SD-13-03Q	1		1						
12	2/22/00	0930		✓	SW-12-03Q	1	1							
12	2/22/00	0935		✓	SD-12-03Q	1		1						
11	2/22/00	1010		✓	SW-11-03Q	3	3							
11	2/22/00	1015		✓	SD-11-03Q	2		2						
10	2/22/00	1100		✓	SW-10-03Q	1	1							
10	2/22/00	1105		✓	SD-10-03Q	1		1						
09	2/22/00	1120		✓	SW-09-03Q	1	1							
09	2/22/00	1125		✓	SD-09-03Q	1		1						
08	2/22/00	1200		✓	SW-08-03Q	1	1							
08	2/22/00	1205		✓	SD-08-03Q	1		1						
07	2/22/00	1220		✓	SW-07-03Q	1	1							
07	2/22/00	1230		✓	SD-07-03Q	1		1						

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
Charlie Meyer	2/22/00 1900				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped via Federal Express Airbill No 810817875309	

Order No. (0693)

147

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

PROJECT NO.: CTO 252 6883

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelepko, Charles Meyer

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	500 ml clear glass Low Concentration Hg	20z clear wide mouth Low Concentration Hg						REMARKS
06	2/22/00	1305		✓	SW-06-03Q	1	1							
06	2/22/00	1315		✓	SD-06-03Q	1		1						
21	2/22/00	1340		✓	SW-21-03Q	1	1							
21	2/22/00	1345		✓	SD-21-03Q	1		1						
RB	2/22/00	1650		✓	RB-022200	1	1							

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
Charles Meyer	2/22/00 1900				X. Mar
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped via Federal Express Air bill No 810817875309	

Order No. 70440 (0693)

148

SOIL QC

Hg Analysis Results

Batch #00-082b(BR-0002).xls, Tracking #00BR082,087

	Analyst:	W. Hagan	*Project:*	TTI002		*Matrix:*	Sediment	*Analysis:*	Hg Total	*Date:*	4/12/00

SAMPLE CALCULATIONS

			Sample	Dilution	Analyzed		Uncorrected		Blank corrected	
			Weight	Volume	Vol.		measured	Result	measured	Result
Run	Tracking #	ID #	(mg)	(mL)	(mL)	PA	pg	ng/g	pg	ng/g
12	00BR082	2	1037	25.6	0.50	14689	938	46.3	938	45.9
13	00BR082	4	1039	25.6	0.50	7910	505	24.9	505	24.5
14	00BR082	6	1018	25.6	0.50	31479	2009	101	2009	101
15	00BR082	6MD	1009	25.6	0.50	18561	1185	60.1	1185	59.7
16	00BR082	6MS	1005	25.6	0.50	76728	4898	250	4898	249
17	00BR082	8	1059	25.6	0.50	3179	203	9.81	203	9.44
20	00BR082	10	1013	25.6	0.50	4598	294	14.8	294	14.4
21	00BR082	12	1088	25.6	0.50	4690	299	14.1	299	13.7
22	00BR082	14	1058	25.6	0.50	2788	178	8.61	178	8.24
23	00BR082	16	1056	25.6	0.50	2880	184	8.91	184	8.54
24	00BR082	18	1066	25.6	0.50	4322	276	13.3	276	12.9
25	00BR087	2	1042	25.6	0.50	5764	368	18.1	368	17.7
26	00BR087	2MD	1043	25.6	0.50	1165	74.4	3.65	74.4	3.28
27	00BR087	2MS	1098	25.6	0.50	64274	4103	191	4103	191
28	00BR087	4	1026	25.6	0.50	2262	144	7.21	144	6.82
29	00BR087	6	1037	25.6	0.50	2327	149	7.33	149	6.96
32	00BR087	8	1044	25.6	0.50	6787	433	21.2	433	20.9
33	00BR087	10	1059	25.6	0.50	1838	117	5.67	117	5.30
34	00BR087	12	1022	25.6	0.50			*reanalyzed*		
35	00BR087	13	1006	25.6	0.50	2506	160	8.14	160	7.75
36	00BR087	12	1022	25.6	0.10	83326	5319	1332	5319	1332

QC CALCULATIONS

Precision

Summary of Split Sample Analysis

			Uncorr.	Corr.					Uncorr.	Corr.
			Result	Result					Result	Result
Run	Tracking #	ID #	ng/g	ng/g		Run	Tracking #	ID #	ng/g	ng/g
14	00BR082	6	101	101		25	00BR087	2	18.1	17.7
15	00BR082	6MD	60.1	59.7		26	00BR087	2MD	3.65	3.28
		Average	80.6	80.2				**Average**	10.9	10.5
		RPD	50.8%	51.0%				**RPD**	133%	138%

Calibration Results

Instrument Calibration

			Blank Corr.
			Calibration
Run	pg	PA	Coefficient
5	50	829	0.06031
6	100	1994	0.05015
7	500	7425	0.06734
8	2500	36233	0.06900
9	10000	138186	0.07237
R:	0.9999	**Avg:**	0.06383
		RSD:	13.8%

Calibration Blanks

Run	PA	pg
1	0	0
2	0	0
3	0	0
4	0	0
Average:	0	0
StDev:	0	0

SOIL QC

Hg Analysis Results
Batch #00-082b(BR-0002).xls, Tracking #00BR082,087

QC CALCULATIONS (continued)

Calibration Checks

Calibration verification standards

Run	pg	PA	%
5	500	7210	92.0%
6	500	7230	92.3%
18	500	7386	94.3%
30	500	8282	106%
37	500	7571	96.7%

Calibration Blanks

Run	PA	pg
1	0	0
2	0	0
3	0	0
4	0	0
7	0	0
19	0	0
31	91	6
38	0	0

Method Blanks

Run	Represent. Weight (mg)	Dilution Volume (mL)	Analyzed Volume' (mL)	PA	measured pg	total pg	Conc. ng/g
8	1000	25.6	5.00	1249	79.7	408	0.408
9	1000	25.6	5.00	1148	73.3	375	0.375
					Average:	392	0.392
					StDev:	23.3	0.023

Action Level
x 5 = 2.04 ng/g
All results above A.L.
Less than MDL of 0.747 ng/g

Bias

Method SRMs

Run	SRM ID	Certified Value ng/g	Sample Weight (mg)	Dilution Volume (mL)	Analyzed Vol. (mL)	PA	pg	Recovery ng/g	% Rec.
10	CRM-1	92.0	606	25.6	0.50	16249	1037	87.0	94.6%
11	CRM-2	92.0	600	25.6	0.50	16623	1061	89.9	97.7%

Matrix Spike Samples (MS)

Run	Sample Tracking #	ID #	spike Concent. ng/g	measured Sample ng/g	measured Sample + Spike ng/g	spike ng/g	Recovery %
16	00BR082	6MS	199	101	249	148	74.6%
27	00BR087	2MS	182	17.7	191	173	95.2%

Water QC

BRL Analytical Summary — Hg in water by Method 1631 B (BRL Mod. #2)

Batch #: 00-084(1631).xls Tracking #(s): 00BR075,082,083,087

QC CALCULATIONS (continued)

Ongoing Precision and Recovery (OPR)

Calibration Verification Standard

Criteria: Recovery=77-123%

Run	known ng/L	PA	measured ng/L	Recovery %
06	5.00	7524	4.76	95.2%

OPR Samples

Criteria: Recovery=77-123%

Run	known ng/L	PA	measured ng/L	Recovery %
05	5.00	7347	4.65	92.9%
18	5.00	7260	4.59	91.8%
30	5.00	6980	4.42	88.3%
42	5.00	6834	4.32	86.5%
54	5.00	7131	4.51	90.2%
59	5.00	7038	4.45	89.0%

Bubbler blank checks

Criteria: < 50 pg and +/- 10 pg of ave. BB

Run	PA	measured pg	difference pg
01	0	0	0
02	0	0	0
03	0	0	0
04	0	0	0
07	0	0	0
19	0	0	0
31	0	0	0
43	0	0	0
55	0	0	0
60	0	0	0

Quality Control Sample (QCS)

Criteria: Recovery=~~77-123%~~ 75-125% FM 03/16/00

Run	QCS ID	known ng/L	PA	corrected ng/L	Recovery %
08	QCS-1	10.0	15018	9.45	94.5%
37	QCS-2	10.0	13692	8.61	86.1%

Matrix Spike Samples (MS/MSD)

Criteria: Recovery=71-125%, RPD<24%

Run	Sample Tracking #	ID #	Spike Concent. ng/L	Measured Sample ng/L	Measured Sample + Spike ng/L	Spike Recovery ng/L	Recovery	RPD (%)
12	00BR082	5MS	39.92	3.57	38.7	35.1	88.0%	
13	00BR082	5MSD	40.00	3.57	34.5	30.9	77.3%	11.5
24	00BR087	1MS	39.62	1.10	36.8	35.7	90.1%	
25	00BR087	1MSD	39.90	1.10	30.9	29.8	74.7%	17.4
35	00BR083	1MS	39.73	2.40	2.57	N/A	N/A	
36	00BR083	1MSD	39.80	2.40	2.55	N/A	N/A	0.8

Reagent Blank (RB)

Criteria: <25 pg/blank

Hg conc. in Blank:	5.0	pg/Blank	≤ 225 (Action Level)	last analyzed:	2/27/00
1 Blank unit =	0.500	ml BrCl		StDev:	2.4
&	0.100	ml Hydroxylamine HCl			

Reagent Blank is <0.2 ng/L

Water QC

BRL Analytical Summary

Hg in water by Method 1631 B (BRL Mod. #2)

Batch #: 00-084(1631).xls Tracking #(s): 00BR075,082,083,087

	Analyst:	W. Hagan		Date:	3/15/00	Project #(s):		TTI002,CAL002,MAI001		
Sample Results										
Run	Tracking #	ID #	Sample Volume (mL)	Dilution Volume (mL)	Analyzed Vol. (mL)	Reagent Blank units	PA	pg	Result ng/L	reported Value
09	00BR082	1	100.42	101.12	89.72	2.0	1922	122	1.26	
10	00BR082	3	100.22	100.92	89.15	2.0	2472	156	1.67	
11	00BR082	5	100.25	100.95	89.59	2.0	5156	326	3.57	
12	00BR082	5MS	100.20	101.30	89.25	2.0	54179	3427	38.7	
13	00BR082	5MSD	100.00	101.10	89.27	2.0	48235	3051	34.5	
14	00BR082	7	100.83	101.53	89.50	2.0	3855	244	2.64	
15	00BR082	9	100.92	101.62	89.15	2.0	2274	144	1.53	
16	00BR082	11	100.02	100.72	90.29	2.0	2725	172	1.82	
17	00BR082	13	100.23	100.93	89.58	2.0	1545	97.7	1.00	
20	00BR082	15	100.19	100.89	90.43	2.0	1716	109	1.11	
21	00BR082	17	100.98	101.68	89.73	2.0	2476	157	1.66	
22	00BR082	19	100.57	101.27	90.24	2.0	301	* 19.0	0.113	Field Blank ND <0.2 ng/L
23	00BR087	1	100.46	101.16	89.00	2.0	1675	106	1.10	
24	00BR087	1MS	100.96	102.06	89.96	2.0	51900	3283	36.8	
25	00BR087	1MSD	100.24	101.34	88.81	2.0	43096	2726	30.9	
26	00BR087	3	100.34	101.04	89.84	2.0	1423	90.0	0.909	
27	00BR087	5	100.49	100.19	90.14	2.0	1160	73.4	0.712	
28	00BR087	7	100.59	101.29	90.27	2.0	1474	93.2	0.941	
29	00BR087	9	100.92	101.62	90.12	2.0	1261	79.8	0.792	
32	00BR087	11	100.01	100.71	89.91	2.0	255	* 16.1	0.081	ND <0.2 ng/L
33	00BR075	2	100.34	101.04	89.58	2.0	406	25.7	0.189	
34	00BR083	1	100.31	101.01	90.47	2.0	3548	224	2.40	
35	00BR083	1MS	100.69	101.79	89.19	2.0	3717	235	2.57	
36	00BR083	1MSD	100.50	101.20	89.02	2.0	3698	234	2.55	
38	00BR075	1	100.61	106.71	89.49	11.0	3649	231	2.19	

* circled values within Blank action Level

QC CALCULATIONS

Calibration Results

Instrument Calibration (03/13/00, No Batch Affiliation)

Criteria: RSD<15%

Criteria: low std. 75-125%

Run	pg	PA	Response Factor	% Recovery
	50	801	0.06242	101%
	100	1668	0.05995	
	500	8508	0.05877	
	2500	37245	0.06712	
	10000	147052	0.06800	
RSD:	6.58%	Avg:	0.06325	

Bubbler Blanks (11.2.1)

Criteria: <50 pg, ave. <25 pg, StDev <10 pg

Run	PA	pg
	0	0
	0	0
	0	0
	0	0
Average:	0.00	0
StDev:	0	0

U.S. EPA - CLP

10
INSTRUMENT DETECTION LIMITS (QUARTERLY)

Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ID Number: _____ Date: 01/28/00

me AA ID Number: _____

urnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L) ng/g	IDL ~~(ug/L)~~ ng/g	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			3		
Magnesium			5000		
Manganese			15		
Mercury	253.7		150 ~~0.2~~	0.747	
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

omments:
The Analytical Method is BR-0002 and units are ng/g. CVAFS Instrumentation was used.

FORM X - IN

ILM03 -

U.S. EPA - CLP

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: 01/19/00

Flame AA ID Number: _____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL ~~(ug/L)~~ ng/L	IDL ~~(ug/L)~~ ng/L	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			3		
Magnesium			5000		
Manganese			15		
Mercury	253.7		12 ~~0.2~~	0.2	
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

U.S. EPA - CLP

13
PREPARATION LOG

Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Method: BR-0002

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
SD-13-030	04/07/00	1.04	
SD-12-030		1.04	
SD-11-030		1.02	
SD-11-030D		1.01	
SD-11-030S		1.01	
SD-10-030		1.06	
SD-09-030		1.01	
SD-08-030		1.10	
SD-07-030		1.06	
SD-06-030		1.06	
SD-21-030		1.07	
SD-05-030		1.04	
SD-05-030D		1.04	
SD-05-030S		1.10	
SD-04-030		1.03	
SD-03-030		1.04	
SD-02-030		1.04	
SD-01-030		1.06	
SS-01-030		1.02	
SS-02-030		1.01	
CRM-1		0.606	
CRM-2		0.600	
PB1			25.6
PB2			25.6

FORM XIII - IN

ILMO

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13
PREPARATION LOG

Lab Name: BROOKS RAND LTD Contract: GCTB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Method: EPA 1631

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
SW1303Q	03/14/00		101
SW1203Q			101
SW1103Q			101
SW1103QS			101
SW1103QSD			101
SW1003Q			102
SW0903Q			102
SW0803Q			101
SW0703Q			101
SW0603Q			101
SW0503Q			102
RB022200			101
SW0503Q			101
SW0503QS			102
SW0503QSD			101
SW0403Q			101
SW0303Q			100
SW0203Q			101
SW0103Q			102
RB022300			101
LCSW1			100
LCSW2			100

FORM XIII - IN

ILMC

03/90

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14

ANALYSIS RUN LOG

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID Number: BR-08 Method: EPA 1631

Start Date: 03/15/00 End Date: 03/15/00

EPA Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ICB		09:42																X									
CCB		09:46																X									
CCB		09:50																X									
CCB		09:55																X									
ICV		10:03																X									
CCV		10:07																X									
CCB		10:11																X									
CSW1		10:15																X									
SW1303Q		10:40																X									
SW1203Q		10:46																X									
SW1103Q		11:41																X									
SW1103QS		10:55																X									
SW1103QSD		10:49																X									
SW1003Q		11:46																X									
SW0903Q		11:49																X									
SW0803Q		11:53																X									
SW0703Q		12:00																X									
CCV		12:06																X									
CCB		12:11																X									
SW0603Q		12:23																X									
SW0503Q		12:28																X									
KB022200		12:40																X									
SW0503Q		12:43																X									
SW0503QS		12:49																X									
SW0503QSD		12:56																X									
SW0403Q		13:01																X									
SW0303Q		13:05																X									
SW0203Q		13:11																X									
SW0103Q		13:25																X									
CCV		13:29																X									
CCB		13:42																X									
KB022300		13:46																X									
ZZZZZZ		13:51																X									

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14

ANALYSIS RUN LOG

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID Number: BR-08 Method: EPA 1631

Start Date: 03/15/00 End Date: 03/15/00

EPA Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ		13:56																X									
ZZZZZZ		13:56																X									
ZZZZZZ		14:03																X									
LCSW2		15:20																X									
ZZZZZZ		15:26																X									
ZZZZZZ		15:29																X									
ZZZZZZ		15:33																X									
ZZZZZZ		16:25																X									
CCV		16:29																X									
CCB		16:34																X									

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14241

TO: GARTH GLENN

DATE: June 2, 2000

FROM: JAMES LUCCHESE

COPIES: FILE

SUBJECT: INORGANIC DATA VALIDATION – TOTAL MERCURY
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. BR082

SAMPLES:

10/Aqueous

RB-022200	SW-10-03Q
SW-06-03Q	SW-11-03Q
SW-07-03Q	SW-12-03Q
SW-08-03Q	SW-13-03Q
SW-09-03Q	SW-21-03Q

9/Solid

SD-06-03Q	SD-10-03Q	SD-21-03Q
SD-07-03Q	SD-11-03Q	
SD-08-03Q	SD-12-03Q	
SD-09-03Q	SD-13-03Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, LAB ID 00BR082, consists of 9 aqueous environmental samples, (designated SW), one rinsate blank (designated RB-) and 9 solid environmental samples, (designated SD-). All samples were analyzed for total mercury. Two field duplicate pairs (SW-07-03Q/SW-21-03Q, and SD-07-03Q/SD-21-03Q) were included in this sample set.

The samples were collected by Tetra Tech NUS, Inc. on February 22, 2000 and analyzed by Brooks Rand, Ltd. (BRL).

The analyses for total mercury in water were conducted using EPA Method 1631, Revision B. The analyses for total mercury in soil were conducted using the proprietary BRL Method BR-0002.

SUMMARY

All analytes were successfully analyzed in all samples. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until analysis, calibration data, laboratory and field quality control blank results, laboratory quality control sample (LCS) recoveries, matrix spike recoveries, laboratory duplicate results, and analyte quantitation.

Areas of concern with respect to data quality are listed on the following page.

MINOR PROBLEMS

- The holding time from date of collection to preparation for the soil samples exceeded the required 28 day period for mercury analysis by 14 to 16 days. Affected positive and nondetected results have been qualified estimated, (J/UJ), respectively.

- The Relative Percent Difference (RPD) for laboratory duplicates with values greater than five times the Contract Required Detection Limit (CRDL) exceeded the ±35% quality control (QC) limit for mercury in the soil matrix. All affected positive values were qualified estimated, (J) due to this problem and other QC exceedences.

- The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries (%R) in the soil matrix were below the 75% lower QC limit for mercury. All affected positive values were previously qualified estimated, (J), due to this problem and other QC exceedences.

EXECUTIVE SUMMARY

Laboratory Performance: Holding times were exceeded for all soil samples.

Other Factors Affecting Data Quality: The MS/MSD percent recoveries for the soil matrix were below the QC limit. The laboratory duplicate RPD exceeded the QC limit.

The data for these analyses were reviewed with reference to the EPA "National Functional Guidelines for Inorganic Data Review", February 1994 revision, as amended for use within EPA Region 3, and the Naval Facilities Engineering Support Center (NFESC) guidelines entitled "Naval Installation Restoration Laboratory Quality Assurance Guide" (Interim Document; February, 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPjP)."

Tetra Tech NUS, Inc.

James Lucchese
CLEAN Data Validator

Tetra Tech NUS, Inc.

Russell Sloboda
CLEAN Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

Qualified Analytical Results

Appendix A
Analytical Results for Mercury Analysis of Aqueous Samples
CTO252 Warminster, PA

Sample ID:	RB-022200			SW-06-03Q			SW-07-03Q			SW-08-03Q			SW-09-03Q		
Laboratory ID:	00BR082-19			00BR082-15			00BR082-13			00BR082-11			00BR082-09		
Sample Date:	2/22/00			2/22/00			2/22/00			2/22/00			2/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/L**			**ng/L**			**ng/L**			**ng/L**			**ng/L**		
Mercury	0.2	U		1.1			1			1.8			1.5		

Appendix A
Analytical Results for Mercury Analysis of Aqueous Samples
CTO252 Warminster, PA

Sample ID:	SW-10-03Q			SW-11-03Q			SW-12-03Q			SW-13-03Q			SW-21-03Q		
Laboratory ID:	00BR082-07			00BR082-05			00BR082-03			00BR082-01			00BR082-17		
Sample Date:	2/22/00			2/22/00			2/22/00			2/22/00			2/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL			NORMAL		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/L**			**ng/L**			**ng/L**			**ng/L**			**ng/L**		
Mercury	2.6			3.6			1.7			1.3			1.7		

Data Qualifiers:

U -- Value is a non-detected result as reported by the laboratory.

Appendix A
Analytical Results for Mercury Analysis of Sediment Samples
CTO252 Warminster, PA

Sample ID:	SD-06-03Q			SD-07-03Q			SD-08-03Q			SD-09-03Q			SD-10-03Q		
Laboratory ID:	00BR082-16			00BR082-14			00BR082-12			00BR082-10			00BR082-08		
Sample Date:	2/22/00			2/22/00			2/22/00			2/22/00			2/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL			NORMAL		
Percent Moisture	81.4			83.4			79.1			75.0			81.4		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/L**			**ng/g**			**ng/g**			**ng/g**			**ng/g**		
Mercury	10.5	J	HFD	10	J	HFD	17	J	HFD	19	J	HFD	12	J	HFD

Appendix A
Analytical Results for Mercury Analysis of Sediment Samples
CTO252 Warminster, PA

Sample ID:	SD-11-03Q			SD-12-03Q			SD-13-03Q			SD-21-03Q		
Laboratory ID:	00BR082-06			00BR082-04			00BR082-02			00BR082-18		
Sample Date:	2/22/00			2/22/00			2/22/00			2/22/00		
QC Sample Type:	NORMAL			NORMAL			NORMAL			NORMAL		
Percent Moisture	77.7			78.1			62.9			83.9		
	RESULT	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**	**RESULT**	**QUAL**	**CODE**
INORGANICS	**ng/g**			**ng/g**			**ng/g**			**ng/g**		
Mercury	130	J	HFD	31	J	HFD	73	J	HFD	15.4	J	HFD

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

APPENDIX B

Results as Reported by the Laboratory

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: SW-13-03G

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1798

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-01

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.3	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 SW-12-03 G

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-03

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.7	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: SW-11-03P

Lab Name: BROOKS RAND LTD Contract: 68D3-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-05

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	3.6	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 S6-10-03GP

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-07

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	2.6	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 SW-09-030

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: 00BR082-09

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.5	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCPB-99-700-1298 | SW-08-039

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: 00BR082-11

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.8	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKSRAND LTD Contract: EQDB-99-700-1298 SW-07-03G

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-13

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.0	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 SW-06-03G

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-1S

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel	1.1	B		
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: CLP-99-700-1298 SW-21-039

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-17

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	1.7	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RANT LTD Contract: GCDB-99-700-1298 RB-022200

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR082-19

Level (low/med): _____ Date Received: 02/23/00

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): ng/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.2	U		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPL

Lab Name: BROOKS RAND LTD Contract: 4CDB-99-700-1298 SD-13-030

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.:

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-02

Level (low/med): _____ Date Received: 02/23/00

% Solids: 62.9

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	73.0	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1248 | SD-12-03Q

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-04

Level (low/med): _____ Date Received: 02/23/00

% Solids: 78.1

Concentration Units (ug/L or mg/kg dry weight): mg/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel	31.4			
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: SD-11-039

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1248

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-06

Level (low/med): _____ Date Received: 02/23/00

% Solids: 77.7

Concentration Units (ug/L or mg/kg dry weight): ug/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	130	B	N*	
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

SD-10-039

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-08

Level (low/med): _____ Date Received: 02/23/00

% Solids: 81.4

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	11.6	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-TOO-1258 | SD-09-03P

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: 00BR082-10

Level (low/med): _____ Date Received: 02/23/00

% Solids: 75.0

Concentration Units (ug/L or mg/kg dry weight): ug/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	19.2	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: GCTB-99-700-1298 | S7-08-039

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-12

Level (low/med): _____ Date Received: 02/23/00

% Solids: 79.1

Concentration Units (ug/L or mg/kg dry weight): ug/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel	17.3	B		
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: ~~CLP-99-700~~-1298 SD-07-03

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-14

Level (low/med): _____ Date Received: 02/23/00

% Solids: 83.4

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	9.9	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1798 SD-06-039

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: 00BR082-16

Level (low/med): _____ Date Received: 02/23/00

% Solids: 81.4

Concentration Units (ug/L or mg/kg dry weight): ug/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	10.5	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPL

SD-21-039

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR082-18

Level (low/med): _____ Date Received: 02/23/00

% Solids: 83.9

Concentration Units (ug/L or mg/kg dry weight): mg/g dry

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	15.4	B		
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

APPENDIX C

Support Documentation

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

SD-11-039

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Level (low/med): _____

% Solids for Sample: 77.7 % Solids for Duplicate: 77.7

Concentration Units (ug/L or mg/kg dry weight): ng/g dry

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury	193	130		76.8		51.4		
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

SD-11-030

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Level (low/med): _____

Solids for Sample: 77.7

Concentration Units (ug/L or mg/kg dry weight): ng/g wet

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury	75-125	249		101		199	74.4	N	
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

BROOKS RAND, LTD.

CASE NARRATIVE

Total Mercury in Water and Soil
for
Tetra Tech N.U.S.

Contract Task Order #:	252
Subcontract #:	GCDB-99-700-1298
BRL Tracking # s:	00BR082 & 087
BRL Project #:	TTI002
Project Name:	Warminster, PA.

All samples were received, stored, prepared and analyzed according to Brooks Rand, Ltd., Standard Operating Procedures (SOPs) and EPA Methodology.

Shipping and Receiving
Ten water samples and nine soil samples were received at 08:15 on 02/23/00. The samples arrived in a cooler with ice, at 3.7°C. The requested analysis was total mercury. The aqueous samples were preserved with BrCl and stored in a locked cabinet until further processing. The soil samples were stored in a locked freezer. All samples were assigned the tracking number 00BR082.

Six water samples and seven soil samples were received at 08:15 on 02/24/00. The samples arrived in a cooler with ice, at 3.7°C. The requested analysis was total mercury. The aqueous samples were preserved with BrCl and stored in a locked cabinet until further processing. The soil samples were stored in a locked freezer. All samples were assigned the tracking number 00BR087.

Storage and Preservation
The samples were preserved and stored in accordance with method requirements. The aqueous samples were analyzed within the 28 day holding time required in the statement of work. Results reported for the soil samples, were yielded outside the 28 day holding time but within the method required holding time as specified in BR-0002.

Mercury Analysis

The samples from the two shipments were analyzed in two analytical batches #00-084 for aqueous samples and #00-082 for soil samples.

Batch #00-084: Total mercury in water, EPA Method 1631, Revision B.
This batch includes all aqueous samples from the two shipments.

Preparation: The samples were prepared on 03/14/00. They were prepared following section 11.1.1.1 of EPA Method 1631, as specified in the sample preparation log. Section 11.1.1.1 of EPA Method 1631 involves the addition of 0.5mL of BrCl to a 100ml aliquot of sample.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was performed on 03/15/00.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix spike duplicate set was performed on sample SW-11-03Q and sample SW-05-03Q. EPA Method 1631 requires precision to be measured by MS/MSD as opposed to Method Duplicates. All method QA criteria were met and no qualification of the data was required. All field sample results have been blank corrected as required in the calculations section of EPA Method 1631.

Batch #00-082: Total mercury in soil, proprietary BRL Method BR-0002
This batch includes all soil samples from the two shipments.

Preparation: The samples were originally prepared on 03/22/00. They were prepared by refluxing in a 7:3 mixture of nitric acid and sulfuric acid, followed by the addition of BrCl. The samples were reprepared on 04/07/00 in response to a corrective action.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was first performed on 04/04/00. The reprepared samples were analyzed on 04/12/00 in response to a corrective action.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix duplicate set was performed on sample SD-11-03Q and on sample SD-05-03Q. The initial preparation and analysis of this batch yielded matrix spike recovery and duplicate precision outside the method criteria.One preparation blank gave a result above the method detection limit. As a result a corrective action was issued for repreparation and reanalysis of the samples as batch 00-082b. Repreparation and reanalysis yielded preparation blanks below the MDL. One matrix spike result fell outside the method criterion and the sample result has been assigned the qualifier "N". Measurement of duplicate precision again fell outside the method criterion, however the sample results fall below the CRDL, therefore qualification of the data is not strictly relevant. The data was reported without further corrective action from batch 00-082r. All field sample results have been blank corrected as required in the calculations section of EPA Method 1631, upon which this proprietory method is based. All field sample results have been dry weight corrected.

The Project required CRDLs of 12 ng/L for aqueous samples and 150 ng/g for soil samples, have been met.

Index of EDD Files:

M _TTNUS02b: Water sample data

M_TTNUS02b: Sediment sample data

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. In addition, I certify that to the best of my knowledge and belief, the data are reported as true and accurate. Release of the data contained in this data package has been authorized by the Laboratory Director or his designee as verified by the following signature.

Rebecca Wood, Project Manager

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

PROJECT NO.: 6883 CTO 252

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelupko Charles Meyer

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	500 ml Clear Glass Low Concentration Hg	20 oz Clear Glass WM Low Concentration Hg						REMARKS
05	2/23/00	0858		✓	SW-05-03Q	1	1							
05	2/23/00	0901		✓	SD-05-03Q	1		1						
04	2/23/00	0918		✓	SW-04-03Q	1	1							
04	2/23/00	0922		✓	SD-04-03Q	1		1						
03	2/23/00	0940		✓	SW-03-03Q	1	1							
03	2/23/00	0945		✓	SD-03-03Q	1		1						
02	2/23/00	1010		✓	SW-02-03Q	1	1							
02	2/23/00	1015		✓	SD-02-03Q	1		1						
01	2/23/00	1040		✓	SW-01-03Q	1	1							
01	2/23/00	1045		✓	SD-01-03Q	1		1						
RB	2/23/00	1350		✓	RB-022300	1	1							
SS-01	2/23/00	1115		✓	SS-01-03Q	1		1						
SS-02	2/23/00	1125		✓	SS-02-03Q	1		1						

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
Charles Meyer	2/23/00 1700				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
	02/24/00 0815	[illegible]			
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped via Federal Express Airbill No 810817875217	

(0178)

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

PROJECT NO.: CTO 252 6883

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelepko Charlie Meyer

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	500ml Glass Low Concentration Hg	20z Clear Wide mouth Low Concentration Hg						REMARKS
13	2/22/00	906		✓	SW-13-03Q	1	1							
13	2/22/00	0915		✓	SD-13-03Q	1		1						
12	2/22/00	0930		✓	SW-12-03Q	1	1							
12	2/22/00	0935		✓	SD-12-03Q	1		1						
11	2/22/00	1010		✓	SW-11-03Q	3	3							
11	2/22/00	1015		✓	SD-11-03Q	2		2						
10	2/22/00	1100		✓	SW-10-03Q	1	1							
10	2/22/00	1105		✓	SD-10-03Q	1		1						
09	2/22/00	1120		✓	SW-09-03Q	1	1							
09	2/22/00	1125		✓	SD-09-03Q	1		1						
08	2/22/00	1200		✓	SW-08-03Q	1	1							
08	2/22/00	1205		✓	SD-08-03Q	1		1						
07	2/22/00	1220		✓	SW-07-03Q	1	1							
07	2/22/00	1230		✓	SD-07-03Q	1		1						

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
Charlie Meyer	2/22/00 1900				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped via Federal Express Airbill No 810817875309	

Order No. 70440 (0693)

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

PROJECT NO.: CTO 252 6883

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelepko, Charles Meyer

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	500 ml clear glass Low Concentration Hg	20z clear wide mouth Low Concentration Hg						REMARKS
06	2/22/00	1305		✓	SW-06-03Q	1	1							
06	2/22/00	1315		✓	SD-06-03Q	1		1						
21	2/22/00	1340		✓	SW-21-03Q	1	1							
21	2/22/00	1345		✓	SD-21-03Q	1		1						
RB	2/22/00	1650		✓	RB-022200	1	1							

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
Charles Meyer	2/22/00 1900				X Meyer
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped via Federal Express Air bill NO 810817875309	

Order No. 70440 (0693)

148

SOIL QC

Hg Analysis Results

Batch #00-082b(BR-0002).xls, Tracking #00BR082,087

	Analyst:	W. Hagan	Project:	TTI002		Matrix:	Sediment	Analysis:	Hg Total	Date:	4/12/00

SAMPLE CALCULATIONS

Run	Tracking #	ID #	Sample Weight (mg)	Dilution Volume (mL)	Analyzed Vol. (mL)	PA	Uncorrected measured pg	Uncorrected Result ng/g	Blank corrected measured pg	Blank corrected Result ng/g
12	00BR082	2	1037	25.6	0.50	14689	938	46.3	938	45.9
13	00BR082	4	1039	25.6	0.50	7910	505	24.9	505	24.5
14	00BR082	6	1018	25.6	0.50	31479	2009	101	2009	101
15	00BR082	6MD	1009	25.6	0.50	18561	1185	60.1	1185	59.7
16	00BR082	6MS	1005	25.6	0.50	76728	4898	250	4898	249
17	00BR082	8	1059	25.6	0.50	3179	203	9.81	203	9.44
20	00BR082	10	1013	25.6	0.50	4598	294	14.8	294	14.4
21	00BR082	12	1088	25.6	0.50	4690	299	14.1	299	13.7
22	00BR082	14	1058	25.6	0.50	2788	178	8.61	178	8.24
23	00BR082	16	1056	25.6	0.50	2880	184	8.91	184	8.54
24	00BR082	18	1066	25.6	0.50	4322	276	13.3	276	12.9
25	00BR087	2	1042	25.6	0.50	5764	368	18.1	368	17.7
26	00BR087	2MD	1043	25.6	0.50	1165	74.4	3.65	74.4	3.28
27	00BR087	2MS	1098	25.6	0.50	64274	4103	191	4103	191
28	00BR087	4	1026	25.6	0.50	2262	144	7.21	144	6.82
29	00BR087	6	1037	25.6	0.50	2327	149	7.33	149	6.96
32	00BR087	8	1044	25.6	0.50	6787	433	21.2	433	20.9
33	00BR087	10	1059	25.6	0.50	1838	117	5.67	117	5.30
34	00BR087	12	1022	25.6	0.50			*reanalyzed*		
35	00BR087	13	1006	25.6	0.50	2506	160	8.14	160	7.75
36	00BR087	12	1022	25.6	0.10	83326	5319	1332	5319	1332

QC CALCULATIONS

Precision

Summary of Split Sample Analysis

Run	Tracking #	ID #	Uncorr. Result ng/g	Corr. Result ng/g	Run	Tracking #	ID #	Uncorr. Result ng/g	Corr. Result ng/g
14	00BR082	6	101	101	25	00BR087	2	18.1	17.7
15	00BR082	6MD	60.1	59.7	26	00BR087	2MD	3.65	3.28
		Average	80.6	80.2			**Average**	10.9	10.5
		RPD	50.8%	51.0%			**RPD**	133%	138%

Calibration Results

Instrument Calibration

Run	pg	PA	Blank Corr. Calibration Coefficient
5	50	829	0.06031
6	100	1994	0.05015
7	500	7425	0.06734
8	2500	36233	0.06900
9	10000	138186	0.07237
R:	0.9999	**Avg:**	0.06383
		RSD:	13.8%

Calibration Blanks

Run	PA	pg
1	0	0
2	0	0
3	0	0
4	0	0
Average:	0	0
StDev:	0	0

SOIL QC

Hg Analysis Results
Batch #00-082b(BR-0002).xls, Tracking #00BR082,087

QC CALCULATIONS (continued)

Calibration Checks

Calibration verification standards

Run	pg	PA	%
5	500	7210	92.0%
6	500	7230	92.3%
18	500	7386	94.3%
30	500	8282	106%
37	500	7571	96.7%

Calibration Blanks

Run	PA	pg
1	0	0
2	0	0
3	0	0
4	0	0
7	0	0
19	0	0
31	91	6
38	0	0

Method Blanks

Run	Represent. Weight (mg)	Dilution Volume (mL)	Analyzed Volume (mL)	PA	measured pg	total pg	Conc. ng/g
8	1000	25.6	5.00	1249	79.7	408	0.408
9	1000	25.6	5.00	1148	73.3	375	0.375
					Average:	392	0.392
					StDev:	23.3	0.023

Action Level x 5 = 2.04 ng/g AA results above A.L.

Less than MDL of 0.747 ng/g

Bias

Method SRMs

Run	SRM ID	Certified Value ng/g	Sample Weight (mg)	Dilution Volume (mL)	Analyzed Vol. (mL)	PA	pg	Recovery ng/g	% Rec.
10	CRM-1	92.0	606	25.6	0.50	16249	1037	87.0	94.6%
11	CRM-2	92.0	600	25.6	0.50	16623	1061	89.9	97.7%

Matrix Spike Samples (MS)

Run	Sample Tracking #	ID #	spike Concent. ng/g	measured Sample ng/g	measured Sample + Spike ng/g	spike ng/g	Recovery %
16	00BR082	6MS	199	101	249	148	74.6%
27	00BR087	2MS	182	17.7	191	173	95.2%

Water QC

BRL Analytical Summary — Hg in water by Method 1631 B (BRL Mod. #2)

Batch #: 00-084(1631).xls Tracking #(s): 00BR075,082,083,087

QC CALCULATIONS (continued)

Ongoing Precision and Recovery (OPR)

Calibration Verification Standard

Criteria: Recovery=77-123%

Run	known ng/L	PA	measured ng/L	Recovery %
06	5.00	7524	4.76	95.2%

OPR Samples

Criteria: Recovery=77-123%

Run	known ng/L	PA	measured ng/L	Recovery %
05	5.00	7347	4.65	92.9%
18	5.00	7260	4.59	91.8%
30	5.00	6980	4.42	88.3%
42	5.00	6834	4.32	86.5%
54	5.00	7131	4.51	90.2%
59	5.00	7038	4.45	89.0%

Bubbler blank checks

Criteria: < 50 pg and +/- 10 pg of ave. BB

Run	PA	measured pg	difference pg
01	0	0	0
02	0	0	0
03	0	0	0
04	0	0	0
07	0	0	0
19	0	0	0
31	0	0	0
43	0	0	0
55	0	0	0
60	0	0	0

Quality Control Sample (QCS)

Criteria: ~~Recovery=77-123%~~ 75-125% FM 03/16/00

Run	QCS ID	known ng/L	PA	corrected ng/L	Recovery %
08	QCS-1	10.0	15018	9.45	94.5%
37	QCS-2	10.0	13692	8.61	86.1%

Matrix Spike Samples (MS/MSD)

Criteria: Recovery=71-125%, RPD<24%

Run	Sample Tracking #	ID #	Spike Concent. ng/L	Measured Sample ng/L	Measured Sample + Spike ng/L	Spike Recovery ng/L	Recovery	RPD (%)
12	00BR082	5MS	39.92	3.57	38.7	35.1	88.0%	
13	00BR082	5MSD	40.00	3.57	34.5	30.9	77.3%	11.5
24	00BR087	1MS	39.62	1.10	36.8	35.7	90.1%	
25	00BR087	1MSD	39.90	1.10	30.9	29.8	74.7%	17.4
35	00BR083	1MS	39.73	2.40	2.57	N/A	N/A	
36	00BR083	1MSD	39.80	2.40	2.55	N/A	N/A	0.8

Reagent Blank (RB)

Criteria: <25 pg/blank

Hg conc. in Blank:	5.0	pg/Blank	~~N~~ 225 (Action Level)	last analyzed:	2/27/00
1 Blank unit =	0.500	ml BrCl		StDev:	2.4
&	0.100	ml Hydroxylamine HCl			

Reagent Blank is <0.2 ng/L

Water QC

BRL Analytical Summary

Hg in water by Method 1631 B (BRL Mod. #2)

Batch #: 00-084(1631).xls Tracking #(s): 00BR075,082,083,087

	Analyst:	W. Hagan		Date:	3/15/00	Project #(s):	TTI002,CAL002,MAI001			
Sample Results										
Run	Tracking #	ID #	Sample Volume (mL)	Dilution Volume (mL)	Analyzed Vol. (mL)	Reagent Blank units	PA	pg	Result ng/L	Reported Value
09	00BR082	1	100.42	101.12	89.72	2.0	1922	122	1.26	
10	00BR082	3	100.22	100.92	89.15	2.0	2472	156	1.67	
11	00BR082	5	100.25	100.95	89.59	2.0	5156	326	3.57	
12	00BR082	5MS	100.20	101.30	89.25	2.0	54179	3427	38.7	
13	00BR082	5MSD	100.00	101.10	89.27	2.0	48235	3051	34.5	
14	00BR082	7	100.83	101.53	89.50	2.0	3855	244	2.64	
15	00BR082	9	100.92	101.62	89.15	2.0	2274	144	1.53	
16	00BR082	11	100.02	100.72	90.29	2.0	2725	172	1.82	
17	00BR082	13	100.23	100.93	89.58	2.0	1545	97.7	1.00	
20	00BR082	15	100.19	100.89	90.43	2.0	1716	109	1.11	
21	00BR082	17	100.98	101.68	89.73	2.0	2476	157	1.66	
22	00BR082	19	100.57	101.27	90.24	2.0	301	* 19.0	0.113	Field Blank ND <0.2 ng/L
23	00BR087	1	100.46	101.16	89.00	2.0	1675	106	1.10	
24	00BR087	1MS	100.96	102.06	89.96	2.0	51900	3283	36.8	
25	00BR087	1MSD	100.24	101.34	88.81	2.0	43096	2726	30.9	
26	00BR087	3	100.34	101.04	89.84	2.0	1423	90.0	0.909	
27	00BR087	5	100.49	100.19	90.14	2.0	1160	73.4	0.712	
28	00BR087	7	100.59	101.29	90.27	2.0	1474	93.2	0.941	
29	00BR087	9	100.92	101.62	90.12	2.0	1261	79.8	0.792	
32	00BR087	11	100.01	100.71	89.91	2.0	255	* 16.1	0.081	ND <0.2 ng/L
33	00BR075	2	100.34	101.04	89.58	2.0	406	25.7	0.189	
34	00BR083	1	100.31	101.01	90.47	2.0	3548	224	2.40	
35	00BR083	1MS	100.69	101.79	89.19	2.0	3717	235	2.57	
36	00BR083	1MSD	100.50	101.20	89.02	2.0	3698	234	2.55	
38	00BR075	1	100.61	106.71	89.49	11.0	3649	231	2.19	

* circled values within Blank action Level

QC CALCULATIONS

Calibration Results

Instrument Calibration (03/13/00, No Batch Affiliation)

Criteria: RSD<15%

Criteria: low std. 75-125%

Run	pg	PA	Response Factor	% Recovery
	50	801	0.06242	101%
	100	1668	0.05995	
	500	8508	0.05877	
	2500	37245	0.06712	
	10000	147052	0.06800	
RSD:	6.58%	Avg:	0.06325	

Bubbler Blanks (11.2.1)

Criteria: <50 pg, ave. <25 pg, StDev <10 pg

Run	PA	pg
	0	0
	0	0
	0	0
	0	0
Average:	0.00	0
StDev:	0	0

U.S. EPA - CLP

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: BROOKS RAND LTD Contract: GCB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: 01/28/00

Flame AA ID Number: _____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L) ng/g	IDL ~~(ug/L)~~ ng/g	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			3		
Magnesium			5000		
Manganese			15		
Mercury	253.7		150 ~~0.2~~	0.747	
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

The Analytical Method is BR-0002 and units are ng/g. CVAFS Instrumentation was used.

FORM X - IN

ILM03

U.S. EPA - CLP

10
INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: 01/19/00

Flame AA ID Number: _____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL ~~(ug/L)~~ ng/L	IDL ~~(ug/L)~~ ng/L	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			3		
Magnesium			5000		
Manganese			15		
Mercury	253.7		12 ~~0.2~~	0.2	
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

FORM X - IN

ILM03

U.S. EPA - CLP

13
PREPARATION LOG

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Method: BR-0002

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
SD-13-03Q	04/07/00	1.04	
SD-12-03Q		1.04	
SD-11-03Q		1.02	
SD-11-03QD		1.01	
SD-11-03QS		1.01	
SD-10-03Q		1.06	
SD-09-03Q		1.01	
SD-08-03Q		1.10	
SD-07-03Q		1.06	
SD-06-03Q		1.06	
SD-21-03Q		1.07	
SD-05-03Q		1.04	
SD-05-03QD		1.04	
SD-05-03QS		1.10	
SD-04-03Q		1.03	
SD-03-03Q		1.04	
SD-02-03Q		1.04	
SD-01-03Q		1.06	
SS-01-03Q		1.02	
SS-02-03Q		1.01	
CRM-1		0.606	
CRM-2		0.600	
PB1			25.6
PB2			25.6

FORM XIII - IN

ILMO

U.S. EPA - CLP

13
PREPARATION LOG

Name: BROOKS RAND LTD Contract: GCDB-99-700-1298

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Method: EPA 1631

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
SW1303Q	03/14/00		101
SW1203Q			101
SW1103Q			101
SW1103QS			101
SW1103QSD			101
SW1003Q			102
SW0903Q			102
SW0803Q			101
SW0703Q			101
SW0603Q			101
SW0503Q			102
RB022200			101
SW0503Q			101
SW0503QS			102
SW0503QSD			101
SW0403Q			101
SW0303Q			100
SW0203Q			101
SW0103Q			102
RB022300			101
LCSW1			100
LCSW2			100

FORM XIII - IN

ILMC

U.S. EPA - CLP

14

ANALYSIS RUN LOG

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID Number: BR-08 Method: EPA 1631

Start Date: 03/15/00 End Date: 03/15/00

EPA Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
				–	–	–	–	–	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–	–	–	–
ICB		09:42		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCB		09:46		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCB		09:50		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCB		09:55		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
ICV		10:03		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCV		10:07		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCB		10:11		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
LCSW1		10:15		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW1303Q		10:40		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW1203Q		10:46		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW1103Q		11:41		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW1103QS		10:55		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW1103QSD		10:49		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW1003Q		11:46		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0903Q		11:49		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0803Q		11:53		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0703Q		12:00		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCV		12:06		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCB		12:11		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0603Q		12:23		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0103Q		12:28		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
RB022200		12:40		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0503Q		12:43		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0503QS		12:49		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0503QSD		12:56		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0403Q		13:01		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0303Q		13:05		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0203Q		13:11		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
SW0103Q		13:25		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCV		13:29		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
CCB		13:42		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
RB022300		13:46		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
ZZZZZZ		13:51		–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–

U.S. EPA - CLP

14

ANALYSIS RUN LOG

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID Number: BR-08 Method: EPA 1631

Start Date: 03/15/00 End Date: 03/15/00

EPA Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ		13:56																X									
ZZZZZZ		13:56																X									
ZZZZZZ		14:03																X									
LCSW2		15:70																X									
ZZZZZZ		15:26																X									
ZZZZZZ		15:29																X									
ZZZZZZ		15:33																X									
ZZZZZZ		16:25																X									
CCV		16:29																X									
CCB		16:34																X									

VALLEY
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SOIL LABORATORY TEST REPORT 2-13

Project No. 99143
March 7, 2000

Attention: Mr. Garth Glenn
TetraTech NUS
600 Clark Avenue, Suite 3
King of Prussia, PA 19406-1433

Re: CLEAN Contract N62472-90-D-1298, CTO No. 0252
Naval Air Warfare Center (NAWC)
Warminster, PA

Samples Received: On 2/24/00 - 18 jar samples, designated SD-01-03Q to SD-13-03Q.

Testing Completed: (See attached Work Order)

Test	Standard
Particle-Size Analysis (Sieve and Hydrometer)	D422

Results:

The results of the particle-size analysis are graphically depicted on the attached gradation curves. Also enclosed is the hard copy date package. If you have any questions about this report, please call.

Sincerely,

Jeffrey W. Rosengarten

Jeffrey W. Rosengarten
Geotechnical Engineer

JWR:lcw

Fax (610) 688-8143 • 6 Berkeley Road, Devon, PA 19333-1397 • (610) 688-8517

www.valleyforgelabs.com • engineers@valleyforgelabs.com

Tetra Tech NUS

CHAIN OF CUSTODY RECORD

Garth Glenn Ext. 144
(610) 491-9688

=> Due 3/17.

PROJECT NO.: 6883 CTO 252

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): Seth Pelepko Charles Meyer

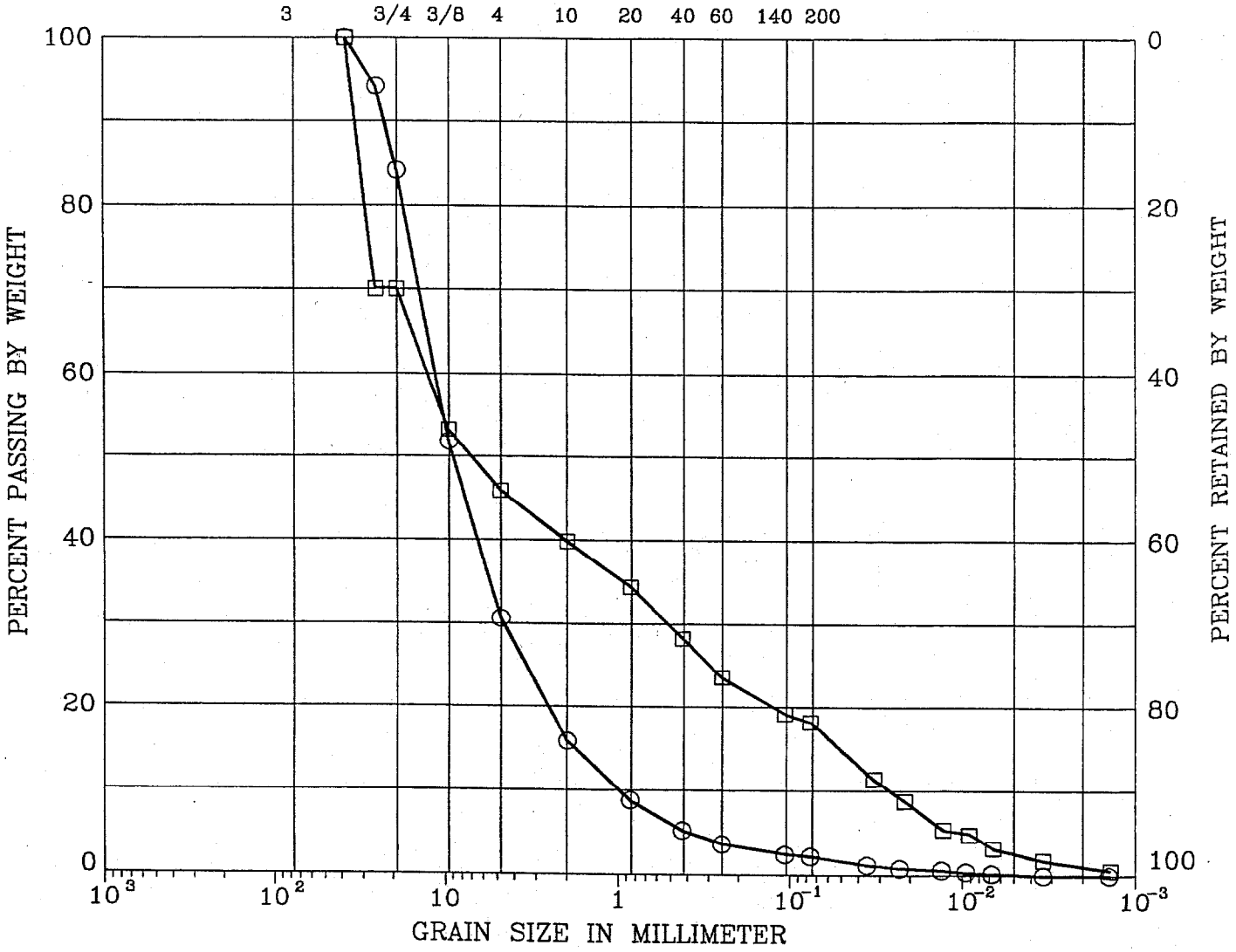
STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	16oz Glass WM Grain Size	32oz Glass WM Grain Size					REMARKS
13	2/22/00	0915		✓	SD-13-03Q	1	1						
12	2/22/00	0935		✓	SD-12-03Q	1	1						
11	2/22/00	1015		✓	SD-11-03Q	2	X 1						Run only 1 test on
10	2/22/00	1005		✓	SD-10-03Q	2	X 1						a composite sample
09	2/22/00	1125		✓	SD-09-03Q	2	X 1						Sieve & Hydro. on all
08	2/22/00	1205		✓	SD-08-03Q	1	1						
07	2/22/00	1230		✓	SD-07-03Q	2	X						
06	2/22/00	1315		✓	SD-06-03Q	2	X						
05	2/23/00	0901		✓	SD-05-03Q	1	1						
04	2/23/00	0922		✓	SD-04-03Q	1		1					
03	2/23/00	0945		✓	SD-03-03Q	1		1					
02	2/23/00	1015		✓	SD-02-03Q	1		1					
01	2/23/00	1045		✓	SD-01-03Q	1		1					

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
Charles Meyer	2/23/00 1700				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Shipped Via Federal Express Airbill No 810817875228	

(0498)

UNIFIED SOIL CLASSIFICATION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



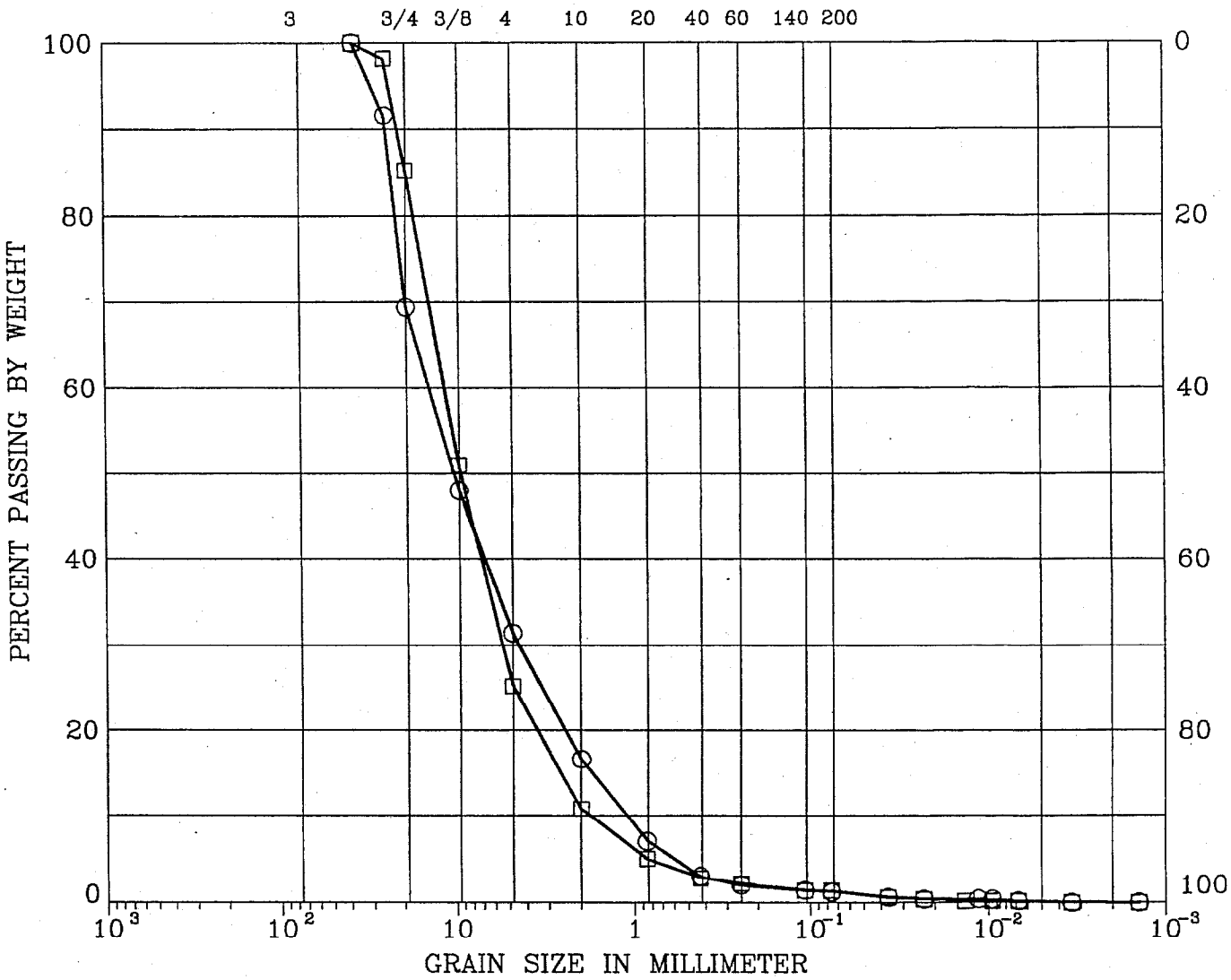
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-01-03Q				Well-Graded Gravel with Sand (GW, visual)
□	SD-02-03Q				Silty Gravel with Sand (GM, visual)

Remark :

Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 2/7/2000

UNIFIED SOIL CLASSIFICATION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



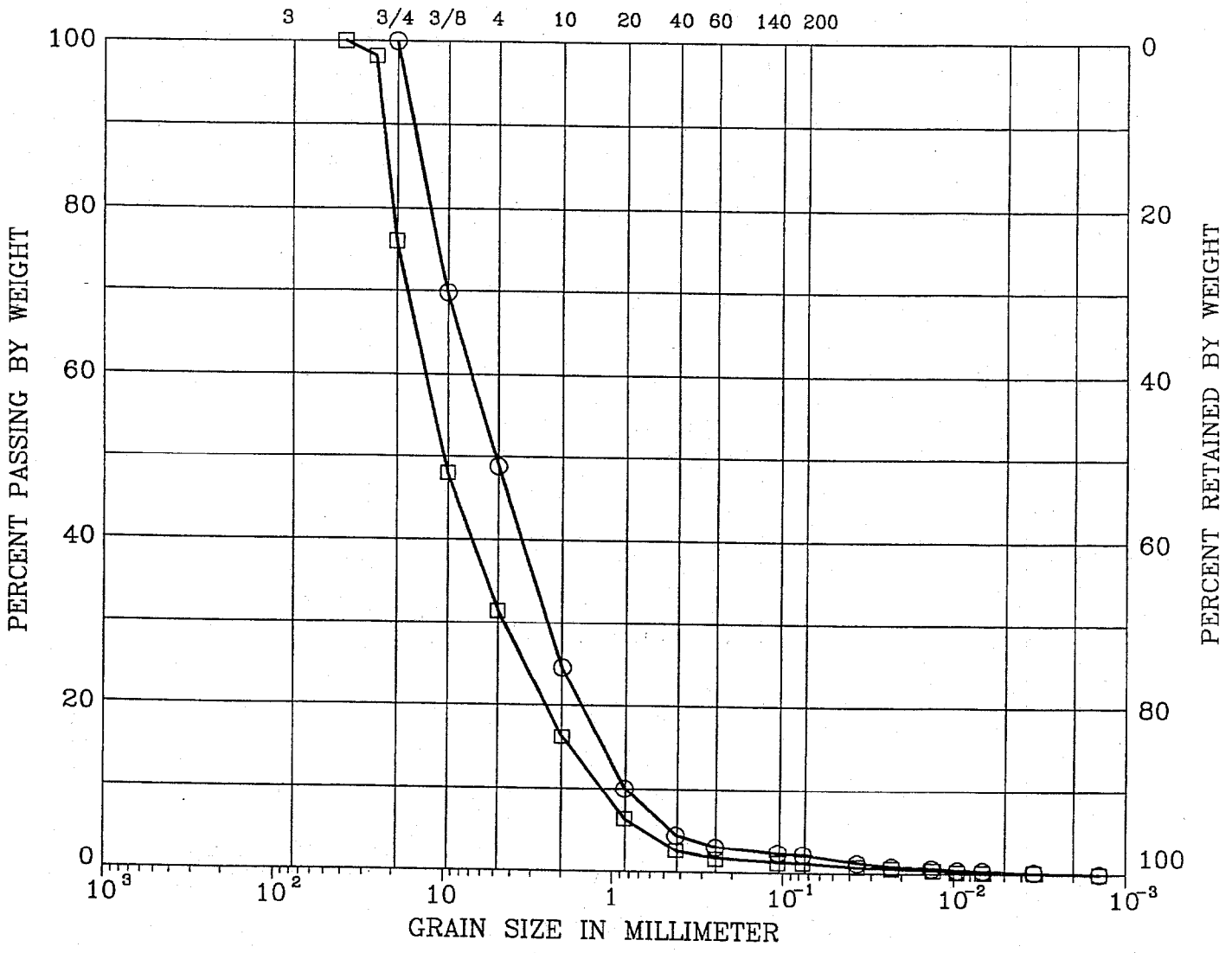
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-03-03Q				Well-Graded Gravel with Sand (GW, visual)
□	SD-04-03Q				Well-Graded Gravel with Sand (GW, visual)

Remark :

Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 3/7/2000

UNIFIED SOIL CLASSIFICATION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



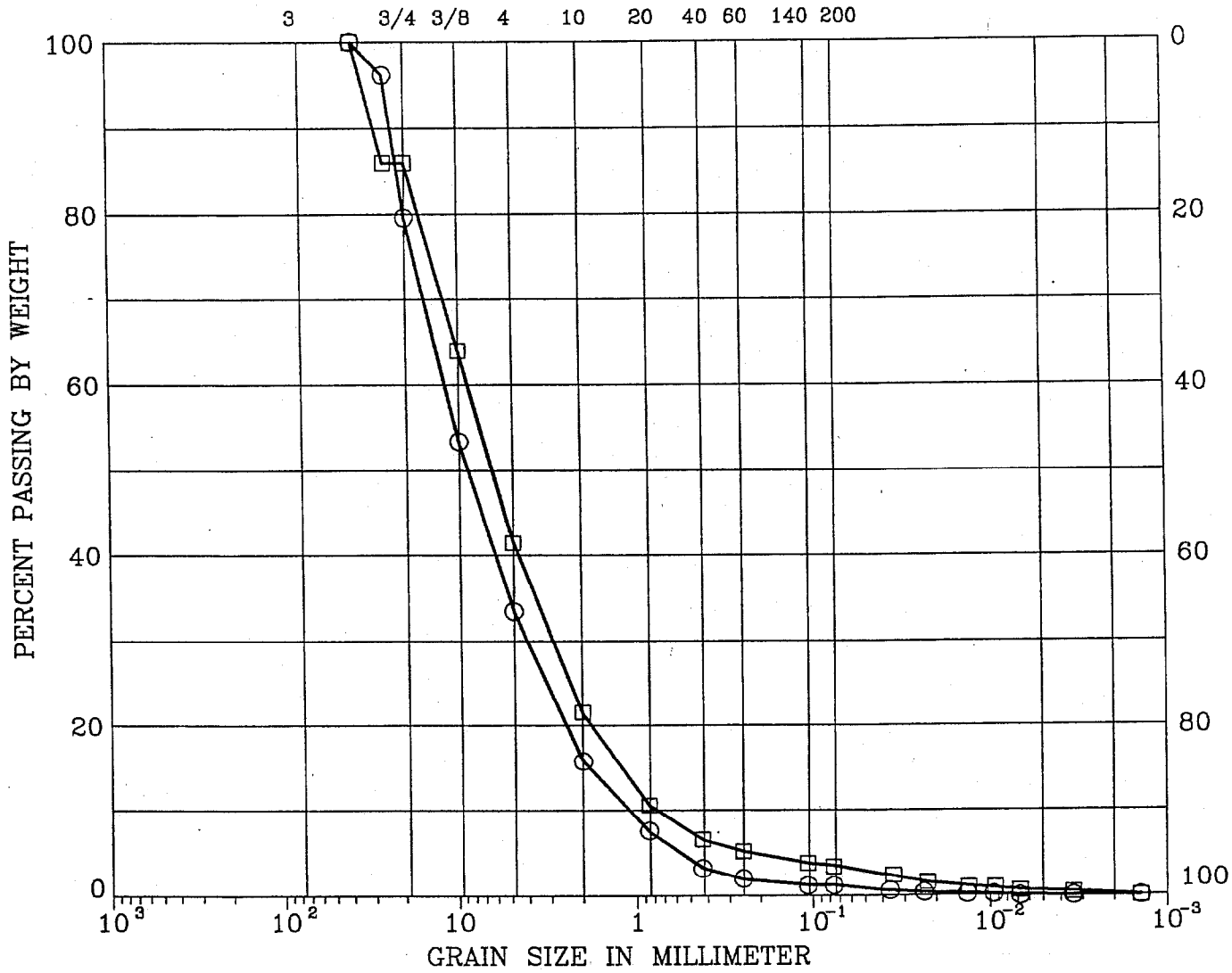
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-05-03Q				Well-Graded Gravel with Sand (GW, visual)
□	SD-06-03Q				Well-Graded Gravel with Sand (GW, visual)

Remark :

Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 3/7/2000

UNIFIED SOIL CLASSIFICATION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



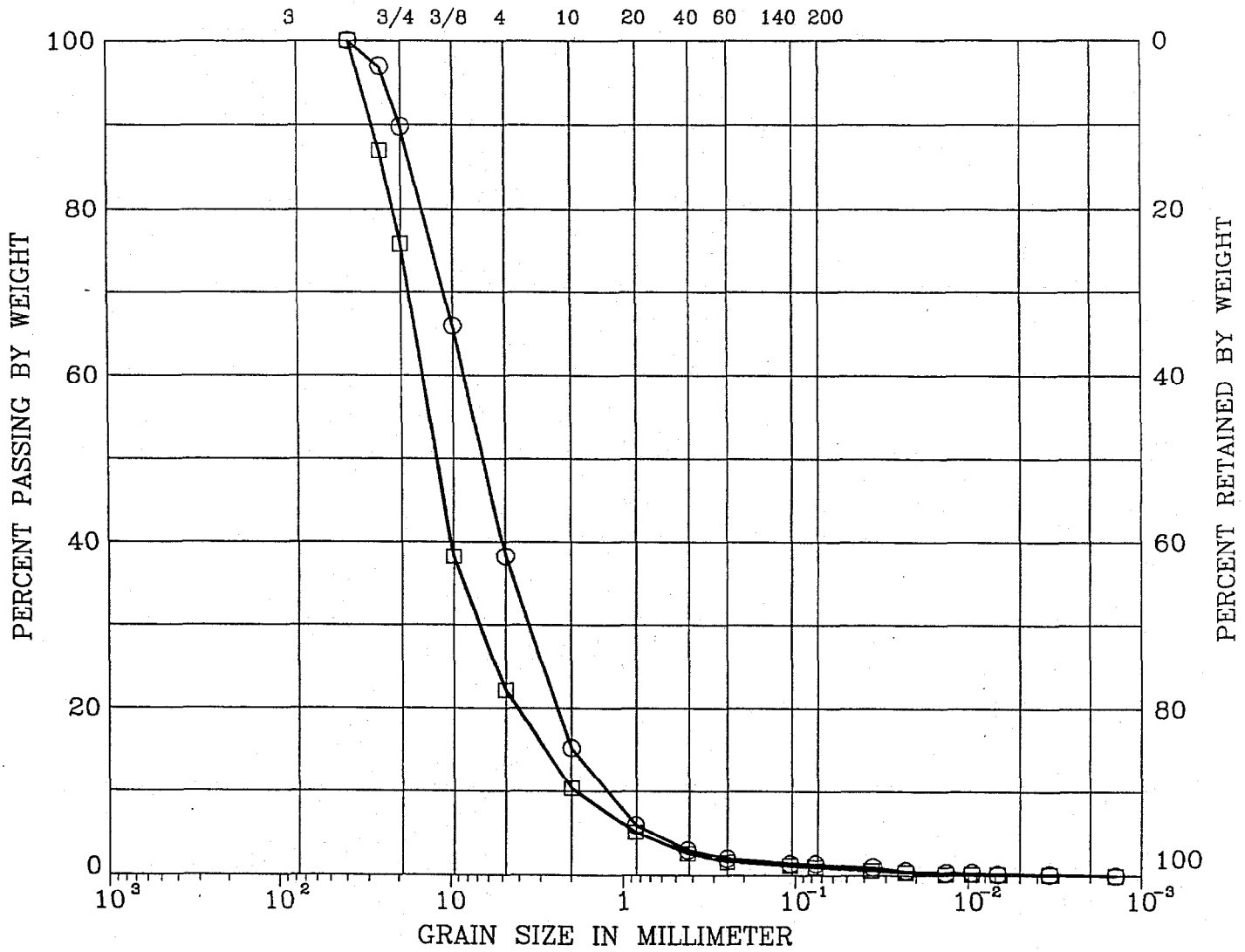
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-07-03Q				Well-Graded Gravel with Sand (GW, visual)
□	SD-08-03Q				Well-Graded Gravel with Sand (GW, visual)

Remark :

Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 3/7/2000

UNIFIED SOIL CLASSIFICATION

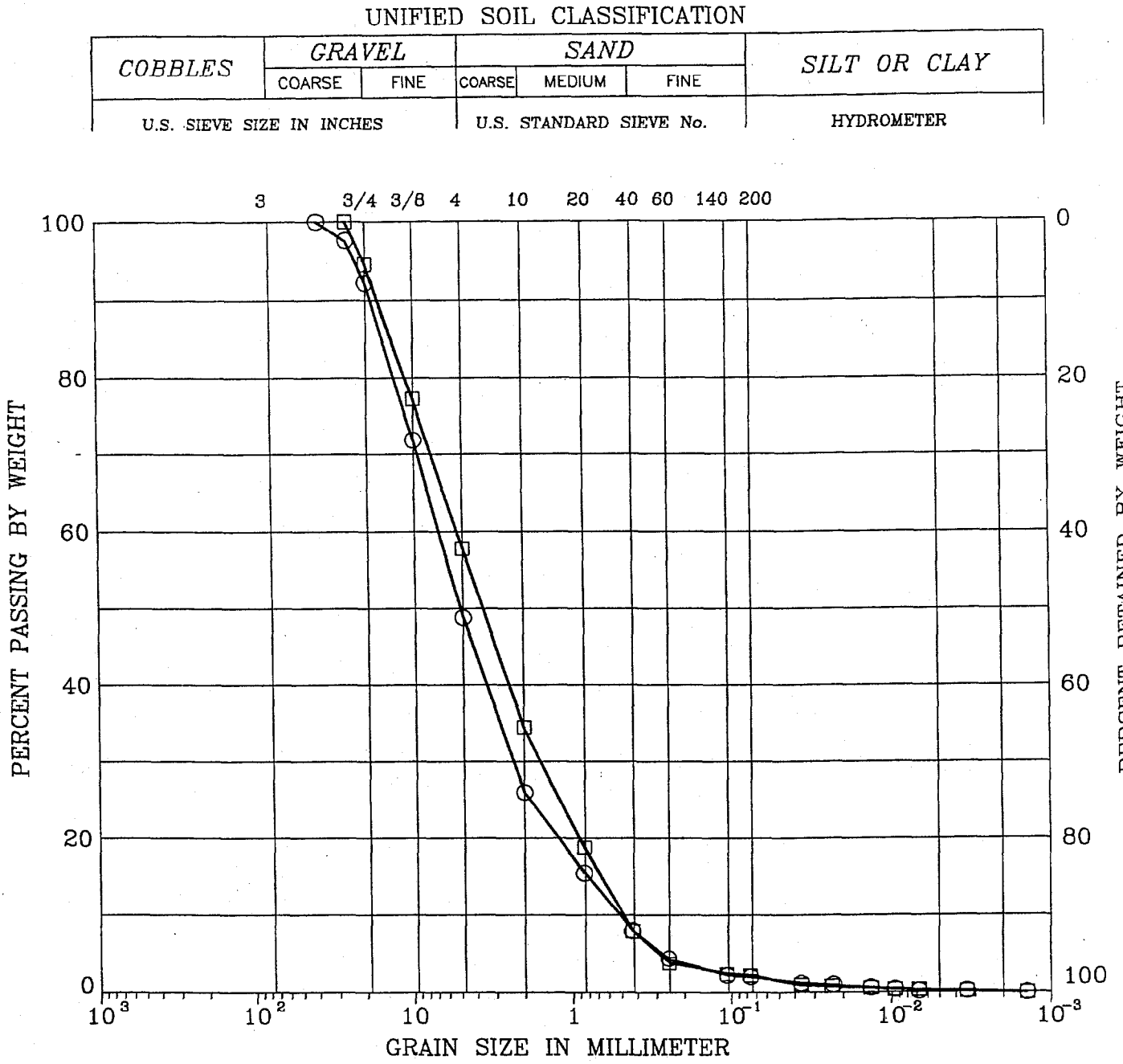
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-09-03Q				Well-Graded Gravel with Sand (GW, visual)
□	SD-10-03Q				Well-Graded Gravel with Sand (GW, visual)

Remark :

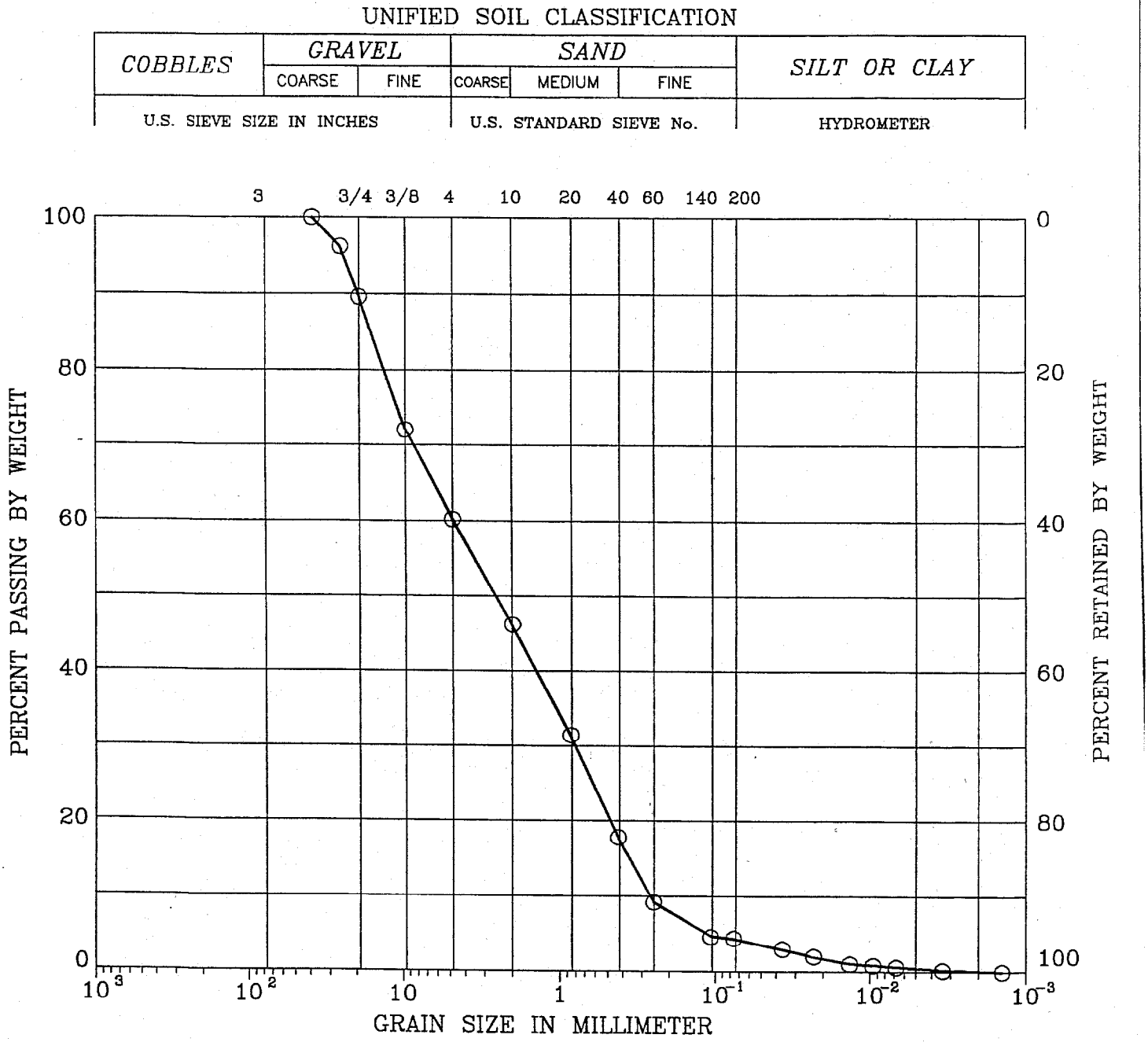
Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 3/7/2000



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-11-03Q				Well-Graded Gravel with Sand (GW, visual)
□	SD-12-03Q				Poorly-Graded Sand with Gravel (SP, visual)

Remark :

Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 3/7/2000



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-13-03Q				Poorly-Graded Sand with Gravel (SP, visual)

Remark :

Project No. 99143	NAWC Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 3/7/2000

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1 Boring SD-01 Depth (ft)

Specific Gravity of Soil	2.70	Temperature	Composite
Weight of Airdry Soil (g)	100.19	(Centigrade)	Correction
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035
Weight of Tare (g)	0.00	29.0	1.0020

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	21.1	1.0085	0.0354	1.2
5.0	21.1	1.0070	0.0227	0.8
15.0	21.1	1.0060	0.0132	0.6
30.0	20.8	1.0050	0.0095	0.3
60.0	20.6	1.0046	0.0067	0.2
247.0	19.7	1.0040	0.0034	0.0
1445.0	19.5	1.0039	0.0014	-0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd1

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-01 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1227.460

Total Weight of Dry Soil For Fine Sieve 100.190

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	45.000	8.7
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	70.460	94.3	# 40 (0.425mm)	67.260	5.2
3/4 (inch)	194.040	84.2	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	592.260	51.7	# 60 (0.250mm)	77.060	3.7
# 4(4.75 mm)	853.000	30.5	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	84.800	2.4
#10(2.00 mm)	1033.140	15.8	# 200(0.075mm)	86.280	2.2

Press [ESC] to continue ... b:sd1

E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2 Boring SD-02 Depth (ft)

Specific Gravity of Soil	2.70	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil (g)	74.12		
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035
Weight of Tare (g)	0.00	29.0	1.0020

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	21.0	1.0170	0.0325	11.3
5.0	21.0	1.0140	0.0212	8.8
15.0	20.8	1.0100	0.0128	5.3
30.0	20.8	1.0095	0.0091	4.9
60.0	20.5	1.0075	0.0066	3.1
240.0	19.8	1.0060	0.0034	1.7
1440.0	19.6	1.0047	0.0014	0.6
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd1

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 2 Boring SD-02 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1224.250

Total Weight of Dry Soil For Fine Sieve 74.120

Sieve No. For Coarse/Fine Sieve Split 10

J.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
.0 (inch)	0.000	0.0	# 20 (0.85 mm)	9.950	34.5
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
.0 (inch)	366.550	70.1	# 40 (0.425mm)	21.500	28.3
/4 (inch)	366.550	70.1	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	573.980	53.1	# 60 (0.250mm)	30.330	23.5
# 4(4.75 mm)	663.640	45.8	# 100(0.150mm)	0.000	0.0
8(2.38 mm)	0.000	0.0	# 140(0.106mm)	38.430	19.2
10(2.00 mm)	737.030	39.8	# 200(0.075mm)	40.280	18.2

Press [ESC] to continue ... b:sd1

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1 Boring SD-03 Depth (ft)

Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	102.57	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.9	1.0060	0.0363	0.6
5.0	20.9	1.0055	0.0231	0.5
20.0	20.9	1.0052	0.0116	0.4
30.0	20.9	1.0050	0.0095	0.3
60.0	20.5	1.0045	0.0068	0.2
240.0	19.8	1.0041	0.0034	0.0
1440.0	19.5	1.0039	0.0014	-0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd3

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-03 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1272.280

Total Weight of Dry Soil For Fine Sieve 102.570

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	59.070	7.1
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	106.370	91.6	# 40 (0.425mm)	84.600	2.9
3/4 (inch)	388.690	69.4	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	660.540	48.1	# 60 (0.250mm)	90.500	2.0
# 4(4.75 mm)	873.160	31.4	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	93.970	1.4
#10(2.00 mm)	1060.000	16.7	# 200(0.075mm)	94.620	1.3

Press [ESC] to continue ... b:sd3

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-04	Depth (ft)		
Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	88.52	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.9	1.0070	0.0360	0.6
5.0	20.9	1.0060	0.0230	0.4
15.0	20.8	1.0052	0.0134	0.3
30.0	20.7	1.0050	0.0095	0.2
60.0	20.5	1.0048	0.0067	0.2
240.0	19.8	1.0043	0.0034	0.1
1440.0	19.6	1.0040	0.0014	-0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd3

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 2 Boring SD-04 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1174.870

Total Weight of Dry Soil For Fine Sieve 88.520

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	47.830	5.0
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	21.610	98.2	# 40 (0.425mm)	65.210	2.8
3/4 (inch)	172.780	85.3	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	576.240	51.0	# 60 (0.250mm)	70.450	2.2
# 4(4.75 mm)	879.020	25.2	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	76.450	1.5
# 10(2.00 mm)	1047.780	10.8	# 200(0.075mm)	77.830	1.3

Press [ESC] to continue ... b:sd3

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1	Boring SD-05	Depth (ft)		
Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	101.30	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.8	1.0070	0.0360	1.3
5.0	20.8	1.0060	0.0230	0.9
15.0	20.7	1.0055	0.0134	0.7
30.0	20.6	1.0050	0.0095	0.5
60.0	20.4	1.0048	0.0067	0.4
240.0	19.8	1.0043	0.0034	0.1
1440.0	19.7	1.0038	0.0014	-0.1
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd5

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-05 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 691.290

Total Weight of Dry Soil For Fine Sieve 101.300

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	59.760	10.1
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	0.000	0.0	# 40 (0.425mm)	82.990	4.4
3/4 (inch)	0.000	0.0	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	209.030	69.8	# 60 (0.250mm)	88.690	3.1
# 4(4.75 mm)	353.610	48.8	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	91.820	2.3
#10(2.00 mm)	521.200	24.6	# 200(0.075mm)	92.430	2.2

Press [ESC] to continue ... b:sd5

GEOSOFT [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-06		Depth (ft)	
Specific Gravity of Soil		2.70	Temperature	Composite
Weight of Airdry Soil	(g)	118.37	(Centigrade)	Correction
Wet Weight of Soil + Tare	(g)	0.00	17.3	1.0045
Dry Weight of Soil + Tare	(g)	0.00	22.0	1.0035
Weight of Tare	(g)	0.00	29.0	1.0020

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.	
2.0	20.8	1.0070	0.0360	0.7	
5.0	20.8	1.0065	0.0229	0.6	
15.0	20.7	1.0060	0.0133	0.5	
30.0	20.5	1.0050	0.0095	0.3	
60.0	20.4	1.0049	0.0067	0.2	
240.0	20.3	1.0045	0.0034	0.1	
1430.0	19.7	1.0040	0.0014	0.0	
0.0	0.0	0.0000	0.0000	0.0	
0.0	0.0	0.0000	0.0000	0.0	Press [ESC]
0.0	0.0	0.0000	0.0000	0.0	to
0.0	0.0	0.0000	0.0000	0.0	continue ...
0.0	0.0	0.0000	0.0000	0.0	b:sd5

GEOSOFT [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 2 Boring SD-06 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve	1221.000
Total Weight of Dry Soil For Fine Sieve	118.370
Sieve No. For Coarse/Fine Sieve Split	10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	71.930	6.4
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	20.800	98.3	# 40 (0.425mm)	99.850	2.5
3/4 (inch)	293.030	76.0	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	635.960	47.9	# 60 (0.250mm)	106.050	1.7
# 4(4.75 mm)	836.950	31.5	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	109.270	1.3
#10(2.00 mm)	1022.460	16.3	# 200(0.075mm)	109.910	1.2

Press [ESC] to continue ... b:sd5

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1 Boring SD-07 Depth (ft)

Specific Gravity of Soil	2.70	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil (g)	97.73		
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035
Weight of Tare (g)	0.00	29.0	1.0020

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.6	1.0060	0.0364	0.6
5.0	20.6	1.0052	0.0232	0.4
15.0	20.5	1.0049	0.0135	0.3
30.0	20.5	1.0045	0.0095	0.2
60.0	20.4	1.0041	0.0068	0.1
240.0	20.3	1.0039	0.0034	0.0
1420.0	19.7	1.0037	0.0014	-0.1
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd7

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-07 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1279.900

Total Weight of Dry Soil For Fine Sieve 97.730

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	51.600	7.5
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	47.830	96.3	# 40 (0.425mm)	77.750	3.3
3/4 (inch)	261.310	79.6	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	597.300	53.3	# 60 (0.250mm)	85.780	1.9
# 4(4.75 mm)	853.420	33.3	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	89.890	1.3
#10(2.00 mm)	1076.420	15.9	# 200(0.075mm)	90.150	1.2

Press [ESC] to continue ... b:sd7

E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2 Boring SD-08 3 Depth (ft)

Specific Gravity of Soil	2.70	3	Temperature	Composite
Weight of Airdry Soil (g)	97.88	3	(Centigrade)	Correction
Wet Weight of Soil + Tare (g)	0.00	3	17.3	1.0045
Dry Weight of Soil + Tare (g)	0.00	3	22.0	1.0035
Weight of Tare (g)	0.00	3	29.0	1.0020

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.4	1.0105	0.0350	2.3
5.0	20.4	1.0085	0.0226	1.6
15.0	20.3	1.0070	0.0132	1.1
30.0	20.3	1.0065	0.0094	0.9
60.0	20.3	1.0058	0.0067	0.7
240.0	20.3	1.0052	0.0034	0.5
1418.0	19.6	1.0041	0.0014	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd7

E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 2 Boring SD-08 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 647.730

Total Weight of Dry Soil For Fine Sieve 97.880

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	49.630	10.6
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
.0 (inch)	91.010	85.9	# 40 (0.425mm)	67.980	6.6
3/4 (inch)	91.010	85.9	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	233.430	64.0	# 60 (0.250mm)	74.330	5.2
4(4.75 mm)	379.460	41.4	# 100(0.150mm)	0.000	0.0
8(2.38 mm)	0.000	0.0	# 140(0.106mm)	80.550	3.8
#10(2.00 mm)	508.340	21.5	# 200(0.075mm)	81.970	3.5

Press [ESC] to continue ... b:sd7

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1	Boring SD-09	Depth (ft)		
Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	105.32	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.7	1.0080	0.0357	1.0
5.0	20.7	1.0060	0.0230	0.5
15.0	20.6	1.0055	0.0134	0.4
30.0	20.6	1.0052	0.0095	0.3
60.0	20.5	1.0050	0.0067	0.3
240.0	20.4	1.0045	0.0034	0.2
1410.0	19.6	1.0041	0.0014	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd9

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-09 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1257.790

Total Weight of Dry Soil For Fine Sieve 105.320

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	63.550	6.0
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	38.670	96.9	# 40 (0.425mm)	84.810	3.0
3/4 (inch)	127.530	89.9	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	427.870	66.0	# 60 (0.250mm)	91.280	2.0
# 4(4.75 mm)	776.910	38.2	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	95.410	1.4
#10(2.00 mm)	1066.040	15.2	# 200(0.075mm)	96.290	1.3

Press [ESC] to continue ... b:sd9

GEOSOFT [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-10	Depth (ft)		
Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	93.59	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.	
2.0	20.7	1.0070	0.0361	0.6	
5.0	20.7	1.0062	0.0230	0.4	
15.0	20.5	1.0052	0.0134	0.2	
30.0	20.4	1.0050	0.0095	0.2	
60.0	20.3	1.0048	0.0067	0.2	
240.0	20.3	1.0045	0.0034	0.1	
1410.0	19.7	1.0038	0.0014	-0.0	
0.0	0.0	0.0000	0.0000	0.0	
0.0	0.0	0.0000	0.0000	0.0	Press [ESC]
0.0	0.0	0.0000	0.0000	0.0	to
0.0	0.0	0.0000	0.0000	0.0	continue ...
0.0	0.0	0.0000	0.0000	0.0	b:sd9

GEOSOFT [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 2 Boring SD-10 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1290.600

Total Weight of Dry Soil For Fine Sieve 93.590

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	46.830	5.2
.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
.0 (inch)	167.120	87.1	# 40 (0.425mm)	69.990	2.6
3/4 (inch)	311.450	75.9	# 50 (0.300mm)	0.000	0.0
?/8 (inch)	797.570	38.2	# 60 (0.250mm)	78.780	1.6
4(4.75 mm)	1004.680	22.2	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	83.540	1.1
#10(2.00 mm)	1156.510	10.4	# 200(0.075mm)	84.370	1.0

Press [ESC] to continue ... b:sd9

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1	Boring SD-11	Depth (ft)		
Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	105.02	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.6	1.0070	0.0361	1.3
5.0	20.6	1.0061	0.0230	0.9
15.0	20.6	1.0052	0.0134	0.6
30.0	20.5	1.0050	0.0095	0.5
60.0	20.3	1.0046	0.0068	0.3
240.0	20.3	1.0044	0.0034	0.2
1400.0	19.9	1.0040	0.0014	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd11

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-11 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 1389.800

Total Weight of Dry Soil For Fine Sieve 105.020

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	42.650	15.5
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	34.100	97.5	# 40 (0.425mm)	72.610	8.0
3/4 (inch)	107.240	92.3	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	391.140	71.9	# 60 (0.250mm)	87.630	4.3
# 4(4.75 mm)	711.110	48.8	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	95.940	2.3
#10(2.00 mm)	1027.500	26.1	# 200(0.075mm)	96.970	2.0

Press [ESC] to continue ... b:sd11

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-12	Depth (ft)		
Specific Gravity of Soil	2.70	Temperature	Composite	
Weight of Airdry Soil (g)	97.54	(Centigrade)	Correction	
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045	
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035	
Weight of Tare (g)	0.00	29.0	1.0020	

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.5	1.0055	0.0366	0.9
5.0	20.5	1.0051	0.0233	0.7
15.0	20.4	1.0049	0.0135	0.6
30.0	20.3	1.0046	0.0096	0.4
60.0	20.3	1.0044	0.0068	0.3
240.0	20.3	1.0041	0.0034	0.1
1390.0	19.7	1.0039	0.0014	-0.1
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd11

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 2 Boring SD-12 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 707.240

Total Weight of Dry Soil For Fine Sieve 97.540

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	44.240	18.8
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	0.000	0.0	# 40 (0.425mm)	74.780	8.0
3/4 (inch)	37.900	94.6	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	161.880	77.1	# 60 (0.250mm)	86.560	3.9
# 4(4.75 mm)	299.120	57.7	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	90.610	2.4
# 10(2.00 mm)	464.370	34.3	# 200(0.075mm)	91.150	2.2

Press [ESC] to continue ... b:sd11

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 1 Boring SD-13 Depth (ft)

Specific Gravity of Soil	2.70	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil (g)	99.92		
Wet Weight of Soil + Tare (g)	0.00	17.3	1.0045
Dry Weight of Soil + Tare (g)	0.00	22.0	1.0035
Weight of Tare (g)	0.00	29.0	1.0020

Time (min)	Temp. (Cent.)	Reading	Grain Size (mm)	% Passing By Wt.
2.0	20.4	1.0078	0.0359	2.9
5.0	20.4	1.0065	0.0230	1.9
15.0	20.3	1.0053	0.0134	1.1
30.0	20.3	1.0050	0.0095	0.8
60.0	20.3	1.0048	0.0067	0.7
240.0	20.3	1.0042	0.0034	0.2
1390.0	19.9	1.0039	0.0014	-0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0
0.0	0.0	0.0000	0.0000	0.0

Press [ESC] to continue ... b:sd13

G E O S O F T [R/GRAIN] SIEVE ANALYSIS (ASTM D-422-63) OUTPUT SCREEN

Curve No. 1 Boring SD-13 Depth (ft)

Total Weight of Dry Soil For Coarse Sieve 738.140

Total Weight of Dry Soil For Fine Sieve 99.920

Sieve No. For Coarse/Fine Sieve Split 10

U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.	U.S. Sieve Size/No.	Cumul. Wt. Retained (gm)	% Passing By Wt.
3.0 (inch)	0.000	0.0	# 16 (1.18 mm)	0.000	0.0
2.0 (inch)	0.000	0.0	# 20 (0.85 mm)	32.100	31.3
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	27.880	96.2	# 40 (0.425mm)	61.560	17.7
3/4 (inch)	76.040	89.7	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	206.009	72.1	# 60 (0.250mm)	80.020	9.2
# 4(4.75 mm)	293.910	60.2	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	89.740	4.7
#10(2.00 mm)	397.650	46.1	# 200(0.075mm)	90.570	4.3

Press [ESC] to continue ... b:sd13