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NAWC WARMINSTER
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Stream Monitoring Fourth 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

September 2000

TETRA TECH NUS, INC.

STREAM MONITORING
FOURTH 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

Submitted to:
Northern Division
Environmental Branch, Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop No. 82
Lester, Pennsylvania 19113-2090

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Contract No. N62472-90-D-1298
Contract Task Order 0252

SEPTEMBER 2000

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L/DOCUMENTS/NAVY/6883/14551

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1.0 INTRODUCTION

This Stream Monitoring Fourth 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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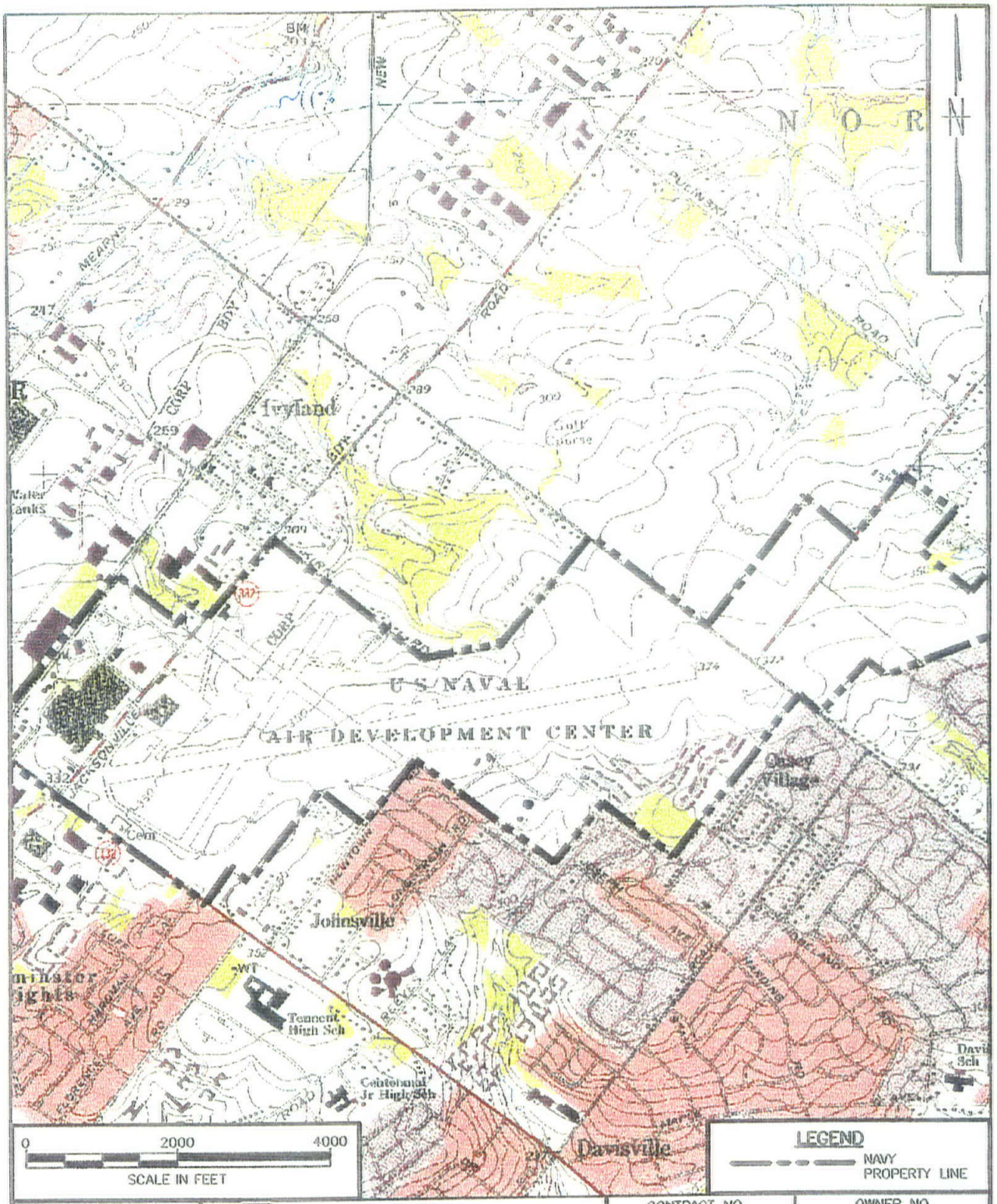

DRAWN BY A.S.M. DATE 11/24/1998	Tetra Tech NUS Inc.	CONTRACT NO. N62472-90-D-1298	OWNER NO. CTO 0252
CHECKED BY DATE	SITE LOCATION MAP	APPROVED BY	DATE 6/29/99
COST/SCHED-AREA	FORMER NAWC WARMINSTER	APPROVED BY	DATE
SCALE 1 in.=2000 ft.	WARMINSTER, PENNSYLVANIA	DRAWING NO. FIGURE 2-1	REV. 0

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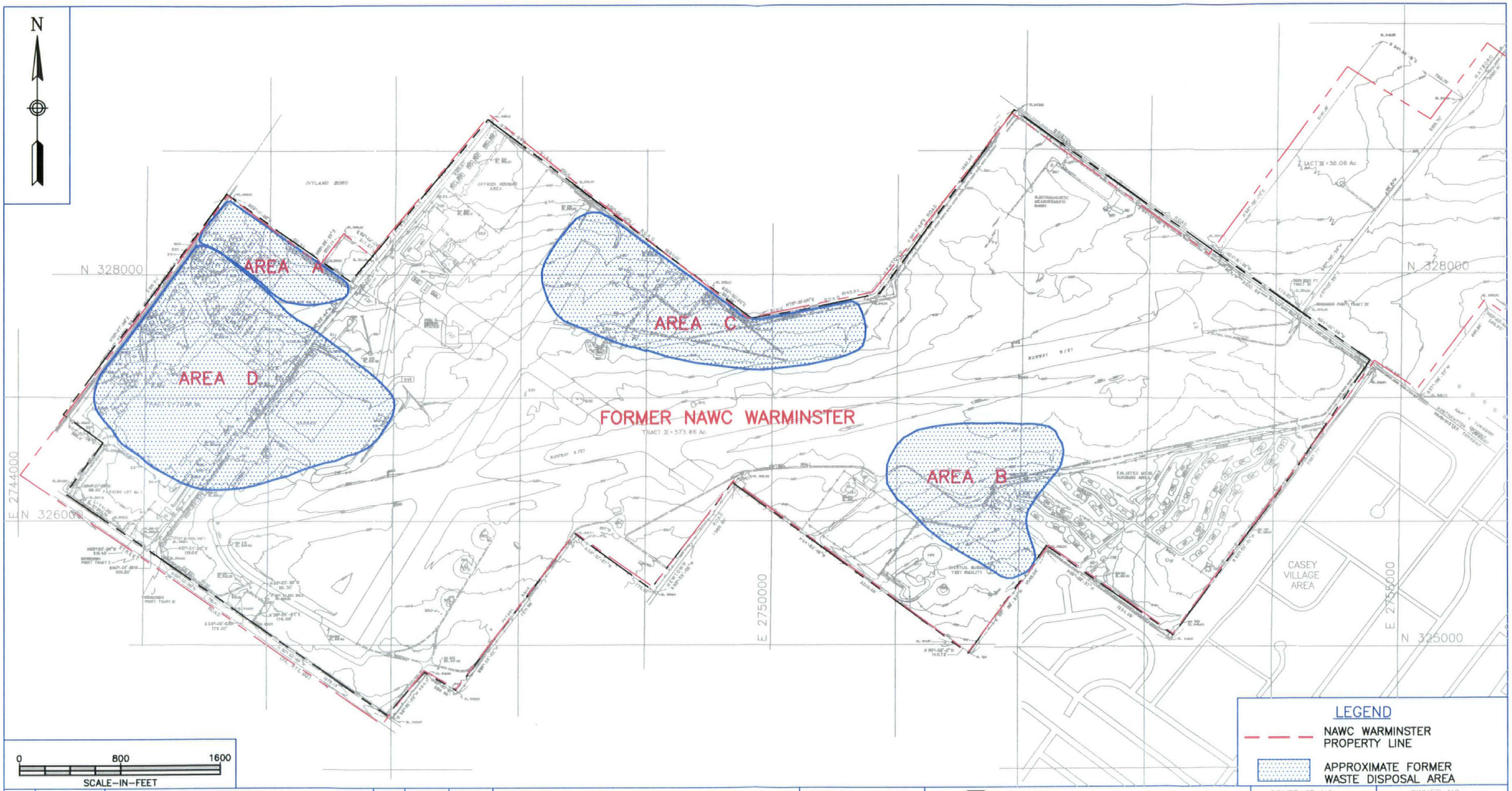

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DRAWN BY EEH DATE 4/5/99
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COST/SCHED-AREA
SCALE AS SHOWN

Tetra Tech NUS, Inc.

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

CONTRACT NO. N62472-90-D-1298
OWNER NO. CTO 0252
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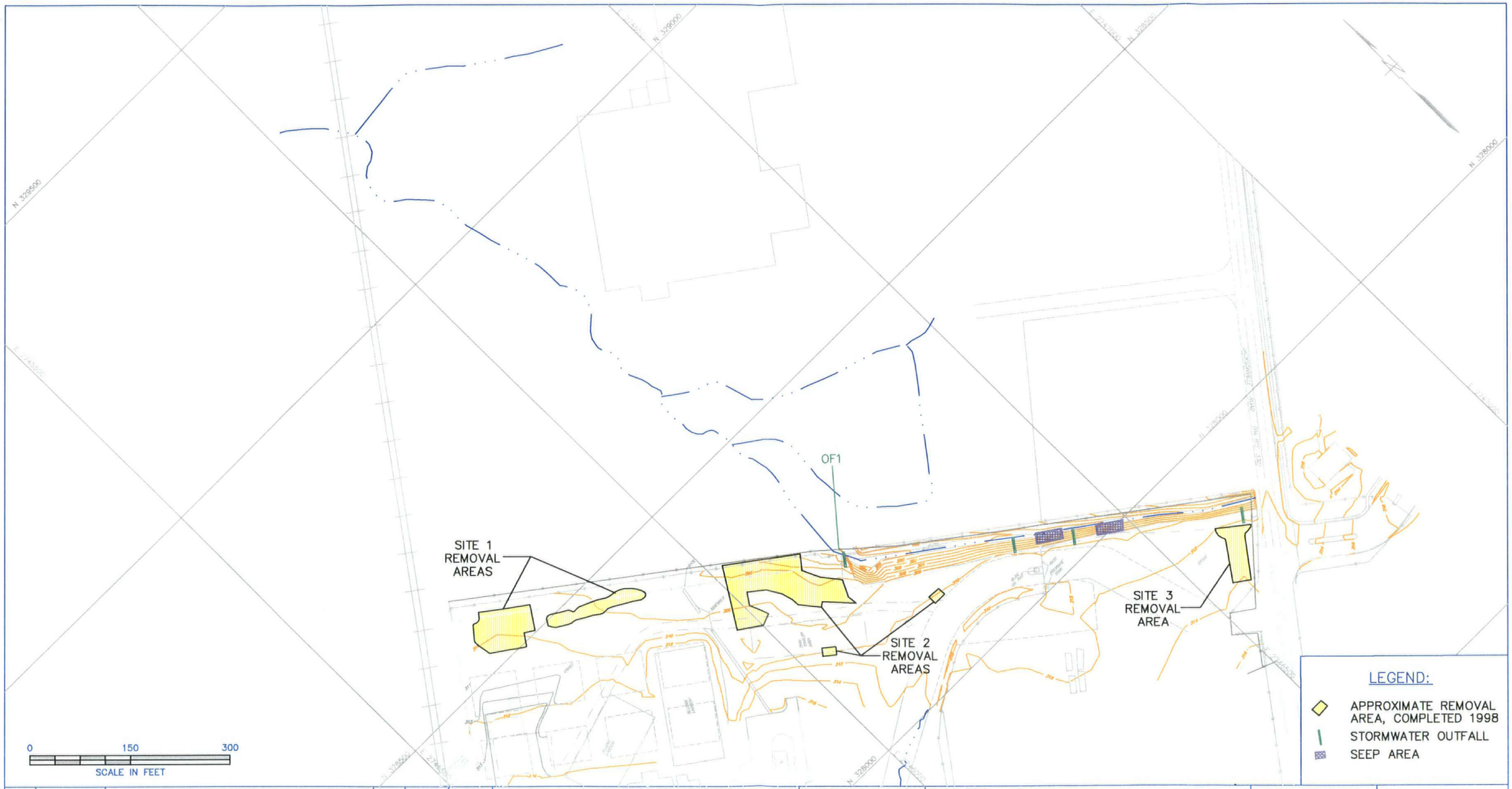

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY LDL DATE 3/31/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE 1" = 150'

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
APPROVED BY DATE
DRAWING NO. FIGURE 2-3
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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.

Upon completion of the removal actions, all three sites were backfilled, regraded, and returned to original condition. The Navy completed an RI/FS for Area A soils and the unnamed tributary Little Neshaminy Creek [Operable Unit 9 (OU-9)] in April 2000 (RI/FS for Operable Unit 9 Area A Media Other Than Groundwater, TtNUS 2000). The Navy selected a final remedy for Area A soils abd the stream in a Record of Decision (ROD) signed in June 2000. The final remedy includes the

implementation and maintenance of an erosion control system at Site 2, institutional controls limiting land use, and the performance of stream monitoring to ascertain the effectiveness of the removal actions and the erosion control systems. The remedy has been implemented and this report presents the results of the first year of stream monitoring. The results of this effort provide baseline data to be used in the development and implementation of the monitoring component of the final OU-9 remedy.

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 that third quarterly event are presented in the Stream Monitoring Third Quarterly Report (June 2000, TtNUS). The fourth quarterly sampling event was conducted in June 2000 and consisted of sampling the same stream and seep locations and the collection of macroinvertebrates from the same locations as the first quarterly event. The results of the fourth 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 FOURTH 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-01-04Q and SS-02-04Q) were collected from leachate outbreaks at or near the tributary (Figure 3-1). Sampling was performed in February 2000. Details of sampling procedures may be found in the Stream Monitoring Work Plan prepared by TtNUS in August 1999. Macroinvertebrate samples also collected during the fourth quarter. The stations where macroinvertebrate samples were obtained were ST-01, ST-04, ST-07, ST-10, ST-12 and ST-13.

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A-22
TAKEN AT OUTFALL NO. 1

SAMPLE COLLECTED FROM OUTFALL (OF1) CHANNEL.

A-14
A-15
A-16
A-17
A-16
A-17
A-18
A8/A10
A-19 aq
A-20 aq
A7
A-21
1A, 1B
A6
A-23
A-24
A-25
A-26
A5
A4
A3
A2
A27
A9
A1
OF1
OF3
2A, 2B

SW-13-04Q
SD-13-04Q
SW-12-04Q
SD-12-04Q
SW-10-04Q
SD-10-04Q
SW-09-04Q
SD-09-04Q
SW-11-04Q
SD-11-04Q
SD-08-04Q
SW-08-04Q
SW-06-04Q
SD-06-04Q
SW-05-04Q
SD-05-04Q
SW-04-04Q
SD-04-04Q
SW-02-04Q
SD-02-04Q
SW-01-04Q
SD-01-04Q
SS-02-04Q
SW-03-04Q
SD-03-04Q
SS-01-04Q
SW-07-04Q
SD-07-04Q
SW-21-04Q
SD-21-04Q DUP

SITE 1 REMOVAL AREAS
SITE 2 REMOVAL AREAS
SITE 3 REMOVAL AREA

N 329500
N 329000
N 328500
N 328000
E 2748500
E 2747000
E 2747500
E 2746500

LEGEND:

- RI SEDIMENT SAMPLE
- RI SURFACE WATER SAMPLE
- RI SURFACE WATER AND SEDIMENT SAMPLE
- APPROXIMATE REMOVAL AREA, COMPLETED 1998
- STORMWATER OUTFALL
- SEEP AREA
- SURFACE WATER AND SEDIMENT SAMPLE
- SEEP SOIL SAMPLE

0 150 300
SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD
6	9/8/00	REVISED STREAM CHANNEL.	LDL		
5	8/9/00	SAMPLE ID CHANGED FROM 3Q TO 4Q.	LDL		
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					

REFERENCES

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CHECKED BY DATE
COST/SCHED-AREA
SCALE 1" = 150'

Tetra Tech NUS, Inc.

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

CONTRACT NO. 6883
OWNER NO. 5130
APPROVED BY DATE
APPROVED BY DATE
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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 fourth 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-01-04Q) 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-02-04Q) 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). During the fourth quarter, stream flow rates, depth, and volume decreased at all locations with the exception of ST-03 where the stream was wider and deeper than in past sampling events. This general trend is expected due to decreased precipitation during the summer months.

3.2.5 Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was conducted at six of the 13 stream locations. The six locations (ST-01, ST-04, ST-07, ST-10, ST-12, and ST-13) were identified by Navy, EPA, and TtNUS personnel based on locations of discharge pipes and seeps which could potentially impact the stream. The locations were the same as those collected during the September 1999 sampling event as discussed in the First Quarterly Monitoring Report (TtNUS, 1999).

Sampling methodology was the same as used during the first quarter. The samples were collected using a Surbur bottom sampler. Samples were collected from the most downstream station to the most upstream location to avoid unnecessary sediment disturbance. After placing the sampler on the streambed, the sediment was agitated to a depth of 0.5 feet with the resulting material being swept into the net. At each sample location two samples (replicates) were collected and composited. The material in the net was then collected for laboratory analysis and preserved with a 95% ethanol solution. The samples were analyzed for species level taxonomy identification, Shannon-Weiner Index (H), Macroinvertebrate Biotic Index (MBI), and Index of Community Similarity (SI). For additional information see sample log sheets in Attachment C.

TABLE 3-1
STREAM FLOW MONITORING RESULTS
FOURTH 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	5.70	0.51	2.91	0.0 (1)	0.0
ST-02	3.00	0.29	0.87	0.65	0.57
ST-03	5.00	0.67	3.35	2.14	7.17
ST-04	2.83	0.29	0.82	0.18	0.15
ST-05	3.25	0.375	1.40	1.22	1.71
ST-06	4.67	0.53	2.48	0.98	2.43
ST-07	2.90	0.27	0.78	0.63	0.49
ST-08	2.50	0.125	0.313	1.00	0.313
ST-09	4.00	0.50	2.00	0.042	0.084
ST-10	3.00	0.50	1.50	0.53	0.795
ST-11	4.75	0.33	1.57	0.068	0.11
ST-12	10.60	0.20	2.12	0.255	0.54
ST-13	3.42	0.125	0.43	0.498	0.21

cfs = cubic feet per second
Cross-section area = Width X Depth
Flow Rate = Cross-section area X Velocity
(1) velocity too low to register on meter

4.0 SAMPLING RESULTS

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

4.1 ANALYTICAL RESULTS

During the fourth 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-01-04Q through SW-13-04Q) 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-01-04Q through SD-13-04Q) were analyzed for TAL metals, low concentration mercury, PAHs, TOC, and grain size. Two surface soil samples (SS-01-04Q and SS-02-04Q) 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-21-04Q and SD-21-04Q.

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 a summary of grain-size results for each quarter. Table 4-3 presents surface soil results in relation to site background. Table 4-4 presents the benthic macroinvertebrate community at the six monitoring locations and Table 4-5 presents the similarity between macroinvertebrate samples. Completed data validation packages for all results are included in Appendix E.

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 fourth quarter showed a increase in temperature (expected with increasing ambient temperatures), stable turbidity levels (with the exception of location ST-08 which showed increased turbidity), stable specific conductivity readings, and a downward trend for pH and DO. DO levels at ST-11 continued to be lower than the other locations. Salinity was 0.0 to 0.01 percent at all locations which are within the range typically recorded during all four quarters. ST-11, which is the location at the outfall receiving runoff from the parking area, did show increased salinity (as well as impacts on other field parameters) during the winter (February 2000) sampling. These results 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 fourth quarter sampling were compared to results from the other three quarterly events. In addition, an annual means were calculated and presented in the result tables.

In general, results for surface water samples generally showed correlation with earlier results. Contaminants exceeding AWQCs were detected at ST-02 (lead), ST-07 (manganese), ST-08 (lead, manganese), ST-10 (barium, manganese), ST-11 (barium, iron, manganese) and ST-12 (barium, manganese, mercury). 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 other sampling events.

With the exceptions noted above, contaminants were detected at approximately the same levels at most locations throughout the year. In general, a review of the first year sampling results suggests that manganese concentrations increase in the water column from stations ST-08 through ST-11 with ST-11 showing the most significant increase in manganese concentrations. Surface water samples from ST-11 also exhibited a significant increase in iron and barium concentrations. Iron and barium appear to return to upstream or reference levels at ST-12, immediately downstream of ST-11, while manganese levels return to levels similar to those found at ST-08 which are slightly elevated above reference station levels. Table 4-1 presents the data for the quarterly sampling events. Appendix E presents the data validation packages for the fourth quarter.

4.1.2 Sediment Results

Levels of metals remained at levels detected during the third quarter with the exception of ST-06 which showed decreasing levels of metals and ST-09 which showed a slight increase. Silver was the most predominant metal exceeding ecological screening values; exceedences were detected at all 13 sampling locations. Other metals, such as copper, lead, nickel, and zinc, exceed ecological screening values at various points along the stream. A review of sediment concentrations recorded over the course of the year suggests that metals concentrations and the number of ecological screening value exceedences appears to decrease from the upstream or reference station (ST-01) through ST-04. Metals concentrations and exceedences increase at ST-05 to levels similar to ST-01 and then continue to decrease again in downstream samples to ST-11. The levels and number of exceedences appear to increase again at ST-11 but, with the exception of zinc, all metals concentrations appear to return to levels at or below the reference station levels at ST-12 and ST-13.

Although levels of PAHs exceed ecological screening values in all the sediment samples, changes in the distribution of these compounds were observed in the fourth quarter. Concentrations of PAHs increased at stations ST-01, ST-03, ST-04, ST-05, ST-08, ST-09, and ST-10, and decreased at ST-07, ST-12 and ST-13. The location with the highest levels recorded in the fourth quarter was ST-10. PAH levels have increased each quarter at this location. The annual mean concentrations of PAHs are also among the highest levels. ST-11 has the highest annual average concentrations of PAHs; however, this location has shown significant decreases during each sampling event. ST-12 showed the lowest levels of PAHs during the fourth sampling event; only one compound [benz(a)anthracene] exceeded the ecological screening value.

A significant decrease in PAH levels was observed at ST-07, which is the location nearest the seep area. High levels were observed during the third quarter; however, the fourth quarter results showed PAH levels among the lowest of any location. Soil samples collected from the seep do not show this same trend (see Section 4.1.3). In fact, surface soils from this seep showed a significant increase in PAH levels during the fourth quarter monitoring event. Based on these results, and those from the previous quarters, there does not appear to be a correlation between the levels of PAHs in the seeps to those detected in sediments from ST-07.

In addition to the apparent trends noted above, the mean of the first year PAH sediment results appears to indicate that concentrations tend to increase from ST-01 through ST-09 with significant increases at ST-05, ST-07, and ST-08. PAH levels in sediments at ST-10 and ST-11 appear to show an even more significant increase and contain the highest levels found in the stream; although levels at ST-10 have increased over the year while the levels at ST-11 have decreased over the year.

There has been little change in grain size of the sediments since those observed from the first to second quarter due to the 1999 flood event. Grain size has remained predominantly gravel mixed with sand. Table 4-2 presents grain size data for the quarterly sampling events. Appendix E presents the data validation packages for the fourth 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 zinc (107 mg/kg at SS-01 and 102 mg/kg at SS-02), and PAHs. In general, levels of metals in SS-02 decreased from the third quarter, the most notable being zinc which decreased from 11,600 J mg/kg to 102 mg/kg. There also has not been a reoccurrence of the elevated levels of metals observed during the second quarter in SS-01.

Although relatively low, PAHs increased in the fourth quarter in both SS-01 and SS-02. The PAH levels in SS-01 were highest during the fourth quarter. The highest levels of PAHs in SS-02 were recorded during the second sampling event. Table 4-3 presents the surface soil data for all sampling events. Appendix E presents the data validation packages for the fourth quarter.

4.2 BIOLOGICAL RESULTS

As noted in Section 3.2.5, benthic macroinvertebrate samples were collected in June 2000 at six locations in the unnamed tributary of Little Neshaminy Creek as part of stream monitoring

activities. The locations, shown in Figure 3-1, included ST-01 (sample BI-01-04Q), ST-04 (sample BI-04-04Q), ST-07 (sample BI-07-04Q), ST-10 (sample BI-10-04Q), ST-12 (sample BI-12-04Q), and ST-13 (sample BI-13-04Q). The stream monitoring is being conducted to assess the impacts, if any, to the tributary from Area A. Sampling and sample analyses were conducted in accordance with the work plan dated August 1999 (TtNUS, 1999).

The taxonomic results of the June 2000 benthic macroinvertebrate sampling are presented in Table 4-5. Analysis of the similarity of the benthic macroinvertebrate communities at each location during the June 2000 sampling event is presented in Table 4-6. Tables 4-7 and 4-8 present the results of the first benthic macroinvertebrate sampling event in September 1999, as initially reported in the First Quarterly Report (TtNUS, 1999). No second or third quarter benthic macroinvertebrate sampling was conducted.

Most of the benthic macroinvertebrate taxa identified in the fourth quarter samples have pollution tolerance values (TVs) in the upper range, i.e. are generally tolerant of at least moderate levels of water contamination (Table 4-4). The MBI values reported in Table 4-4 are generally indicative of fair water quality (MBI in range from 6.68 to 7.70) or good to fair water quality (MBI in range from 5.96 to 6.67). The highest MBI value, 7.56, occurs at ST-07, located immediately adjacent to one of two seeps that emerge from the southern embankment of the tributary in Area A. This highest MBI value reflects a high count of tubificid worms (Annelida: Oligochaeta: Tubificidae) at that location, relative to the other locations. Tubificid worms, a taxon that has the highest possible TV value of 10, have oxygen-binding pigments that allow them to survive extended periods of anoxic water conditions. Therefore, they are tolerant of high levels of organic contamination that result in severe depletion of dissolved oxygen (i.e. high biochemical oxygen demand or BOD) that is fatal to most other aquatic fauna.

Counts of tubificid worms are substantially lower at the location adjacent to the other seep associated with Area A (ST-04) and at the locations downstream of the seeps (ST-10, ST-12, and ST-13). The fact that the tubificid counts are very low in the downstream samples, and the fact that the MBI in the downstream samples is lower, suggests that any effect of the seeps on the benthic macroinvertebrate community in the stream may be localized. Reasons for a slight spike in the tubificid count in the last downstream sample (at ST-13) are not apparent, but that spike is not nearly as pronounced as that at ST-07.

The other taxon for which large numbers of individuals were counted in the samples is the genus *Cricotopus* sp. (Insecta: Diptera: Chironomidae), one of several genera of Chironomid midges. Chironomid midges inhabit aquatic habitats during their juvenile life cycle stages (egg, larva, and

pupa) before emerging as terrestrial adults. A few of the *Cricotopus* organisms could be identified to species, but most could only be identified to genus. The TV for the overall genus is 7, indicative of tolerance to water of fair but not poor quality. As for tubificid worms, the highest numbers of *Cricotopus* organisms were found at ST-07, immediately adjacent to one of the seeps.

The fourth quarter data in Table 4-4 clearly indicates that the macroinvertebrate community in the investigated reach of the tributary was dominated (at the time of the June 2000 sampling event) by taxa tolerant of at least moderate water pollution. As noted above, the taxa with the highest counts at most locations are the tubificid worms (TV of 10) and midges of the genus *Cricotopus* (TV of 7). Taxa generally associated with good water quality, such as larvae of most families within the Insecta Orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (Caddisflies), are either absent or present only in very few numbers at all locations. Furthermore, the data in Table 4-4 shows a low macroinvertebrate community diversity throughout the investigated stream reach, with organisms in the Collector-Gatherer (CG) functional feeding group (FFG) overwhelmingly outnumbering organisms in other FFGs such as Filtering/Collectors (FC), Scrapers (SC), Shredders (SH), Predators (P), and Piercers (PI). Lack of representation from most or all of these FFGs suggests an unbalanced community typical of impaired habitats. This is not unexpected considering the stream location, general surrounding environment, and the nature of the stream headwaters.

While the fourth quarter data shows a localized increase in pollution-tolerant biota where the stream passes one of the seeps associated with Area A, the data does not convincingly demonstrate that the observed dominance by pollution tolerant organisms is attributable to Area A. Large numbers of *Cricotopus* organisms were counted in the sample from ST-01, the only sample upstream of Area A. The MBI and community diversity for ST-01 does not contrast sharply with the other locations. It is therefore quite possible that the benthic macroinvertebrate community observed at ST-07 and other locations in the unnamed tributary reflects contamination sources or other stressful conditions not associated with Area A.

The ability to draw meaningful conclusions from the macroinvertebrate data is limited by the available data and the lack of a good reference site.

ST-01 is located in the investigated tributary immediately upstream of Area A, and thus can be interpreted as a reference site. However, the stream channel at ST-01 has been even more disturbed than has the channel at the downstream locations. The cross-sections of the stream channel in Appendix A of the First Quarterly Report (TtNUS, 1999) show that the channel at ST-

01 is generally narrower and more sharply incised than at most downstream sampling locations. ST-01 is located very close to a headwall that releases the flow of the buried upstream reach of the unnamed tributary. Water flowing at ST-01 has not had as much exposure time to the ambient physical conditions (e.g., air temperature) as has the water that reaches the downstream locations. Furthermore, ST-01 provides only a single reference location for sample collection. The distinct variability in the macroinvertebrate taxonomy in samples from ST-12 and ST-13, both downstream locations located only 100 feet apart, demonstrates the uncertainty associated with macroinvertebrate sample data collected from a single location.

Interpretation of the macroinvertebrate data is further limited by the fact that interpretable data is only available for a single sampling event (June 2000). As noted in the First Quarterly Report (TtNUS, 1999), the very low numbers of organisms counted in the macroinvertebrate samples collected in September 1999 (Tables 4-6 and 4-7) limits the usefulness of that data. No benthic macroinvertebrate data were collected for the second or third quarterly sampling events. Having at least two rounds of benthic macroinvertebrate data with roughly similar overall results would strengthen any conclusions drawn on the basis of the fourth quarter data.

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

	NOAA	AWQC	SW-01								
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	350	B	41	UL	41	U	62	U	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	34.2	B	**67.4**	L	63.9	B	74.9	B	**16.9**
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.48	U	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	B	- -
Calcium	NA	NA	5180	B	21800		16800		20000		14650
Chromium	81	74/11	6.2		5.4	U	5.4	U	6.4	U	1.6
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	3.3	UL	- -
Copper	34	9	10.7	B	3.8	UL	3.8	U	8.7	U	- -
Iron	NA	1000	683		55.5	B	40	U	176	K	214.8
Lead	46.7	2.5	**78.8**		2.7	U	2.7	U	6	B	**19.7**
Magnesium	NA	NA	2030	K	6820		6680		6840	K	5593
Manganese	NA	80	32	B	8.8	L	9.3	B	47.7		14.1
Mercury	0.15	0.012	0.01		0.00087		0.00079		0.0002	U	0.00292
Nickel	20.9	52.0	6.3	UL	6.3	U	6.3	U	7.3	U	- -
Potassium	NA	NA	1040	B	1190		1020	B	859	B	298
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	3.7	UJ	3.7	U	3.7	U	6.1	U	- -
Sodium	NA	NA	3110	K	15900		10400		17700		11778
Thallium	NA	NA	4.4	U	4.4	UL	4.4	U	2.4	U	- -
Vanadium	NA	19	2.8	B	2.8	UL	2.8	U	4.5	U	- -
Zinc	150	120	47.1		23.4	B	20.6	B	20	L	16.8
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			21.3		82		69.5		78.1		62.7
Total Organic Carbon			5		1.5	B	1.5		5	U	1.6
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L
Acenaphthene	16	24	NA		0.5	U	0.5	U	0.5	U	- -
Acenaphthylene	44	24	NA		1	U	1	U	1	U	- -
Anthracene	85.3	24	NA		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	- -
Benzo(a)pyrene	430	0.014	NA		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	- -
Benzo(g,h,i)perylene	430	0.014	NA		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	- -
Chrysene	384	0.014	NA		0.05	U	0.05	U	0.05	U	- -
Dibenz(a,h)anthracene	63.4	0.014	NA		0.1	U	0.1	U	0.1	U	- -
Fluoranthene	600	3.9	NA		0.1	U	0.1	U	0.1	U	- -
Fluorene	19	3.9	NA		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	- -
Naphthalene	160	24	NA		0.5	U	0.5	U	0.5	U	- -
Phenanthrene	240	24	NA		0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	NA		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-02								
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	**1050**		41	UL	41	U	137	B	**263**
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	42.3	B	**69.2**	L	59.7	B	74.8	B	**17.3**
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.98	B	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	8980	J	25300		16000		19700		17495
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	6.4	UL	- -
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	3.3	UJ	- -
Copper	34	9	9.1	B	3.8	UL	3.8	U	8.7	B	- -
Iron	NA	1000	**1800**	J	93.4	B	40	U	368		542
Lead	46.7	2.5	**119**		2.7	U	2.7	U	**5.7**	J	**31.2**
Magnesium	NA	NA	3040	J	7900		6390		7130	J	6115
Manganese	NA	80	**86.4**	J	14.8	L	9.8	B	23.1	L	31.1
Mercury	0.15	0.012	**0.0142**		0.00100		0.00094		0.0041		0.00506
Nickel	20.9	52.0	6.3	UL	6.3	U	6.3	U	7.3	U	- -
Potassium	NA	NA	1090	B	1330		923	B	1160	K	623
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	4	B	3.7	U	3.7	U	6.1	U	- -
Sodium	NA	NA	4730	J	17900		9930	K	17800		12590
Thallium	NA	NA	4.4	U	4.4	UL	4.4	U	2.4	U	- -
Vanadium	NA	19	5.7	B	2.8	UL	2.8	U	4.5	UJ	- -
Zinc	150	120	82.1		24.2	B	18	B	49.9	B	33.0
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			34.9		96		66.3		78.5		68.9
Total Organic Carbon			7.7		1.6	B	1.3		8	L	4.3
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L
Acenaphthene	16	24	NA		0.5	U	0.5	U	0.5	U	- -
Acenaphthylene	44	24	NA		1	U	1	U	1	U	- -
Anthracene	85.3	24	NA		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	- -
Benzo(a)pyrene	430	0.014	NA		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	- -
Benzo(g,h,i)perylene	430	0.014	NA		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	- -
Chrysene	384	0.014	NA		0.05	U	0.05	U	0.05	U	- -
Dibenz(a,h)anthracene	63.4	0.014	NA		0.1	U	0.1	U	0.1	U	- -
Fluoranthene	600	3.9	NA		0.1	U	0.1	U	0.1	U	- -
Fluorene	19	3.9	NA		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	- -
Naphthalene	160	24	NA		0.5	U	0.5	U	0.5	U	- -
Phenanthrene	240	24	NA		0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	NA		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-03								
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	138	B	41	UL	69.8	B	62	U	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	100	B	**68.3**	L	65.9	B	84.9	B	**38.3**
Beryllium	NA	5.1	0.65	B	0.37	UL	0.37	U	0.48	U	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	29100	J	25600		17600		24500		24200
Chromium	81	74/11	15.4		5.4	U	5.4	U	6.4	UL	3.9
Cobalt	NA	3	12.6	B	5.2	U	5.2	U	3.3	UJ	- -
Copper	34	9	13	B	3.8	UL	6.8	B	8.7	UJ	- -
Iron	NA	1000	136	B	119	B	233	B	270		68
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	1.8	U	- -
Magnesium	NA	NA	11200	J	8130		7120		8820	J	8818
Manganese	NA	80	32.3	B	41.7		21.5	B	53.9		23.9
Mercury	0.15	0.012	0.0017		0.00066		0.00071		0.0061		0.00229
Nickel	20.9	52.0	16.5	B	6.3	U	6.3	U	7.3	U	- -
Potassium	NA	NA	2130	J	1180		1040	B	1450	K	1190
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	7.2	B	3.7	U	3.7	U	6.1	U	- -
Sodium	NA	NA	17600	J	16400		10800		20200		16250
Thallium	NA	NA	4.4	U	4.4	UL	4.4	U	2.4	U	- -
Vanadium	NA	19	12.8	B	2.8	UL	2.8	U	4.5	UJ	- -
Zinc	150	120	32.4	B	21.8	B	26	B	42.6	B	- -
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			119		97		73.2		97.5		96.7
Total Organic Carbon			3.1		2	B	1.9		5	UL	1.3
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	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 4-4
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-04								
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	**773**		81.6	L	45.9	B	152	B	**213.7**
Antimony	2	NA	2.6	U	2.6	U	3.2	B	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	58.9	B	**100**	L	**73.6**	K	79.1	B	**63.2**
Beryllium	NA	5.1	1.1	B	0.37	UL	0.37	U	0.49	B	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	12900		30400		20000		23100		21600
Chromium	81	74/11	19.6		5.8		5.4	U	6.4	UL	6.4
Cobalt	NA	3	12	B	5.2	U	5.2	U	9.6	B	- -
Copper	34	9	20.5	B	4.8	L	6.1	B	10.8	B	1.2
Iron	NA	1000	**1430**		**1120**		132	B	425		744
Lead	46.7	2.5	**56.9**		2.7	U	2.7	U	2	J	**14.7**
Magnesium	NA	NA	5320	K	9690		7970		8340	J	7830
Manganese	NA	80	78.9		**134**		28.9	K	59		75.2
Mercury	0.15	0.012	0.0112		0.00160		0.00091		0.0002	U	0.00343
Nickel	20.9	52.0	18	B	7.7		6.3	U	8.2	B	1.9
Potassium	NA	NA	1820	J	1540		1330		1100	K	1448
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	3.7	UJ	4.5	K	3.7	U	6.1	U	1.1
Sodium	NA	NA	7180	K	18700		12000		18400		14070
Thallium	NA	NA	4.4	U	4.4	UL	4.4	U	2.4	U	- -
Vanadium	NA	19	19.7	B	5.1	B	2.8	U	6.1	B	- -
Zinc	150	120	52.6		25.6	B	17.9	B	33.2	B	13.2
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			54.2		116		82.8		92.1		86.3
Total Organic Carbon			9		2.3	B	1.3		5	UL	3.8
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	0.05	U	0.05	U	0.05	U	0.05	U	- -
Benz(a)anthracene	261	0.014	**0.056**		0.05	U	0.05	U	0.05	U	**0.014**
Benzo(a)pyrene	430	0.014	0.06		0.05	U	0.05	U	0.05	U	**0.015**
Benzo(b)fluoranthene	430	0.014	0.1	U	0.1	U	0.1	U	0.1	U	- -
Benzo(g,h,i)perylene	430	0.014	**0.11**		0.1	U	0.1	U	0.1	U	**0.028**
Benzo(k)fluoranthene	430	0.014	0.05	U	0.05	U	0.05	U	0.05	U	- -
Chrysene	384	0.014	**0.085**		0.05	U	0.05	U	0.05	U	**0.021**
Dibenz(a,h)anthracene	63.4	0.014	0.03	U	0.1	U	0.1	U	0.1	U	- -
Fluoranthene	600	3.9	0.2		0.1	U	0.1	U	0.1	U	0.050
Fluorene	19	3.9	0.1	U	0.1	U	0.1	U	0.1	U	- -
Indeno(1,2,3-cd)pyrene	430	0.014	**0.065**		0.05	U	0.05	U	0.05	U	**0.016**
Naphthalene	160	24	0.5	U	0.5	U	0.5	U	0.5	U	- -
Phenanthrene	240	24	0.086		0.05	UR	0.05	U	0.05	U	0.02
Pyrene	665	24	0.13		0.05	U	0.05	U	0.05	U	0.03

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-05								
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	41	U	46	B	52.9	B	62	U	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	87.3	B	**101**		63.5	B	79.6	B	**25.3**
Beryllium	NA	5.1	0.37	UL	0.61	B	0.51	B	0.48	U	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	27700	J	29200		16100		23200		24050
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	6.4	UL	- -
Cobalt	NA	3	5.2	U	**6.7**		5.2	U	4.3	B	1.7
Copper	34	9	3.8	U	3.8	UL	5.3	B	15.2	B	- -
Iron	NA	1000	149	B	**1100**	L	110	B	174	K	319
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	1.8	U	- -
Magnesium	NA	NA	10300	J	9560		6500		8300	J	8665
Manganese	NA	80	46.8	J	**348**	L	22.4	B	43.8		**109.7**
Mercury	0.15	0.012	0.0021		0.00410		0.0011		0.0002	U	0.00183
Nickel	20.9	52.0	6.3	UL	8.3	B	6.3	U	7.3	U	- -
Potassium	NA	NA	1630	J	1360	L	944	B	1270	K	1065
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	5.2	B	8.6	B	3.7	U	6.1	U	- -
Sodium	NA	NA	16700	J	19300		9910	K	19600		16378
Thallium	NA	NA	4.4	U	4.4	U	4.4	U	2.4	U	- -
Vanadium	NA	19	2.8	U	6.7	L	4.2	B	4.5	UJ	1.7
Zinc	150	120	12.8	B	19.5	B	17	B	64.4	B	- -
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			111		NA		66.9		92.1		90
Total Organic Carbon			2.9		1.8	B	1.4		6		2.6
SEMIVOLATILES	ug/kg	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L
Acenaphthene	16	24	NA		0.5	U	0.5	U	0.5	U	- -
Acenaphthylene	44	24	NA		1	U	1	U	1	U	- -
Anthracene	85.3	24	NA		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	- -
Benzo(a)pyrene	430	0.014	NA		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	- -
Benzo(g,h,i)perylene	430	0.014	NA		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	- -
Chrysene	384	0.014	NA		**0.052**		0.05	U	0.05	U	0.013
Dibenz(a,h)anthracene	63.4	0.014	NA		0.1	U	0.1	U	0.1	U	- -
Fluoranthene	600	3.9	NA		0.1	U	0.1	U	0.1	U	- -
Fluorene	19	3.9	NA		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	- -
Naphthalene	160	24	NA		0.5	U	0.5	U	0.5	U	- -
Phenanthrene	240	24	NA		0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	NA		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-06								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	41	U	41	UL	51	B	62	U	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	102	B	**95.9**		**71.6**		84	B	**41.9**
Beryllium	NA	5.1	0.37	UL	0.46	B	0.37	U	0.98	B	
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	31600	J	29000		20900		23900		26350
Chromium	81	74/11	5.4		5.4	U	5.4	U	6.4	UL	1.4
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	3.3	UJ	- -
Copper	34	9	6.5	B	3.8	UL	3.8	U	13	B	- -
Iron	NA	1000	97.1	B	206	B	142	B	208		52
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	1.8	U	- -
Magnesium	NA	NA	11800	J	9720		8240		8860	J	9655
Manganese	NA	80	53	J	**86.9**	L	30.3		66.2		59.1
Mercury	0.15	0.012	0.0009		0.00045		0.00110		0.0010		0.00086
Nickel	20.9	52.0	6.3	UL	7.9	B	6.3	U	7.3	U	- -
Potassium	NA	NA	1830	J	1300	L	1270	L	1270	K	1418
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	3.7	UJ	8.3	B	3.7	U	6.1	U	- -
Sodium	NA	NA	19300	J	19700		12100		20500		17900
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	4	B	2.8	UL	2.8	U	4.5	UJ	- -
Zinc	150	120	15.3	B	13.6	B	28.6	B	30.1	B	- -
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			128		NA		86.2		96.2		103.5
Total Organic Carbon			3.6		1.8	B	1.8		5		2.6
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	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								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	41	U	41	UL	70	B	62	U	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	2	B	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	83.2	B	**87.6**		**67.4**		86	B	**38.8**
Beryllium	NA	5.1	0.37	UL	0.46	B	0.37	U	0.48	U	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	26500		25900		19150		23100		23663
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	6.4	U	- -
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	3.3	UL	- -
Copper	34	9	3.8	U	3.8	UL	3.8	U	8.7	U	- -
Iron	NA	1000	258	J	321	B	332	B	510		192
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	1.8	U	- -
Magnesium	NA	NA	9845	J	8765		7650		8560	K	8705
Manganese	NA	80	77.5	J	**144**	L	64		**145**		**107.7**
Mercury	0.15	0.012	0.0015		0.00045		0.00135		0.00111		0.00110
Nickel	20.9	52.0	6.3	UL	6.3	UL	6.3	U	7.3	U	- -
Potassium	NA	NA	1425	J	1225	L	926	L	1175	B	894
Selenium	NA	5	2.1	U	2.1	U	2.1	B	3.7	U	- -
Silver	1	NA	3.7	UJ	7.9	B	3.7	U	6.1	U	- -
Sodium	NA	NA	15450	J	17550		11250		19400		15913
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	2.8	U	2.8	UL	2.8	U	6.9	B	- -
Zinc	150	120	19.7	B	17	B	34	B	13.7	L	3.43
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			107		NA		79.4				62.1
Total Organic Carbon			3.1		2.2	B	1.6				1.2
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	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

Tab[illegible]

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-08								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	140	B	41	UL	206	B	201	B	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	98.5	B	**88.2**		**83.4**		96.5	B	**42.9**
Beryllium	NA	5.1	0.37	UL	0.46	B	0.54	B	0.98	B	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	- -
Calcium	NA	NA	32200	J	27300		22100		26900		27125
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	6.4	UL	- -
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	6.9	B	- -
Copper	34	9	3.8	U	3.8	UL	4.1		10.9	B	1.03
Iron	NA	1000	553	J	443	L	599		851		612
Lead	46.7	2.5	**3.2**		2.7	U	**5.8**	K	**4.1**	J	**3.28**
Magnesium	NA	NA	11700	J	9220		9040		9910	J	9968
Manganese	NA	80	**158**	J	**232**	L	**102**		**240**		**183**
Mercury	0.15	0.012	0.0017		0.00069		0.00180		0.0040	U	0.00205
Nickel	20.9	52.0	6.7	B	7.1	B	6.3	U	7.6	B	- -
Potassium	NA	NA	1630	J	1290	L	1230	L	1580	K	1433
Selenium	NA	5	2.1	U	2.1	U	4	B	3.7	U	- -
Silver	1	NA	3.7	UJ	6.3	B	3.7	U	6.1	U	- -
Sodium	NA	NA	19700	J	18200		13300		21700		18225
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	5.4	B	2.8	UL	4.3	B	4.5	UJ	- -
Zinc	150	120	22.9	B	22.6	B	49.1	B	46.6	B	- -
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			129		NA		92.3		108		109.8
Total Organic Carbon			3		2.2	B	1.9		4		2.2
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	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								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	149	B	53.2	B	76.9	B	119	B	
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	
Barium	NA	3.9	97.6	B	**85.7**		**75.4**		84.4	B	**40.3**
Beryllium	NA	5.1	0.49	B	0.37	UL	0.37	U	0.98	B	
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	0.35	U	
Calcium	NA	NA	29800	J	27000		20200		24900		25475
Chromium	81	74/11	11.6		5.4	U	5.4	U	6.4	UL	2.9
Cobalt	NA	3	9.6	B	5.2	U	5.2	U	3.5	B	- -
Copper	34	9	11.4	B	3.8	UL	3.8	U	19.5	B	- -
Iron	NA	1000	418	J	439	L	240	B	588		361
Lead	46.7	2.5	2.7	U	2.7	U	2.7	U	2.3	J	- -
Magnesium	NA	NA	11100	J	9070		9160		8690	J	9505
Manganese	NA	80	**164**	J	**251**	L	62.9		**185**		**166**
Mercury	0.15	0.012	0.006		0.00081		0.00150		0.0022		0.00263
Nickel	20.9	52.0	16.5	B	6.3	UL	6.3	U	7.3	U	- -
Potassium	NA	NA	1920	J	1180	L	1360	L	1450	K	1478
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	4.9	B	5.9	B	3.7	U	6.1	U	- -
Sodium	NA	NA	18700	J	18000		13600		18900		17300
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	11.5	B	2.8	UL	2.8	U	4.5	UJ	- -
Zinc	150	120	30.5	B	26.4	B	31.3	B	32.1	B	- -
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			120		NA		88.1		98		102.0
Total Organic Carbon			2.5		2.3	B	1.8		2.7		1.8
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	0.05	U	0.05	UR	0.05	U	0.05	U	- -
Pyrene	665	24	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

Tab

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-10								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	262	B	41	UL	65.3	B	119	B	- -
Antimony	2	NA	2.6	U	2.6	U	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	121	B	**89.1**		**75.8**		**104**	K	**67.2**
Beryllium	NA	5.1	0.81	B	0.37	UL	0.37	U	0.48	U	- -
Cadmium	1.2	2.2	0.43	UL	0.43	UL	0.43	UL	1.1	B	- -
Calcium	NA	NA	31300		28200		21400		25300		26550
Chromium	81	74/11	16.2		5.4	U	5.4	U	6.4	U	4.1
Cobalt	NA	3	11.4	B	5.2	U	5.2	U	3.4	B	- -
Copper	34	9	19.7	B	3.8	UL	3.8	U	8.7	U	- -
Iron	NA	1000	**1550**		405	L	229	B	296		563
Lead	46.7	2.5	**4.4**		2.7	U	2.7	U	2.3	B	1.1
Magnesium	NA	NA	12000		9680		9060		10000	K	10185
Manganese	NA	80	**208**		**243**	L	70.9		**144**		**166.5**
Mercury	0.15	0.012	0.01		0.00073		0.0026		0.0002	U	0.00333
Nickel	20.9	52.0	16.9	B	6.3	UL	6.3	U	7.3	U	- -
Potassium	NA	NA	2190	J	1260	L	1080	L	1270	B	1133
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	3.7	UJ	9	B	4.2	B	6.1	U	- -
Sodium	NA	NA	19500		18500		13700		22200		18475
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	14.4	B	2.8	UL	2.8	U	5.9	B	- -
Zinc	150	120	30.3	B	30.2	B	33	B	27.3	L	6.8
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			127		NA		94		104		108.3
Total Organic Carbon			2.3		2.3	B	1.3		7		2.7
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	0.05	U	0.05	U	0.05	U	0.05	U	- -
Dibenz(a,h)anthracene	63.4	0.014	0.03	U	0.03	U	0.1	U	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	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	- -

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								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	71.3	B	51.4	B	211	B	86.8	B	- -
Antimony	2	NA	2.6	U	11.1	B	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	**199**	J	**178**		**130**		**191**	K	**175**
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.49	B	- -
Cadmium	1.2	2.2	0.43	UL	**2.8**	L	0.43	UL	0.35	U	- -
Calcium	NA	NA	58300	J	44000		47700		51100		50275
Chromium	81	74/11	5.4	U	6.9	B	5.4	U	6.4	UL	- -
Cobalt	NA	3	5.4	B	5.2	U	5.2	U	3.3	UJ	- -
Copper	34	9	6.8	B	3.8	UL	5		12.1	B	1.3
Iron	NA	1000	**3190**	J	**2720**	L	**1150**		**2480**		**2385**
Lead	46.7	2.5	**4.1**		**12.7**		**7**		1.8	U	**6.0**
Magnesium	NA	NA	23800	J	17500		19500		21200	J	20500
Manganese	NA	80	**746**	J	**856**	L	**462**		**724**		**697**
Mercury	0.15	0.012	0.004		0.00590		0.00360		0.0021		0.00390
Nickel	20.9	52.0	6.7	B	9.5	B	6.3	U	7.3	U	- -
Potassium	NA	NA	2400	J	2020	L	1810	L	2250	K	2120
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	6.8	B	9.3	B	3.7	U	6.1	U	- -
Sodium	NA	NA	49100	J	34400		41900		40300		41425
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	2.8	U	5	L	4.4	B	7.4	B	3.1
Zinc	150	120	34	B	**352**		44.5	B	63	B	103.8
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			244		NA		199		215		219.3
Total Organic Carbon			3.3		4.1	B	1.9		2.8		2.0
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	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	- -

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Bold Values exceed ecological screening levels

Tab

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SW-12								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	41	U	41	UL	41	U	115	B	
Antimony	2	NA	2.6	U	4.4	B	2.6	U	1.8	U	
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	
Barium	NA	3.9	112	B	**92.1**		**75.4**		104	B	**41.9**
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.98	B	
Cadmium	1.2	2.2	1		1.2	L	0.43	UL	0.35	U	0.55
Calcium	NA	NA	36600	J	27600		24700		35600		31125
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	6.4	UL	- -
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	4.3	B	- -
Copper	34	9	5.9	B	3.8	UL	3.8	U	11.9	B	- -
Iron	NA	1000	**1380**	J	461	L	199	B	738		645
Lead	46.7	2.5	2.7	U	**3.3**	K	2.7	U	1.9	J	1.3
Magnesium	NA	NA	14000	J	10000		10500		13600		12025
Manganese	NA	80	**244**	J	**226**	L	**122**		**180**		**193**
Mercury	0.15	0.012	0.002		0.00031		0.0017		**0.018**		0.00550
Nickel	20.9	52.0	6.3	UL	6.3	UL	6.3	U	7.3	U	- -
Potassium	NA	NA	1570	J	1360	L	987	L	1550	K	1367
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	3.7	UJ	5.9	B	3.7	U	6.1	U	- -
Sodium	NA	NA	27100	J	18800		18400		26500		22700
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	2.8	U	3.3	L	2.8	U	6.2	B	0.83
Zinc	150	120	78.4		**149**		32.2	B	39.4	B	56.9
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			149		NA		105		145		133.0
Total Organic Carbon			4.5		3	B	2.1		5	L	2.9
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	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	- -

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-13								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**		**ug/L**
Aluminum	NA	87	41	U	54.3	B	41	U	62	U	- -
Antimony	2	NA	2.6	U	4.6	B	2.6	U	1.8	U	- -
Arsenic	8.2	8.1	3.6	U	3.6	U	3.6	U	5	U	- -
Barium	NA	3.9	90	B	**115**		**76.7**		97.5	B	**47.9**
Beryllium	NA	5.1	0.37	UL	0.37	UL	0.37	U	0.73	B	- -
Cadmium	1.2	2.2	0.43	U	1.5	L	0.43	UL	0.35	U	0.38
Calcium	NA	NA	32400	J	32400		28100		29700		30650
Chromium	81	74/11	5.4	U	5.4	U	5.4	U	6.4	UL	- -
Cobalt	NA	3	5.2	U	5.2	U	5.2	U	4.3	B	- -
Copper	34	9	3.8	U	3.8	UL	4.1		19.5	B	1.0
Iron	NA	1000	270	J	571	L	178	B	174	K	254
Lead	46.7	2.5	2.7	U	**5.1**	K	2.7	U	1.8	U	1.7
Magnesium	NA	NA	12400	J	11900		10800		11600		11675
Manganese	NA	80	**139**	J	**240**	L	**112**		73		**141**
Mercury	0.15	0.012	0.001		0.00360		0.00130		0.0038		0.00243
Nickel	20.9	52.0	6.3	UL	6.3	UL	6.3	U	8.7	B	- -
Potassium	NA	NA	1360	J	1450	L	1110	L	1440	K	1340
Selenium	NA	5	2.1	U	2.1	U	2.1	U	3.7	U	- -
Silver	1	NA	3.7	UJ	9.7	B	3.7	U	6.1	U	- -
Sodium	NA	NA	23400	J	22300		18800		22900		21850
Thallium	NA	NA	4.4	U	4.4	U	4.4	UL	2.4	U	- -
Vanadium	NA	19	2.8	U	2.8	UL	2.8	U	4.5	UJ	- -
Zinc	150	120	12.1	B	**177**		37.5	B	34.2	B	44.3
MISCELLANEOUS PARAMETERS			mg/L		mg/L		mg/L		mg/L		mg/L
Hardness as CaCO3			132		NA		114		122		122.7
Total Organic Carbon			3.9		2.7	B	1.6		2.6		2.0
SEMIVOLATILES	ug/kg	ug/L	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	- -
Acenaphthylene	44	24	1	U	1	U	1	U	1	U	- -
Anthracene	85.3	24	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	- -
Benzo(a)pyrene	430	0.014	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	- -
Benzo(g,h,i)perylene	430	0.014	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	- -
Chrysene	384	0.014	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	0.1	U	- -
Fluoranthene	600	3.9	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	- -
Indeno(1,2,3-cd)pyrene	430	0.014	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	- -
Phenanthrene	240	24	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	- -

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

Tab

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-01								
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	7900		11300		11500		7380		9520
Antimony	2	NA	**5.1**	K	0.6	B	0.66	B	0.43	B	1.28
Arsenic	8.2	8.1	0.36	UL	3.2		4.7		2.5	L	1.80
Barium	NA	3.9	85.8		98.5		95		173		113.1
Beryllium	NA	5.1	0.95	J	1.4	K	1.6	K	1.1		1.3
Cadmium	1.2	2.2	0.85	UL	0.43	UL	0.35	UL	0.11	U	- -
Calcium	NA	NA	24100		17000		10200		8250		14888
Chromium	81	74/11	**494**		34.9		40.4		33.2		**151**
Cobalt	NA	3	9.2	K	11.9	K	10.6		7.7	L	9.9
Copper	34	9	**65.8**		28.7		29.8		22.9		**36.8**
Iron	NA	1000	67200		30600		35600		20900		38575
Lead	46.7	2.5	**69.1**		**127**	J	41.6		**56.4**	L	**73.5**
Magnesium	NA	NA	9480		11400		9900		6670		9363
Manganese	NA	80	6220		607	J	524		497		1962
Mercury	0.15	0.012	0.0087	L	0.03910		0.00600	J	0.0314		0.02130
Nickel	20.9	52.0	17.9	L	**21.8**		**21.6**		14.8		19.0
Potassium	NA	NA	2020	K	3690	J	3390		2190		2823
Selenium	NA	5	4.2	U	2.1	UR	2.9		1.2	U	0.73
Silver	1	NA	**3.5**	K	**1.5**	J	**8.3**		**5.4**		**4.68**
Sodium	NA	NA	322	B	404	J	457	K	306	L	292
Thallium	NA	NA	8.7	U	0.44	UL	0.36	U	0.2	U	- -
Vanadium	NA	19	264		44.1	L	50.6		34.9		98.4
Zinc	150	120	132		109	L	123		108		118
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			13400		3690		6360		6370		7455
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	95	UJ	210	U	100	U	420	U	- -
Acenaphthylene	44	24	190	UJ	420	U	200	U	830	U	- -
Anthracene	85.3	24	29	J	20	U	59		**98**		47
Benz(a)anthracene	261	0.014	200	J	**1000**		**630**		**1000**		**708**
Benzo(a)pyrene	430	0.014	220	J	**900**		**580**		**810**		**628**
Benzo(b)fluoranthene	430	0.014	200	J	**880**		**520**		**940**		**635**
Benzo(g,h,i)perylene	430	0.014	120	J	**760**		**550**		**770**		**550**
Benzo(k)fluoranthene	430	0.014	54	J	**430**		300		320		276
Chrysene	384	0.014	190	J	**850**		**520**		**890**		**613**
Dibenz(a,h)anthracene	63.4	0.014	19	UJ	**74**		24		**78**	J	44
Fluoranthene	600	3.9	410	J	**1700**		**1000**		**1900**		**1253**
Fluorene	19	3.9	19	UJ	42	U	20	U	**61**	J	15
Indeno(1,2,3-cd)pyrene	430	0.014	130	J	**520**		350		**560**		390
Naphthalene	160	24	95	UJ	210	U	100	U	420	U	- -
Phenanthrene	240	24	160	J	**460**		**320**		**660**		**400**
Pyrene	665	24	290	J	**1100**		**690**		**1300**		**845**

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-02								
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	NA		11800		12200		8650		10883
Antimony	2	NA	NA		0.54	B	0.83	B	0.43	B	- -
Arsenic	8.2	8.1	NA		3		3.3		2	K	2.8
Barium	NA	3.9	NA		104		116		115	J	112
Beryllium	NA	5.1	NA		1.2	J	1.7	K	1.8		1.57
Cadmium	1.2	2.2	NA		0.04	UL	0.38	UL	0.12	U	- -
Calcium	NA	NA	NA		11600		14800		5460		10620
Chromium	81	74/11	NA		29.5		37.4		31.2		32.7
Cobalt	NA	3	NA		10.3	K	11		6.9	J	9.4
Copper	34	9	NA		26.2		**36**		17.4	L	26.5
Iron	NA	1000	NA		29700		35900		23500		29700
Lead	46.7	2.5	NA		29.7	J	**59.1**		**50.3**	J	46.4
Magnesium	NA	NA	NA		8520		10300		4620		7813
Manganese	NA	80	NA		693	J	770		346	J	603
Mercury	0.15	0.012	0.0277	L	0.01260		0.02600	J	0.0195		0.02145
Nickel	20.9	52.0	NA		19.5		**22.4**		14.3	L	18.7
Potassium	NA	NA	NA		2680	J	3320		1370		2457
Selenium	NA	5	NA		2.1	UR	1.9	U	1.3	UL	- -
Silver	1	NA	NA		**1.6**	J	**8.4**		**6**	J	**5.3**
Sodium	NA	NA	NA		421	J	1180		413	J	671
Thallium	NA	NA	NA		0.5	J	0.39	U	0.45	J	0.32
Vanadium	NA	19	NA		41.2	L	48.3		33.1	L	40.9
Zinc	150	120	NA		78	L	99.2		86.2	L	87.8
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			3070		5060		10800		8240		6793
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	190	U	200	U	230	U	330	U	- -
Acenaphthylene	44	24	380	U	400	U	450	U	660	U	- -
Anthracene	85.3	24	**220**		**130**		**180**		**220**		**188**
Benz(a)anthracene	261	0.014	**1000**		**1000**		**1700**		**1000**		**1175**
Benzo(a)pyrene	430	0.014	**950**		**910**		**1100**		**880**		**960**
Benzo(b)fluoranthene	430	0.014	**970**		**860**		**1000**		**900**		**933**
Benzo(g,h,i)perylene	430	0.014	**680**		**750**		**1100**		**780**		**828**
Benzo(k)fluoranthene	430	0.014	**550**		390		**550**		290		**445**
Chrysene	384	0.014	**900**		**910**		**1200**		**970**		**995**
Dibenz(a,h)anthracene	63.4	0.014	34	J	61		**67**		**72**		59
Fluoranthene	600	3.9	**2600**		**1900**		**2700**		**2300**		**2375**
Fluorene	19	3.9	**90**		40	U	**67**		**97**		**64**
Indeno(1,2,3-cd)pyrene	430	0.014	**490**		**520**		**660**		**550**		**555**
Naphthalene	160	24	190	U	200	U	230	U	330	U	- -
Phenanthrene	240	24	**1000**		**730**		**840**		**1000**		**893**
Pyrene	665	24	**1600**		**1300**		**1700**		**1800**		**1600**

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

Tab

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-03								
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	NA		6330		9040		10100		8490
Antimony	2	NA	NA		0.28	UL	0.38	B	0.48	B	- -
Arsenic	8.2	8.1	NA		1.5		0.38	U	3.1	K	1.53
Barium	NA	3.9	NA		62.7		77.9		168	J	102.9
Beryllium	NA	5.1	NA		0.8	J	2.1		1.3	K	1.4
Cadmium	1.2	2.2	NA		0.05	UL	0.46	UL	0.27	U	- -
Calcium	NA	NA	NA		29200		27800		21400		26133
Chromium	81	74/11	NA		24.6		31.2		36.7		30.8
Cobalt	NA	3	NA		7.9	K	10		13.9	K	10.6
Copper	34	9	NA		**37.3**		26.3		33.1		32.2
Iron	NA	1000	NA		26300		40700		30000		32333
Lead	46.7	2.5	NA		42.8	J	19.5		32.5	J	31.6
Magnesium	NA	NA	NA		19300		16400		14600		16767
Manganese	NA	80	NA		568	J	1030		1210	J	936
Mercury	0.15	0.012	0.0336	L	0.00770		0.00870	J	0.0111		0.01528
Nickel	20.9	52.0	NA		19		17.9		**21.1**		19.3
Potassium	NA	NA	NA		1800	J	3440		3160		2800
Selenium	NA	5	NA		2.2	UR	2.2	U	2.8	UL	- -
Silver	1	NA	NA		**1.1**	J	**8.6**		**6.6**	J	**5.4**
Sodium	NA	NA	NA		277	J	398	K	1330	J	668
Thallium	NA	NA	NA		0.47	UL	0.47	U	0.18	UL	- -
Vanadium	NA	19	NA		31.1	L	39.8		48.3	L	39.7
Zinc	150	120	NA		67.3	L	79.3		106	L	84.2
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			8670		3950		2830		5110		5140
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	110	U	200	U	110	U	410	U	- -
Acenaphthylene	44	24	210	U	390	U	210	U	810	U	- -
Anthracene	85.3	24	**91**		20	U	79		**600**		**198**
Benz(a)anthracene	261	0.014	**440**		**1200**		**990**		**2900**		**1383**
Benzo(a)pyrene	430	0.014	**430**		**920**		**720**		**2000**		**1018**
Benzo(b)fluoranthene	430	0.014	370		**920**		**760**		**2200**		**1063**
Benzo(g,h,i)perylene	430	0.014	400		**670**		**720**		**1600**		**848**
Benzo(k)fluoranthene	430	0.014	200		**500**		410		**890**		**500**
Chrysene	384	0.014	360		**1100**		**720**		**2500**		**1170**
Dibenz(a,h)anthracene	63.4	0.014	21		46		46		**190**		**76**
Fluoranthene	600	3.9	**870**		**3000**		**1300**		**8600**		**3443**
Fluorene	19	3.9	21	U	39	U	**68**		**310**		**110**
Indeno(1,2,3-cd)pyrene	430	0.014	230		**470**		**450**		**1200**		**588**
Naphthalene	160	24	110	U	200	U	110	U	410	U	- -
Phenanthrene	240	24	**360**		**860**		**420**		**3700**		**1335**
Pyrene	665	24	**700**		**1900**		**960**		**4800**		**2090**

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-04								
	ER-L	Freshwater	09/15/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	7760		9130		11000		8010		8975
Antimony	2	NA	0.53	K	2.2	B	0.33	B	0.33	B	0.13
Arsenic	8.2	8.1	2.8	L	1.6		1.2		2.7	K	2.1
Barium	NA	3.9	85.1		96.1		87.5		70.4	J	84.8
Beryllium	NA	5.1	1.3	J	1.2	J	1.4	K	2		1.5
Cadmium	1.2	2.2	0.05	UL	0.47	UL	0.37	UL	0.29	U	- -
Calcium	NA	NA	12200		20900		10300		15700		14775
Chromium	81	74/11	28.1		**231**		30.4		29.3		79.7
Cobalt	NA	3	10.1	K	11.6	K	10.6		9	J	10.3
Copper	34	9	**46**		21.7		27		31.9		31.7
Iron	NA	1000	28000		41500		32300		34000		33950
Lead	46.7	2.5	**52.7**		45.3	J	33.4		33.3	J	41.2
Magnesium	NA	NA	8550		11100		8530		11300		9870
Manganese	NA	80	737		3020	J	594		527	J	1220
Mercury	0.15	0.012	0.017	L	0.00740		0.00800	J	0.0073		0.00993
Nickel	20.9	52.0	19	L	17.4		**21**		**21.4**	L	19.7
Potassium	NA	NA	1830		2130	J	2940		2040		2235
Selenium	NA	5	2.6	U	2.3	UR	1.8	U	3.1	UL	- -
Silver	1	NA	1.6	B	**2.3**	J	**7.6**		**7.9**	J	**4.9**
Sodium	NA	NA	1270		507	J	655	K	420	J	713
Thallium	NA	NA	0.55	U	0.48	UL	0.5		0.33	J	0.21
Vanadium	NA	19	34.2		142	L	40		45.1	L	65.3
Zinc	150	120	**230**		99.7	L	100		82.4	L	128
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			6230		4960		3440		3230		4465
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	110	UJ	190	U	97	U	400	U	- -
Acenaphthylene	44	24	220	UJ	370	U	190	U	790	U	- -
Anthracene	85.3	24	36	J	20	U	43		**98**		44
Benz(a)anthracene	261	0.014	**350**	J	**1300**		**450**		**690**		**698**
Benzo(a)pyrene	430	0.014	320	J	**930**		390		**570**		**553**
Benzo(b)fluoranthene	430	0.014	380	J	**910**		410		**590**		**573**
Benzo(g,h,i)perylene	430	0.014	300	J	**760**		400		**500**		**490**
Benzo(k)fluoranthene	430	0.014	190	J	**430**		250		210		270
Chrysene	384	0.014	320	J	**990**		**400**		**600**		**578**
Dibenz(a,h)anthracene	63.4	0.014	22	UJ	50		20		56	J	32
Fluoranthene	600	3.9	**640**	J	**2600**		**830**		**1200**		**1318**
Fluorene	19	3.9	22	UJ	**45**		19	U	**47**	J	**23**
Indeno(1,2,3-cd)pyrene	430	0.014	190	J	**530**		230		400		338
Naphthalene	160	24	110	UJ	190	U	97	U	400	U	- -
Phenanthrene	240	24	180	J	**820**		**260**		**500**		**440**
Pyrene	665	24	410	J	**1600**		530		**890**		**858**

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-05								
	ER-L	Freshwater	09/14/99		11/23/99		2/23/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL			
INORGANICS	mg/kg	ug/L	mg/kg		mg/kg		mg/kg				mg/kg
Aluminum	NA	87	7110		9180		7840		9350		8370
Antimony	2	NA	0.73	J	0.47	B	0.89	B	1.4	L	0.53
Arsenic	8.2	8.1	5.3	L	5	J	1.9		3.6	K	4.0
Barium	NA	3.9	73	J	103	K	110		143	J	107
Beryllium	NA	5.1	1.1	J	1.8	J	1.9	K	1.2	K	1.5
Cadmium	1.2	2.2	0.05	UL	0.04	UL	0.38	UL	0.31	U	- -
Calcium	NA	NA	15300	J	13300		22800		16400		16950
Chromium	81	74/11	34.8	J	30.6	J	55.7		28.4		37.4
Cobalt	NA	3	10.1	K	11.1		11.7		9.3	J	10.6
Copper	34	9	30.3	J	19.6	L	**47.2**		**58.8**		**39**
Iron	NA	1000	26100	J	30400		42200		34700		33350
Lead	46.7	2.5	**199**		**129**	J	**71.9**		39.1	J	**109.8**
Magnesium	NA	NA	11100	J	9270		12100		11200		10918
Manganese	NA	80	676	J	1040		941		783	J	860
Mercury	0.15	0.012	0.0115	L	0.00910		0.02100	J	0.0075		0.01228
Nickel	20.9	52.0	17.2	L	19.7	J	**34**		**23.3**	L	**23.4**
Potassium	NA	NA	1960	J	2310		2140		2470		2220
Selenium	NA	5	4.7	UR	4.1	UR	2	U	3.3	UL	- -
Silver	1	NA	1.4	B	2.3	B	**10**		**8.3**	J	**4.5**
Sodium	NA	NA	818	J	1080	L	453	K	691	J	761
Thallium	NA	NA	0.49	U	0.43	UL	0.44		0.41	J	0.21
Vanadium	NA	19	39.3		44.2		48		34.6	L	41.4
Zinc	150	120	125		136	J	**187**		114	L	141
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			5770		5430		3990		6390		5395
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	110	U	210	U	210	U	400	U	- -
Acenaphthylene	44	24	210	U	420	U	410	U	790	U	- -
Anthracene	85.3	24	**95**		20	U	**240**		**300**		**164**
Benz(a)anthracene	261	0.014	11	U	**1100**		**890**		**2500**		**1125**
Benzo(a)pyrene	430	0.014	**870**		**990**		**590**		**1600**		**1013**
Benzo(b)fluoranthene	430	0.014	**800**		**890**		**630**		**1700**		**1005**
Benzo(g,h,i)perylene	430	0.014	**660**		**770**		**530**		**1200**		**790**
Benzo(k)fluoranthene	430	0.014	**500**		**460**		380		**750**		**523**
Chrysene	384	0.014	**940**		**1000**		**720**		**1800**		**1115**
Dibenz(a,h)anthracene	63.4	0.014	18	J	47		23	J	**150**		60
Fluoranthene	600	3.9	**2100**		**1900**		**2300**		**5100**		**2850**
Fluorene	19	3.9	**21**	U	42	U	**170**		**120**		**73**
Indeno(1,2,3-cd)pyrene	430	0.014	380		**520**		340		**930**		**543**
Naphthalene	160	24	110	U	210	U	210	U	400	U	- -
Phenanthrene	240	24	**430**		**620**		**1100**		**1700**		**963**
Pyrene	665	24	**1600**		**1400**		**1400**		**2800**		**1800**

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-06								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	7440		8390		8330	J	5600		7440
Antimony	2	NA	1.1	J	0.73	B	0.62	L	0.18	B	0.43
Arsenic	8.2	8.1	0.73	L	1.3	J	2	L	2.3	K	1.58
Barium	NA	3.9	104	J	89.2	K	95.8	J	76.4	J	91.4
Beryllium	NA	5.1	1.1	J	0.99	J	1.8		0.9	B	1.2
Cadmium	1.2	2.2	0.95	UL	0.04	UL	0.17	UL	0.13	U	- -
Calcium	NA	NA	10200	J	7780		31400		4290		13418
Chromium	81	74/11	30.5	J	44	J	50.3	J	22.4		36.8
Cobalt	NA	3	8.6	K	8.8		10.8	J	6.8	J	8.8
Copper	34	9	32	J	19.7		**67.7**	J	18.2	L	**34.4**
Iron	NA	1000	52100	J	25000		34400	J	21400		33225
Lead	46.7	2.5	**50.3**		28.7	J	**89.4**	J	35	J	**50.9**
Magnesium	NA	NA	7640	J	7240		20600		3760		9810
Manganese	NA	80	1040	J	814		1130	J	824	J	952
Mercury	0.15	0.012	**0.188**	L	0.01720		0.01050	J	0.0528		0.06713
Nickel	20.9	52.0	**21.2**	L	17.8	J	**23.3**	J	13.8	L	19.0
Potassium	NA	NA	1980	J	2370		2060	J	1000	K	1853
Selenium	NA	5	4.7	UR	3.8	UR	0.89	B	1.4	UL	- -
Silver	1	NA	2.8	B	1.9	B	**6.5**	J	**5.6**	J	**3.0**
Sodium	NA	NA	678	J	1260		404	K	633	J	744
Thallium	NA	NA	0.49	U	0.4	UL	0.34	UL	0.22	J	- -
Vanadium	NA	19	44.2	K	39.8		57.6	L	30.6	L	43
Zinc	150	120	142		88.8	J	**520**	J	91.6	L	**211**
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			11000		5020		3300		6560		6470
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	110	U	200	U	99	U	400	U	- -
Acenaphthylene	44	24	210	U	400	U	200	U	790	U	- -
Anthracene	85.3	24	32		**180**		79		**95**		**97**
Benz(a)anthracene	261	0.014	260		**840**		**510**		**810**		**605**
Benzo(a)pyrene	430	0.014	240		**740**		**470**		**600**		**513**
Benzo(b)fluoranthene	430	0.014	200		**680**		**430**		**610**		**480**
Benzo(g,h,i)perylene	430	0.014	240		**560**		**590**		**500**		**473**
Benzo(k)fluoranthene	430	0.014	56		390		220		190		214
Chrysene	384	0.014	260		**760**		**520**		**710**		**563**
Dibenz(a,h)anthracene	63.4	0.014	14	J	44		20	J	51	J	32
Fluoranthene	600	3.9	580		**1900**		**1200**		**1600**		**1320**
Fluorene	19	3.9	21	U	**58**		**64**		79	U	31
Indeno(1,2,3-cd)pyrene	430	0.014	130		390		250		360		283
Naphthalene	160	24	110	U	200	U	99	U	400	U	- -
Phenanthrene	240	24	230		**790**		**590**		**590**		**550**
Pyrene	665	24	400		**1300**		660		**1100**		**865**

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 1-1

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-07								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	6530		7135		9715	J	6080		7365
Antimony	2	NA	1.8	K	1.0	B	1	L	0.51	B	0.6
Arsenic	8.2	8.1	5.5	L	7.8	K	3.5	L	2.4	L	4.8
Barium	NA	3.9	84		95	K	82.9	J	64		81.5
Beryllium	NA	5.1	1	J	1.05	J	1.6		0.91	K	1.14
Cadmium	1.2	2.2	0.05	UL	0.45	UL	0.2	UL	0.15	U	- -
Calcium	NA	NA	12700		8500		17350		17655		14051
Chromium	81	74/11	29.8		43.7	J	31	J	22.6		31.8
Cobalt	NA	3	10.4	K	9.75		11.4	J	7.55	L	9.78
Copper	34	9	**65.3**		**53.4**		26.6	J	20		**41.4**
Iron	NA	1000	38200		32700		36850	J	23050		32700
Lead	46.7	2.5	**61.3**		42.1	J	35.1	J	34.9	L	43.4
Magnesium	NA	NA	9550		7545		12445		11510		10263
Manganese	NA	80	755		1059		625	J	513		738
Mercury	0.15	0.012	0.0128	L	0.01575		0.0127	J	0.0142		0.01386
Nickel	20.9	52.0	**23.7**	L	**22.2**	J	20.7	J	15.9		20.6
Potassium	NA	NA	2090		1965		2695	J	1505		2064
Selenium	NA	5	4.5	U	4.25	UR	0.99	UL	1.5	U	- -
Silver	1	NA	1.7	B	2.15	B	**8.5**	J	**5.1**		**3.4**
Sodium	NA	NA	534	K	383	L	547	K	625	L	522
Thallium	NA	NA	0.47	U	0	UL	0.41	UL	0.25	U	- -
Vanadium	NA	19	37.4		44.8		44.4	L	28.2		38.7
Zinc	150	120	127		**247**	J	98	J	98.4		143
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			5260		5185		4195		4920		4890
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	100	UJ	110	U	1000	U	425	U	- -
Acenaphthylene	44	24	200	UJ	210	U	2100	U	845	U	- -
Anthracene	85.3	24	68	J	10	U	**1250**		45		**341**
Benz(a)anthracene	261	0.014	**310**	J	**785**		**4550**		**460**		**1526**
Benzo(a)pyrene	430	0.014	340	J	**690**		**2000**		345		**844**
Benzo(b)fluoranthene	430	0.014	340	J	**660**		**2400**		360		**940**
Benzo(g,h,i)perylene	430	0.014	265	J	**605**		**1700**		320		**723**
Benzo(k)fluoranthene	430	0.014	120	J	340		**1250**		120		**458**
Chrysene	384	0.014	355	J	**920**		**3000**		**390**		**1166**
Dibenz(a,h)anthracene	63.4	0.014	52		52		**112**	J	38	J	63
Fluoranthene	600	3.9	**820**	J	**1075**		**12000**		**815**		**3678**
Fluorene	19	3.9	**26.5**	J	11	J	**685**		85	U	**181**
Indeno(1,2,3-cd)pyrene	430	0.014	110	J	380		**1195**		235		**480**
Naphthalene	160	24	100	UJ	110	U	1000	U	425	U	- -
Phenanthrene	240	24	**370**	J	**360**		**7050**		**310**		**2023**
Pyrene	665	24	620	J	**900**		**6050**		660		**2058**

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-08								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	6890		10400		10800	J	8640		9183
Antimony	2	NA	1.9	J	1	B	0.37	L	0.39	B	0.57
Arsenic	8.2	8.1	2.5	L	2.7	J	3.3	L	3.1	K	2.9
Barium	NA	3.9	78.4	J	93.7	K	809	J	88.3	J	267.4
Beryllium	NA	5.1	0.9	J	1.8	J	2.2		1.3	K	1.6
Cadmium	1.2	2.2	0.32	J	0.05	UL	0.21	UL	0.16	U	0.08
Calcium	NA	NA	6050	J	11300		16000		18200		12888
Chromium	81	74/11	**84.1**	J	50.4	J	32	J	25.8		48.1
Cobalt	NA	3	7.8	K	10.4		14.7	J	9.3	J	10.6
Copper	34	9	23.3	J	**50.4**		**35.5**	J	20.5	L	32.4
Iron	NA	1000	17500	J	33300		36000	J	24500		27825
Lead	46.7	2.5	**118**		41.8	J	**47.4**	J	28.6	J	**59**
Magnesium	NA	NA	5290	J	8610		13000		12500		9850
Manganese	NA	80	335	J	841		3300	J	624	J	1275
Mercury	0.15	0.012	0.0591	L	0.02060		0.01700	J	0.0118		0.02713
Nickel	20.9	52.0	16	L	20.5	J	20	J	18.4		18.7
Potassium	NA	NA	1570	J	3100		2620	J	2910		2550
Selenium	NA	5	2.6	UR	4.9	UR	0.58	B	1.7	UL	- -
Silver	1	NA	1.3	B	2.3	B	**9.1**	J	**5.5**	J	**3.7**
Sodium	NA	NA	678	J	314	L	426	K	373	J	448
Thallium	NA	NA	0.54	U	0.51	UL	0.42	UL	0.27	J	0.07
Vanadium	NA	19	30.9		58.8		39.4	L	33.1	L	40.6
Zinc	150	120	146		87.1	J	129	J	87.6	L	112.4
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			15100		4570		4940		2740		6838
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	1100	U	210	U	110	U	390	U	- -
Acenaphthylene	44	24	2200	U	420	U	210	U	780	U	- -
Anthracene	85.3	24	**680**		20	U	56		**250**		**247**
Benz(a)anthracene	261	0.014	**3700**		**990**		**400**		**1700**		**1698**
Benzo(a)pyrene	430	0.014	**2600**		**810**		360		**1200**		**1243**
Benzo(b)fluoranthene	430	0.014	**3200**		**790**		320		**1200**		**1378**
Benzo(g,h,i)perylene	430	0.014	**2700**		**600**		320		**940**		**1140**
Benzo(k)fluoranthene	430	0.014	**1700**		300		150		410		**640**
Chrysene	384	0.014	**4000**		**870**		**390**		**1400**		**1665**
Dibenz(a,h)anthracene	63.4	0.014	**110**	J	**73**		26		**110**		**80**
Fluoranthene	600	3.9	**7900**		**1900**		**870**		**3700**		**3593**
Fluorene	19	3.9	220	U	42	U	21	U	**130**		**33**
Indeno(1,2,3-cd)pyrene	430	0.014	**1600**		**440**		200		**690**		**733**
Naphthalene	160	24	1100	U	210	U	110	U	390	U	- -
Phenanthrene	240	24	**3200**		**570**		**300**		**1400**		**1368**
Pyrene	665	24	**6900**		**1300**		480		**2200**		**2720**

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

Tab

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-09								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	9500		8430		11800	J	8300		9508
Antimony	2	NA	1	J	1.3	B	0.4	L	0.3	B	0.35
Arsenic	8.2	8.1	2.4	L	3.2	J	2.5	L	3.1	K	2.8
Barium	NA	3.9	72	J	93.2	K	78.9	J	83.1	J	81.8
Beryllium	NA	5.1	1.1	J	1.3	J	1.3		1.1	K	1.20
Cadmium	1.2	2.2	0.05	UL	0.04	UL	0.16	UL	0.27	U	- -
Calcium	NA	NA	28300	J	11600		21000		12900		18450
Chromium	81	74/11	43.3	J	57.9	J	30	J	34.8		41.5
Cobalt	NA	3	8.3	K	10.6		10.2	J	9.3	J	9.6
Copper	34	9	21.3	J	25.1		22.6	J	28	L	24.3
Iron	NA	1000	23700	J	30000		28400	J	48800		32725
Lead	46.7	2.5	**83.1**		**57.2**	J	31.6	J	**91.5**	J	**65.9**
Magnesium	NA	NA	18900	J	7770		15100		8240		12503
Manganese	NA	80	399	J	1180		621	J	609	J	702
Mercury	0.15	0.012	0.0321	L	0.00660		0.01900	J	0.0226		0.02008
Nickel	20.9	52.0	15.2	L	17.4	J	19.5	J	**21.7**	L	18.5
Potassium	NA	NA	2530	J	2250		3170	J	2550		2625
Selenium	NA	5	2.4	UR	4.2	UR	0.79	UL	2.8	UL	- -
Silver	1	NA	1.1	B	2.3	B	**6.2**	J	**10.9**	J	**4.3**
Sodium	NA	NA	1830	J	395	L	2150		516	J	1223
Thallium	NA	NA	0.51	U	0.44	UL	0.33	UL	0.47	J	
Vanadium	NA	19	40.1		55.2		42.9	L	38	J	44.1
Zinc	150	120	101		120	J	105	J	74.2	L	100
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			9000		3720		7360		4570		6163
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	110	U	210	U	100	U	410	U	- -
Acenaphthylene	44	24	210	U	420	U	200	U	820	U	- -
Anthracene	85.3	24	40		**180**		**88**		**370**		**170**
Benz(a)anthracene	261	0.014	200		**940**		**490**		**2500**		**1033**
Benzo(a)pyrene	430	0.014	210		**790**		**440**		**1400**		**710**
Benzo(b)fluoranthene	430	0.014	180		**720**		400		**1400**		**675**
Benzo(g,h,i)perylene	430	0.014	100		**570**		**470**		**1100**		**560**
Benzo(k)fluoranthene	430	0.014	54		250		210		**600**		**279**
Chrysene	384	0.014	210		**810**		**500**		**1800**		**830**
Dibenz(a,h)anthracene	63.4	0.014	21	U	**69**		20	U	**90**		40
Fluoranthene	600	3.9	480		**2000**		**990**		**4600**		**2018**
Fluorene	19	3.9	21	U	42	U	20	U	**130**		**33**
Indeno(1,2,3-cd)pyrene	430	0.014	99		420		210		**740**		367
Naphthalene	160	24	110	U	210	U	100	U	410	U	- -
Phenanthrene	240	24	210		**690**		**440**		**1500**		**710**
Pyrene	665	24	370		**1300**		660		**3000**		**1333**

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-10								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	6900		7020		10700	J	6550		7793
Antimony	2	NA	0.84	K	0.56	B	0.43	L	0.34	B	0.32
Arsenic	8.2	8.1	3.1	L	2.5	J	4	L	2.7	L	3.1
Barium	NA	3.9	159		67.5	K	82.8	J	80		97.3
Beryllium	NA	5.1	0.81	J	0.86	J	1.1		1.2		0.99
Cadmium	1.2	2.2	0.46	J	0.05	UL	0.18	UL	0.04	U	- -
Calcium	NA	NA	9160		15000		13900		7300		11340
Chromium	81	74/11	41.6		27.1	J	27.1	J	21.1		29.2
Cobalt	NA	3	9.7	K	8.3		10.3	J	8.3	L	9.2
Copper	34	9	**46.8**		22.3		25.9	J	30.2		31.3
Iron	NA	1000	24700		22900		27200	J	20600		23850
Lead	46.7	2.5	**106**		26.5	J	27.4	J	43.1	L	**50.8**
Magnesium	NA	NA	6890		8440		11800		7430		8640
Manganese	NA	80	654		614		529	J	1030		707
Mercury	0.15	0.012	0.018	L	0.02470		0.01200	J	0.0097		0.01610
Nickel	20.9	52.0	20.8	L	15.5	J	**21.7**	J	16.2		18.6
Potassium	NA	NA	1370		2120		3340	J	1910		2185
Selenium	NA	5	2.6	U	2.2	UR	0.17	UL	0.39	U	- -
Silver	1	NA	1.1	B	2	B	6.4	J	**4.9**		**2.8**
Sodium	NA	NA	622	K	375	L	1750		338	L	771
Thallium	NA	NA	0.54	U	0.46	UL	0.36	UL	0.25	U	- -
Vanadium	NA	19	33.4		33.5		47.3	L	31.2		36.4
Zinc	150	120	**176**		94.8	J	84.1	J	118		118.2
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			7640		2810		6510		4000		5240
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	100	UJ	200	U	1200	U	3700	U	- -
Acenaphthylene	44	24	200	UJ	400	U	2400	U	7400	U	- -
Anthracene	85.3	24	58	J	**260**		**1500**		**2700**		**1130**
Benz(a)anthracene	261	0.014	**420**	J	**1100**		**6000**		**11120**		**4660**
Benzo(a)pyrene	430	0.014	390	J	**990**		**3700**		**5800**		**2720**
Benzo(b)fluoranthene	430	0.014	**510**	J	**930**		**4200**		**6100**		**2935**
Benzo(g,h,i)perylene	430	0.014	370	J	**670**		**3900**		**3600**		**2135**
Benzo(k)fluoranthene	430	0.014	220	J	**470**		**1900**		**2200**		**1198**
Chrysene	384	0.014	**440**	J	**1100**		**4500**		**7600**		**3410**
Dibenz(a,h)anthracene	63.4	0.014	20	UJ	**74**		**180**	J	740	U	**64**
Fluoranthene	600	3.9	**850**	J	**2600**		**7900**		**29580**		**10233**
Fluorene	19	3.9	20	UJ	**89**		240	U	**1400**		**372**
Indeno(1,2,3-cd)pyrene	430	0.014	240	J	**500**		**2100**		**3000**		**1460**
Naphthalene	160	24	100	UJ	200	U	1200	U	3700	U	- -
Phenanthrene	240	24	**380**	J	**1100**		**1800**		**11180**		**3615**
Pyrene	665	24	**750**	J	**1700**		**7900**		**15320**		**6418**

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

Tab

Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-11								
	ER-L	Freshwater	09/14/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	7700		11600		8770	J	7380		8863
Antimony	2	NA	1.1	J	**5**	J	0.72	L	1.6	L	**2.11**
Arsenic	8.2	8.1	3.1	L	**8.5**	J	2.6	L	3.2	K	4.4
Barium	NA	3.9	143	J	236	K	151	J	121	J	163
Beryllium	NA	5.1	0.96	J	2.5	J	1.4		1.3	K	1.54
Cadmium	1.2	2.2	**2.9**	J	**2.9**	J	**1.4**	L	0.19	U	**1.8**
Calcium	NA	NA	6510	J	21000		12500		19600		14903
Chromium	81	74/11	57.3	J	**140**	J	40.7	J	**151**		**97.3**
Cobalt	NA	3	6.5	K	14.3		10.6	J	9.3	J	10.2
Copper	34	9	**44**	J	**150**		**89.4**	J	26.1	L	**77.4**
Iron	NA	1000	20800	J	43200		27700	J	31700		30850
Lead	46.7	2.5	**188**		**1180**	J	**72.6**	J	41.6	J	**370.6**
Magnesium	NA	NA	4770	J	13200		9650		11500		9780
Manganese	NA	80	578	J	1060		1440	J	3180	J	1565
Mercury	0.15	0.012	**0.195**	L	**0.16500**		0.130	J	0.0245		0.12863
Nickel	20.9	52.0	12.5	L	**51.8**	J	**25.5**	J	18	L	**27.0**
Potassium	NA	NA	1450	J	2500		2220	J	2100		2068
Selenium	NA	5	2.3	UR	5	UR	0.21	UL	2	UL	- -
Silver	1	NA	1.7	B	3.2	B	**7.4**	J	**8.2**	J	**5.1**
Sodium	NA	NA	801	J	1410	L	972	K	279	B	796
Thallium	NA	NA	0.47	U	0.53	UL	0.45	UL	0.25	UL	- -
Vanadium	NA	19	34		60.7		53.9	L	148	L	74.2
Zinc	150	120	**704**		**888**	J	**293**	J	**191**	L	**519**
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			19500		10700		8840		7540		11645
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	1700	U	4100	U	410	U	300	U	- -
Acenaphthylene	44	24	3300	U	8200	U	820	U	590	U	- -
Anthracene	85.3	24	**2000**		**4200**		**260**		**290**		**1688**
Benz(a)anthracene	261	0.014	**6800**		**9300**		**1400**		**910**		**4603**
Benzo(a)pyrene	430	0.014	**5700**		**9500**		**1200**		**780**		**4295**
Benzo(b)fluoranthene	430	0.014	**6500**		**8300**		**1300**		**830**		**4233**
Benzo(g,h,i)perylene	430	0.014	**4400**		**6400**		**1100**		**640**		**3135**
Benzo(k)fluoranthene	430	0.014	**2900**		**3400**		**710**		280		**1823**
Chrysene	384	0.014	**7600**		**9300**		**1400**		**960**		**4815**
Dibenz(a,h)anthracene	63.4	0.014	**240**	J	**1700**		45	J	63		**512**
Fluoranthene	600	3.9	**20000**		**25000**		**2800**		**2500**		**12575**
Fluorene	19	3.9	330	U	**2000**		**120**		**100**		**555**
Indeno(1,2,3-cd)pyrene	430	0.014	**2800**		**5000**		**630**		**440**		**2218**
Naphthalene	160	24	1700	U	4100	U	410	U	300	U	- -
Phenanthrene	240	24	**8900**		**16000**		**1400**		**1300**		**6900**
Pyrene	665	24	**17000**		**23000**		**2600**		**2000**		**11150**

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-12								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/9/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	NA		7170		9390	J	8390		8317
Antimony	2	NA	NA		0.75	B	0.47	L	0.57	B	0.16
Arsenic	8.2	8.1	NA		2.7	J	1.9	L	2.5	K	2.4
Barium	NA	3.9	NA		80	K	85.6	J	84.1	J	83.2
Beryllium	NA	5.1	NA		1	J	1.6		1.5	K	1.4
Cadmium	1.2	2.2	NA		0.05	UL	0.04	UL	0.15	U	- -
Calcium	NA	NA	NA		19700		8990		21300		16663
Chromium	81	74/11	NA		36.6	J	32.7	J	33.2		34.2
Cobalt	NA	3	NA		9		12.3	J	10	J	10.4
Copper	34	9	NA		26.1		**37.4**	J	**72.8**		**45.4**
Iron	NA	1000	NA		25300		24300	J	27800		25800
Lead	46.7	2.5	NA		**47.6**	J	**88.4**	J	**51.3**	J	**62.4**
Magnesium	NA	NA	NA		10500		8200		11300		10000
Manganese	NA	80	NA		908		726	J	769	J	801
Mercury	0.15	0.012	0.0684	L	0.02610		0.03100	J	0.0194		0.03623
Nickel	20.9	52.0	NA		18.2	J	**22**	J	19.9		20.0
Potassium	NA	NA	NA		1970		2430	J	2720		2373
Selenium	NA	5	NA		2.3	UR	0.21	UL	1.5	UL	- -
Silver	1	NA	NA		1.7	B	**6.4**	J	**6.5**	J	**4.3**
Sodium	NA	NA	NA		922	L	926	K	689	J	846
Thallium	NA	NA	NA		0.49	UL	0.44	UL	0.2	UL	- -
Vanadium	NA	19	NA		53.7		36.5	L	40.9	L	43.7
Zinc	150	120	NA		120	J	**228**	J	**184**	L	**177**
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			3760		6510		5270		5970		5378
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	490	U	220	U	100	U	380	U	- -
Acenaphthylene	44	24	980	U	430	U	210	U	760	U	- -
Anthracene	85.3	24	**800**		20	U	84		34	J	**230**
Benz(a)anthracene	261	0.014	**2000**		**870**		**770**		**310**		**988**
Benzo(a)pyrene	430	0.014	**2000**		**900**		**720**		260		**970**
Benzo(b)fluoranthene	430	0.014	**2100**		**820**		**650**		260		**958**
Benzo(g,h,i)perylene	430	0.014	**1300**		**640**		**770**		270		**745**
Benzo(k)fluoranthene	430	0.014	**1200**		**450**		380		110		**535**
Chrysene	384	0.014	**2200**		**920**		**780**		290		**1048**
Dibenz(a,h)anthracene	63.4	0.014	**200**		59		26		76	U	**71**
Fluoranthene	600	3.9	**5600**		**2000**		**1300**		480		**2345**
Fluorene	19	3.9	**390**		43	U	21	U	76	U	**98**
Indeno(1,2,3-cd)pyrene	430	0.014	**970**		**470**		390		170		**500**
Naphthalene	160	24	490	U	220	U	100	U	380	U	- -
Phenanthrene	240	24	**3700**		**810**		**500**		190		**1300**
Pyrene	665	24	**5200**		**1600**		**1100**		410		**2078**

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 [redacted]
Analytical Results
Surface Water and Sediment
NAWC Warminster

	NOAA	AWQC	SD-13								
	ER-L	Freshwater	09/15/99		11/22/99		2/22/00		6/8/00		MEAN
		Chronic Screening									
			RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	
INORGANICS	**mg/kg**	**ug/L**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**
Aluminum	NA	87	NA		5950		8810	J	6560		7107
Antimony	2	NA	NA		0.68	B	0.67	L	0.55	B	0.22
Arsenic	8.2	8.1	NA		4.7	K	3.4	L	3.6	K	3.9
Barium	NA	3.9	NA		126	K	127	J	104	J	119
Beryllium	NA	5.1	NA		1.1	J	1.2		1.1	K	1.1
Cadmium	1.2	2.2	NA		**3**	J	0.73	L	0.73	K	1.49
Calcium	NA	NA	NA		2800		8980		7350		6377
Chromium	81	74/11	NA		22	J	39	J	35.8		32
Cobalt	NA	3	NA		7.3		11	J	9.3	J	9.2
Copper	34	9	NA		33.1		**40.5**	J	**46.8**		**40.1**
Iron	NA	1000	NA		18600		24400	J	27700		23567
Lead	46.7	2.5	NA		**51.1**	J	**76.1**	J	39.7	J	**55.6**
Magnesium	NA	NA	NA		3220		7920		4990		5377
Manganese	NA	80	NA		1970		1370	J	1330	J	1557
Mercury	0.15	0.012	0.0375	L	0.08300		0.073	J	0.1430		0.08413
Nickel	20.9	52.0	NA		16.8	J	**23.4**	J	**22.5**		**20.9**
Potassium	NA	NA	NA		1070	L	2120	J	1510		1567
Selenium	NA	5	NA		2.5	UR	0.35	B	1.7	UL	- -
Silver	1	NA	NA		2.2	B	**6.4**	J	**7.6**	J	**4.7**
Sodium	NA	NA	NA		776	L	675	K	327	J	593
Thallium	NA	NA	NA		0.52	UL	0.45	UL	0.89	J	0.22
Vanadium	NA	19	NA		28.3		40.5	L	34.2	L	34.3
Zinc	150	120	NA		**396**	J	**286**	J	**257**	J	**313**
MISCELLANEOUS PARAMETERS			mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
Hardness as CaCO3			NA		NA		NA		NA		NA
Total Organic Carbon			3610		7190		9100		3840		5935
SEMIVOLATILES	ug/kg	ug/L	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg
Acenaphthene	16	24	110	U	210	U	690	U	380	U	- -
Acenaphthylene	44	24	210	U	420	U	1400	U	750	U	- -
Anthracene	85.3	24	**120**		**200**		**600**		**100**		**255**
Benz(a)anthracene	261	0.014	**640**		**760**		**3200**		**680**		**1320**
Benzo(a)pyrene	430	0.014	**640**		**740**		**2500**		**610**		**1123**
Benzo(b)fluoranthene	430	0.014	**670**		**790**		**3000**		**620**		**1270**
Benzo(g,h,i)perylene	430	0.014	**680**		**670**		**2100**		**470**		**980**
Benzo(k)fluoranthene	430	0.014	360		230		**1600**		250		**610**
Chrysene	384	0.014	**670**		**880**		**3300**		**700**		**1388**
Dibenz(a,h)anthracene	63.4	0.014	34		34	J	**110**	J	75	U	45
Fluoranthene	600	3.9	**1300**		**1900**		**7800**		**1600**		**3150**
Fluorene	19	3.9	21	U	**54**		**330**		75	U	**96**
Indeno(1,2,3-cd)pyrene	430	0.014	420		**470**		**1400**		400		**673**
Naphthalene	160	24	110	U	210	U	690	U	380	U	- -
Phenanthrene	240	24	**590**		**770**		**3500**		**710**		**1393**
Pyrene	665	24	**1100**		**1600**		**5900**		**1200**		**2450**

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 w/ sand	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-02	Well-graded sand w/ gravel	Poorly-graded sand w/ silt and gravel	Silty gravel w/ sand	Well-graded sand w/ silt and gravel
ST-03	Well-graded sand w/ silt and gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-04	Well-graded sand w/ gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-05	Well-graded sand w/ silt and gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Poorly-graded gravel w/ sand
ST-06	Well-graded sand w/ gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-07	Well-graded sand w/ silt and gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Poorly graded sand w/ gravel
ST-08	Silty sand	Well-graded sand w/ silt and gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-09	Well-graded sand w/ silt and gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-10	Poorly-graded sand w/ silt and gravel	Well-graded sand w/ gravel	Well-graded gravel w/ sand	Well-graded gravel w/ sand
ST-11	Poorly-graded sand w/ silt and gravel	Well-graded sand w/ gravel	Well-graded gravel w/ sand	Well-graded sand w/ gravel
ST-12	Poorly-graded sand w/ gravel	Well-graded sand w/ silt and gravel	Poorly-graded sand w/ gravel	Well-graded gravel w/ sand
ST-13	Well-graded sand w/ silt and gravel	Silty sand w/ gravel	Poorly-graded sand w/ gravel	Well-graded sand w/ gravel

TABLE 4-3
SURFACE SOIL SAMPLING RESULTS
NAWC WARMINSTER

Substance	Background Data				Surface Soil Sampling Results							
	Freq. of etectio	Range of Positive Detection Min.	Max.	Mean of All Data	SS-01 QTR. 1	SS-01 QTR. 2	SS-01 QTR. 3	SS-01 QTR. 4	SS-02 QTR. 1	SS-02 QTR. 2	SS-02 QTR. 3	SS-02 QTR. 4
METALS (mg/kg)												
aluminum	31/31	4780	18100	13400	8240	7040 J	7400	8690	12200	8080	13800	7640
antimony	1/22	13.6	13.6	3.75	0.81 K	3.3 B	1 B	0.19 U	1.6 K	1.4 B	6.1	1.8 B
arsenic	27/31	0.28	12.1	3.88	3.2 L	9.3 J	2.6	2.5 L	4.6 L	3.6	5	7.6 L
barium	27/29	34.1	225	61.6	246	546 J	127	49.5	153	113	245	186
beryllium	27/31	0.31	1.7	0.806	0.66 B	0.87 J	0.91 K	0.97 K	1.2 J	0.87 L	1.3 K	1 K
cadmium	0/31	-			0.82 J	8.9 J	0.45 UL	0.15 U	0.53 J	0.28 J	17.8	0.35 K
calcium	25/29	240	1910	664	3740	13000 J	42900	9840	3010	17100	6710	2530
chromium	31/31	7.9	35.3	19.4	34.4	86.1 J	24.2	31.7	28.5	32	37.8	18.9
cobalt	27/30	1.6	22.1	8.9	25.1 K	46.3 J	6.3	8.3 L	7.6 K	6.2 K	62.2	4.3 B
copper	29/31	3.6	30.6	11.8	15.3	54.8 J	33.2	24.5	53.6	46.9	226	58.8
iron	31/31	6980	410500	33100	23700	73100 J	36800	23200	26000	30100	70100	27500
lead	31/31	1.6	96.5	11.7	39.4	51.2 J	71	35.4 L	97.5	439 J	79.8	67.5 L
magnesium	27/31	518	4960	1980	1920	5210 J	26500	9320	2840	11400	5280	2000
manganese	31/31	30.9	2010	424	6000	9860 J	1040	466	372	352 J	2080	344
mercury	1/28	0.37	0.37	0.0436	0.29 L	0.35 J	3.98 J	0.0423	0.192 L	0.0456	0.01 J	0.4580
nickel	20/27	4.1	21.7	10.5	47.9	113 J	13.8	19.3	14.6 L	12.8	249	7.8 L
potassium	27/29	89.1	3050	706	608 J	677 J	1520	1270	1030 J	997 J	1600	512 K
selenium	0/20	-			0.71 B	ND	2.2 U	1.6 U	ND	ND	0.53 U	0.48 U
silver	0/17	-			3.6 B	6.8 J	6.8	5.6	6 K	2.7 J	21.9	9.3
sodium	5/20	55.2	86.7	102	171 B	301 J	282 K	346 L	218 B	281 J	234 K	116 L
thallium	3/31	0.37	0.42	0.378	ND	ND	0.46 U	0.25 U	ND	ND	1.6	0.31 U
vanadium	31/31	15.4	45	29.7	30.6	66.5 J	38.7	40.3	48.4	38.6 L	91.6	32
zinc	27/29	9	60	27.7	850	23300 J	117	107	117	130 L	11600	102
PAHs (ug/kg)												
acenaphthene	0/11	-			ND	ND	110 U	440 U	ND	ND	95 U	450 U
acenaphthylene	0/11	-			ND	ND	220 U	870 U	ND	ND	190 U	890 U
anthracene	0/11	-			ND	ND	32	140	65 J	300	26	76
benz(a)anthracene	0/11	-			130 J	110 J	390	990	380 J	1300	200	380
benzo(a)pyrene	0/11	-			200 J	130 J	330	830	420 J	1200	230	350
benzo(b)fluoranthene	1/11	58	58	185	190 J	130 J	270	1100	380 J	1300	230	360
benzo(g,h,i)perylene	0/11	-			170 J	110 J	340	770	270 J	1100	260	300
benzo(k)fluoranthene	1/11	46	46	184	71 J	94 J	160	360	170 J	670	130	120
chrysene	1/11	51	51	185	230 J	99 J	340	1100	400 J	1400	200	370
dibenz(a,h)anthracene	0/11	-			11 J	ND	14 J	77 J	ND	67	18 J	40 J
fluoranthene	1/11	92	92	188	350 J	260 J	620	2300	830 J	3300	480	820
fluorene	0/11	-			ND	ND	22 U	84 J	32 J	97	19 U	89 U
indeno(1,2,3-cd)pyrene	0/11	-			120 J	79 J	190	590	250 J	720	160	240
naphthalene					ND	ND	110 U	440 J	ND	ND	95 U	450 U
phenanthrene	1/11	51	51	185	150 J	87 J	11 U	990	380 J	1500	220	410
pyrene					260 J	230 J	600	1900	700 J	2800	430	650
TOC (mg/kg)					19100	55100 J	3990	17400	7300	12000	38300	9390

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.

TABLE 4-4
BENTHIC MACROINVERTEBRATE COMMUNITY
UNNAMED TRIBUTARY TO LITTLE NESHAMINY CREEK - AREA A SITES
FOURTH QUARTER RESULTS
NAWC WARMINSTER, PENNSYLVANIA

SPECIES	T.V.[1,2]	F.F.G.[3]	BI-01-04Q	BI-04-04Q	BI-07-04Q	BI-10-04Q	BI-12-04Q	BI-13-04Q
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina			4	1				
MOLLUSCA								
Gastropoda								
Physidae								
Physella sp.	8	CG						1
ANNELIDA								
Oligochaeta								
Haplotaxida								
Lumbricidae				2		2		
Naididae	8	CG			7			5
Nais sp.	8	CG			3	1		2
Tubificidae w.o.h.c.	10	CG		5	58	1		14
Limnodrilus hoffmeisteri	10	CG		1				
Tubificidae w.h.c.	10	CG						3
ARTHROPODA								
Insecta								
Ephemeroptera								
Baetidae	4	CG						
Baetis sp.	4	CG		1	2			
Heteroptera								
Gerridae		P				1		
Trichoptera								
Hydropsychidae								
Cheumatopsyche sp.	6	FC				1		
Coleoptera								
Dytiscidae	5	P			1			
Diptera								
Chironomidae			2		5			
Brillia flavifrons	5	SH				1	1	1
Corynoneura	2	CG						1
Cricotopus sp.	7	CG	31		89		15	17
Cricotopus bicinctus	10	CG	11					4
Cricotopus tremulus	8	SH	12		13			2
Cricotopus trifascia	6	SH			6			
Dicrotendipes sp.	6	CG	11	2	9		7	1
Eukiefferiella sp.	4	CG	2	1	9	4		23
Parametriocnemus lundbecki	5	CG	1	2		1		3
Phaenopsectra sp.	4	SC			3		3	
Procladius sp.	8	P	1	1	1			
Rheotanytarsus sp.	6	FC					2	
Tanytarsus sp.	7	FC	1	2	7	2	1	1
Thienemanniella xena	2	CG			1			4
Thienemannimyia gp.	6	P	2			1		
Tvetenia bavarica gp.	5	CG			7			
Muscidae				1				
Simuliidae	6	FC						
Simulium sp.	6	FC	2					
Tipulidae								
Tipula sp.	4	SH		1				
CHORDATA****								
Ostelchthyes				2				
TOTAL NO. OF ORGANISMS			**80**	**20**	**221**	**15**	**29**	**82**
TOTAL NO. OF TAXA			**12**	**12**	**16**	**10**	**6**	**15**
BIOTIC INDEX			**7.31**	**7.25**	**7.56**	**5.83**	**6.31**	**6.63**
SHANNON DIVERSITY			**2.713**	**3.341**	**2.725**	**3.107**	**1.927**	**3.09**

1 Hilsenhoff Tolerance Values (TVs) used when North Carolina Tolerance Values are not available

2 North Carolina Tolerance Values range from 0 for organisms very intolerant of organic wastes to 10 for organisms very tolerant of organic wastes

3 FFG-Functional Feeding Group: CG=Collector/Gatherer, FC=Filtering/Collectors, SC=Scrapers, SH=Shredders, P=Predators and PI=Piercer

TABLE 4-5
SIMILARITY BETWEEN BENTHIC MACROINVERTEBRATE SAMPLES
UNNAMED TRIBUTARY TO LITTLE NESHAMINY CREEK - AREA A SITES
FOURTH QUARTER RESULTS
NAWC WARMINSTER, PENNSYLVANIA

Jaccard Coefficient						
Sample Location	Sample Location					
	ST-01	ST-04	ST-07	ST-10	ST-12	ST-13
ST-01	0	0.333	0.333	0.222	0.200	0.350
ST-04	0.333	0	0.273	0.294	0.125	0.227
ST-07	0.333	0.273	0	0.182	0.222	0.409
ST-10	0.222	0.294	0.182	0	0.143	0.316
ST-12	0.200	0.125	0.222	0.143	0	0.235
ST-13	0.350	0.227	0.409	0.316	0.235	0
Percent Similarity						
Sample Location	Sample Location					
	ST-01	ST-04	ST-07	ST-10	ST-12	ST-13
ST-01	0	21.3	55.2	7.5	53.8	28.2
ST-04	21.3	0	37.7	38.3	13.4	28.2
ST-07	55.2	37.7	0	15.3	48.9	51.7
ST-10	7.5	38.3	15.3	0	6.9	41.9
ST-12	53.8	13.4	48.9	6.9	0	24.4
ST-13	34.2	28.2	51.7	41.9	24.4	0

TABLE 4-6
BENTHIC MACROINVERTEBRATE COMMUNITY
UNNAMED TRIBUTARY TO LITTLE NESHAMINY CREEK - AREA A SITES
FIRST QUARTER RESULTS
NAWC WARMINSTER, PENNSYLVANIA

Taxon	TV[1,2]	FFG[3]	Sampling Station					
			ST-01	ST-04	ST-07	ST-10	ST-12	ST-13
PLATYHELMINTHES								
Turbellaria								
Tricladida								
Planariidae								
Dugesia tigrina			1					
MOLLUSCA								
Gastropoda								
Basommatophora								
Physidae								
Physa sp.	9	CG			2			
ANNELIDA								
Oligochaeta								
Haplotaxida		CG						
Lumbricidae				1				
Tubificidae w.o.h.c.	10	CG			2	2		
ARTHROPODA								
Insecta								
Trichoptera								
Hydroptilidae								
Hydroptila sp.	2	PI						1
Coleoptera								
Psephenidae								
Psephenus herricki	4	SC						1
Diptera								
Chironomidae								
Chaetocladius sp.	6	CG			1			
Cricotopus sp.	8	CG						1
Dicrotendipes sp.	6	CG			10	1	1	1
Orthocladius sp.	4	CG			1			
Tanytarsus sp.	7	FC			1			
Psychodidae								
Pericoma sp.	4	CG			1			
Tipulidae								
Tipula sp.	4	SH			3			
TOTAL NO. OF ORGANISMS			1	1	21	3	1	4
TOTAL NO. OF TAXA			1	1	8	2	1	4
BIOTIC INDEX					6.24	8.67	6	5
SHANNON DIVERSITY			0	0	2.394	0.918	0	2

1 Hilsenhoff Tolerance Values (TVs) used when North Carolina Tolerance Values are not available

2 North Carolina Tolerance Values range from 0 for organisms very intolerant of organic wastes to 10 for organisms very tolerant of organic wastes

3 FFG-Functional Feeding Group: CG=Collector/Gatherer, FC=Filtering/Collectors, SC=Scrapers, SH=Shredders, P=Predators and PI=Piercer

TABLE 4-7
SIMILARITY BETWEEN BENTHIC MACROINVERTEBRATE SAMPLES
UNNAMED TRIBUTARY OF LITTLE NESHAMINY CREEK - AREA A SITES
FIRST QUARTER RESULTS
NAWC WARMINSTER, PENNSYLVANIA

Jaccard Coefficient						
Sample Location	Sample Location					
	ST-01	ST-04	ST-07	ST-10	ST-12	ST-13
ST-01		0	0	0	0	0
ST-04	0		0	0	0	0
ST-07	0	0		0.25	0.125	0.091
ST-10	0	0	0.25		0.5	0.2
ST-12	0	0	0.125	0.5		0.25
ST-13	0	0	0.091	0.2	0.25	
Percent Similarity						
Sample Location	Sample Location					
	ST-01	ST-04	ST-07	ST-10	ST-12	ST-13
ST-01		0	0	0	0	0
ST-04	0		0	0	0	0
ST-07	0	0		42.9	47.6	25
ST-10	0	0	42.9		33.3	25
ST-12	0	0	47.6	33.3		25
ST-13	0	0	25	25	25	

5.0 CONCLUSIONS AND RECOMMENDATIONS

Fourth quarter results were compared to results from the three previous quarters. 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 fourth quarter sampling, particularly in the PAH levels of stream sediments (see Section 4.1 for details). During the fourth quarter location ST-10 showed higher levels of contamination than the other sample locations. The average annual concentrations of PAHs at this location are also among the highest along the stream. In addition, PAH levels at this station have increased each quarter.

Analytical results from the first year of monitoring indicate that metals and PAHs are present throughout the study area, including the reference station, at levels that exceed ecological screening levels. The data also indicates that station11, located immediately downstream of the outfall, exhibits the highest levels of contaminants of potential concern. This indicates that OF-1 is a significant source of metals and PAHs into the stream.

There does not appear to be a correlation between the levels of PAHs in the seeps to the PAH levels observed in downstream sediments. This also provides additional evidence that the PAHs observed in the stream downstream of the seeps is primarily due to discharges from the parking area via the outfalls.

Based on the results of the fourth quarter sampling event, no changes to the aqueous and sediment sampling procedures are recommended.

Macroinvertebrate sampling was only conducted during the first and fourth quarterly sampling events. The fourth quarter data indicates that the macroinvertebrate community in the investigated reach of the tributary was dominated (at the time of the June 2000 sampling event) by taxa tolerant of at least moderate water pollution. Taxa generally associated with good water quality, such as larvae of most families within the Insecta Orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (Caddisflies), are either absent or present only in very

few numbers at all locations. Furthermore, the data shows a low macroinvertebrate community diversity throughout the investigated stream reach, including the reference station, and suggests an unbalanced community typical of impaired habitats.

While the fourth quarter data shows a localized increase in pollution-tolerant biota where the stream passes one of the seeps associated with Area A, the data does not convincingly demonstrate that the observed dominance by pollution tolerant organisms is attributable to Area A. Large numbers of *Cricotopus* organisms were counted in the sample from ST-01, the only sample upstream of Area A. The MBI and community diversity for ST-01 does not contrast sharply with the other locations. It is therefore quite possible that the benthic macroinvertebrate community observed at ST-07 and other locations in the unnamed tributary reflects contamination sources or other stressful conditions not associated with Area A.

The ability to draw meaningful conclusions from the macroinvertebrate data is limited by the lack of data and a good reference station. It is therefore recommended that the benthic macroinvertebrate sampling be continued for one additional year. Ideally, three rather than two quarterly rounds of benthic macroinvertebrate sampling would help ensure that temporary incidences of extreme conditions, such as the drought followed by flood that immediately preceded the first quarterly round, do not limit the usability of the data. The three rounds are recommended for spring, summer, and fall (winter data would be expected to be of lower utility).

It is also recommended that ST-03 be added to the subsequent sampling efforts. This station provides an additional reference location to complement ST-01. ST-03 is more similar to ST-07 with respect to channel geometry and flow characteristics than is ST-01. The fact that ST-03 is downstream from Outfall 3 (OF-3) does mean that it is not a perfect reference location and interpretation of the data may be complicated. However, this outfall does not flow continuously. The outfall discharges stormwater runoff from parking lots and roof drains during precipitation events. Water chemistry for metals is similar in ST-01 and ST-03; however PAH levels are somewhat higher in ST-03 sediments. This is most likely due to materials discharged from the parking lots. PAH levels in ST-01 and ST-03 have shown increasing levels through all four quarters. Including ST-03 should still help by providing additional, although imperfect, reference data from a location unaffected by the two seeps or by the other outfalls and any potential impacts from the other Navy IR sites.

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

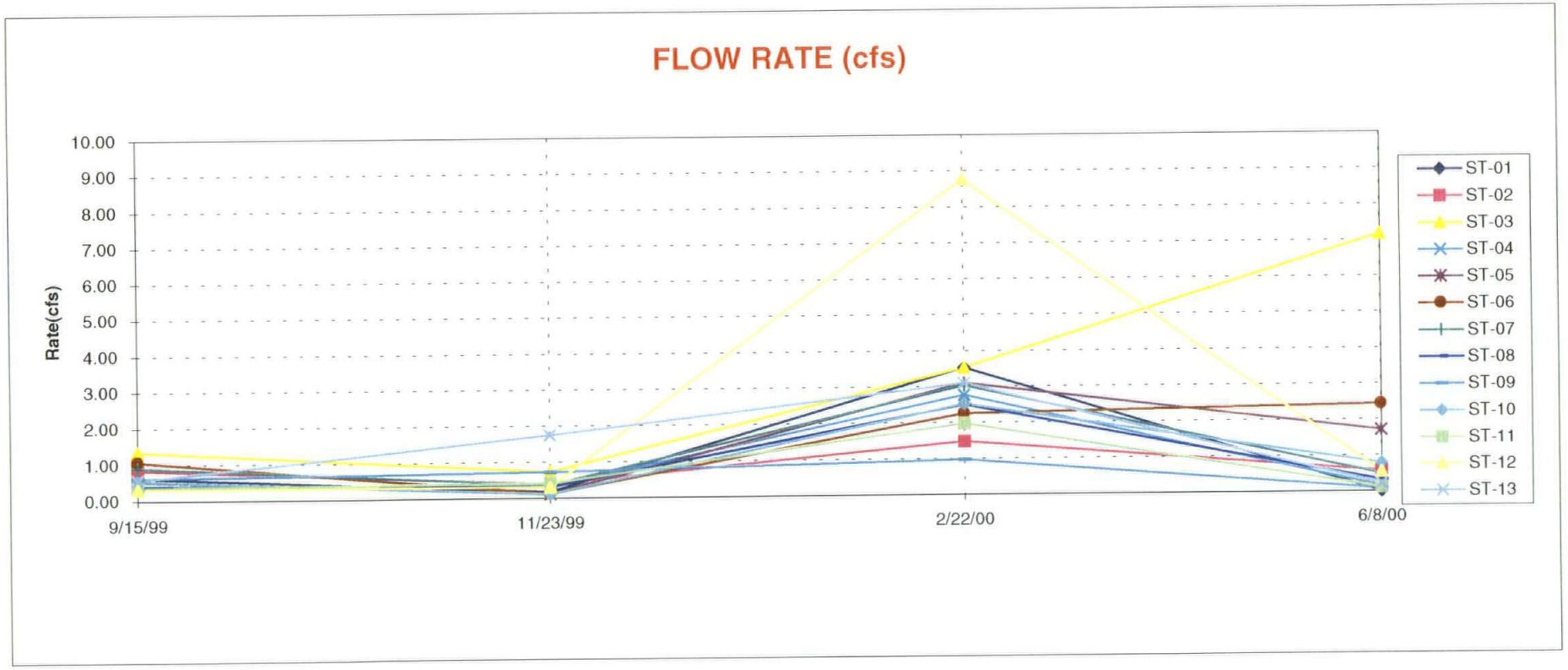
Appendix B

Stream Monitoring – Field Parameters

flow

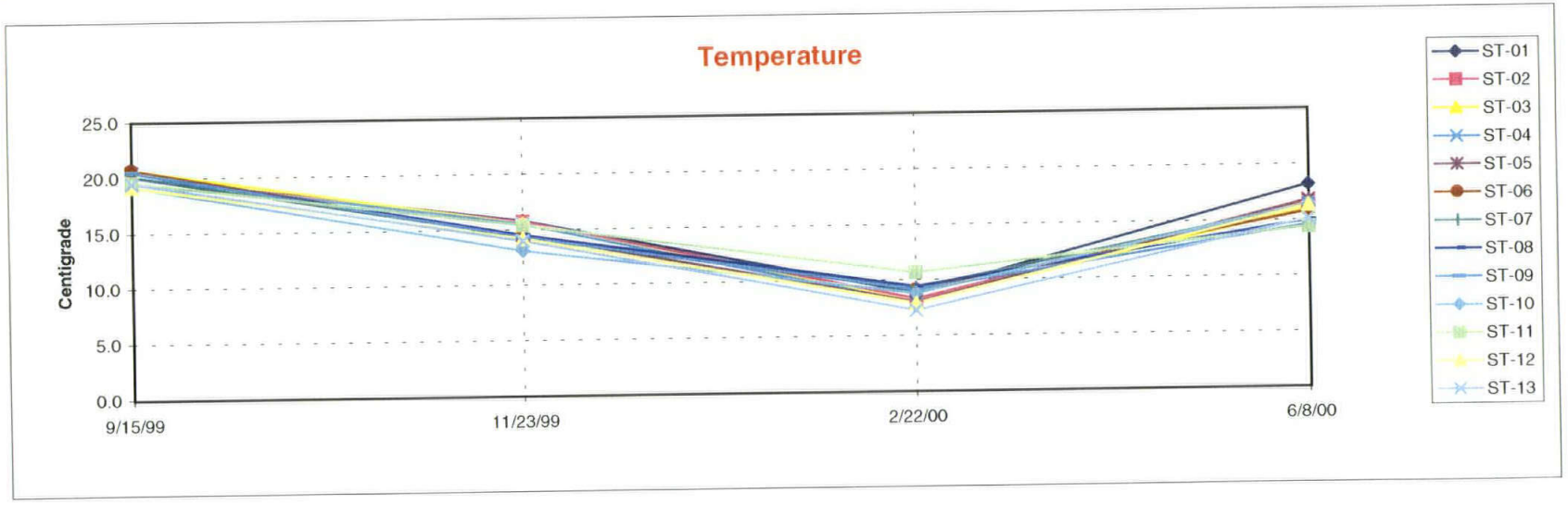
Flow Rate (cfs)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/8/00	Mean Annual Flow Rate
ST-01	0.62	0.17	3.53	0.00	1.08
ST-02	0.84	0.38	1.47	0.57	1.09
ST-03	1.35	0.73	3.53	7.17	3.20
ST-04	0.42	0.33	2.78	0.15	0.92
ST-05	0.53	0.11	3.10	1.71	1.36
ST-06	1.07	0.11	2.25	2.43	1.47
ST-07	0.91	0.36	3.04	0.49	1.20
ST-08	0.38	0.31	2.50	0.31	0.88
ST-09	0.62	0.73	0.97	0.08	0.60
ST-10	0.54	0.10	2.53	0.80	0.99
ST-11	0.36	0.41	1.98	0.11	0.72
ST-12	0.32	0.31	8.76	0.54	2.48
ST-13	0.57	1.76	3.1	0.21	1.41



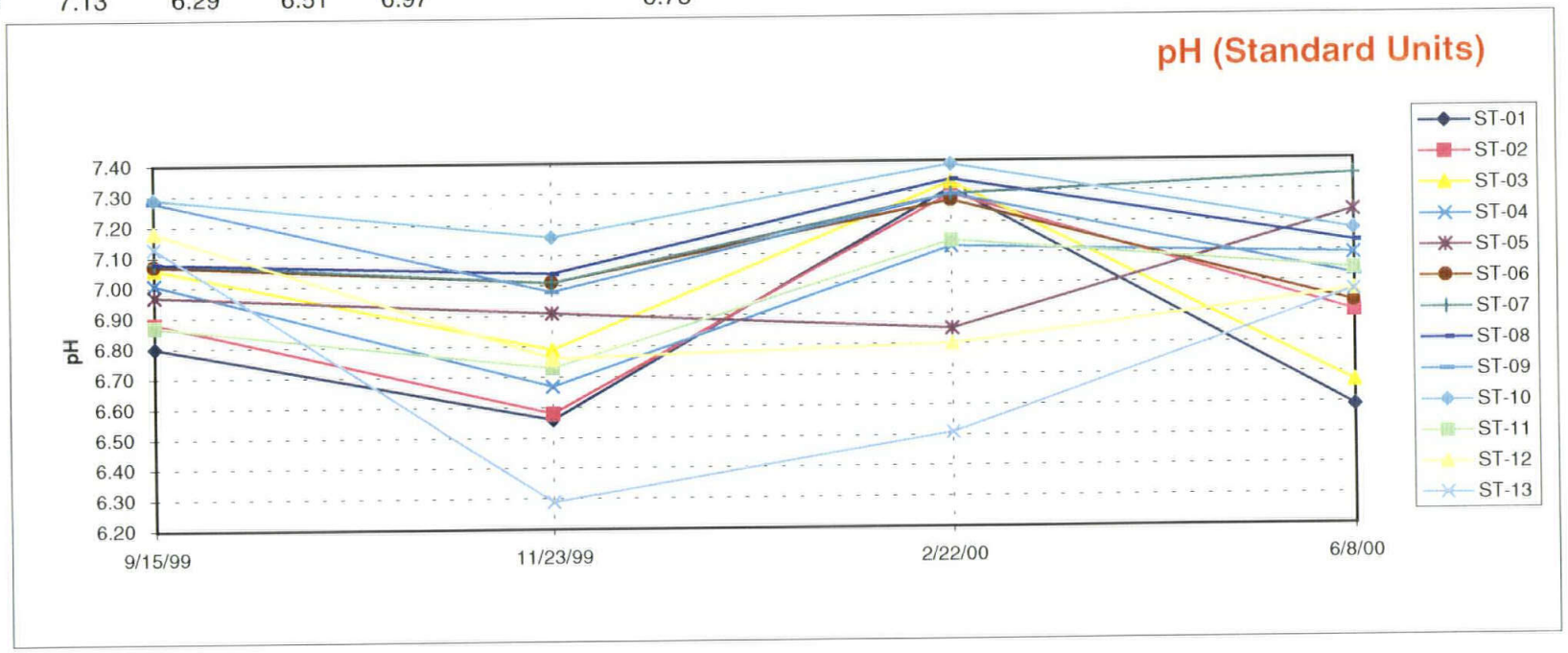
Temperature (C)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/8/00	Mean Annual Temp.
ST-01	20.1	15.8	8.8	18.2	15.73
ST-02	20.1	15.7	8.3	16.5	15.15
ST-03	20.7	15.5	8.0	16.0	15.05
ST-04	20.1	15.5	7.9	16.4	14.98
ST-05	20.5	14.5	8.0	16.8	14.95
ST-06	20.7	14.4	9.1	15.8	15.00
ST-07	20.1	14.4	9.3	16.3	15.03
ST-08	20.5	14.5	9.4	15.0	14.85
ST-09	20.5	14.3	9.1	14.6	14.63
ST-10	19.2	13.1	8.8	16.4	14.38
ST-11	19.6	15.4	10.7	14.4	15.03
ST-12	19.2	14.2	7.9	16.3	14.40
ST-13	19.5	14.0	7.3	15.1	13.98



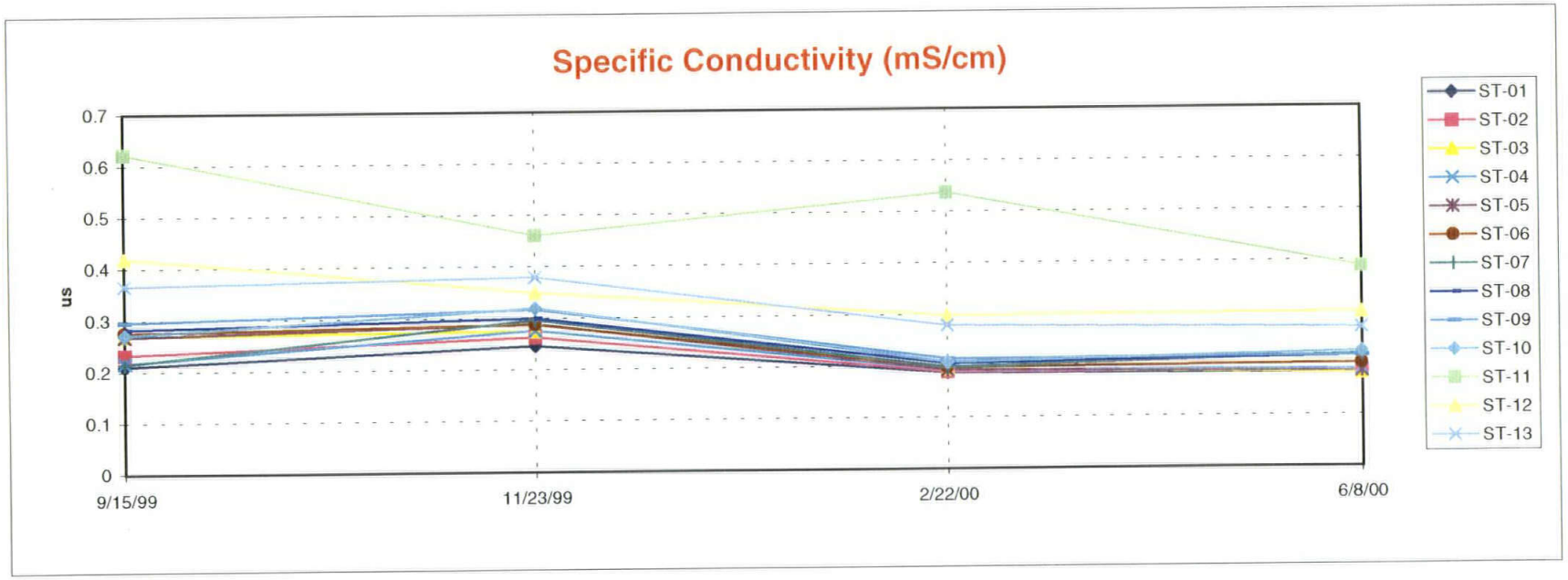
pH
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/8/00	Mean Annual pH pH
ST-01	6.80	6.56	7.31	6.59	6.82
ST-02	6.88	6.58	7.29	6.90	6.91
ST-03	7.06	6.79	7.33	6.67	6.96
ST-04	7.01	6.67	7.12	7.09	6.97
ST-05	6.97	6.91	6.85	7.23	6.99
ST-06	7.07	7.01	7.27	6.93	7.07
ST-07	7.08	7.01	7.29	7.35	7.18
ST-08	7.08	7.04	7.34	7.13	7.15
ST-09	7.28	6.98	7.29	7.02	7.14
ST-10	7.29	7.16	7.39	7.17	7.25
ST-11	6.87	6.73	7.14	7.04	6.95
ST-12	7.18	6.76	6.80	6.97	6.93
ST-13	7.13	6.29	6.51	6.97	6.73



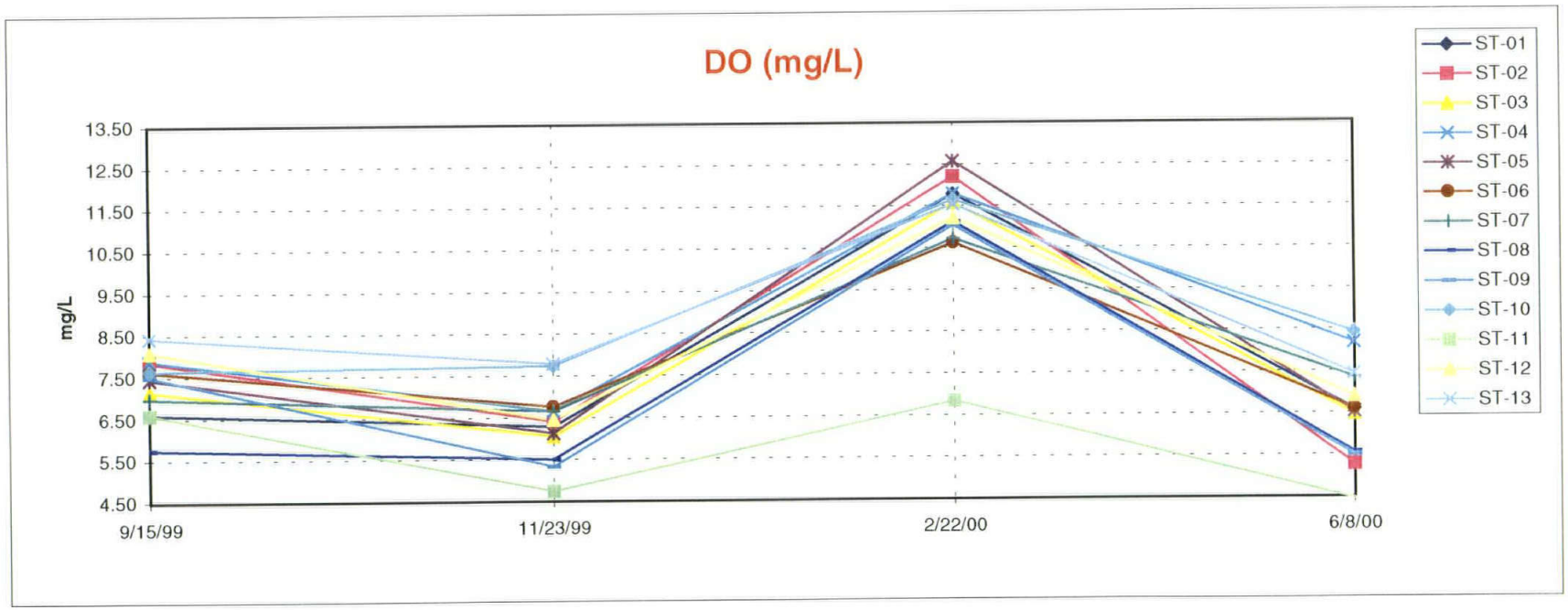
Specific Conductivity (mS/cm)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/8/00	Mean Annual SC
ST-01	0.209	0.245	0.186	0.182	0.21
ST-02	0.232	0.262	0.188	0.185	0.22
ST-03	0.268	0.274	0.193	0.181	0.23
ST-04	0.216	0.275	0.191	0.188	0.22
ST-05	0.267	0.288	0.191	0.184	0.23
ST-06	0.275	0.287	0.196	0.200	0.24
ST-07	0.214	0.295	0.197	0.217	0.23
ST-08	0.282	0.299	0.204	0.214	0.25
ST-09	0.295	0.316	0.213	0.214	0.26
ST-10	0.271	0.318	0.207	0.223	0.25
ST-11	0.622	0.460	0.537	0.388	0.50
ST-12	0.419	0.348	0.298	0.300	0.34
ST-13	0.366	0.379	0.278	0.270	0.32



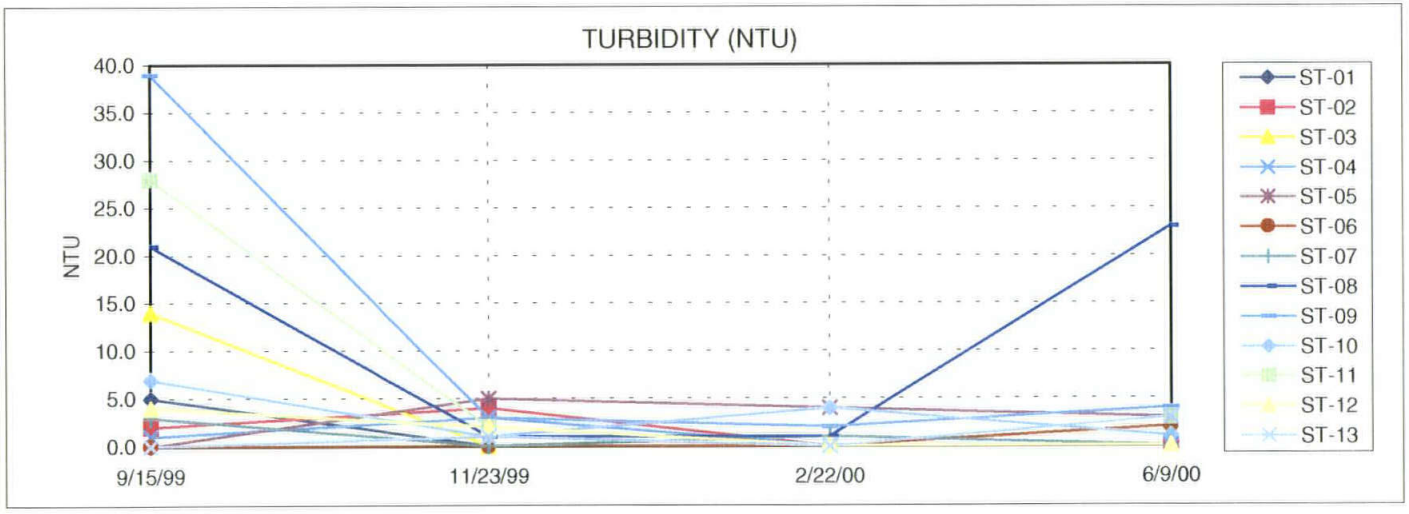
Dissolved Oxygen (mg/L)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/8/00	Mean Annual DO
ST-01	6.60	6.29	11.79	6.59	7.82
ST-02	7.85	6.40	12.20	5.27	7.93
ST-03	7.15	6.05	11.58	6.48	7.82
ST-04	7.89	6.65	11.80	8.19	8.63
ST-05	7.45	6.13	12.57	6.53	8.17
ST-06	7.63	6.76	10.62	6.60	7.90
ST-07	6.98	6.65	10.72	7.35	7.93
ST-08	5.76	5.50	11.12	5.57	6.99
ST-09	7.51	5.33	11.04	5.50	7.35
ST-10	7.65	7.74	11.65	8.44	8.87
ST-11	6.60	4.74	6.85	4.46	5.66
ST-12	8.09	6.44	11.22	6.90	8.16
ST-13	8.44	7.80	11.55	7.45	8.81



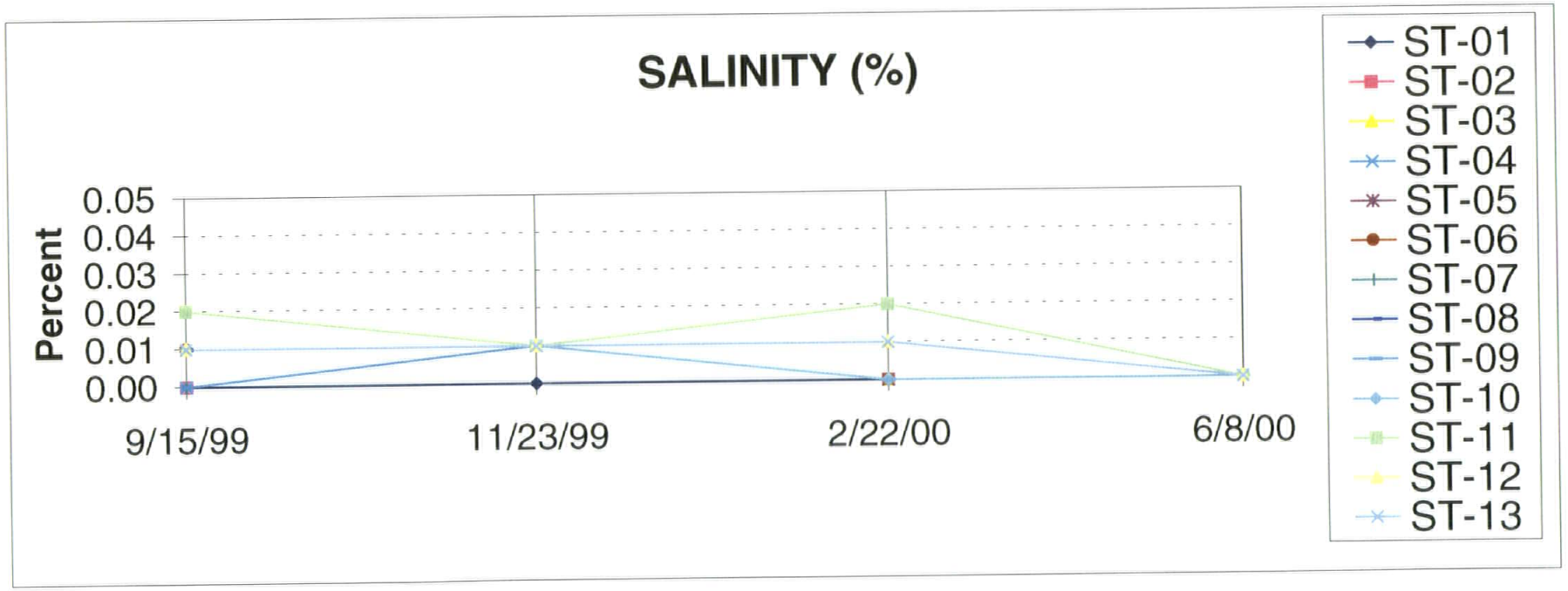
TURBIDITY (NTU)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/9/00
ST-01	5.0	0.0	0.0	3.0
ST-02	2.0	4.0	0.0	0.0
ST-03	14.0	0.0	0.0	0.0
ST-04	1.0	3.0	0.0	0.0
ST-05	0.0	5.0	4.0	3.0
ST-06	0.0	0.0	0.0	2.0
ST-07	3.0	0.0	1.0	0.0
ST-08	21.0	1.0	1.0	23.0
ST-09	39.0	3.0	2.0	4.0
ST-10	7.0	1.0	4.0	1.0
ST-11	28.0	2.0	0.0	3.0
ST-12	4.0	2.0	0.0	0.0
ST-13	0.0	1.0	0.0	3.0



SALINITY (%)
NAWC Warminster Surface Water Sample Results

Location	9/15/99	11/23/99	2/22/00	6/8/00	Mean Annual Salinity
ST-01	0.00	0.00	0.00	0.00	0.00
ST-02	0.00	0.01	0.00	0.00	0.00
ST-03	0.01	0.01	0.00	0.00	0.01
ST-04	0.00	0.01	0.00	0.00	0.00
ST-05	0.01	0.01	0.00	0.00	0.01
ST-06	0.01	0.01	0.00	0.00	0.01
ST-07	0.00	0.01	0.00	0.00	0.00
ST-08	0.01	0.01	0.00	0.00	0.01
ST-09	0.00	0.01	0.00	0.00	0.00
ST-10	0.01	0.01	0.00	0.00	0.01
ST-11	0.02	0.01	0.02	0.00	0.01
ST-12	0.01	0.01	0.01	0.00	0.01
ST-13	0.01	0.01	0.01	0.00	0.01



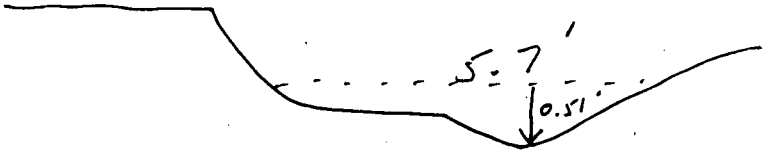
Appendix C

Stream Flow Calculations

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT CTO 252		JOB NUMBER 6883	
SUBJECT ST-01			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



AVG. FLOW RATE = 0.0 ft/sec.

CROSS SECTION = 5.70 X 0.51 = 2.91 ft^2

AVG. FLOW RATE: 2.91 ft^2 X 0.0 ft/sec =

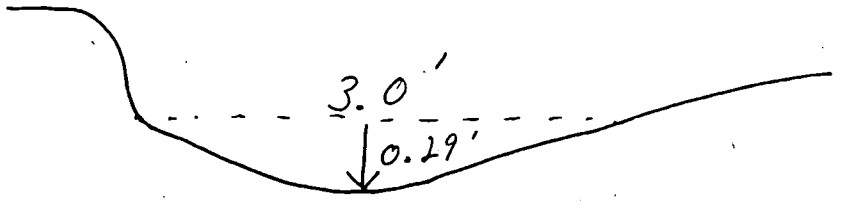
0.0 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT	CTO 252	JOB NUMBER	6883
SUBJECT	ST-02		
BASED ON		DRAWING NUMBER	

BY	CHECKED BY	APPROVED BY	DATE



AVG. FLOW = 0.65 ft/sec.

CROSS SECTION AREA: 0.87 ft^2

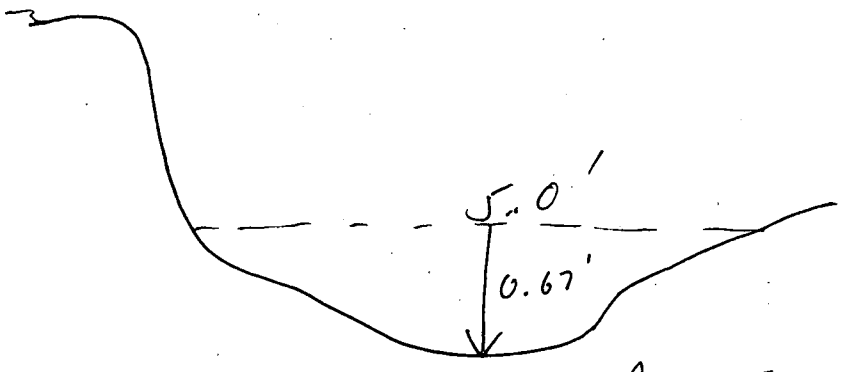
FLOW RATE = 0.87 ft^2 X 0.65 ft/sec =
0.57 ft^3/sec

* FLOW DATA NOT AVAILABLE

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT	CT0252	JOB NUMBER	6883
SUBJECT	ST-03		
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



AVG. FLOW 2.14 ft/sec

CROSS SECTION AREA: 3.35 ft^2

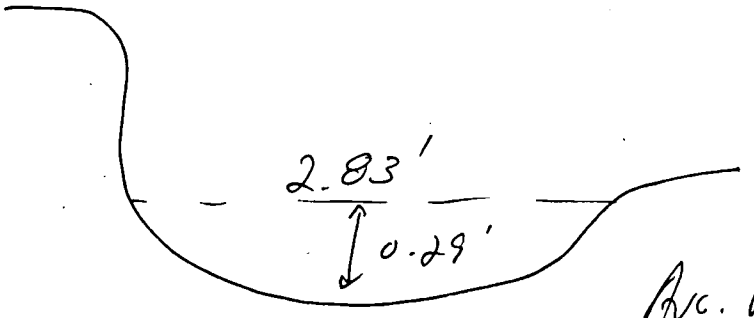
FLOW RATE: 3.35 ft^2 X 2.14 ft/sec =

7.17 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT CT0252		JOB NUMBER 6883	
SUBJECT ST-04			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



AVG. VELOCITY = 0.18 ft/sec.

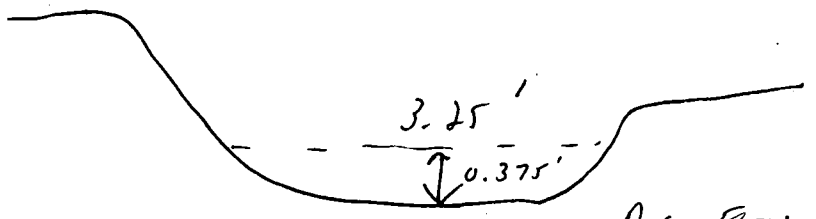
FLOW = 2.83 ft x 0.29 ft x 0.18 ft/sec =

0.15 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT CTOL52		JOB NUMBER 6883	
SUBJECT ST-05			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



AVG. FLOW RATE: 1.4 ft/sec

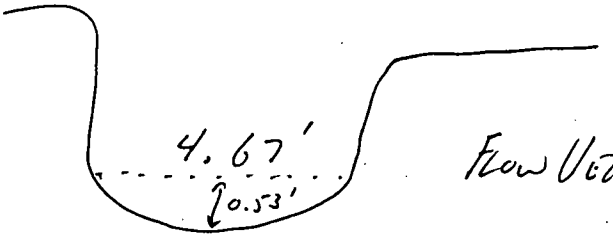
AREA: 3.25' x 0.375' = 1.22 ft^2

FLOW RATE = 1.22 ft^2 x 1.4 ft/sec = 1.71 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT	CTU 252	JOB NUMBER	6883
SUBJECT	ST- 06		
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Flow Velocity: 0.98 ft/sec.

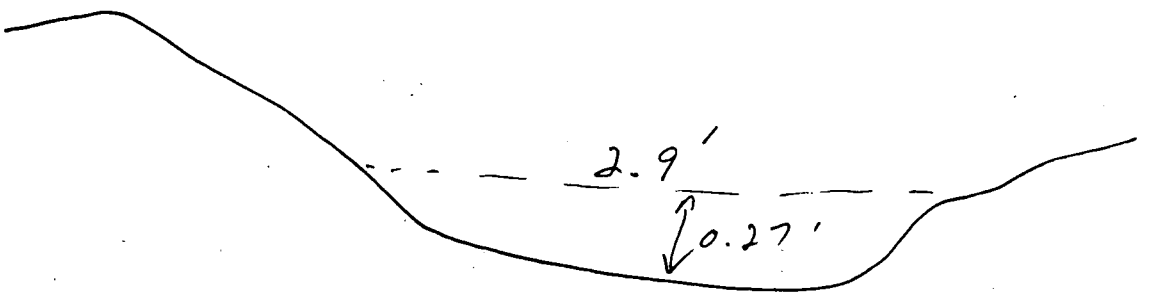
Area: 4.67' x 0.53' = 2.48 ft^2

Flow: 2.48 ft^2 x 0.98 ft/sec = 2.43 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT	CPCLSZ	JOB NUMBER	6883
SUBJECT	ST-07		
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



Flow Velocity: 0.63 ft/sec

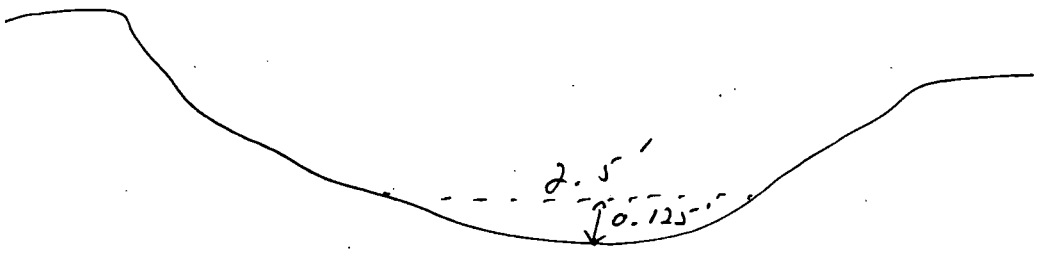
Flow Rate: 2.9 ft x 0.27 ft x 0.63 ft/sec =

0.49 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT CT0252		JOB NUMBER 6883	
SUBJECT ST-08			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



AVG. VELOCITY = 1.0 ft/sec.

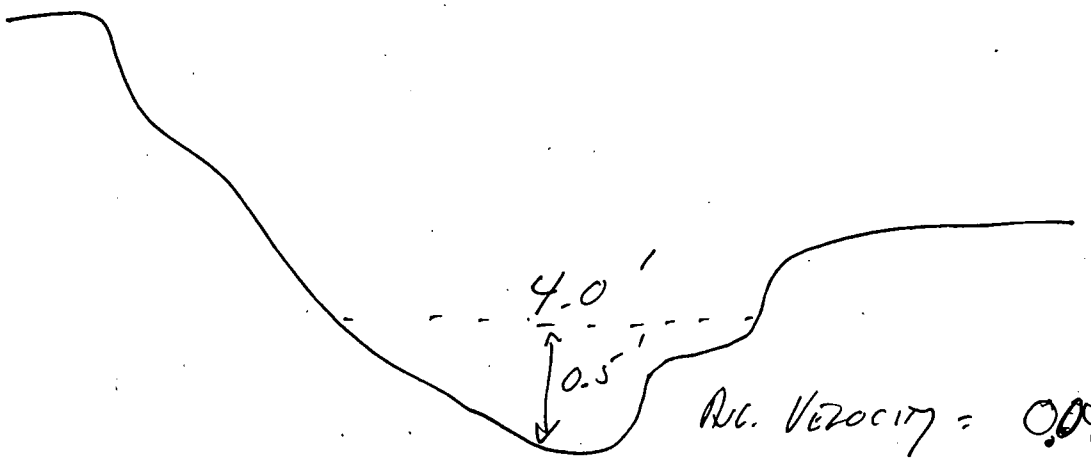
FLOW RATE = 2.5 ft X 0.125' X 1.0 ft/sec =

0.313 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
CT0252		6883	
SUBJECT			
ST-09			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



AVG. VELOCITY = 0.042 ft/sec

FLOW = 4.0 ft x 0.5 ft x 0.042 ft/sec =

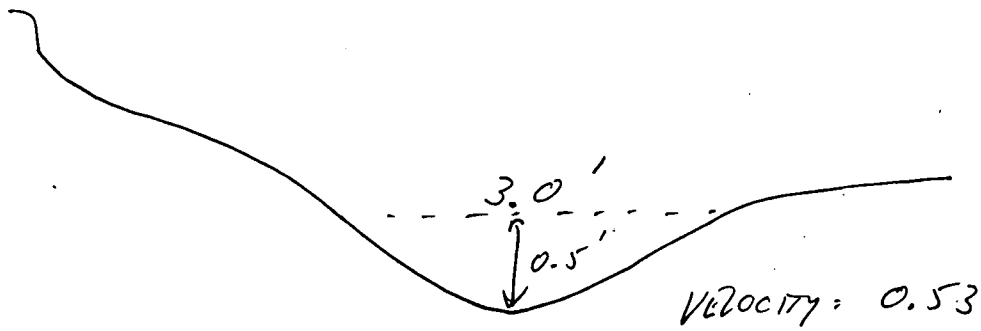
0.084 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT	CTO 252	JOB NUMBER	6883
SUBJECT	ST-10		
BASED ON		DRAWING NUMBER	

BY	CHECKED BY	APPROVED BY	DATE



VELOCITY: 0.53 ft/sec.

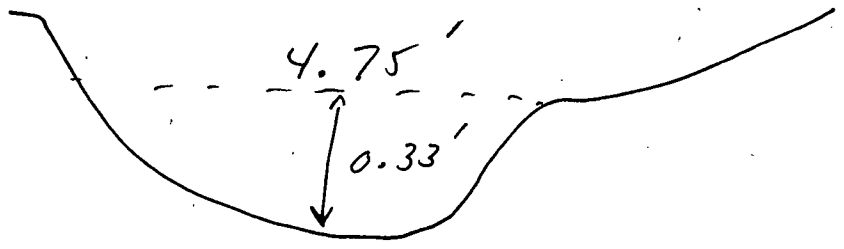
Flow = 3.0 ft x 0.5 ft x 0.53 ft/sec =

0.795 ft^3/sec

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT CTDLSZ		JOB NUMBER 6883	
SUBJECT ST-11			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



VELOCITY = 0.068 ft/sec.

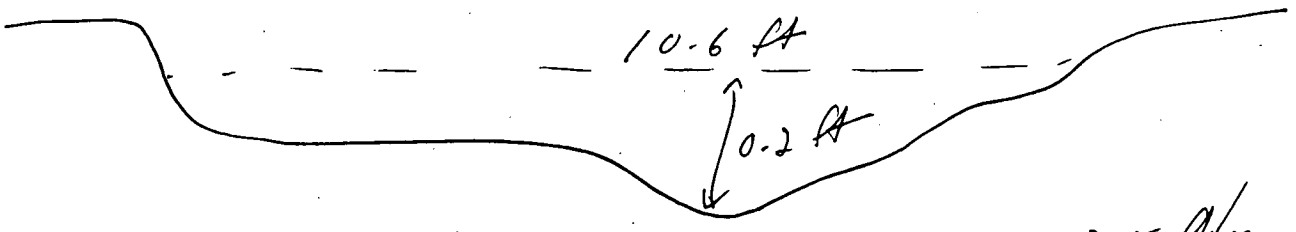
FLOW: 4.75 ft X 0.33 ft X 0.068 ft/sec =

0.11 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT	CTD252	JOB NUMBER	6883
SUBJECT	ST-12		
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



VELOCITY = 0.255 ft/sec

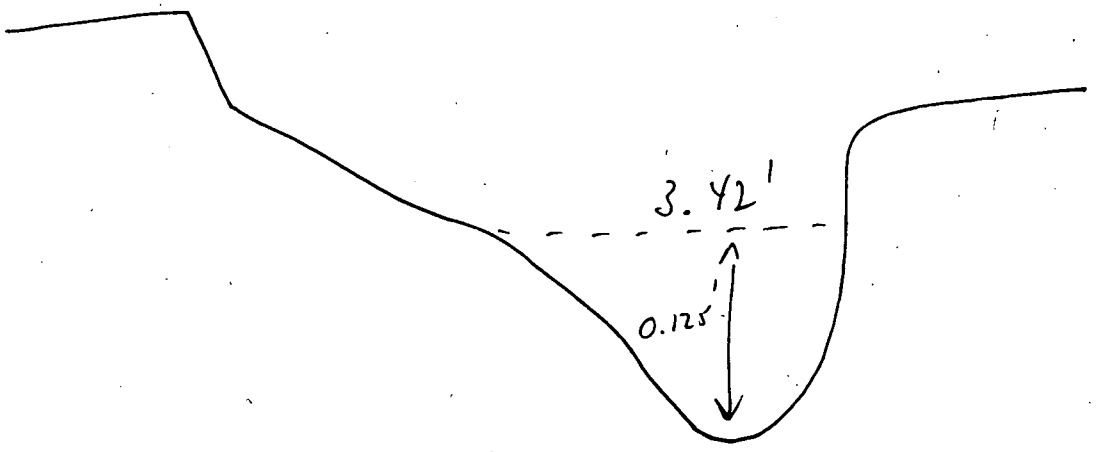
FLOW = 10.6 ft x 0.2 ft x 0.255 ft/sec =

0.54 cfs

CALCULATION WORKSHEET

PAGE _____ OF _____

CLIENT		JOB NUMBER	
GT0252		6883	
SUBJECT	ST-13		
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE



VELOCITY = 0.498 ft/sec

FLOW = 3.42' X 0.125' X 0.498 ft/sec =

0.21 cfs

Appendix D

Sample Logs

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO252

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

Sample ID No.: SW-01-049
Sample Location: ST-01
Sampled By: AP
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: 6/9/00								
Time: 1244								
Depth: 0.51 ft								
Method: Bottle Sample	CLEAR	6.59	0.182	18.2	3.0	8.35	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, No ODORS,
Green Algae Mat
on Stream Bottom.

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-01-04P
Sample Location: ST-01
Sampled By: AB
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1252 Method: SS Trowel Monitor Reading (ppm): 0.0	0.51 ft	lt. to dk. Br.	Gravel w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID READINGS

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-02-049
Sample Location: ST-02
Sampled By: EH
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: 6/8/00								
Time: 1512								
Depth: 3.5"	CLEAR	6.90	0.185	16.5	0.0	5.27	0.0	
Method: Bottleware								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-02-0YQ
Sample Location: ST-02
Sampled By: GH
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1517 Method: SS Trowel Monitor Reading (ppm): 0.0	3.5"	Brown	Sandy Clay w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-03-049
Sample Location: ST-03
Sampled By: EH
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: 6/8/00								
Time: 1449								
Depth: 8"								
Method: Bottleware	CLEAR	6.67	0.181	16.0	0.0	6.48	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, No Odors

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-03-04Q
Sample Location: ST-03
Sampled By: EH
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1455 Method: SS Trowel Monitor Reading (ppm): 0.0	8"	Br.-Red Br.	Sand w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-04-040
Sample Location: ST-04
Sampled By: EH
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: 6/8/00 Time: 1317 Depth: 3.5" Method: Bottleware	CLEAR	7.09	0.188	16.4	0	8.19	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS
BROWN PLACE ON BOTTOM

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-04-049
Sample Location: ST-04
Sampled By: LEH
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1323 Method: SS Trowel Monitor Reading (ppm): 0.0	3.5"	Brown	Sand + 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-05-04Q
Sample Location: ST-05
Sampled By: EH
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: 6/8/00								
Time: 1248								
Depth: 4.5"	CLEAR	7.23	0.194	16.8	3.0	6.53	0.00	
Method: BOTTLEWATER								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS

MAP:

See Survey

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page 1 of 1

Project Site Name: NAWC Warminster
Project No.: CTO252

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

Sample ID No.: SD-05-049
Sample Location: ST-05
Sampled By: GH
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1252 Method: SS Trowel Monitor Reading (ppm): 0.0	4.5"	Red-Br.	Sand w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PIDs

MAP:

See Survey

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NAWC Warminster
Project No.: CTO252

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

Sample ID No.: SW-06-048
Sample Location: ST-06
Sampled By: EH
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: 6/8/00								
Time: 1201								
Depth: 6"	CLEAR	6.93	0.200	15.8	2.0	6.60	0.00	
Method:								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS
GREEN ALGAE ON STREAM BED

MAP:

SEE SURVEY

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.: CTO252

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

Sample ID No.: SD-06-049
Sample Location: ST-06
Sampled By: EH
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1205 Method: SS Trowel Monitor Reading (ppm): 0.0	0.5 ft	Br. to Black	Coarse sand w/ clay

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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-07-04Q
Sample Location: ST-07
Sampled By: AP
C.O.C. No.:

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

SAMPLING DATA:

Date: 6/9/00
Time: 1113
Depth: 0.27 ft
Method: Bottlewhale

Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Clear	7.21	0.217	16.3	0.0	7.35	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

Clear, No Odors, Orange Algae on Bottom

MAP:

See Survey

Circle if Applicable:

MS/MSD
Duplicate ID No.: SW-21-04Q

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO252

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

Sample ID No.: SD-07-04Q
Sample Location: ST-07
Sampled By: AP
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/9/00 Time: Method: SS Trowel Monitor Reading (ppm): 0.0	0.27 ft	Lt dk. Br.	Sand w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

Circle if Applicable:

MS/MSD

Duplicate ID No.: SD-21-04Q

Signature(s):

Tetra Tech NUS, Inc.

SURFACE WATER SAMPLE LOG SHEET

Project Site Name: NAWC Warminster
Project No.: CTO252

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

Sample ID No.: SW-08-049
Sample Location: ST-08
Sampled By: LH
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: 6/8/00								
Time: 1110								
Depth: 1.5"	Turbid	7.13	0.214	15.0	23.0	5.57	0.0	
Method: Bottleneck	Lt. Br.							

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

Turbid, Light Brown
No Odors

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-08-049
Sample Location: ST-08
Sampled By: EM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 1112 Method: SS Trowel Monitor Reading (ppm): 0.0	0.5 ft	lt-br-grey	Sands w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID > BACKGROUND

MAP:

SEE SURVEY

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.: CTO252

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

Sample ID No.: SW-09-040
Sample Location: ST-09
Sampled By: EH
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: 6/8/00	Turbid - Lt. Br.	7.02	0.214	14.6	4.0	5.5	0.0	
Time: 10:45								
Depth: 0.5 ft								
Method: Bottlewate								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

Turbid, light Brown with Brown Algae on Bed. No Odors

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-09-04Q
Sample Location: SD-09
Sampled By: E.H
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00			
Time: 10:49	0.5 ft		
Method: SS Trowel	~~Red/Br.~~	Red/Brown	Gravel w/ Sand + Silt
Monitor Reading (ppm): 0.0			

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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-10-04Q
Sample Location: ST-10
Sampled By: AP
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: 6/9/00								
Time: 1009								
Depth: 0.5 ft								
Method: Bottle Wade	Clear	7.17	0.223	16.4	1.0	8.44	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

Clear, No Odors

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-10-049
Sample Location: ST-10
Sampled By: AC
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/9/00	0.5 ft	Red-brown	SAND w/ SILT
Time: 1013			
Method: SS Trowel			
Monitor Reading (ppm): 0.0			

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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-11-04Q
Sample Location: ST-11
Sampled By: E.H.
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: 6/8/00 Time: 1007 Depth: 4.0" Method: BOTTLEWARE	CLEAR	7.04	0.388	14.4	3.0	4.46	0.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS. SOME SLIGHT OIL SHEEN AT SPOTS. ORANGE + GREEN ALGAE ON BOTTOM

PID reading: 1.3 ppm

MAP:

SEE SURVEY

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.: CTO252

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

Sample ID No.: SD-11-049
Sample Location: ST-11
Sampled By: E.H.
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 10:17 Method: SS Trowel Monitor Reading (ppm): ~~BZ~~ 1.3	4.0"	Brown	Coarse Sand w/ Gravel + 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

PID = 1.3 ppm

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-12-04Q
Sample Location: ST-12
Sampled By: AF
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: 6/9/00								
Time: 0915								
Depth: 0-2 ft	CLEAR	6.97	0.300	16.3	0.0	6.90	0.00	
Method: Bottle Grab								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS, ORANGE-GREEN ALGAE ON STREAM BOTTOM.

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SD-12-049
Sample Location: ST-12
Sampled By: AP
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/9/00 Time: 0917 Method: SS Trowel Monitor Reading (ppm): 0.0	0.2 ft	Red. Br.	SAND w/ 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID READINGS

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SW-13-048
Sample Location: ST-13
Sampled By: E. H.
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: 6/8/00								
Time: 0915								
Depth: 1.5"	CLEAR	6.97	0.270	15.1	3.0	7.45	0.0	
Method: BOTTOM WADE								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	4 C	1 L. Glass amber	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:

CLEAR, NO ODORS

MAP:

STATION 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.: CTO252

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

Sample ID No.: SD-13-048
Sample Location: ST-13
Sampled By: E.H.
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/8/00 Time: 0924 Method: SS Trowel Monitor Reading (ppm): 0.0	1.5'	Br / Dk. Br.	Fine Grained Gravel + 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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings > Background

MAP:

See Survey

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.: CTO252

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

Sample ID No.: SS-01-0Y4
Sample Location: SS-01
Sampled By: AM
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/9/00 Time: 1150 Method: SS Trowel Monitor Reading (ppm): 0.0	0-0.5ft	Black	Sandy Silt

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

Collected below ST-07 Stake

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.: CTO252

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

Sample ID No.: SS-02-049
Sample Location: SS-02
Sampled By: AP
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/9/00 Time: 1215 Method: SS Trowel Monitor Reading (ppm): 0.0	0-0.5 ft	Brown	Silty Clay

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	Preservative
PAH/Metals	8 oz. Clear glass widemouth	1	
TOC	4 oz. Clear glass widemouth	1	
Grain Size	60 ml. Clear glass widemouth	1	
Ultra Clean Mercury	16 oz. Clear glass widemouth	1	

OBSERVATIONS / NOTES:

No PID Readings

MAP:

Furthest Seep downstream of ST-04 and 13.3 ft upstream of ST-05

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Appendix E

Data Packages

VALLEY
FORGE
LABORATORIES, INC.

Engineering Consultants Since 1967

JUL - 7 2000

Geotechnical Engineering

Construction Quality Control

Laboratory Testing

NDT and Related Services

Research and Special Studies

Environmental Engineering

Transportation and Traffic Engineering

SOIL LABORATORY TEST REPORT 6-6

Project No. 99143
July 5, 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 6/13/00 - 14 jar samples, designated SD-01-04Q to SD-13-04Q.

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

CHAIN OF CUSTODY RECORD

PROJECT NO.: CTO 252

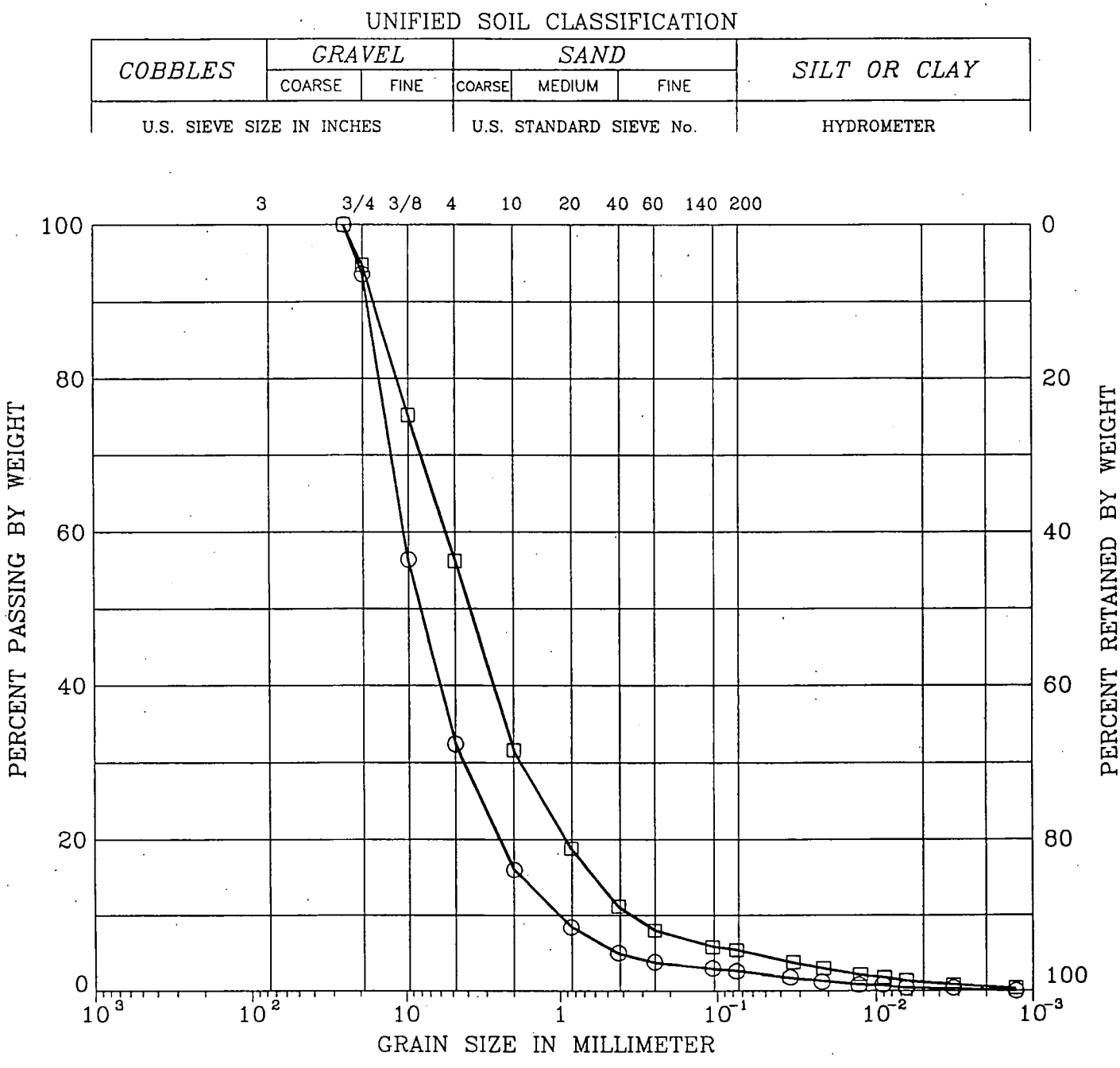
SITE NAME: NAWC

SAMPLERS (SIGNATURE):

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	Hot. & Kill Jar						REMARKS
SD01	6/8/00	1252		✓	SD-01-04Q	1	1						GRAIN SIZE
SD02	6/8/00	1377		✓	SD-02-04Q	1	1						
SD03	6/8/00	1415		✓	SD-03-04Q	1	1						
SD04	6/8/00	1323		✓	SD-04-04Q	1	1						
SD05	6/8/00	1252		✓	SD-05-04Q	1	1						
SD06	6/8/00	1205		✓	SD-06-04Q	2	2						
SD07	6/9/00	1125		✓	SD-07-04Q	1	1						
SD08	6/8/00	1112		✓	SD-08-04Q	1	1						
SD09	6/8/00	1049		✓	SD-09-04Q	1	1						
SD10	6/9/00	1013		✓	SD-10-04Q	1	1						
SD11	6/8/00	1047		✓	SD-11-04Q	1	1						
SD12	6/9/00	0917		✓	SD-12-04Q	1	1						
SD13	6/8/00	0924		✓	SD-13-04Q								

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
	6/12/00 1500				
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: SUB# GCDB-99-701-1298	

Order No. 70440 (0693)



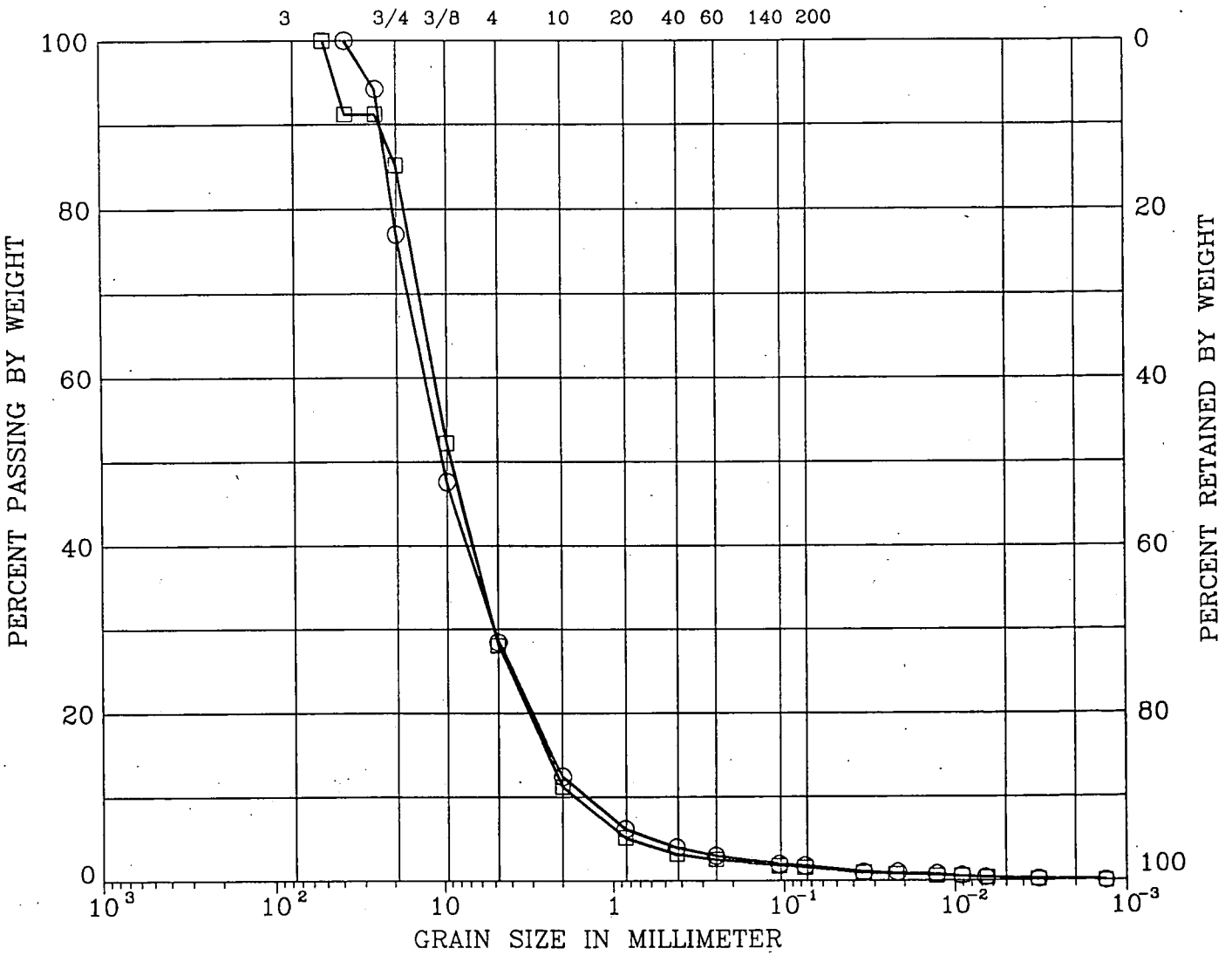
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-01-04Q				Well-Graded Gravel w/ Sand (gw)
□	SD-02-04Q				Well-Graded Sand w/ Silt and Gravel (sw-sm)

Remark : CTO 252

Project No. 99143	NAWC – Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000

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



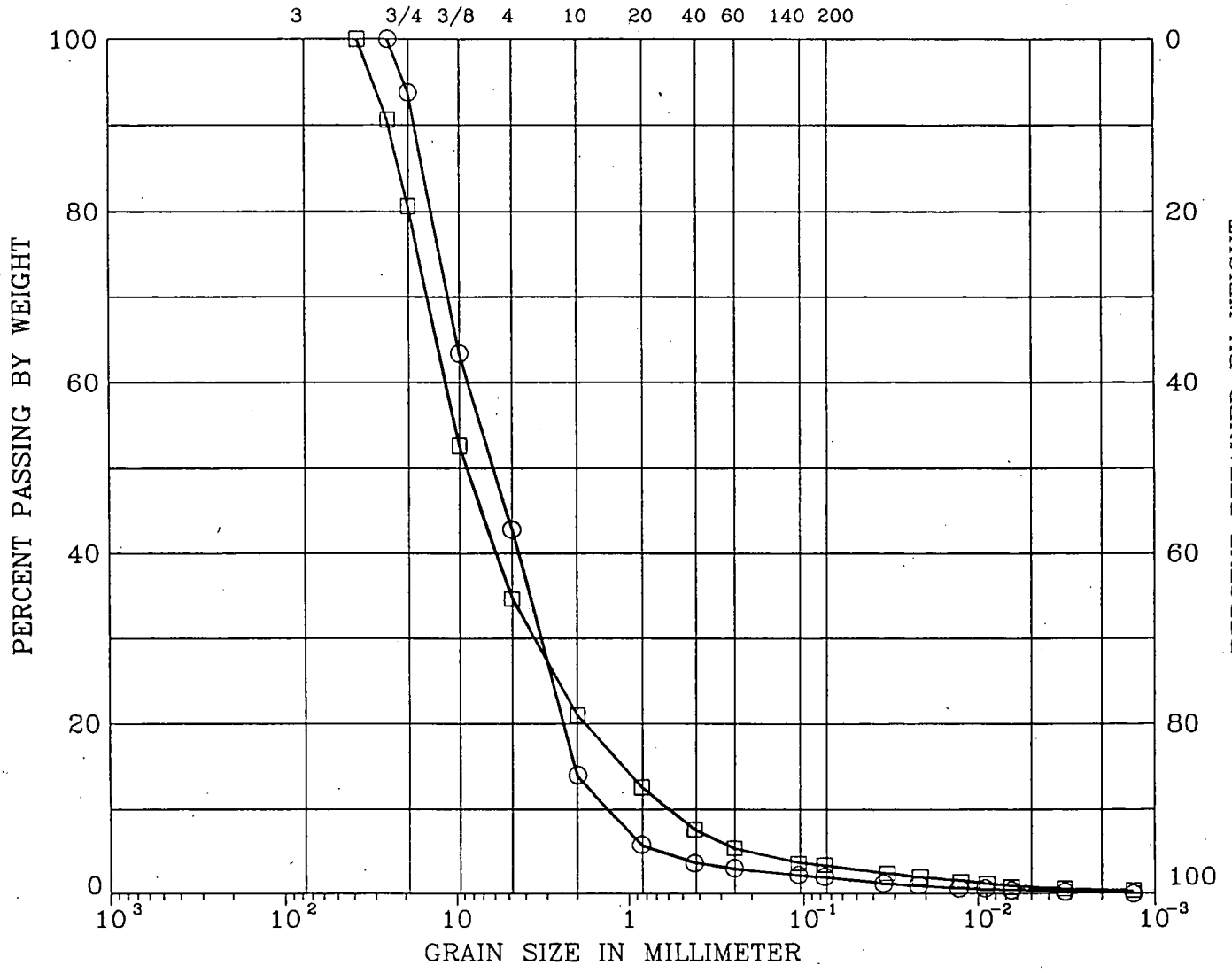
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-03-04Q				Well-Graded Gravel w/ Sand (gw)
□	SD-04-04Q				Well-Graded Gravel w/ Sand (gw)

Remark : CTO 252

Project No. 99143	NAWC - Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000

UNIFIED SOIL CLASSIFICATION

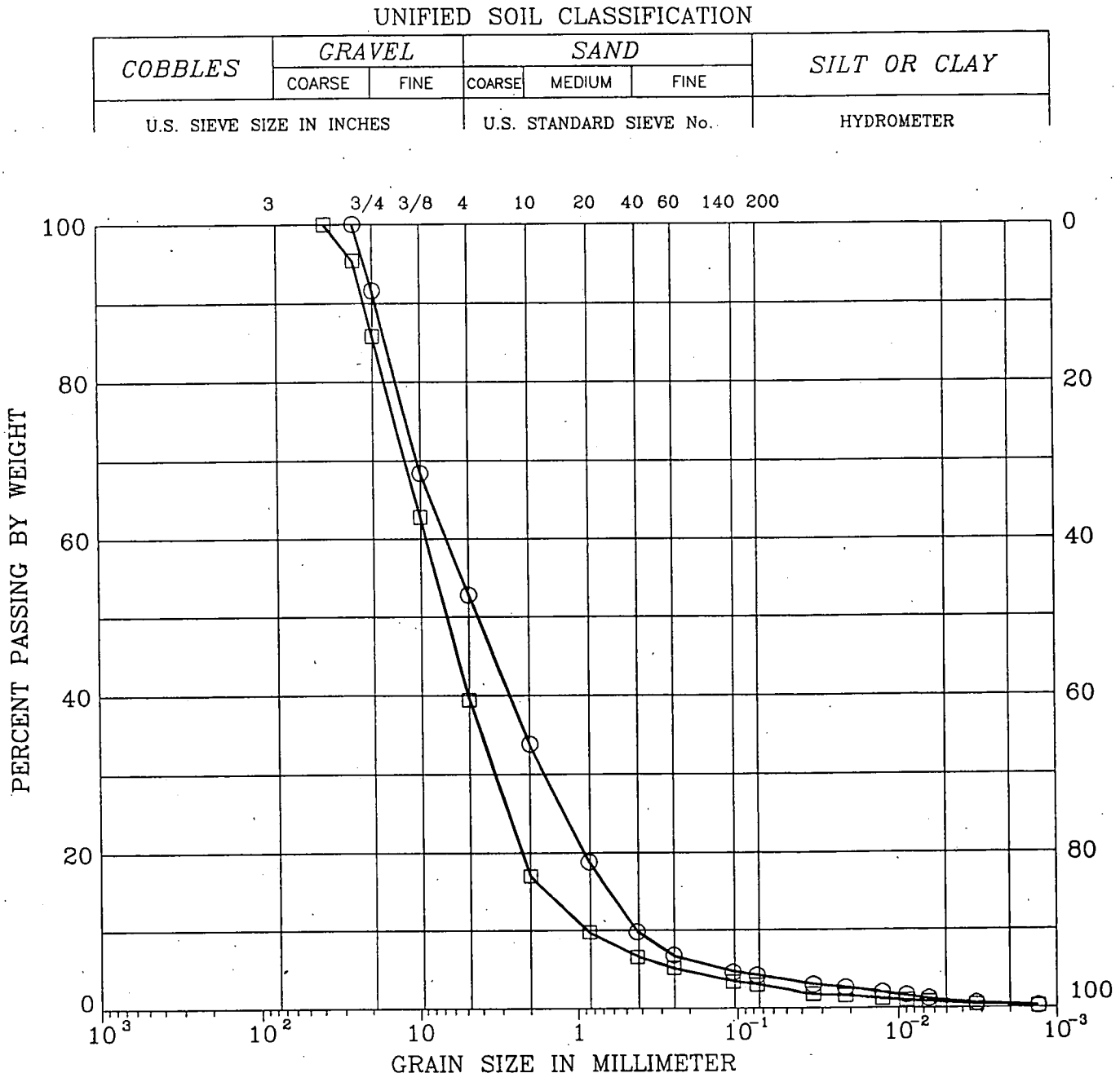
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-05-04Q				Poorly Graded Gravel w/ Sand (gp)
□	SD-06-04Q				Well-Graded Gravel w/ Sand (gw)

Remark : CTO 252

Project No. 99143	NAWC – Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000



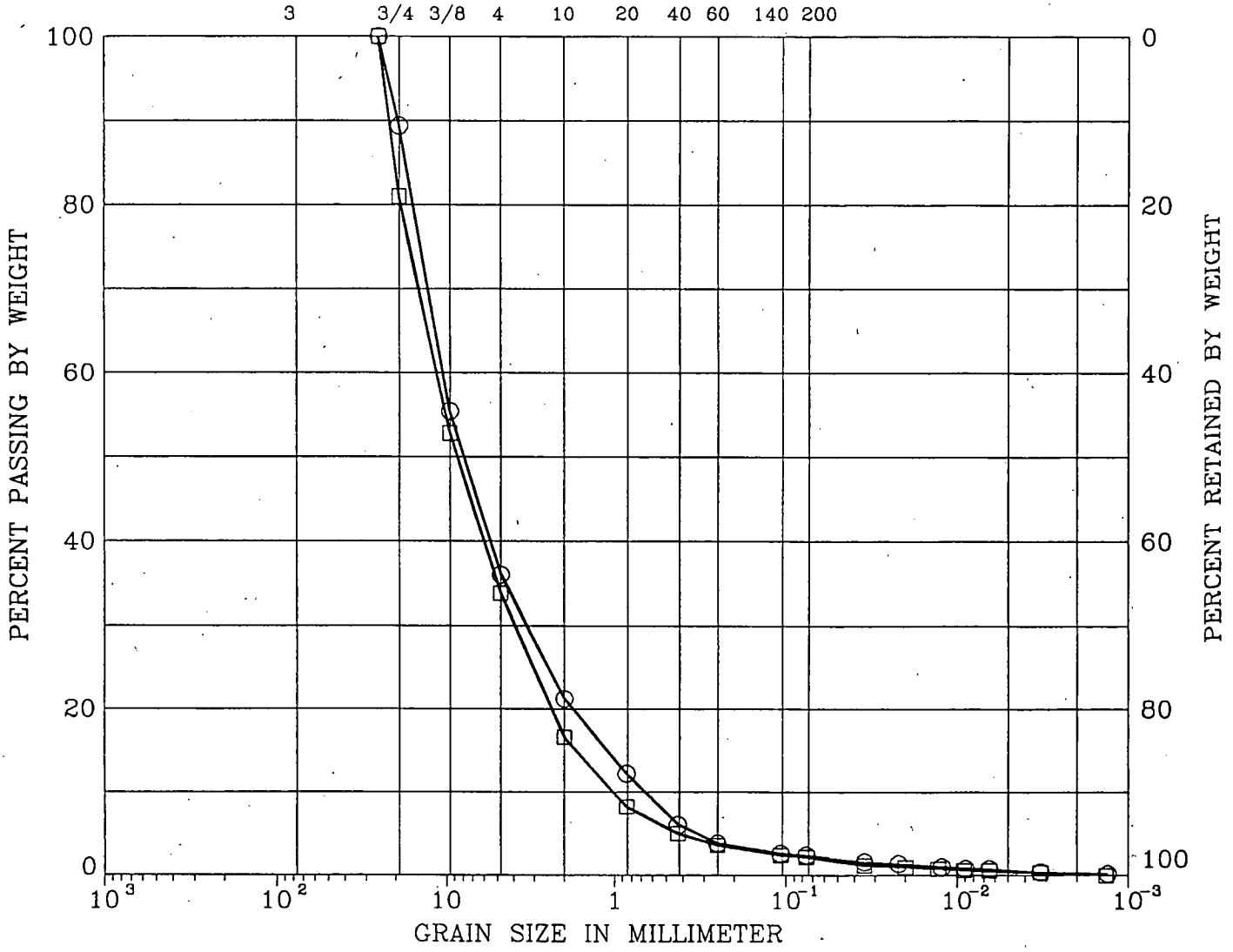
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-07-04Q				Poorly-Graded Sand w/ Gravel (sp)
□	SD-08-04Q				Well-Graded Gravel w/ Sand (gw)

Remark : CTO 252

Project No. 99143	NAWC - Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000

UNIFIED SOIL CLASSIFICATION

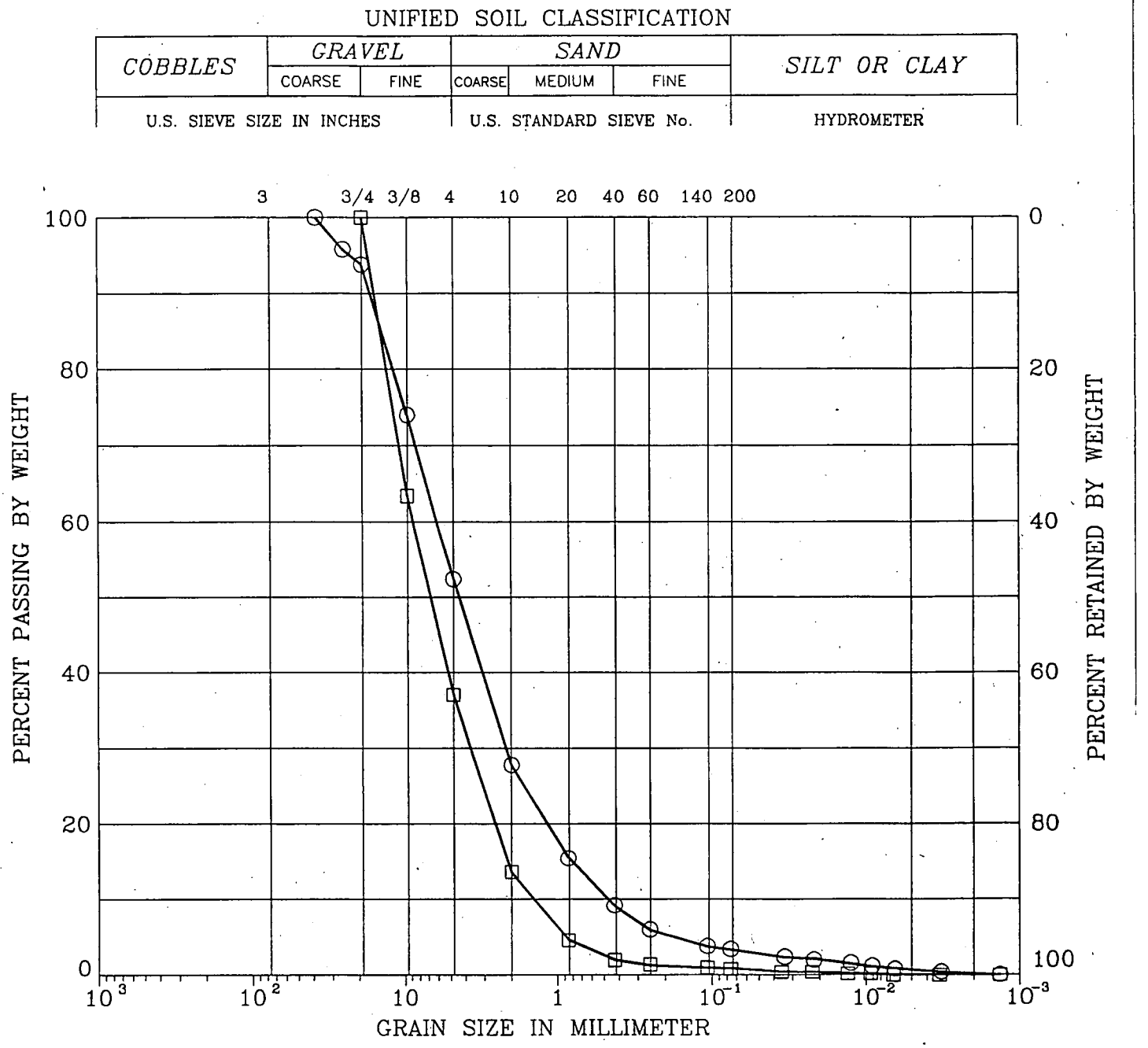
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S. STANDARD SIEVE No.			HYDROMETER



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-09-04Q				Well-Graded Gravel w/ Sand (gw)
□	SD-10-04Q				Well-Graded Gravel w/ Sand (gw)

Remark : CTO 252

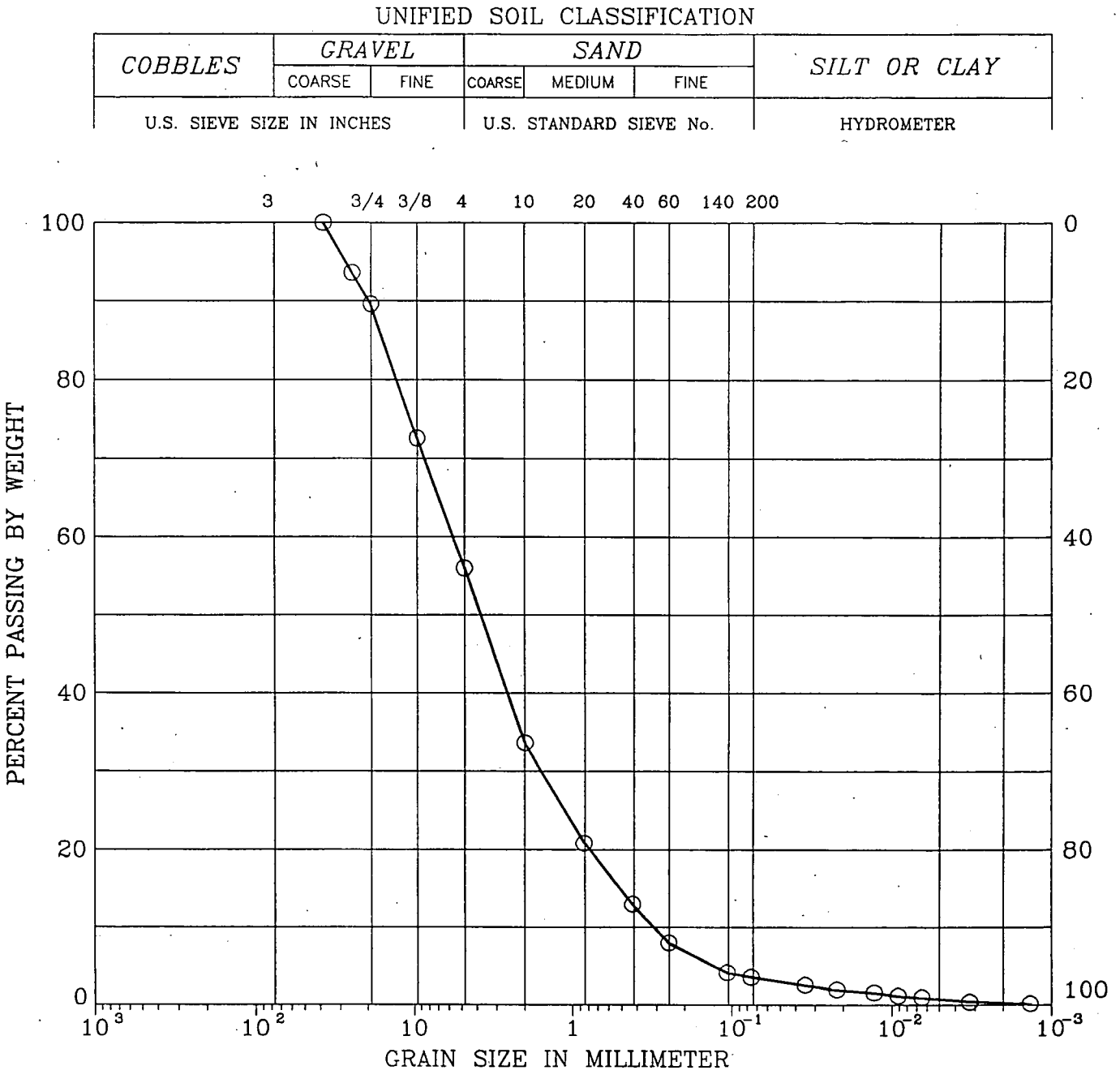
Project No. 99143	NAWC - Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-11-04Q				Well-Graded Sand w/ Gravel (sw)
□	SD-12-04Q				Well-Graded Gravel w/ Sand (gw)

Remark : CTO 252

Project No. 99143	NAWC - Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	SD-13-04Q				Well-Graded Sand w/ Gravel (sw)

Remark : CTO 252

Project No. 99143	NAWC - Warminster
Valley Forge Laboratories, Inc.	GRAIN SIZE DISTRIBUTION 7/3/2000

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	2.68	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil (g)	60.71		
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	24.7	1.0070	0.0346	1.7
5.0	24.7	1.0060	0.0221	1.3
15.0	24.7	1.0050	0.0129	0.9
30.0	24.7	1.0047	0.0091	0.8
60.0	24.7	1.0043	0.0065	0.6
240.0	24.5	1.0038	0.0033	0.4
1440.0	28.2	1.0020	0.0013	-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 ... a:sd01

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 493.320

Total Weight of Dry Soil For Fine Sieve 60.710

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)	28.600	8.5
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)	42.090	4.9
3/4 (inch)	31.110	93.7	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	215.390	56.3	# 60 (0.250mm)	46.640	3.7
# 4(4.75 mm)	333.260	32.4	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	49.740	2.9
#10(2.00 mm)	414.070	16.1	# 200(0.075mm)	50.580	2.7

Press [ESC] to continue ... a:sd01

G 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		2.68	Temperature	Composite
Weight of Airdry Soil	(g)	119.73	(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	24.6	1.0118	0.0331	3.7
5.0	24.6	1.0101	0.0213	3.0
15.0	24.6	1.0080	0.0125	2.1
30.0	24.6	1.0072	0.0089	1.8
60.0	24.6	1.0061	0.0064	1.3
240.0	24.4	1.0050	0.0032	0.8
1440.0	26.8	1.0032	0.0013	0.3
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 ... a:sd01

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 712.360
Total Weight of Dry Soil For Fine Sieve 119.730
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)	48.760	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)	77.660	11.1
3/4 (inch)	36.730	94.8	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	176.470	75.2	# 60 (0.250mm)	89.460	8.0
# 4(4.75 mm)	311.890	56.2	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	97.540	5.9
#10(2.00 mm)	486.890	31.7	# 200(0.075mm)	99.330	5.4

Press [ESC] to continue ... a:sd01

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	2.68	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil (g)	73.24		
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	24.6	1.0070	0.0347	1.1
5.0	24.6	1.0065	0.0220	1.0
15.0	24.6	1.0060	0.0128	0.8
30.0	24.6	1.0050	0.0091	0.6
59.0	24.4	1.0047	0.0065	0.5
240.0	24.3	1.0040	0.0033	0.3
1440.0	26.0	1.0030	0.0013	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 ... a:sd03

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 706.890
Total Weight of Dry Soil For Fine Sieve 73.240
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)	36.660	6.2
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	40.970	94.2	# 40 (0.425mm)	49.630	4.0
3/4 (inch)	162.190	77.1	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	370.870	47.5	# 60 (0.250mm)	55.550	3.0
# 4(4.75 mm)	505.500	28.5	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	61.310	2.0
#10(2.00 mm)	619.050	12.4	# 200(0.075mm)	62.620	1.8

Press [ESC] to continue ... a:sd03

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		2.68	Temperature	Composite
Weight of Airdry Soil	(g)	59.08	(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	24.7	1.0063	0.0349	1.0
5.0	24.7	1.0058	0.0222	0.9
15.0	24.7	1.0052	0.0129	0.7
30.0	24.6	1.0048	0.0091	0.6
61.0	24.6	1.0042	0.0064	0.4
240.0	24.4	1.0038	0.0033	0.2
1440.0	25.4	1.0030	0.0013	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 ... a:sd03

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 645.280
Total Weight of Dry Soil For Fine Sieve 59.080
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)	31.950	5.2
1.5 (inch)	56.860	91.2	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	56.860	91.2	# 40 (0.425mm)	42.260	3.2
3/4 (inch)	95.990	85.1	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	308.060	52.3	# 60 (0.250mm)	45.920	2.5
# 4(4.75 mm)	464.220	28.1	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	49.320	1.9
#10(2.00 mm)	572.790	11.2	# 200(0.075mm)	50.260	1.7

Press [ESC] to continue ... a:sd03

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	2.68	Temperature	Composite	
Weight of Airdry Soil (g)	75.85	(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	24.6	1.0071	0.0347	1.2
5.0	24.6	1.0061	0.0221	0.9
15.0	24.6	1.0051	0.0129	0.6
30.0	24.5	1.0049	0.0091	0.6
60.0	24.5	1.0046	0.0065	0.5
240.0	24.3	1.0040	0.0033	0.3
1440.0	25.1	1.0031	0.0013	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 ... a:sd05

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 669.470
Total Weight of Dry Soil For Fine Sieve 75.850
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)	44.480	5.8
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)	55.870	3.7
3/4 (inch)	41.570	93.8	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	244.830	63.4	# 60 (0.250mm)	59.870	2.9
# 4(4.75 mm)	382.970	42.8	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	64.120	2.2
#10(2.00 mm)	576.380	13.9	# 200(0.075mm)	65.300	1.9

Press [ESC] to continue ... a:sd05

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-06		Depth (ft)	
Specific Gravity of Soil		2.68	Temperature	Composite
Weight of Airdry Soil	(g)	113.14	(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	24.7	1.0110	0.0333	2.4
5.0	24.6	1.0095	0.0214	1.9
15.0	24.6	1.0080	0.0125	1.5
30.0	24.6	1.0070	0.0090	1.2
60.0	24.5	1.0060	0.0064	0.9
240.0	24.4	1.0050	0.0032	0.6
1440.0	25.1	1.0040	0.0013	0.3
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 ...
a:sd05

G E O S O F T [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 1474.200
Total Weight of Dry Soil For Fine Sieve 113.140
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)	45.050	12.6
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	138.780	90.6	# 40 (0.425mm)	72.310	7.6
3/4 (inch)	286.010	80.6	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	698.570	52.6	# 60 (0.250mm)	84.200	5.4
# 4(4.75 mm)	963.290	34.7	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	93.340	3.7
#10(2.00 mm)	1164.650	21.0	# 200(0.075mm)	95.250	3.3

Press [ESC] to continue ... a:sd05

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	2.68	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil (g)	123.92		
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	24.7	1.0100	0.0337	3.1
5.0	24.7	1.0090	0.0215	2.6
15.0	24.6	1.0075	0.0126	2.0
30.0	24.6	1.0065	0.0090	1.5
60.0	24.5	1.0056	0.0064	1.1
240.0	24.3	1.0044	0.0033	0.6
1440.0	25.0	1.0035	0.0013	0.3
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 ... a:sd07

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 733.490
Total Weight of Dry Soil For Fine Sieve 123.920
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)	54.800	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)	87.730	9.9
3/4 (inch)	62.120	91.5	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	231.550	68.4	# 60 (0.250mm)	99.260	6.7
# 4(4.75 mm)	346.480	52.8	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	106.670	4.7
#10(2.00 mm)	485.970	33.7	# 200(0.075mm)	108.260	4.3

Press [ESC] to continue ... a:sd07

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-08		Depth (ft)	
Specific Gravity of Soil		2.68	Temperature	Composite
Weight of Airdry Soil	(g)	100.77	(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	24.4	1.0095	0.0340	1.8
5.0	24.5	1.0090	0.0216	1.6
15.0	24.4	1.0075	0.0126	1.2
31.0	24.4	1.0065	0.0089	0.9
60.0	24.3	1.0060	0.0064	0.8
240.0	24.1	1.0048	0.0032	0.5
1440.0	24.7	1.0038	0.0013	0.2
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 ... a:sd07

G 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 734.300
Total Weight of Dry Soil For Fine Sieve 100.770
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)	43.190	9.7
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	33.690	95.4	# 40 (0.425mm)	61.140	6.7
3/4 (inch)	104.670	85.7	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	273.560	62.7	# 60 (0.250mm)	70.350	5.1
# 4(4.75 mm)	444.640	39.4	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	80.290	3.5
#10(2.00 mm)	609.400	17.0	# 200(0.075mm)	82.560	3.1

Press [ESC] to continue ... a:sd07

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		2.68	Temperature (Centigrade)	Composite Correction
Weight of Airdry Soil	(g)	119.39		
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	24.3	1.0085	0.0343	1.6
5.0	24.3	1.0078	0.0219	1.4
16.0	24.3	1.0065	0.0124	1.0
31.0	24.3	1.0060	0.0089	0.9
60.0	24.3	1.0055	0.0064	0.7
240.0	24.2	1.0042	0.0033	0.3
1440.0	24.8	1.0035	0.0013	0.2
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 ... a:sd09

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 666.880
Total Weight of Dry Soil For Fine Sieve 119.390
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)	51.070	12.2
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)	85.220	6.1
3/4 (inch)	70.700	89.4	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	297.880	55.3	# 60 (0.250mm)	97.930	3.8
# 4(4.75 mm)	426.430	36.1	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	104.800	2.6
#10(2.00 mm)	524.850	21.3	# 200(0.075mm)	106.170	2.4

Press [ESC] to continue ... a:sd09

G E O S O F T [R/GRAIN] HYDROMETER ANALYSIS (ASTM 151-H) OUTPUT SCREEN

Curve No. 2	Boring SD-10		Depth (ft)	
Specific Gravity of Soil		2.68	Temperature	Composite
Weight of Airdry Soil	(g)	87.76	(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	24.4	1.0070	0.0348	1.2
6.0	24.4	1.0065	0.0202	1.1
15.0	24.4	1.0059	0.0128	0.9
30.0	24.4	1.0052	0.0091	0.7
60.0	24.2	1.0049	0.0065	0.6
245.0	24.1	1.0041	0.0032	0.3
1440.0	24.7	1.0031	0.0013	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 ... a:sd09

G E O S O F T [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 624.080
Total Weight of Dry Soil For Fine Sieve 87.760
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)	44.590	8.2
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)	61.490	5.0
3/4 (inch)	118.330	81.0	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	294.290	52.8	# 60 (0.250mm)	68.850	3.6
# 4(4.75 mm)	413.260	33.8	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	75.000	2.4
#10(2.00 mm)	520.170	16.7	# 200(0.075mm)	76.290	2.2

Press [ESC] to continue ... a:sd09

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	2.68	Temperature	Composite	
Weight of Airdry Soil (g)	115.25	(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	24.5	1.0091	0.0341	2.4
5.0	24.5	1.0084	0.0217	2.1
15.0	24.5	1.0070	0.0127	1.6
30.0	24.4	1.0060	0.0091	1.2
60.0	24.4	1.0053	0.0064	0.9
240.0	24.2	1.0040	0.0033	0.4
1440.0	24.1	1.0031	0.0013	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 ... a: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 682.120
Total Weight of Dry Soil For Fine Sieve 115.250
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)	51.130	15.5
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	28.400	95.8	# 40 (0.425mm)	77.550	9.1
3/4 (inch)	42.310	93.8	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	177.740	73.9	# 60 (0.250mm)	90.680	5.9
# 4(4.75 mm)	324.960	52.4	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	99.750	3.7
#10(2.00 mm)	492.240	27.8	# 200(0.075mm)	101.360	3.4

Press [ESC] to continue ... a: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		2.68	Temperature	Composite
Weight of Airdry Soil	(g)	51.02	(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	24.5	1.0040	0.0357	0.4
5.0	24.5	1.0039	0.0226	0.4
15.0	24.5	1.0036	0.0131	0.3
30.0	24.5	1.0035	0.0093	0.2
60.0	24.5	1.0031	0.0066	0.1
240.0	24.3	1.0031	0.0033	0.0
1440.0	24.6	1.0029	0.0013	-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 ... a: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 446.090
Total Weight of Dry Soil For Fine Sieve 51.020
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)	33.460	4.7
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)	43.480	2.0
3/4 (inch)	0.000	0.0	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	162.860	63.5	# 60 (0.250mm)	45.920	1.4
# 4(4.75 mm)	281.400	36.9	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	47.290	1.0
#10(2.00 mm)	385.630	13.6	# 200(0.075mm)	47.640	0.9

Press [ESC] to continue ... a: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	2.68	Temperature	Composite	
Weight of Airdry Soil (g)	115.81	(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	24.3	1.0085	0.0343	2.5
5.0	24.3	1.0072	0.0220	1.9
15.0	24.3	1.0063	0.0128	1.5
30.0	24.2	1.0055	0.0091	1.1
60.0	24.2	1.0050	0.0065	0.9
240.0	24.2	1.0040	0.0033	0.4
1440.0	24.7	1.0032	0.0013	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 ... a: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 735.700
Total Weight of Dry Soil For Fine Sieve 115.810
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)	43.850	20.9
1.5 (inch)	0.000	0.0	# 30 (0.60 mm)	0.000	0.0
1.0 (inch)	46.350	93.7	# 40 (0.425mm)	71.330	12.9
3/4 (inch)	77.140	89.5	# 50 (0.300mm)	0.000	0.0
3/8 (inch)	201.380	72.6	# 60 (0.250mm)	88.450	7.9
# 4(4.75 mm)	324.210	55.9	# 100(0.150mm)	0.000	0.0
# 8(2.38 mm)	0.000	0.0	# 140(0.106mm)	101.520	4.1
#10(2.00 mm)	488.530	33.6	# 200(0.075mm)	103.450	3.6

Press [ESC] to continue ... a:sd13

Tetra Tech NUS

INTERNAL CORRESPONDENCE

PITT-07-0-035

TO: MR. G. GLENN

DATE: JULY 31, 2000

FROM: JUSTIN ORBICH

COPIES: DV FILE

SUBJECT: ORGANIC DATA VALIDATION – PAH
CTO252, NAWC WARMINSTER
SDG 200398

SAMPLES: 10/Sediment

SD-02-04Q	SD-03-04Q
SD-04-04Q	SD-05-04Q
SD-06-04Q	SD-08-04Q
SD-09-04Q	SD-11-04Q
SD-12-04Q	SD-13-04Q

10/Surface Water

SW-02-04Q	SW-03-04Q
SW-04-04Q	SW-05-04Q
SW-06-04Q	SW-08-04Q
SW-09-04Q	SW-11-04Q
SW-12-04Q	SW-13-04Q

OVERVIEW

The sample set for CTO 252, SDG 200398, Naval Air Warfare Center (NAWC) Warminster consists of ten (10) sediment and ten (10) surface water environmental samples. The samples were analyzed for selected Polynuclear Aromatic Hydrocarbon (PAH) organic compounds. No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech NUS, Inc. on June 8th, 2000 and analyzed by Ceimic Corporation. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, and SW 846 Method 8330 analytical and reporting protocols.

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, and compound identification and quantitation.

Areas of concern are listed below.

Major Problems

- None noted.

Minor Problems

- Several samples contained positive results for compounds below the reporting limits. These results were qualified as estimated (J). The direction of bias is unknown.

Notes

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries (%Rs) were zero percent (0%) for acenaphthylene, acenaphthene, 1-methylnapthalene, 2-methylnapthalene, and naphthalene, however, the sample was analyzed at a 15X dilution. No action was warranted since the sample was analyzed at a dilution.

It should be noted the laboratory did not analyze for carbazole and dibenzofuran as per the laboratory specification. The project manager was notified, and the reviewer validated the samples without the two aforementioned compounds.

All the sediment samples were analyzed at a dilution due to high levels of target compounds.

Since the laboratory spiked carbazole as a surrogate and due to the presence of carbazole in the samples, the surrogate %Rs exceeded the quality control limit affecting all sediment samples, except SD-12-04Q.

It should be noted that several surrogates were below the quality control limit in all sediment samples due to the samples being diluted.

EXECUTIVE SUMMARY

Laboratory Performance Issues: None.

Other Factors Affecting Data Quality: Several MS/MSD %Rs were 0%. All sediment samples were analyzed at a dilution. Several surrogate %Rs were 0% in the sediment samples.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September 1999), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy IRCDQM" (September 1999).

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.

Justin Orbich
Chemist/Data Validator

Tetra Tech NUS, Inc.

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

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

DATA QUALIFIER DEFINITIONS:

U	-	Value is a nondetected result as reported by the laboratory and should not be considered present.
J	-	Positive result is estimated as a result of a value below the CRQL or a technical noncompliance.
UJ	-	Nondetected results is estimated as a result of a technical noncomplicane.

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCB D% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = % Solid content is less than 30%

APPENDIX A

Qualified Analytical Results

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-02-04Q	SD-03-04Q	SD-04-04Q	SD-05-04Q
SAMPLE DATE:	06/08/00	06/08/00	06/08/00	06/08/00
LABORATORY ID:	200398-18	200398-16	200398-14	200398-12
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	75.0 %	82.0 %	84.0 %	84.0 %
UNITS:	UG/KG	UG/KG	UG/KG	UG/KG
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	330	U		410	U		400	U		400	U	
2-METHYLNAPHTHALENE	330	U		410	U		400	U		400	U	
ACENAPHTHENE	330	U		410	U		400	U		400	U	
ACENAPHTHYLENE	660	U		810	U		790	U		790	U	
ANTHRACENE	220			600			98			300		
BENZO(A)ANTHRACENE	1000			2900			690			2500		
BENZO(A)PYRENE	880			2000			570			1600		
BENZO(B)FLUORANTHENE	900			2200			590			1700		
BENZO(G,H,I)PERYLENE	780			1600			500			1200		
BENZO(K)FLUORANTHENE	290			890			210			750		
CHRYSENE	970			2500			600			1800		
DIBENZO(A,H)ANTHRACENE	72			190			56	J	P	150		
FLUORANTHENE	2300			8600			1200			5100		
FLUORENE	97			310			47	J	P	120		
INDENO(1,2,3-CD)PYRENE	550			1200			400			930		
NAPHTHALENE	330	U		410	U		400	U		400	U	
PHENANTHRENE	1000			3700			500			1700		
PYRENE	1800			4800			890			2800		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-06-04Q			SD-08-04Q			SD-09-04Q			SD-11-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-10			200398-08			200398-06			200398-04		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	84.0 %			84.0 %			81.0 %			85.0 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	400	U		390	U		410	U		300	U	
2-METHYLNAPHTHALENE	400	U		390	U		410	U		300	U	
ACENAPHTHENE	400	U		390	U		410	U		300	U	
ACENAPHTHYLENE	790	U		780	U		820	U		590	U	
ANTHRACENE	95			250			370			290		
BENZO(A)ANTHRACENE	810			1700			2500			910		
BENZO(A)PYRENE	600			1200			1400			780		
BENZO(B)FLUORANTHENE	610			1200			1400			830		
BENZO(G,H,I)PERYLENE	500			940			1100			640		
BENZO(K)FLUORANTHENE	190			410			600			280		
CHRYSENE	710			1400			1800			960		
DIBENZO(A,H)ANTHRACENE	51	J	P	110			90			63		
FLUORANTHENE	1600			3700			4600			2500		
FLUORENE	79	U		130			130			100		
INDENO(1,2,3-CD)PYRENE	360			690			740			440		
NAPHTHALENE	400	U		390	U		410	U		300	U	
PHENANTHRENE	590			1400			1500			1300		
PYRENE	1100			2200			3000			2000		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-12-04Q	SD-13-04Q		
SAMPLE DATE:	06/09/00	06/08/00	/ /	/ /
LABORATORY ID:	200398-20	200398-02		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	87.0 %	88.0 %	100.0 %	100.0 %
UNITS:	UG/KG	UG/KG		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	380	U		380	U							
2-METHYLNAPHTHALENE	380	U		380	U							
ACENAPHTHENE	380	U		380	U							
ACENAPHTHYLENE	760	U		750	U							
ANTHRACENE	34	J	P	100								
BENZO(A)ANTHRACENE	310			680								
BENZO(A)PYRENE	260			610								
BENZO(B)FLUORANTHENE	260			620								
BENZO(G,H,I)PERYLENE	270			470								
BENZO(K)FLUORANTHENE	110			250								
CHRYSENE	290			700								
DIBENZO(A,H)ANTHRACENE	76	U		75	U							
FLUORANTHENE	480			1600								
FLUORENE	76	U		75	U							
INDENO(1,2,3-CD)PYRENE	170			400								
NAPHTHALENE	380	U		380	U							
PHENANTHRENE	190			710								
PYRENE	410			1200								

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-02-04Q			SW-03-04Q			SW-04-04Q			SW-05-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-17			200398-15			200398-13			200398-11		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
2-METHYLNAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
ACENAPHTHENE	0.5	U		0.5	U		0.5	U		0.5	U	
ACENAPHTHYLENE	1	U		1	U		1	U		1	U	
ANTHRACENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(A)ANTHRACENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(A)PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(B)FLUORANTHENE	0.1	U		0.1	U		0.1	U		0.1	U	
BENZO(G,H,I)PERYLENE	0.1	U		0.1	U		0.1	U		0.1	U	
BENZO(K)FLUORANTHENE	0.05	U		0.05	U		0.05	U		0.05	U	
CHRYSENE	0.05	U		0.05	U		0.05	U		0.05	U	
DIBENZO(A,H)ANTHRACENE	0.1	U		0.1	U		0.1	U		0.1	U	
FLUORANTHENE	0.1	U		0.1	U		0.1	U		0.1	U	
FLUORENE	0.1	U		0.1	U		0.1	U		0.1	U	
INDENO(1,2,3-CD)PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	
NAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
PHENANTHRENE	0.05	U		0.05	U		0.05	U		0.05	U	
PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-06-04Q			SW-08-04Q			SW-09-04Q			SW-11-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-09			200398-07			200398-05			200398-03		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
2-METHYLNAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
ACENAPHTHENE	0.5	U		0.5	U		0.5	U		0.5	U	
ACENAPHTHYLENE	1	U		1	U		1	U		1	U	
ANTHRACENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(A)ANTHRACENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(A)PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(B)FLUORANTHENE	0.1	U		0.1	U		0.1	U		0.1	U	
BENZO(G,H,I)PERYLENE	0.1	U		0.1	U		0.1	U		0.1	U	
BENZO(K)FLUORANTHENE	0.05	U		0.05	U		0.05	U		0.05	U	
CHRYSENE	0.05	U		0.05	U		0.05	U		0.05	U	
DIBENZO(A,H)ANTHRACENE	0.1	U		0.1	U		0.1	U		0.1	U	
FLUORANTHENE	0.1	U		0.1	U		0.1	U		0.1	U	
FLUORENE	0.1	U		0.1	U		0.1	U		0.1	U	
INDENO(1,2,3-CD)PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	
NAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
PHENANTHRENE	0.05	U		0.05	U		0.05	U		0.05	U	
PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-12-04Q			SW-13-04Q								
SAMPLE DATE:	06/09/00			06/08/00			/ /			/ /		
LABORATORY ID:	200398-19			200398-01								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %		
UNITS:	UG/L			UG/L								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	0.5	U		0.5	U							
2-METHYLNAPHTHALENE	0.5	U		0.5	U							
ACENAPHTHENE	0.5	U		0.5	U							
ACENAPHTHYLENE	1	U		1	U							
ANTHRACENE	0.05	U		0.05	U							
BENZO(A)ANTHRACENE	0.05	U		0.05	U							
BENZO(A)PYRENE	0.05	U		0.05	U							
BENZO(B)FLUORANTHENE	0.1	U		0.1	U							
BENZO(G,H,I)PERYLENE	0.1	U		0.1	U							
BENZO(K)FLUORANTHENE	0.05	U		0.05	U							
CHRYSENE	0.05	U		0.05	U							
DIBENZO(A,H)ANTHRACENE	0.1	U		0.1	U							
FLUORANTHENE	0.1	U		0.1	U							
FLUORENE	0.1	U		0.1	U							
INDENO(1,2,3-CD)PYRENE	0.05	U		0.05	U							
NAPHTHALENE	0.5	U		0.5	U							
PHENANTHRENE	0.05	U		0.05	U							
PYRENE	0.05	U		0.05	U							

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-07-0-035

TO:	**MR. G. GLENN**	**DATE:**	**JULY 31, 2000**
FROM:	**JUSTIN ORBICH**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – PAH CTO252, NAWC WARMINSTER SDG 200399**		

SAMPLES:

4/Sediment

SD-01-04Q	SD-07-04Q
SD-10-04Q	SD-21-04Q

2/Surface Soil

SS-04-04Q	SS-02-04Q

5/Surface Water

RB-060900	SW-01-04Q
SW-07-04Q	SW-10-04Q
SW-21-04Q	

OVERVIEW

The sample set for CTO 252, SDG 200399, Naval Air Warfare Center (NAWC) Warminster consists of four (4) sediment, two (2) surface soil, and five (5) surface water environmental samples. The samples were analyzed for selected Polynuclear Aromatic Hydrocarbon (PAH) organic compounds. No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech NUS, Inc. on June 9th, 2000 and analyzed by Ceimic Corporation. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, and SW 846 Method 8330 analytical and reporting protocols.

All compounds were successfully analyzed. The findings offered in this report are based upon a general review of all available data including data completeness, holding times until extraction/analysis, initial and continuing calibration data, laboratory and field quality control blank results, surrogate spike recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, Laboratory Control Sample (LCS) results, and compound identification and quantitation.

Areas of concern are listed below.

Major Problems

- None noted.

Minor Problems

- Several samples contained positive results for compounds below the reporting limits. These results were qualified as estimated (J). The direction of bias is unknown.

Notes

It should be noted the laboratory did not analyze for carbazole and dibenzofuran as per the laboratory specification. The project manager was notified, and the reviewer validated the samples without the two aforementioned compounds.

All sediment and surface soil samples were analyzed at a dilution due to high levels of target compounds.

Since the laboratory spiked carbazole as a surrogate and due to the presence of carbazole in the samples, the surrogate %Rs exceeded the quality control limit affecting all sediment samples, except SD-12-04Q.

It should be noted that several surrogates were below the quality control limit in all sediment samples due to the samples being diluted.

EXECUTIVE SUMMARY

Laboratory Performance Issues: None.

Other Factors Affecting Data Quality: All sediment and surface soil samples were analyzed at a dilution. Several surrogate %Rs were 0% in the sediment samples.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (September 1999), as amended for use within EPA Region III, and the NFESC Interim Guidance Document entitled "Navy IRCDQM" (September 1999).

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

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Tetra Tech NUS, Inc.

Justin Orbich
Chemist/Data Validator

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Joseph A. Samchuck
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E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCB D% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = % Solid content is less than 30%

APPENDIX A

Qualified Analytical Results

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	RB-060900			SW-01-04Q			SW-07-04Q			SW-10-04Q		
SAMPLE DATE:	06/09/00			06/09/00			06/09/00			06/09/00		
LABORATORY ID:	200399-11			200399-07			200399-03			200399-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
2-METHYLNAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
ACENAPHTHENE	0.5	U		0.5	U		0.5	U		0.5	U	
ACENAPHTHYLENE	1	U		1	U		1	U		1	U	
ANTHRACENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(A)ANTHRACENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(A)PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	
BENZO(B)FLUORANTHENE	0.1	U		0.1	U		0.1	U		0.1	U	
BENZO(G,H,I)PERYLENE	0.1	U		0.1	U		0.1	U		0.1	U	
BENZO(K)FLUORANTHENE	0.05	U		0.05	U		0.05	U		0.05	U	
CHRYSENE	0.05	U		0.05	U		0.05	U		0.05	U	
DIBENZO(A,H)ANTHRACENE	0.1	U		0.1	U		0.1	U		0.1	U	
FLUORANTHENE	0.1	U		0.1	U		0.1	U		0.1	U	
FLUORENE	0.1	U		0.1	U		0.1	U		0.1	U	
INDENO(1,2,3-CD)PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	
NAPHTHALENE	0.5	U		0.5	U		0.5	U		0.5	U	
PHENANTHRENE	0.05	U		0.05	U		0.05	U		0.05	U	
PYRENE	0.05	U		0.05	U		0.05	U		0.05	U	

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SW-21-04Q											
SAMPLE DATE:	06/09/00			/ /			/ /			/ /		
LABORATORY ID:	200399-09											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	0.5	U										
2-METHYLNAPHTHALENE	0.5	U										
ACENAPHTHENE	0.5	U										
ACENAPHTHYLENE	1	U										
ANTHRACENE	0.05	U										
BENZO(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										
DIBENZO(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										

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SD-01-04Q			SD-07-04Q			SD-10-04Q			SD-21-04Q		
SAMPLE DATE:	06/09/00			06/09/00			06/09/00			06/09/00		
LABORATORY ID:	200399-08			200399-04			200399-02			200399-10		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	80.0 %			77.0 %			90.0 %			79.0 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	420	U		430	U		3700	U		420	U	
2-METHYLNAPHTHALENE	420	U		430	U		3700	U		420	U	
ACENAPHTHENE	420	U		430	U		3700	U		420	U	
ACENAPHTHYLENE	830	U		850	U		7400	U		840	U	
ANTHRACENE	98			35	J	P	2700			54		
BENZO(A)ANTHRACENE	1000			330			11120			590		
BENZO(A)PYRENE	810			260			5800			430		
BENZO(B)FLUORANTHENE	940			300			6100			420		
BENZO(G,H,I)PERYLENE	770			260			3600			380		
BENZO(K)FLUORANTHENE	320			99			2200			140		
CHRYSENE	890			330			7600			450		
DIBENZO(A,H)ANTHRACENE	78	J	P	85	U		740	U		38	J	P
FLUORANTHENE	1900			630			29580			1000		
FLUORENE	61	J	P	85	U		1400			84	U	
INDENO(1,2,3-CD)PYRENE	560			190			3000			280		
NAPHTHALENE	420	U		430	U		3700	U		420	U	
PHENANTHRENE	660			220			11180			400		
PYRENE	1300			490			15320			830		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SS-01-04Q			SS-02-04Q								
SAMPLE DATE:	06/09/00			06/09/00			/ /			/ /		
LABORATORY ID:	200399-05			200399-06								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	76.0 %			74.0 %			100.0 %			100.0 %		
UNITS:	UG/KG			UG/KG								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	440	U		450	U							
2-METHYLNAPHTHALENE	440	U		450	U							
ACENAPHTHENE	440	U		450	U							
ACENAPHTHYLENE	870	U		890	U							
ANTHRACENE	140			76								
BENZO(A)ANTHRACENE	990			380								
BENZO(A)PYRENE	830			350								
BENZO(B)FLUORANTHENE	1100			360								
BENZO(G,H,I)PERYLENE	770			300								
BENZO(K)FLUORANTHENE	360			120								
CHRYSENE	1100			370								
DIBENZO(A,H)ANTHRACENE	77	J	P	40	J	P						
FLUORANTHENE	2300			820								
FLUORENE	84	J	P	89	U							
INDENO(1,2,3-CD)PYRENE	590			240								
NAPHTHALENE	440	U		450	U							
PHENANTHRENE	990			410								
PYRENE	1900			650								

Tetra Tech NUS

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INTERNAL CORRESPONDENCE

TO:	G. GLENN	DATE:	JULY 31, 2000
FROM:	GRETCHEN A. PHIPPS	COPIES:	DV FILE

SUBJECT: INORGANIC DATA VALIDATION – TAL METALS, TOC AND HARDNESS
CT0 252 - NAWC WARMINSTER, PENNSYVANIA
SAMPLE DELIVERY GROUP SDG – 200398

SAMPLES: 10/Aqueous/

SW-02-04Q	SW-03-04Q	SW-04-04Q
SW-05-04Q	SW-06-04Q	SW-08-04Q
SW-09-04Q	SW-11-04Q	SW-12-04Q
SW-13-04Q		

10/Sediments/

SD-02-04Q	SD-03-04Q	SD-04-04Q
SD-05-04Q	SD-06-04Q	SD-08-04Q
SD-09-04Q	SD-11-04Q	SD-12-04Q
SD-13-04Q		

Overview

The sample set SDG 200398, NAWC Warminster, consists of ten (10) aqueous and ten (10) sediment environmental samples.

All samples were analyzed for target analyte list (TAL) metals. The aqueous environmental samples were also analyzed for hardness and total organic carbon (TOC). The sediment environmental samples were also analyzed for TOC. The samples were collected by Tetra Tech NUS on June 8 and 9, 2000 and analyzed by Ceimic Corporation under the Naval Facilities Engineering Service Center (NFESC) Quality Assurance/ Quality Control (QA/AC) criteria. Metals analyses were conducted using SW 846 method 6010B. TOC analyses were conducted using EPA method 415.1. Hardness analyses were conducted using EPA method 130.

Summary

All analytes were analyzed successfully. The finding in this report are based upon a general review of all available data. The data was review based on data completeness, holding times, calibration data, laboratory method/ preparation/ rinsate blanks, interference check sample (ICS) results, matrix spike / matrix spike duplicate (MS/MSD) results, laboratory duplicate results, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quanitation.

All metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

Areas of concern with respect to data quality are listed below.

Major Problems

- None.

Minor Problems

- The holding time for TOC analyses was exceeded by five (5) to six (6) days affecting samples SW-02-04Q, SW-03-04Q, SW-04-04Q and SW-12-04Q. The positive and nondetected results reported for TOC in the affected samples were qualified as biased low, "L" and "UL", respectively.

- The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for barium, iron, lead and potassium were >110% quality control limit. The positive results <2X CRDL reported for barium, iron and potassium were qualified as biased high, "K". The positive results <2X CRDL reported for lead were qualified as estimated, "J", as a result of conflicting noncompliances.

- The CRDL %R for chromium was <90% quality control limit. The nondetected results reported for chromium were qualified as biased low, "UL".

- The CRDL %R for manganese was <50% quality control limit. The positive results <2X CRDL reported for manganese were qualified as biased extremely low, "L".

- The CRDL %Rs for cobalt, copper, magnesium and vanadium were both above and below the 90-110% quality control limits. The positive <2X CRDL and the nondetected results reported for cobalt, copper, magnesium and vanadium were qualified as estimated, "J" and "UJ", respectively, due to conflicting noncompliances.

- The CRDL %Rs for sodium were both above and below the 50-110% quality control limits. The positive results <2X CRDL reported for sodium were qualified as estimated, "J", due to conflicting noncompliances.

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level(sediment)	Action Level(aqueous)
Aluminum	139µg/L	69.5 mg/kg	695µg/L
Antimony	1.9µg/L	0.95 mg/kg	9.5µg/L
Barium	26.1µg/L	13.05 mg/kg	130.5µg/L
Beryllium	1.5µg/L	0.75 mg/kg	7.5µg/L
Calcium	339.5µg/L	169.8 mg/kg	1698µg/L
Cobalt	10.4µg/L	5.2 mg/kg	52µg/L
Copper(1)	16.2µg/L	NA	81µg/L
Iron	98.6µg/L	493 mg/kg	49.3µg/L
Magnesium	116.8µg/L	58.4 mg/kg	NA
Magnesium(1)	139µg/L	NA	695µg/L
Nickel	9.3µg/L	4.65 mg/kg	46.5µg/L
Sodium	488µg/L	244 mg/kg	2440µg/L
Vanadium	10.4µg/L	5.2 mg/kg	52.0µg/L
Zinc	8.2µg/L	4.1 mg/kg	NA
Zinc(1)	18.6µg/L	NA	93µg/L

(1) Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot, dilution factors and percent solids were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level for aluminum, antimony, barium, beryllium, cobalt, copper, nickel, sodium, vanadium and zinc were qualified, "B", as a result of blank contamination.

- The interfering analytes calcium, iron and magnesium were present in sample SD-03-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, cobalt and silver in the affected sample. The positive results reported for beryllium and cobalt were qualified as biased high, "K". The positive result reported for silver was qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analytes calcium, iron and magnesium were present in sample SD-08-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, cobalt, copper, silver, sodium and thallium in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive result reported for copper was qualified as biased low, "L". The positive results reported for cobalt, silver, sodium and thallium were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analytes calcium and iron were present in sample SD-04-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for cobalt, nickel, silver, sodium and thallium in the affected sample. The positive result reported for nickel was qualified as biased low, "L". The positive results reported for cobalt, silver, sodium and thallium were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analytes calcium and iron were present in sample SD-05-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony, beryllium, cobalt, nickel, silver and thallium in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive results reported for antimony and nickel were qualified as biased low, "L". The positive results reported for cobalt, silver and thallium were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analytes calcium and iron were present in sample SD-09-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument

Detection Limit (IDL). Interference affects exist for beryllium, cobalt, copper, nickel, silver, sodium, thallium and vanadium in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive results reported for copper and nickel were qualified as biased low, "L". The positive results reported for cobalt, silver, sodium, thallium and vanadium were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analytes calcium and iron were present in sample SD-11-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony, beryllium, cobalt, copper, nickel and silver in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive results reported for antimony, copper and nickel were qualified as biased low, "L". The positive results reported for cobalt and silver were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analytes calcium and iron were present in sample SD-12-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, cobalt and silver in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive results reported for cobalt and silver were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analyte iron was present in sample SD-02-04Q at a concentrations which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for cobalt, copper, nickel, silver, sodium and thallium in the affected sample. The positive results reported for copper and nickel were qualified as biased low, "L". The positive results reported for cobalt, silver, sodium and thallium were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analyte iron was present in sample SD-06-04Q at a concentrations which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for cobalt, copper, nickel, silver and thallium in the affected sample. The positive results reported for copper and nickel were qualified as biased low, "L". The positive results reported for cobalt, silver and thallium were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analyte iron was present in sample SD-13-04Q at a concentrations which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, selenium, silver, sodium, thallium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, cadmium, cobalt, silver, sodium and thallium in the affected sample. The positive results reported for beryllium and cadmium were qualified as biased high, "K". The

positive results reported for cobalt, silver, sodium and thallium were qualified as estimated, "J", due to conflicting noncompliances.

- The Matrix Spike / Matrix Spike Duplicate (MS/MSD) Percent Recoveries (%Rs) for antimony, selenium, silver, thallium, vanadium and zinc were <75% quality control limit affecting the sediment samples. The positive results reported for antimony and zinc in the affected samples were qualified as biased low, "L". The positive results reported for vanadium in the affected samples were qualified as either biased low, "L" or estimated, "J", as a result of conflicting noncompliances. The nondetected results reported for selenium in the affected samples were qualified as biased low, "UL". The positive and nondetected results reported for silver in the affected samples were qualified as estimated, "J" and "UJ", respectively, as a result of conflicting noncompliances. The nondetected results reported for thallium were qualified as either biased low, "UL", or estimated, "UJ", as a result of conflicting noncompliances. The positive results reported for thallium were qualified as estimated, "J", as a result of conflicting noncompliances.

- The MS/MSD %Rs for arsenic, barium and sodium were >125% quality control limit affecting the sediment samples. The positive results reported for arsenic were qualified as biased high, "K". The positive results reported for barium and sodium in the affected samples were qualified as estimated, "J", as a result of conflicting noncompliances.

- Laboratory duplicate imprecision (>35% RPD quality control limit when sample result is >5X CRDL or difference between results is >2X CRDL when sample result is <5X CRDL) was noted for barium, lead, manganese and sodium affecting the sediment samples. The positive results reported for barium, lead, manganese and sodium were qualified as estimated, "J", in the affected samples. The direction of bias could not be determined.

- The ICP Serial Dilution Percent Difference (%D) for lead was >10% quality control limit affecting the sediment samples. The positive results reported for lead were qualified as estimated, "J". The direction of bias could not be determined.

Notes

The CRDL %Rs for aluminum, silver, selenium and zinc were >110% quality control limit. However, all results reported for the above listed analytes were either nondetected, qualified as a result of blank contamination or >2X CRDL. Therefore, no validation action was required.

The MS %R for selenium was >125% quality control limit affecting the aqueous samples. All results reported for selenium in the affected samples were nondetected. Therefore, no validation action was required.

Executive Summary

Laboratory Performance: The CRDL %Rs for several analytes were outside the 90-110% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: ICP interference affects were present in all sediment samples. Sever analytes were qualified due to MS/MSD, laboratory duplicate and ICP Serial Dilution noncompliances in the sediment samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

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

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

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

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

Data Qualifier Key:

U	-	Value is nondetect as reported by laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
UL	-	Nondetected result is considered biased low, "UL", as a result of validation noncompliances.
L	-	Positive result is considered biased low, "L", as a result of validation noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
UJ	-	Nondetected result is considered estimated, "UJ", as a result of validation noncompliances.
J	-	Positive result is considered estimated, "J", as a result of validation noncompliances.

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-02-04Q			SD-03-04Q			SD-04-04Q			SD-05-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-18			200398-16			200398-14			200398-12		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	75.4 %			84.7 %			81.2 %			82.2 %		
UNITS:	MG/KG			MG/KG			MG/KG			MG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	8650			10100			8010			9350		
ANTIMONY	0.43	B	A	0.48	B	A	0.33	B	A	1.4	L	DK
ARSENIC	2.0	K	D	3.1	K	D	2.7	K	D	3.6	K	D
BARIUM	115	J	DF	168	J	DF	70.4	J	DF	143	J	DF
BERYLLIUM	1.8			1.3	K	K	2.0			1.2	K	K
CADMIUM	0.12	U		0.27	U		0.29	U		0.31	U	
CALCIUM	5460			21400			15700			16400		
CHROMIUM	31.2			36.7			29.3			28.4		
COBALT	6.9	J	CK	13.9	K	K	9.0	J	CK	9.3	J	CK
COPPER	17.4	L	K	33.1			31.9			58.8		
IRON	23500			30000			34000			34700		
LEAD	50.3	J	F	32.5	J	F	33.3	J	F	39.1	J	F
MAGNESIUM	4620			14600			11300			11200		
MANGANESE	346	J	F	1210	J	F	527	J	F	783	J	F
NICKEL	14.3	L	K	21.1			21.4	L	K	23.3	L	K
POTASSIUM	1370			3160			2040			2470		
SELENIUM	1.3	UL	D	2.8	UL	D	3.1	UL	D	3.3	UL	D
SILVER	6.0	J	DK	6.6	J	DK	7.9	J	DK	8.3	J	DK
SODIUM	413	J	CDFK	1330	J	DF	420	J	CDFK	691	J	CDF
THALLIUM	0.45	J	DK	0.18	UL	D	0.33	J	DK	0.41	J	DK
VANADIUM	33.1	L	D	48.3	L	D	45.1	L	D	34.6	L	D
ZINC	86.2	L	D	106	L	D	82.4	L	D	114	L	D

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-06-04Q			SD-08-04Q			SD-09-04Q			SD-11-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-10			200398-08			200398-06			200398-04		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	80.1 %			81.2 %			85.7 %			78.8 %		
UNITS:	MG/KG			MG/KG			MG/KG			MG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	5600			8640			8300			7380		
ANTIMONY	0.18	B	A	0.39	B	A	0.30	B	A	1.6	L	DK
ARSENIC	2.3	K	D	3.1	K	D	3.1	K	D	3.2	K	D
BARIUM	76.4	J	DF	88.3	J	DF	83.1	J	DF	121	J	DF
BERYLLIUM	0.90	B	A	1.3	K	K	1.1	K	K	1.3	K	K
CADMIUM	0.13	U		0.16	U		0.27	U		0.19	U	
CALCIUM	4290			18200			12900			19600		
CHROMIUM	22.4			25.8			34.8			151		
COBALT	6.8	J	CK	9.3	J	CK	9.3	J	CK	9.3	J	CK
COPPER	18.2	L	K	20.5	L	K	28.0	L	K	26.1	L	K
IRON	21400			24500			48800			31700		
LEAD	35.0	J	F	28.6	J	F	91.5	J	F	41.6	J	F
MAGNESIUM	3760			12500			8240			11500		
MANGANESE	824	J	F	624	J	F	609	J	F	3180	J	F
NICKEL	13.8	L	K	18.4			21.7	L	K	18.0	L	K
POTASSIUM	1000	K	C	2910			2550			2100		
SELENIUM	1.4	UL	D	1.7	UL	D	2.8	UL	D	2.0	UL	D
SILVER	5.6	J	DK	5.5	J	DK	10.9	J	DK	8.2	J	DK
SODIUM	633	J	CDF	373	J	CDFK	516	J	CDFK	279	B	A
THALLIUM	0.22	J	DK	0.27	J	DK	0.47	J	DK	0.25	UL	D
VANADIUM	30.6	L	D	33.1	L	D	38.0	J	DK	148	L	D
ZINC	91.6	L	D	87.6	L	D	74.2	L	D	191	L	D

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-12-04Q	SD-13-04Q		
SAMPLE DATE:	06/09/00	06/08/00	/ /	/ /
LABORATORY ID:	200398-20	200398-02		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	86.8 %	79.3 %	100.0 %	100.0 %
UNITS:	MG/KG	MG/KG		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	8390			6560								
ANTIMONY	0.57	B	A	0.55	B	A						
ARSENIC	2.5	K	D	3.6	K	D						
BARIUM	84.1	J	DF	104	J	DF						
BERYLLIUM	1.5	K	K	1.1	K	K						
CADMIUM	0.15	U		0.73	K	EK						
CALCIUM	21300			7350								
CHROMIUM	33.2			35.8								
COBALT	10.0	J	CK	9.3	J	CK						
COPPER	72.8			46.8								
IRON	27800			27700								
LEAD	51.3	J	F	39.7	J	F						
MAGNESIUM	11300			4990								
MANGANESE	769	J	F	1330	J	F						
NICKEL	19.9			22.5								
POTASSIUM	2720			1510								
SELENIUM	1.5	UL	D	1.7	UL	D						
SILVER	6.5	J	DK	7.6	J	DK						
SODIUM	689	J	CDF	327	J	CDFK						
THALLIUM	0.20	UL	D	0.89	J	DK						
VANADIUM	40.9	L	D	34.2	L	D						
ZINC	184	L	D	257	J	D						

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-02-04Q			SW-03-04Q			SW-04-04Q			SW-05-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-17			200398-15			200398-13			200398-11		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	MG/L			MG/L			MG/L			MG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
HARDNESS as CaCO3	78.5			97.5			92.1			92.1		
TOTAL ORGANIC CARBON	8	L	H	5	UL	H	5	UL	H	6		

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-06-04Q			SW-08-04Q			SW-09-04Q			SW-11-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-09			200398-07			200398-05			200398-03		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	MG/L			MG/L			MG/L			MG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
HARDNESS as CaCO3	96.2			108			98			215		
TOTAL ORGANIC CARBON	5			4			2.7			2.8		

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-12-04Q			SW-13-04Q								
SAMPLE DATE:	06/08/00			06/08/00			/ /			/ /		
LABORATORY ID:	200398-19			200398-01								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %		
UNITS:	MG/L			MG/L								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
HARDNESS as CaCO3	145			122								
TOTAL ORGANIC CARBON	5	L	H	2.6								

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-02-04Q			SD-03-04Q			SD-04-04Q			SD-05-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-18			200398-16			200398-14			200398-12		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	75.4 %			84.7 %			81.2 %			82.2 %		
UNITS:	MG/KG			MG/KG			MG/KG			MG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
TOTAL ORGANIC CARBON	8240			5110			3230			6390		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-06-04Q	SD-08-04Q	SD-09-04Q	SD-11-04Q
SAMPLE DATE:	06/08/00	06/08/00	06/08/00	06/08/00
LABORATORY ID:	200398-10	200398-08	200398-06	200398-04
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	80.1 %	81.2 %	85.7 %	78.8 %
UNITS:	MG/KG	MG/KG	MG/KG	MG/KG
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
TOTAL ORGANIC CARBON	6560			2740			4570			7540		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SD-12-04Q			SD-13-04Q								
SAMPLE DATE:	06/09/00			06/08/00			/ /			/ /		
LABORATORY ID:	200398-20			200398-02								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	86.8 %			79.3 %			100.0 %			100.0 %		
UNITS:	MG/KG			MG/KG								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
TOTAL ORGANIC CARBON	5970			3840								

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-02-04Q			SW-03-04Q			SW-04-04Q			SW-05-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-17			200398-15			200398-13			200398-11		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	137	B	A	62.0	U		152	B	A	62.0	U	
ANTIMONY	1.8	U		1.8	U		1.8	U		1.8	U	
ARSENIC	5.0	U		5.0	U		5.0	U		5.0	U	
BARIUM	74.8	B	A	84.9	B	A	79.1	B	A	79.6	B	A
BERYLLIUM	0.98	B	A	0.48	U		0.49	B	A	0.48	U	
CADMIUM	0.35	U		0.35	U		0.35	U		0.35	U	
CALCIUM	19700			24500			23100			23200		
CHROMIUM	6.4	UL	C	6.4	UL	C	6.4	UL	C	6.4	UL	C
COBALT	3.3	UJ	C	3.3	UJ	C	9.6	B	A	4.3	B	A
COPPER	8.7	B	A	8.7	UJ	C	10.8	B	A	15.2	B	A
IRON	368			270			425			174	K	C
LEAD	5.7	J	IK	1.8	U		2.0	J	IK	1.8	U	
MAGNESIUM	7130	J	C	8820	J	C	8340	J	C	8300	J	C
MANGANESE	23.1	L	C	53.9			59.0			43.8		
NICKEL	7.3	U		7.3	U		8.2	B	A	7.3	U	
POTASSIUM	1160	K	C	1450	K	C	1100	K	C	1270	K	C
SELENIUM	3.7	U		3.7	U		3.7	U		3.7	U	
SILVER	6.1	U		6.1	U		6.1	U		6.1	U	
SODIUM	17800			20200			18400			19600		
THALLIUM	2.4	U		2.4	U		2.4	U		2.4	U	
VANADIUM	4.5	UJ	C	4.5	UJ	C	6.1	B	A	4.5	UJ	C
ZINC	49.9	B	A	42.6	B	A	33.2	B	A	64.4	B	A

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-06-04Q			SW-08-04Q			SW-09-04Q			SW-11-04Q		
SAMPLE DATE:	06/08/00			06/08/00			06/08/00			06/08/00		
LABORATORY ID:	200398-09			200398-07			200398-05			200398-03		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	62.0	U		201	B	A	119	B	A	86.8	B	A
ANTIMONY	1.8	U		1.8	U		1.8	U		1.8	U	
ARSENIC	5.0	U		5.0	U		5.0	U		5.0	U	
BARIUM	84.0	B	A	96.5	B	A	84.4	B	A	191	K	C
BERYLLIUM	0.98	B	A	0.98	B	A	0.98	B	A	0.49	B	A
CADMIUM	0.35	U		0.35	U		0.35	U		0.35	U	
CALCIUM	23900			26900			24900			51100		
CHROMIUM	6.4	UL	C	6.4	UL	C	6.4	UL	C	6.4	UL	C
COBALT	3.3	UJ	C	6.9	B	A	3.5	B	A	3.3	UJ	C
COPPER	13.0	B	A	10.9	B	A	19.5	B	A	12.1	B	A
IRON	208			851			588			2480		
LEAD	1.8	U		4.1	J	K	2.3	J	K	1.8	U	
MAGNESIUM	8860	J	CI	9910	J	CI	8690	J	CI	21200	J	I
MANGANESE	66.2			240			185			724		
NICKEL	7.3	U		7.6	B	A	7.3	U		7.3	U	
POTASSIUM	1270	K	C	1580	K	C	1450	K	C	2250	K	C
SELENIUM	3.7	U		3.7	U		3.7	U		3.7	U	
SILVER	6.1	U		6.1	U		6.1	U		6.1	U	
SODIUM	20500			21700			18900			40300		
THALLIUM	2.4	U		2.4	U		2.4	U		2.4	U	
VANADIUM	4.5	UJ	C	4.5	UJ	C	4.5	UJ	C	7.4	B	A
ZINC	30.1	B	A	46.6	B	A	32.1	B	A	63.0	B	A

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200398

SAMPLE NUMBER:	SW-12-04Q			SW-13-04Q								
SAMPLE DATE:	06/09/00			06/08/00			/ /			/ /		
LABORATORY ID:	200398-19			200398-01								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %		
UNITS:	UG/L			UG/L								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	115	B	A	62.0	U							
ANTIMONY	1.8	U		1.8	U							
ARSENIC	5.0	U		5.0	U							
BARIUM	104	B	A	97.5	B	A						
BERYLLIUM	0.98	B	A	0.73	B	A						
CADMIUM	0.35	U		0.35	U							
CALCIUM	35600			29700								
CHROMIUM	6.4	UL	C	6.4	UL	C						
COBALT	4.3	B	A	4.3	B	A						
COPPER	11.9	B	A	19.5	B	A						
IRON	738			174	K	C						
LEAD	1.9	J	CI	1.8	U							
MAGNESIUM	13600			11600								
MANGANESE	180			73.0								
NICKEL	7.3	U		8.7	B	A						
POTASSIUM	1550	K	C	1440	K	C						
SELENIUM	3.7	U		3.7	U							
SILVER	6.1	U		6.1	U							
SODIUM	26500			22900								
THALLIUM	2.4	U		2.4	U							
VANADIUM	6.2	B	A	4.5	UJ	C						
ZINC	39.4	B	A	34.2	B	A						

Tetra Tech NUS

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INTERNAL CORRESPONDENCE

TO:	G. GLENN	DATE:	JULY 27, 2000
FROM:	GRETCHEN A. PHIPPS	COPIES:	DV FILE

SUBJECT: INORGANIC DATA VALIDATION – TAL METALS, TOC AND HARDNESS
CT0 252 - NAWC WARMINSTER, PENNSYVANIA
SAMPLE DELIVERY GROUP SDG – 200399

SAMPLES: 5/Aqueous/

RB-060900 SW-01-04Q SW-07-04Q
SW-10-07Q SW-21-04Q

4/Sediments/

SD-01-04Q SD-07-04Q SD-10-04Q
SD-21-04Q

2/Soils/

SS-01-04Q SS-02-04Q

Overview

The sample set SDG 200399, NAWC Warminster, consists of four (4) aqueous, four (4) sediment and two (2) soil environmental samples. One (1) rinsate blank (RB-060900) was included within this SDG.

All samples were analyzed for target analyte list (TAL) metals. The aqueous environmental samples were also analyzed for hardness and total organic carbon (TOC). The soil and sediment environmental samples were also analyzed for TOC. The samples were collected by Tetra Tech NUS on June 9, 2000 and analyzed by Ceimic Corporation under the Naval Facilities Engineering Service Center (NFESC) Quality Assurance/ Quality Control (QA/AC) criteria. Metals analyses were conducted using SW 846 method 6010B. TOC analyses were conducted using EPA method 415.1. Hardness analyses were conducted using EPA method 130.

Summary

All analytes, with exception to those qualified "UR", were analyzed successfully. The finding in this report are based upon a general review of all available data. The data was review based on data completeness, holding times, calibration data, laboratory method/ preparation/ rinsate blanks, interference check sample (ICS) results, laboratory control sample (LCS) results, detection limits and analyte quanitation.

All metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

Areas of concern with respect to data quality are listed below.

Major Problems

- The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for calcium and sodium were <50% quality control limit. The nondetected results reported for calcium and sodium were qualified as rejected, "UR". The positive results reported for sodium were qualified as biased extremely low, "L".

Minor Problems

- The CRDL %Rs for barium, iron, magnesium and potassium were >110% quality control limit. The positive results <2X CRDL reported for barium, iron, magnesium and potassium were qualified as biased high, "K".

- The CRDL %Rs for cobalt and zinc were <90% quality control limit. The nondetected results reported for cobalt were qualified as biased low, "UL". The positive results <2X CRDL reported for cobalt and zinc were qualified as either biased low, "L".

- The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level(soil)	Action Level(aqueous)
Aluminum	78.3µg/L	39.15 mg/kg	391.5µg/L
Antimony	3.4µg/L	1.7 mg/kg	17µg/L
Barium	19.2µg/L	9.6 mg/kg	96µg/L
Beryllium	0.6µg/L	0.3 mg/kg	3.0µg/L
Cadmium(1)	0.371µg/L	NA	1.855µg/L
Cobalt	8.0µg/L	4.0 mg/kg	40µg/L
Lead(1)	1.82µg/L	NA	9.1µg/L
Lead(2)	0.231 mg/kg	1.155 mg/kg	NA
Magnesium	191.6µg/L	95.8 mg/kg	958µg/L
Manganese	3.4µg/L	1.7 mg/kg	17µg/L
Potassium	316.7µg/L	158.35 mg/kg	1584µg/L
Vanadium	6.8µg/L	3.4 mg/kg	34µg/L
Zinc(2)	1.120 mg/kg	5.6 mg/kg	NA

(1) Maximum concentration present in an aqueous preparation blank.
(2) Maximum concentration present in a soil preparation blank.

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot, dilution factors and percent solids were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level for aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were qualified, "B", as a result of blank contamination. It should be noted that field quality control blanks are not evaluated for laboratory or field blank contamination.

- The interfering analytes calcium, iron and magnesium were present in sample SD-21-04Q at concentrations which were comparable to the levels of calcium, iron and magnesium in the Interference Check Sample (ICS) solution. Several analytes namely aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium and cobalt in the affected sample. The positive result reported for beryllium was

qualified as biased high, "K". The positive result reported for cobalt was qualified as biased low, "L".

- The interfering analyte iron was present in sample SD-01-04Q at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for cobalt and sodium in the affected sample. The positive results reported for cobalt and sodium were qualified as biased low, "L".

- The interfering analyte iron was present in sample SD-07-04Q at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium and cobalt in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive result reported for cobalt was qualified as biased low, "L".

- The interfering analyte iron was present in sample SD-10-04Q at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for sodium in the affected sample. The positive result reported for sodium was qualified as biased low, "L".

- The interfering analyte iron was present in sample SS-01-04Q at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, nickel and sodium in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive results reported for nickel and sodium were qualified as biased low, "L".

- The interfering analyte iron was present in sample SS-02-04Q at a concentration which was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes namely aluminum, antimony, barium, cadmium, cobalt, lead, potassium and vanadium were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for beryllium, cobalt and sodium in the affected sample. The positive result reported for beryllium was qualified as biased high, "K". The positive results reported for cobalt and sodium were qualified as biased low, "L".

- The Laboratory Control Sample (LCS) recoveries were less than the lower quality control limits for arsenic and lead affecting the sediment and soil samples. The positive results reported for arsenic and lead in the affected samples were qualified as biased low, "L".

- The LCS recovery for cadmium was greater than the upper quality control limit affecting the sediment and soil samples. The positive result reported for cadmium in the affected samples were qualified as biased high, "K".

Notes

The CRDL %Rs for antimony, lead and manganese were >110% quality control limit. However, all results reported for the above listed analytes were either nondetected, qualified as a result of blank contamination or >2X CRDL. Therefore, no validation action was required.

The LCS recovery for thallium was greater than the upper quality control limit affecting the sediment and soil samples. All results reported for thallium in the affected samples were nondetected. Therefore, no validation action was required.

Matrix Spike, Laboratory Duplicate and ICP Serial Dilution samples were not analyzed. No explanation was provided.

Executive Summary

Laboratory Performance: The CRDL %Rs for several analytes were outside the 90-110% quality control limit. Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: ICP interference affects were present in all soil/sediment samples. Arsenic, lead and cadmium were qualified due to LCS noncompliances.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 Revision as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

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

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

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

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

Data Qualifier Key:

U	-	Value is nondetect as reported by laboratory.
B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
UL	-	Nondetected result is considered biased low, "UL", as a result of validation noncompliances.
L	-	Positive result is considered biased low, "L", as a result of validation noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	RB-060900			SW-01-04Q			SW-07-04Q			SW-10-04Q		
SAMPLE DATE:	06/09/00			06/09/00			06/09/00			06/09/00		
LABORATORY ID:	200399-11			200399-07			200399-03			200399-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	62.0	U		62.0	U		62.0	U		119	B	A
ANTIMONY	1.8	U		1.8	U		2.0	B	A	1.8	U	
ARSENIC	5.0	U		5.0	U		5.0	U		5.0	U	
BARIUM	4.1	U		74.9	B	A	86.5	B	A	104	K	C
BERYLLIUM	0.48	U		0.48	U		0.48	U		0.48	U	
CADMIUM	0.35	U		0.35	B	A	0.35	U		1.1	B	A
CALCIUM	141	UR	C	20000			21300			25300		
CHROMIUM	6.4	U		6.4	U		6.4	U		6.4	U	
COBALT	3.3	UL	C	3.3	UL	C	3.3	UL	C	3.4	B	A
COPPER	8.7	U		8.7	U		8.7	U		8.7	U	
IRON	47.0	U		176	K	C	553			296		
LEAD	1.8	U		6.0	B	A	1.8	U		2.3	B	A
MAGNESIUM	131	K	C	6840	K	C	8330	K	C	10000	K	C
MANGANESE	1.8	U		47.7			147			144		
NICKEL	7.3	U		7.3	U		7.3	U		7.3	U	
POTASSIUM	265	U		859	B	A	1180	B	A	1270	B	A
SELENIUM	3.7	U		3.7	U		3.7	U		3.7	U	
SILVER	6.1	U		6.1	U		6.1	U		6.1	U	
SODIUM	242	UR	C	17700			19000			22200		
THALLIUM	2.4	U		2.4	U		2.4	U		2.4	U	
VANADIUM	4.5	U		4.5	U		6.9	B	A	5.9	B	A
ZINC	11.2	L	C	20.0	L	C	12.4	L	C	27.3	L	C

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SW-21-04Q											
SAMPLE DATE:	06/09/00			/ /			/ /			/ /		
LABORATORY ID:	200399-09											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	62.0	U										
ANTIMONY	1.8	U										
ARSENIC	5.0	U										
BARIUM	84.7	B	A									
BERYLLIUM	0.48	U										
CADMIUM	0.35	U										
CALCIUM	24900											
CHROMIUM	6.4	U										
COBALT	3.3	UL	C									
COPPER	8.7	U										
IRON	466											
LEAD	1.8	U										
MAGNESIUM	8790	K	C									
MANGANESE	142											
NICKEL	7.3	U										
POTASSIUM	1170	B	A									
SELENIUM	3.7	U										
SILVER	6.1	U										
SODIUM	19800											
THALLIUM	2.4	U										
VANADIUM	4.5	U										
ZINC	14.9	L	C									

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SD-01-04Q			SD-07-04Q			SD-10-04Q			SD-21-04Q		
SAMPLE DATE:	06/09/00			06/09/00			06/09/00			06/09/00		
LABORATORY ID:	200399-08			200399-04			200399-02			200399-10		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	79.4 %			79.0 %			85.0 %			77.5 %		
UNITS:	MG/KG			MG/KG			MG/KG			MG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	7380			6870			6550			5270		
ANTIMONY	0.43	B	A	0.60	B	A	0.34	B	A	0.42	B	A
ARSENIC	2.5	L	E	2.8	L	E	2.7	L	E	1.9	L	E
BARIUM	173			66.5			80.0			61.9		
BERYLLIUM	1.1			0.90	K	K	1.2			0.92	K	K
CADMIUM	0.11	U		0.15	U		0.04	U		0.15	U	
CALCIUM	8250			9910			7300			25400		
CHROMIUM	33.2			29.2			21.1			15.9		
COBALT	7.7	L	CK	8.7	L	CK	8.3	L	C	6.4	L	CK
COPPER	22.9			21.8			30.2			18.4		
IRON	20900			25500			20600			20600		
LEAD	56.4	L	E	37.2	L	E	43.1	L	E	32.6	L	E
MAGNESIUM	6670			6820			7430			16200		
MANGANESE	497			686			1030			339		
NICKEL	14.8			17.9			16.2			13.9		
POTASSIUM	2190			1510			1910			1500		
SELENIUM	1.2	U		1.5	U		0.39	U		1.6	U	
SILVER	5.4			6.0			4.9			4.2		
SODIUM	306	L	CK	756	L	C	338	L	CK	494	L	C
THALLIUM	0.20	U		0.25	U		0.25	U		0.26	U	
VANADIUM	34.9			31.9			31.2			24.4		
ZINC	108			102			118			94.8		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SS-01-04Q			SS-02-04Q								
SAMPLE DATE:	06/09/00			06/09/00			/ /			/ /		
LABORATORY ID:	200399-05			200399-06								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	83.0 %			72.7 %			100.0 %			100.0 %		
UNITS:	MG/KG			MG/KG								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	8690			7640								
ANTIMONY	0.19	U		1.8	B	A						
ARSENIC	2.5	L	E	7.6	L	E						
BARIUM	49.5			186								
BERYLLIUM	0.97	K	K	1.0	K	K						
CADMIUM	0.15	U		0.35	K	E						
CALCIUM	9840			2530								
CHROMIUM	31.7			18.9								
COBALT	8.3	L	CK	4.3	B	A						
COPPER	24.5			58.8								
IRON	23200			27500								
LEAD	35.4	L	E	67.5	L	E						
MAGNESIUM	9320			2000								
MANGANESE	466			344								
NICKEL	19.3			7.8	L	K						
POTASSIUM	1270			512	K	C						
SELENIUM	1.6	U		0.48	U							
SILVER	5.6			9.3								
SODIUM	346	L	CK	116	L	CK						
THALLIUM	0.25	U		0.31	U							
VANADIUM	40.3			32.0								
ZINC	107			102								

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SD-01-04Q			SD-07-04Q			SD-10-04Q			SD-21-04Q		
SAMPLE DATE:	06/09/00			06/09/00			06/09/00			06/09/00		
LABORATORY ID:	200399-08			200399-04			200399-02			200399-10		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	79.4 %			79.0 %			85.0 %			77.5 %		
UNITS:	MG/KG			MG/KG			MG/KG			MG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
TOTAL ORGANIC CARBON	6370			5230			4000			4610		

CTO252-NAWC WARMINSTER
SOIL DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SS-01-04Q			SS-02-04Q								
SAMPLE DATE:	06/09/00			06/09/00			/ /			/ /		
LABORATORY ID:	200399-05			200399-06								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	83.0 %			72.7 %			100.0 %			100.0 %		
UNITS:	MG/KG			MG/KG								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
TOTAL ORGANIC CARBON	17400			9390								

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	RB-060900			SW-01-04Q			SW-07-04Q			SW-10-04Q		
SAMPLE DATE:	06/09/00			06/09/00			06/09/00			06/09/00		
LABORATORY ID:	200399-11			200399-07			200399-03			200399-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	MG/L			MG/L			MG/L			MG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
HARDNESS as CaCO3	2	U		78.1			87.6			104		
TOTAL ORGANIC CARBON	5	U		5	U		9			7		

CTO252-NAWC WARMINSTER
WATER DATA
CEIMIC CORPORATION
SDG: 200399

SAMPLE NUMBER:	SW-21-04Q											
SAMPLE DATE:	06/09/00			/ /			/ /			/ /		
LABORATORY ID:	200399-09											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	MG/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
HARDNESS as CaCO3	98.5											
TOTAL ORGANIC CARBON	9											

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14443

TO: GARTH GLENN

DATE: August 4, 2000

FROM: JAMES LUCCHESE

COPIES: FILE

SUBJECT: INORGANIC DATA VALIDATION – TOTAL MERCURY
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. 00BR262

SAMPLES:

6/Aqueous

SW-02-04Q	SW-06-04Q	SW-13-04Q
SW-03-04Q	SW-08-04Q	
SW-04-04Q	SW-09-04Q	
SW-05-04Q	SW-11-04Q	

9/Solid

SD-02-04Q	SD-06-04Q	SD-13-04Q
SD-03-04Q	SD-08-04Q	
SD-04-04Q	SD-09-04Q	
SD-05-04Q	SD-11-04Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, LAB ID 00BR262, consists of 9 aqueous environmental samples, (designated SW), and 9 solid environmental samples, (designated SD-). All samples were analyzed for total mercury.

The samples were collected by Tetra Tech NUS, Inc. on June 8, 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. Water and soil sample analysis methods utilized stannous chloride reduction, gold amalgamation, and cold vapor atomic fluorescence spectrometry.

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.

EXECUTIVE SUMMARY

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 Aqueous Samples
CTO252, NAWC Warminster

Sample ID:	SW-02-04Q		SW-03-04Q		SW-04-04Q		SW-05-04Q		SW-06-04Q		SW-08-04Q		SW-09-04Q		SW-11-04Q		SW-13-04Q	
Laboratory ID:	00BR262-07		00BR262-05		00BR262-03		00BR262-01		00BR262-17		00BR262-15		00BR262-13		00BR262-11		00BR262-09	
Sample Date:	6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/8/00	
QC Sample Type:	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
	RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
Mercury	0.0041		0.0061		0.0002	U	0.0002	U	0.0010		0.0040		0.0022		0.0021		0.0038	

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

Database source file: D:\WARM_MERCURY_7_21_00\M_TTNUS03B.DBF data retrieved on: 07/21/00

Appendix A
Analytical Results For Soil Samples
CTO252, NAWC Warminster

Sample ID:	SD-02-04Q		SD-03-04Q		SD-04-04Q		SD-05-04Q		SD-06-04Q		SD-08-04Q		SD-09-04Q		SD-11-04Q		SD-13-04Q	
Laboratory ID:	00BR262-08		00BR262-06		00BR262-04		00BR262-02		00BR262-18		00BR262-16		00BR262-14		00BR262-12		00BR262-10	
Sample Date:	6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/8/00		6/9/00		6/8/00	
QC Sample Type:	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
	RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**ng/L**	
Mercury	0.0195		0.0111		0.0073		0.0075		0.0528		0.0118		0.0226		0.0245		0.1430	

Data Qualifiers:

Database source file: D:\WARM_MERCURY_7_21_00\M_TTNUS03BSOILS.DBF data retrieved on: 07/21/00

APPENDIX B

Results as Reported by the Laboratory

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDA-99-700-1298 SW-05-04-0

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR262-01

Level (low/med): _____ Date Received: 06/09/00

% 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 SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1208 SW-04-040

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR262-03

Level (low/med): _____ Date Received: 06/09/00

% 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 SAMPLE No.: SW-03-040

Lab Name: BROOKS RAND LTD. Contract: EQB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR262-05

Level (low/med): _____ Date Received: 06/09/00

% 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	6.1	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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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: CDB-99-700-1298 SW-02-04

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR262-07

Level (low/med): _____ Date Received: _____

% 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	4.1	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE No.: SW-13-040

Lab Name: BROOKS RAND LTD Contract: GCB-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00B2262-09

Level (low/med): _____ Date Received: 06/09/00

% 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	3.8	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 | SW-11-04Q

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00B2262-11

Level (low/med): _____ Date Received: 06/09/00

% 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	2.1	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE No.: SW-09-04

Lab Name: BROOKS RAND LTD Contract: EC-99-700-1298

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR262-13

Level (low/med): _____ Date Received: 06/09/00

% 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	2.2	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

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: CLP-99-700-1298 SW-08-04-P

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00B2262-15

Level (low/med): _____ Date Received: 06/09/00

% 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	4.0	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 SW-06-04

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR262-17

Level (low/med): _____ Date Received: 06/09/00

% 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	0.97	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-91-700-1788 SD-05-04

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00B2262-02

Level (low/med): _____ Date Received: 06/09/00

% Solids: 83.7%

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	7.5	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 SAMPLE: S7-04-04

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-100-128

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: COBR262-04

Level (low/med): _____ Date Received: 06/09/00

% Solids: 85.0%

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	7.3	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

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 SD-03-040

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR262-06

Level (low/med): _____ Date Received: 06/09/00

% Solids: 84.6%

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	11.1	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SD-02-0401

Lab Name: BROOKS RAND LTD Contract: GCTR-99-700-1798

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00B12762-08

Level (low/med): _____ Date Received: 06/09/00

% Solids: 77.0

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	19.5	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 SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-178 SD-13-040

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR262-10

Level (low/med): _____ Date Received: 06/09/00

% Solids: 80.7%

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	14.3	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

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298 SD-11-04

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR262-12

Level (low/med): _____ Date Received: 06/09/00

% Solids: 82.5%

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	24.5	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 SAMPLE: SD-09-04

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-128

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00B2262-14

Level (low/med): _____ Date Received: 06/09/00

% Solids: 85.8%

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	22.6	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-99-700-1298 SD-08-040

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR262-16

Level (low/med): _____ Date Received: 06/09/00

% 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	11.8	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1798 SD-06-04-9

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR262-18

Level (low/med): _____ Date Received: 06/09/00

% Solids: 82.4%

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	52.8	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

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:	00BR262 & 268
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

Nine water samples and nine soil samples were received at 08:30 on 06/09/00. The samples arrived in a cooler with ice, at 6.2°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 00BR262.

Six water samples and seven soil samples were received at 10:00 on 06/10/00. The samples arrived in a cooler with ice, at 2.6°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 00BR268.

Storage and Preservation

The samples were preserved and stored in accordance with method requirements.The first shipment of aqueous samples was received outside the required temperature range for EPA Method 1631. All samples were oxidized prior to the 28 day holding time required in the statement of work.

Mercury Analysis

The samples from the two shipments were analyzed in two analytical batches #00-191 for aqueous samples and #00-189 for soil samples.

Batch #00-191: 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 06/26/00. They were prepared following sections 11.1.1.1 and 11.1.1.2 of EPA Method 1631, as appropriate.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was performed on 07/10/00.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix spike duplicate set was performed on sample SW-01-04Q and sample SW-11-04Q. EPA Method 1631 requires precision to be measured by MS/MSD as opposed to Method Duplicates. All method QA criteria were met. All field sample results have been blank corrected as required in the calculations section of EPA Method 1631.

Batch #00-189: Total mercury in soil, proprietary BRL Method BR-0002
This batch includes all soil samples from the two shipments.

Preparation: The samples were prepared on 07/06/00. They were prepared by refluxing in a 7:3 mixture of nitric acid and sulfuric acid, followed by the addition of BrCl.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was performed on 07/07/00.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix duplicate set was performed on sample SD-05-04Q and on sample SD-11-04Q. Measurement of duplicate precision for sample SD-05-04Q fell outside the 35% method criterion, however the sample results fell below 5X the PQL, therefore qualification of the data was not applied. 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 _TTNUS03b: Water sample data

M_TTNUS03b: 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

U.S. EPA - CLP

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab: BROOKS RAND LTD.

Contract: GCDB-99-700-1298

Case No.: _____

SAS No.: _____

SDG No.: _____

Date: 1/18/00

Number: _____

AA ID Number: _____

AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL ~~(ug/L)~~ ng/L	IDL (ug/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		2 ~~0.2~~	0.2	
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

ILM03.0

FORM X - IN

U.S. EPA - CLP

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab: BROOKS RAND LTD.

Contract: GCDB-99-700-1298

Case No.: _____

SAS No.: _____

SDG No.: _____

Date: 01/28/00

ICP Number: _____

CVAA ID Number: _____

GFAA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	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		0.2	0.75	
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

ILM03

FORM X - IN

BROOKS RAND, LTD.

3950 6th Ave. NW/ Seattle, WA, 98107 / phone (206) 632-6206 / fax (206) 632-6017

BRL Client: Tetra Tech NUS		Phone#: 610 491 9688			Analysis R quested					TAT:
Client Contact: Garth Glenn		PO#:			250 ml Glass Ultra Pure Mercury	202 Glass Ultra Pure Mercury				Deliverables (circle one)
Client Project #: CTO 252		BRL Project #: TTI 007								Standard / Full / Other
#	Sample ID	Date	Time	Matrix						Comments
1	SW-05-04Q	6/8/00	1248	SW	1					
2	SD-05-04Q	6/8/00	1252	SD		1				
3	SW-04-04Q	6/8/00	1317	SW	1					
4	SD-04-04Q	6/8/00	1323	SD		1				
5	SW-03-04Q	6/8/00	1449	SW	1					
6	SD-03-04Q	6/8/00	1455	SD		1				
7	SW-02-04Q	6/8/00	1512	SW	1					
8	SD-02-04Q	6/8/00	1517	SD		1				
9										
10										

Relinquished by: (signature) Charles Meyer	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Printed Name: Charles Meyer	Printed Name:	Printed Name:	Printed Name:
Company: Tetra Tech NUS	Company:	Company:	Company:
Time/Date: 6/8/00 1940	Time/Date:	Time/Date:	Time/Date:
Special Instructions/Comments:		Relinquished by: (signature)	Received by: (signature)
		Printed Name:	Printed Name: Stephanie Mandin
		Company:	Company: BRL
Carrier/Airbill #: Federal Express 8183 3288 1965		Time/Date:	Time/Date: 08:30 06/09/00

Pl ase Fax COC to BRL on day of shipm nt & include in shipment

BROOKS RAND, LTD.

3950 6th Ave. NW/ Seattle, WA, 98107 / phone (206) 632-6206 / fax (206) 632-6017

BRL Client: Tetra Tech NUS		Phone#: 610 491 9688			Analysis Request d					TAT:
Client Contact: Garth Glenn		PO#:								Deliverables (circle one)
Client Project #: 010-252		BRL Project #: TTI007								Standard / Full / Other
#	Sample ID	Date	Time	Matrix	250ml glass ultra pure Mercury	202 glass ultra pure Mercury				Comments
1	SW-13-04Q	6/8/00	0915	SW	1					
2	SD-13-04Q	6/8/00	0924	SD		1				
3	SW-11-04Q	6/8/00	1007	SW	3					DO MS/MSD
4	SD-11-04Q	6/8/00	1017	SD		2				DO MS/MSD
5	SW-09-04Q	6/8/00	1045	SW	1					
6	SD-09-04Q	6/8/00	1049	SD		1				
7	SW-08-04Q	6/8/00	1110	SW	1					
8	SD-08-04Q	6/8/00	1112	SD		1				
9	SW-06-04Q	6/8/00	1201	SW	1					
10	SD-06-04Q	6/8/00	1205	SD		1				

Relinquished by: (signature) Charles Mayer	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Printed Name: Charles Mayer	Printed Name:	Printed Name:	Printed Name:
Company: Tetra Tech NUS	Company:	Company:	Company:
Time/Date: 6/8/00 1940	Time/Date:	Time/Date:	Time/Date:
Special Instructions/Comments:		Relinquished by: (signature)	Received by: (signature) Stephanie Mandino
		Printed Name:	Printed Name: Stephanie Mandino
		Company:	Company: BRL
Carri r/Airbill #: Federal Express 8183 3788 1965		Time/Date:	Time/Date: 08:30 6/09/00

Pl as Fax COC to BRL on day of shipment & includ in shipm nt

119

Tetra Tech NUS, Inc.

INTERNAL CORRESPONDENCE

PHIL-14444

TO: GARTH GLENN

DATE: August 4, 2000

FROM: JAMES LUCCHESE

COPIES: FILE

SUBJECT: INORGANIC DATA VALIDATION – TOTAL MERCURY
CTO252, NAWC WARMINSTER, PENNSYLVANIA
SDG NO. 00BR268

SAMPLES:

10/Aqueous

1213-060900	SW-21-04Q
SW-01-04Q	
SW-07-04Q	
SW-10-04Q	
SW-12-04Q	

9/Solid

SD-01-04Q	SD-21-04Q
SD-07-04Q	
SD-10-04Q	
SD-12-04Q	

OVERVIEW

The sample set for the CTO252, NAWC Warminster, PA, LAB ID 00BR268, consists of 5 aqueous environmental samples, (designated SW), one rinsate blank, (designated 1213-), and 5 solid environmental samples, (designated SD-). All samples were analyzed for total mercury. Two field duplicate pairs (SW-07-04Q/SW-21-04Q and SD-07-04Q/SD-21-04Q) were included in this sample set.

The samples were collected by Tetra Tech NUS, Inc. on June 9, 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. Water and soil sample analysis methods utilized stannous chloride reduction, gold amalgamation, and cold vapor atomic fluorescence spectrometry.

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.

EXECUTIVE SUMMARY

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 Aqueous Samples
CTO252, NAWC Warminster

Sample ID:	1213-060900		SW-01-04Q		SW-07-04Q		SW-10-04Q		SW-12-04Q		SW-21-04Q	
Laboratory ID:	00BR268-13		00BR268-09		00BR268-05		00BR268-03		00BR268-01		00BR268-11	
Sample Date:	6/9/00		6/9/00		6/9/00		6/9/00		6/9/00		6/9/00	
QC Sample Type:	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
Duplicate:					SW-21-04Q						SW-07-04Q	
	RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**	
Mercury	0.0002	U	0.0002	U	0.00082		0.0002	U	0.0180		0.0014	

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

Database source file: D:\WARM_MERCURY_7_21_00\M_TTNUS03B.DBF data retrieved on: 07/21/00

Appendix A
Analytical Results for Soil Samples
CTO252, NAWC Warminster

Sample ID:	SD-01-04Q		SD-07-04Q		SD-10-04Q		SD-12-04Q		SD-21-04Q		SS-01-04Q		SS-02-04Q	
Laboratory ID:	00BR268-10		00BR268-06		00BR268-04		00BR268-02		00BR268-12		00BR268-07		00BR268-08	
Sample Date:	6/9/00		6/9/00		6/9/00		6/9/00		6/9/00		6/9/00		6/9/00	
QC Sample Type:	NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL		NORMAL	
Duplicate			SD-21-04Q						SD-07-04Q					
	RESULT	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**	**RESULT**	**QUAL**
INORGANICS	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Mercury	0.0314		0.0090		0.0097		0.0613		0.0194		0.0423		0.4580	

Data Qualifiers:

Database source file: D:\WARM_MERCURY_7_21_00\M_TTNUS03BSOILS.DBF data retrieved on: 07/21/00

APPENDIX B

Results as Reported by the Laboratory

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 SW-12-049

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: OCBR268-01

Level (low/med): _____ Date Received: 06/10/00

% 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	18.0			
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: 68-D-99-700-1298 SW-10-040

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR268-03

Level (low/med): _____ Date Received: 06/10/00

% 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 SAMPLE: SW-07-04

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: 00BR268-05

Level (low/med): _____ Date Received: 06/10/00

% 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	0.82	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: 68-W-99-700-1798 SW-01-040

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BP768-09

Level (low/med): _____ Date Received: 06/10/00

% 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 SAMPLE No.

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1248 SW-21-04-G

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00B2268-11

Level (low/med): _____ Date Received: 06/10/00

% 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	1.4	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE

Lab Name: BROOKS RAND LTD Contract: GCDB-99-700-1298 1213-060900

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 00BR268-13

Level (low/med): _____ Date Received: 06/10/00

% 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	0.2	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 SAMPLE

Lab Name: BROOKS RAND LTD Contract: EC18-99-700-1298 SD-12-04-03

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR28-02

Level (low/med): _____ Date Received: 06/10/00

% Solids: 88.5%

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	61.3	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

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298 SD-004-01

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00B12768-04

Level (low/med): _____ Date Received: 06/10/00

% Solids: 81.6%

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	9.7	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: SD-07-04G

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: 00BR268-06

Level (low/med): _____ Date Received: 06/10/00

% Solids: 82.2%

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	9.0	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:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE SS-01-04

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: 00BR268-07

Level (low/med): _____ Date Received: 06/10/00

% Solids: 81.3

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	42.3	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 No.: SS-02-040

Lab Name: BROOKS RAND LTD Contract: GCAB-99-TO-1788

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: OOBR268-08

Level (low/med): _____ Date Received: 6/10/00

% Solids: 70.2%

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	4.58			
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: SB-01-04

Lab Name: BROOKS RAND LTD Contract: GCLB-99-700-1798

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 00BR268-10

Level (low/med): _____ Date Received: 06/10/00

% Solids: 77.4%

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	31.4	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:

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE: SD-21-04-Q

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: OOBR268-12

Level (low/med): _____ Date Received: 06/10/00

% Solids: 82.4%

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	19.4	R		
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

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:	00BR262 & 268
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

Nine water samples and nine soil samples were received at 08:30 on 06/09/00. The samples arrived in a cooler with ice, at 6.2°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 00BR262.

Six water samples and seven soil samples were received at 10:00 on 06/10/00. The samples arrived in a cooler with ice, at 2.6°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 00BR268.

Storage and Preservation

The samples were preserved and stored in accordance with method requirements.The first shipment of aqueous samples was received outside the required temperature range for EPA Method 1631. All samples were oxidized prior to the 28 day holding time required in the statement of work.

Mercury Analysis

The samples from the two shipments were analyzed in two analytical batches #00-191 for aqueous samples and #00-189 for soil samples.

Batch #00-191: 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 06/26/00. They were prepared following sections 11.1.1.1 and 11.1.1.2 of EPA Method 1631, as appropriate.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was performed on 07/10/00.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix spike duplicate set was performed on sample SW-01-04Q and sample SW-11-04Q. EPA Method 1631 requires precision to be measured by MS/MSD as opposed to Method Duplicates. All method QA criteria were met. All field sample results have been blank corrected as required in the calculations section of EPA Method 1631.

Batch #00-189: Total mercury in soil, proprietary BRL Method BR-0002
This batch includes all soil samples from the two shipments.

Preparation: The samples were prepared on 07/06/00. They were prepared by refluxing in a 7:3 mixture of nitric acid and sulfuric acid, followed by the addition of BrCl.

Analysis: The samples were analyzed by stannous chloride reduction, gold amalgamation and cold vapor atomic fluorescence spectrometry (CVAFS) detection. Analysis was performed on 07/07/00.

Quality Control: Please refer to the batch specific QA Report. A matrix spike/matrix duplicate set was performed on sample SD-05-04Q and on sample SD-11-04Q. Measurement of duplicate precision for sample SD-05-04Q fell outside the 35% method criterion, however the sample results fell below 5X the PQL, therefore qualification of the data was not applied. 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 _TTNUS03b: Water sample data

M_TTNUS03b: 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

U.S. EPA - CLP

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: BROOKS RAND LTD. Contract: GCDB-99-700-1298

Case No.: _____ SAS No.: _____ SDG No.: _____

Date: 1/18/00

Number: _____

AA ID Number: _____

AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL ~~(ug/L)~~ ng/L	IDL (ug/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		2 ~~0.2~~	0.2	
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

ILM03.

FORM X - IN

U.S. EPA - CLP

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab: BROOKS RAND LTD.

Contract: GCDB-99-700-1298

Case No.: _____

SAS No.: _____

SDG No.: _____

GC: _____

Date: 01/28/00

ID Number: _____

AA ID Number: _____

AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	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		0.2	0.75	
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.

ILM03

FORM X - IN

000

CHAIN OF CUSTODY RECORD

Tetra Tech NUS
Carin Glass 610 491 9688

PROJECT NO.: CTO 252

SITE NAME: NAWC Warminster

SAMPLERS (SIGNATURE): [signature]

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	Aqueous Trichloroethylene with Pure Nitrogen	Aqueous Trichloroethylene with Pure Nitrogen						REMARKS
	6/9/00	0915		✓	SW-12-04Q	1	1							
	6/9/00	0917		✓	SD-12-04Q	1		1						
	6/9/00	1009		✓	SW-10-04Q	1	1							
	6/9/00	1013		✓	SD-10-04Q	1		1						
	6/9/00	1113		✓	SW-07-04Q	1	1							
	6/9/00	1125		✓	SD-07-04Q	1		1						
	6/9/00	1150		✓	SS-01-04Q	1		1						
	6/9/00	1215		✓	SS-02-04Q	1		1						
	6/9/00	1244		✓	SW-01-04Q	1	1							
	6/9/00	1252		✓	SD-01-04Q	1		1						
	6/9/00	1405		✓	SW-21-04Q	1	1							
	6/9/00	1411		✓	SD-21-04Q	1		1						
	6/9/00	1755		✓	RB-060900	1	1							

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
[signature]	6/9/00 1650				
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 8153 3788 1943	
		[signature]	06/10/00 1000		

Order No. 70440 (0693)

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